



**THE BLOCKCHAIN
REVOLUTION 2020**

IN BANKS AND FINANCIAL
INSTITUTIONS

MINDSMITH

**C L I F F O R D
C H A N C E**

AUTHORS



Ruslan Yusufov
Managing Partner,
MINDSMITH



Alexander Anichkin
Partner,
Head of the Russian Tech Group,
Clifford Chance Moscow



Evgeny Soloviev
Counsel,
Tech Group, Clifford Chance
Moscow



Ekaterina Makarova
Senior Associate,
Tech Group, Clifford Chance
Moscow



Ksenia Kasyanovich
Development Director,
MINDSMITH



Gleb Borisov
Analyst,
MINDSMITH

EXPERT PANEL



Ainur Zhanturina
Head of the FinTech Competence
Centre of the Astana
International Financial Centre



Alexey Arkhipov
CEO, QIWI Blockchain
Technologies



Anatoly Konkin
Head of Development of Distributed
Registry Technology, FinTech
Association



Herbert Shopnik
Director of Business
Development, S7
TechLab



Oleg Shibanov
Director of the Centre for Research
on Financial Technologies and
Digital Economy, SKOLKOVO-NES

RESEARCH PARTNERS

MINDSMITH

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We speak the languages of business and technology and can translate from one to the other. This is how we solve the most difficult puzzles.

We have our own Analytics Department and access to the necessary expertise around the world to tailor individual solutions in each particular case.

CLIFFORD CHANCE

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Clifford Chance's Tech Group brings together more than 400 highly skilled specialists worldwide (talkingtech.cliffordchance.com) and is a leader in legal advice on blockchain and other rapidly developing digital technologies. Tech Group specialists have all the knowledge and resources necessary to implement modern high-tech projects.

OPENING STATEMENT 1

More than 20 years ago, Bill Gates said: «Banking services are necessary, but banks are not.»

Financial institutions are under enormous pressure today: the needs of new, digitally savvy, generations of customers are changing, compliance with business rules requires more and more expense, and innovative fintech projects are targeting a significant piece of the pie.

Financial institutions understand that they must change. That being said, the changes may affect not only product offerings, but may also lead to a significant change in the roles of organisations themselves.

We cannot look behind the scenes of the research and development departments of financial institutions, because this is a trade secret. But based on various indirect signs, we can draw conclusions about where these structures see themselves in five-ten years.

When it comes to digital transformation, we can generally assume several scenarios: you can come up with an innovative solution yourself; you can buy it on the market; or you can buy a company with all its innovations and best practices.

Taking into account these three scenarios, we analysed the work with blockchain technology in the world's largest financial institutions. We studied their patents and patent applications («come up with it yourself»), their case studies («buy on the market»), and their investments («buy a company»).

In this study, we discuss what such attempts by financial institutions to «reinvent» themselves might lead to: what new roles they might play, what markets might appear, and how the balance of power in the financial industry might change.



Ruslan Yusufov

Managing Partner
of MINDSMITH

OPENING STATEMENT 2

Blockchain as a technological phenomenon is actively embraced by many organisations that have moved over the last couple of years from a position of scepticism about the technology to a position of searching for its advantages and opportunities for its practical implementation in business or everyday life.

Despite the fact that the legal regulation of blockchain-based products and services lags behind the pace of development of the technology itself, such regulation already exists, in one form or another, in many developed legal systems. The widespread use of blockchain and its application value in the digitalisation of the modern world is quite obvious, although the degree of its practical implementation depends on many factors, including the applicable regulatory requirements that must be met. Legislation on the protection of personal data, regulation of the activities of organisations operating in the financial sector (banks, payment systems, bidding process organisers, etc.), control over the prevention of money laundering and financing of terrorism, licensing, certification, and registration are examples of regulatory requirements that should not be forgotten when developing any product or service. Blockchain and blockchain-based technology solutions and products are no exception.

In this regard, it is very important to have at least a general idea of the potential legal problems which the developer may face and which, with professional legal assistance, can be resolved successfully.



Alexander Anichkin

Partner,
Head of the Russian Tech Group,
Clifford Chance Moscow

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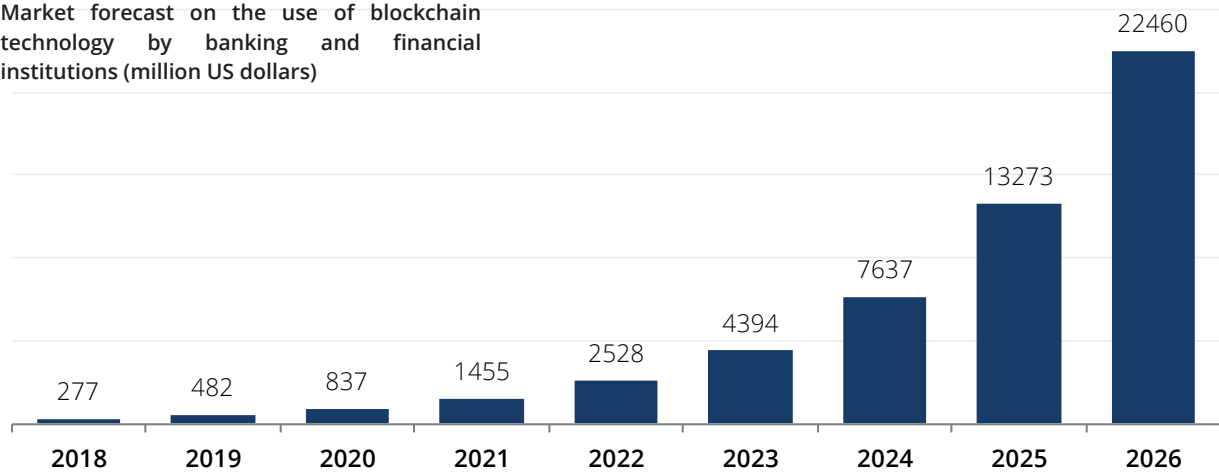
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1. PREFACE

Market forecast on the use of blockchain technology by banking and financial institutions (million US dollars)



Source: Allied Market Research. Blockchain in BFSI Market Statistics, 2019.

In the 11 years since the first block of the bitcoin network¹ was mined, blockchain technology has experienced bursts of mass hype and dramatic drops in popularity. Today, however, blockchain is recognised, not without reason, as a disruptive technology, and its application has encompassed almost all industries – from agriculture and medicine to the financial sector.

At the beginning of its development, blockchain found a powerful application in one industry – the payments industry. Further research and experimentation by major players have demonstrated that blockchain is much more than the basis for transactions in a «trustless environment». This technology has proven capable of fundamentally changing the processes that underlie financial services. Among large financial institutions, in recent years we have seen a shift from individual projects and scattered testing of technology to thoughtful and systematic development of practical solutions.

We are currently witnessing the formation of industry standards and an industrial approach to the use of blockchain. Solutions appear that cover the entire business chain – from internal organisational processes

to client applications. Given the attention paid to technology, it is no exaggeration to talk about the «blockchain revolution» taking place in financial institutions.

Only the study and use of disruptive technologies such as blockchain will allow the largest financial institutions of the «old world» not to lose their leading positions and remain at the forefront of the development of the financial industry. Thus, according to Allied Market Research, the market for blockchain solutions for banking and financial institutions in 2018 was estimated at US\$ 277 million. It is expected that the market will grow rapidly and will reach US\$ 22.46 billion by 2026, growing at an average rate of 74% per year.

Within the framework of this study, the activity of financial institutions in relation to blockchain was analysed in three possible formats of interaction with the technology:

- practical implementation of blockchain in real-life scenarios;
 - patenting of blockchain inventions;
 - investments in companies working with blockchain technology (hereinafter referred to as «blockchain companies»).
- The study focused on 234 organisations, including major

banks, payment systems, insurance companies, diversified financial institutions and organisations working with securities (hereinafter referred to as «Financial Institutions»), the choice of which was based on the methodology of the Fortune 500 and Fortune Global 500 ratings. A detailed methodology for collecting data, selecting, and defining categories of organisations is provided in the «Methodology» section.

The task of the research group was to identify:

- leading Financial Institutions in the application of blockchain technology;
- main formats of interaction of Financial Institutions with blockchain technology;
- geographical centres of the blockchain revolution in Financial Institutions; and
- global trends and regional features of Financial Institutions' interaction with blockchain technology.

The research team also focused on identifying global trends in the use of the technology and on determining the impact of blockchain on the transformation of business models of the world's largest Financial Institutions.

¹ Eleven years ago, on 3 January 2009, Satoshi Nakamoto launched the bitcoin network when the first (genesis) block of bitcoin and the first 50 BTC were mined. Six days later, on 9 January 2009, after the appearance of the genesis block, the release of Bitcoin V. 0.1 was published and, three days later, the first transaction was made on the network – Satoshi Nakamoto sent bitcoins to Hal Finney, an American programmer and crypto activist.

2. KEY CONCLUSIONS

1 THE INTEREST OF FINANCIAL INSTITUTIONS IN BLOCKCHAIN IS NOT FADING, BUT THE FORMAT OF INTERACTION WITH THE TECHNOLOGY IS CHANGING

The intensity of interaction with the technology is growing every year. While from 2017 to 2019 the main priority was to study blockchain in practice, in 2019 there was a shift in focus on patenting inventions.

The problems that Facebook and Telegram faced could have played a role in this – Financial Institutions are cautious, as they are afraid of regulatory risks. In addition, the blockchain projects launched may fall short of commercial expectations. Nevertheless, Financial Institutions do not want to lag behind in the «blockchain

arms race» and want to take their place in the emerging markets of blockchain solutions, which explains the increase in scientific research and the transition to more closed formats of interaction with the technology.

Thus, the «blockchain revolution» continues and moves to a qualitatively new level, despite the decrease in the number of public blockchain projects. The world's largest Financial Institutions continue to actively work with this technology, investing both time and money in it.

2 VARIOUS GROUPS OF FINANCIAL INSTITUTIONS ARE BEING FORMED WITH THEIR OWN PREFERENCES REGARDING THE FORMATS OF INTERACTION WITH BLOCKCHAIN

Among them, there are **the Scientists** (they focus on patenting inventions), **the Practitioners** (they prefer to invest and apply blockchain in practice), **the Flagships** (they have chosen a cross-blockchain approach and actively interact with the technology in all possible

formats), as well as **the Followers** (they have not yet chosen the main format of interaction for themselves). The question remains as to which format of interaction with the blockchain technology will be most effective.

3 WE CAN EXPECT INCREASED COMPETITION BETWEEN US AND CHINESE FINANCIAL INSTITUTIONS IN THE USE OF BLOCKCHAIN TECHNOLOGY

Among the four Flagships was a Chinese bank. This is the expected result of the explosive growth of interest in blockchain in China and the inclusion of blockchain as one

of the main components of the country's technological infrastructure of interest to the Chinese Communist Party.

4 COUNTRIES KNOWN FOR WIDESPREAD SUPPORT FOR THE USE OF BLOCKCHAIN AND CRYPTOCURRENCIES WERE NOT AMONG THE LEADERS

For example, Switzerland, Estonia, Australia and South Korea are not among the leaders.

5 THE USA IS THE CENTRE OF THE «BLOCKCHAIN REVOLUTION»

By 2020, the main hotbeds of the «blockchain revolution» in the world's largest Financial Institutions are the United States, China, Japan, France and Canada.

6 TECHNOLOGICAL CHANGES CAN HAVE AN IMPACT ON INTERNATIONAL FINANCIAL CENTRES

Not all traditional financial centres are among the technology leaders. For example, Switzerland and the United Kingdom are lagging behind the hotbeds of the «blockchain revolution» in the study of blockchain. Moreover, lagging financial centres that publicly declare

broad support for the development of blockchain technology, such as Switzerland, may in the future turn from global financial hubs into incubators of innovative startups, whose products can be absorbed by competing Financial Institutions from other countries.

7 DIFFERENT COUNTRIES HAVE THEIR OWN APPROACH TO STUDYING AND IMPLEMENTING BLOCKCHAIN

While Financial Institutions in China and Canada prefer internal research and patenting of blockchain inventions,

Japanese and French Financial Institutions have chosen to invest in blockchain startups.

8 COMPETITION WILL INTENSIFY AND THE BOUNDARIES BETWEEN FINANCIAL INSTITUTIONS WILL CONTINUE TO BLUR

The world's largest banks have clearly demonstrated that they do not plan to stay clear of the «blockchain revolution» and, if necessary, are ready to innovate and «reinvent» themselves. However, these efforts by the banks do not guarantee them technological and blockchain leadership: other Financial Institutions are breathing down their necks.

Today, the banking industry and traditional major players from other Financial Institutions are under significant pressure. On the one hand, tight regulation of the financial sector and the compression of the interest rate

spread in most developed countries have led to a general decrease in the marginality of the banking business. On the other hand, competition from non-traditional players has grown considerably in recent years. While banks previously had to fight for customers with other banks, now, after the blurring of the borderline between banks and fintech companies, in addition to innovative startups that are traditionally called «disruptors» (which means innovators who think unconventionally), major fintech service providers are actively involved in the fight for market share.

9 DIFFERENT INDUSTRIES HAVE DIFFERENT APPROACHES TO THE STUDY AND IMPLEMENTATION OF BLOCKCHAIN

Banks are leaders in the engagement and support of blockchain technology and are the most active in the practical implementation of blockchain solutions. Payment systems and fintech service providers prefer patenting to the practical implementation of blockchain technology

and investments in blockchain companies. Insurance companies are less active in the patenting of blockchain inventions and prefer to invest in blockchain companies and the practical implementation of the technology.

10 INVESTING IN BLOCKCHAIN COMPANIES IS A WAY TO JUMP ON THE OUTGOING TRAIN

After a decrease in the number of public blockchain projects in 2017-2019, a number of countries saw a surge in investment in blockchain companies. Apparently, for countries such as Japan, Spain and the United Kingdom, direct investment in blockchain startups is becoming

a way to jump on the outgoing train of the «blockchain revolution» of Financial Institutions and ensure that they are not relegated to the sidelines. Such a scenario may become a reference point for other countries and Financial Institutions.

11 FUTURE MONOPOLISTS ARE BEING FORMED AT THE COUNTRY LEVEL

Sberbank in Russia, the State Bank of India and ING Group in the Netherlands are examples of companies that single-handedly put their countries among the leaders in the use and study of blockchain. Such Financial Institutions may

eventually become fintech monopolists in their countries and begin to capitalise on their position and local market knowledge.

12 THE INFORMATION SECURITY SCENARIO IS COMING TO THE FORE, REPLACING THE ISSUES OF TRANSACTION PROCESSING

Blockchain application scenarios related to information security have recently become the most widespread. Apparently, areas related to data security are viewed by banks as critical. We can assume that after the build-up of internal blockchain expertise in terms of information

security, banking organisations may decide to deal with AML/CFT procedures (combating money laundering and terrorist financing) and information security strictly in-house, using blockchain technology.

13 PAYMENT SYSTEMS ARE SHAPING THE MARKET FOR CROSS-BLOCKCHAIN SOLUTIONS

The active development of new blockchain solutions by various Financial Institutions creates a need for cross-blockchain solutions and infrastructures that will act as intermediaries between families of solutions. We found that major players in the payment system market are aware of the emerging need and are actively working on projects dedicated to interoperability (i.e. the ability

to interact). These companies, which have traditionally acted as intermediaries and mediators in the financial markets, are now ready to continue this activity in the emerging market of cross-blockchain solutions, which may be occupied by large payment systems even before it is explicitly shaped.

14 THE INFORMATION SECURITY MARKET MAY UNDERGO SIGNIFICANT CHANGES

In connection with investments in their own solutions, Financial Institutions may gradually abandon a number of third-party services in the field of information security. We may see attempts by banks to enter this market independently as vendors of such solutions. Financial Institutions have significantly more expertise in the field

of finance and, together with internal expertise and their own information security solutions, this threatens external providers with the loss of market share and the emergence of new competitors. Such scenarios should be considered both by information security solution providers and blockchain solution vendors.

15 PAYMENT SYSTEMS MAY BECOME GLOBAL PROVIDERS OF BLOCKCHAIN PAYMENT INFRASTRUCTURE PLATFORMS

Payment systems and fintech service providers are actively working with alternative blockchain-based payment solutions. We discovered a significant number of developments related to the creation of fundamentally new payment infrastructures that go beyond the usual framework of transactions in fiat currencies and cryptocurrencies. Mastercard, Visa and PayPal were

announced as members of the Libra Association in June 2019. Apparently, we are seeing the formation of a new market in which leading Financial Institutions are actively seeking to take their place. In the future, such developments will open the way for these Financial Institutions to form international blockchain payment infrastructure platforms.

16 INSURANCE COMPANIES MAY BECOME DRIVERS OF TECHNOLOGY ADOPTION IN VARIOUS INDUSTRIES

It is possible to predict the appearance of proposals by major insurance companies to create multi-industry identification platforms. Insurance companies themselves may act as integrators of such blockchain solutions and may introduce boxed identification blockchain systems to the market. Companies in almost every industry use insurance

and reinsurance services. If insurance companies become drivers of mass adoption of boxed blockchain solutions, the «blockchain revolution» will quickly spread to related industries, such as medicine and logistics. This, in turn, may open up new market opportunities for blockchain vendors and traditional system integrators.

17 THE FIRST RESULTS OF THE «BLOCKCHAIN REVOLUTION» MAY APPEAR IN THE INSURANCE INDUSTRY

The analysis of the activity of insurance and reinsurance companies in the context of blockchain technology has revealed a special interest of this category of Financial Institutions in the automation of the entire life cycle of insurance operations using smart contracts, as well as in technologies of sovereign identity and tokenisation of identification data – from customers' data to medical

data of insurance policy holders. The insurance market is characterised by a high level of opacity and high risks of fraud, as well as by a large number of easily unified and digitalised operations. It is quite possible that we will see the first results of the «blockchain revolution» in the insurance industry.

18 FINANCIAL INSTITUTIONS WILL START COMPETING WITH TECHNOLOGY COMPANIES IN THEIR FIELD

The prospect for major payment systems and fintech service providers to become vendors of infrastructure blockchain platforms raises the question about the future position of blockchain platform providers such as

Microsoft, IBM and SAP. Mastercard may not be the new Microsoft in the market for cross-blockchain infrastructure platforms, but traditional IT players will certainly have to make room.

3. FOCUS ON AND DYNAMICS OF INTEREST IN BLOCKCHAIN

1 THE INTEREST OF FINANCIAL INSTITUTIONS IN BLOCKCHAIN IS NOT FADING, THOUGH THE FORMAT OF INTERACTION WITH THE TECHNOLOGY IS CHANGING

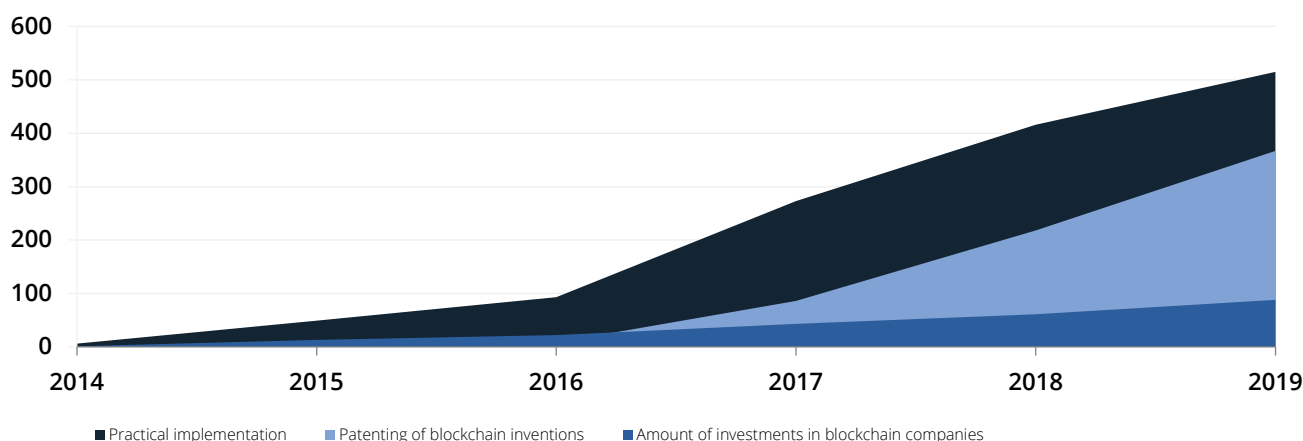
The intensity of interaction with the technology is growing every year. If, from 2017 to 2019, priority was basically given to the practical study of blockchain, the focus shifted to invention patenting in 2019.

This might have been due to the challenges faced by Facebook and Telegram. Being concerned with regulatory risks, Financial Institutions are cautious. Besides, the blockchain projects launched may fall short of commercial expectations. Nevertheless, Financial Institutions do not want to be left behind in the blockchain arms race and

are eager to carve out a niche in the emerging markets of blockchain solutions, which explains the growth of scientific developments and the transition to more closed formats of interaction with the technology.

Therefore, the «blockchain revolution» continues and moves to a qualitatively new level, despite the decreased number of public blockchain projects. Major global Financial Institutions continue to work actively on the technology, investing time and money in it.

Breakdown of the formats of interaction with blockchain technology used by Financial Institutions



Source: MINDSMITH, Clifford Chance, 2020. «The Blockchain Revolution in Banks and Financial Institutions»

The formats of blockchain technology interaction used by Financial Institutions are as follows:

- blockchain implementation in real case scenarios;
 - patenting of blockchain inventions;
 - investments in blockchain companies.
- Financial Institutions are becoming more active in using the technology. We discovered that, in the period from 2014 to 2019, the aggregate number of practical uses of blockchain, patents taken out, and patent applications filed in relation to blockchain inventions and

investments in blockchain companies increased, on average, by 168%.

Over the same period, average annual growth equalled:

- in the case of practical blockchain implementation, 144%;
- in the case of patents and patent applications filed in relation to blockchain inventions, 226%;
- in the case of investments in blockchain companies, 145%.

However, against the background of the cryptocurrency market collapse and the fading interest of the world community in blockchain technology, 2018 also showed a significant

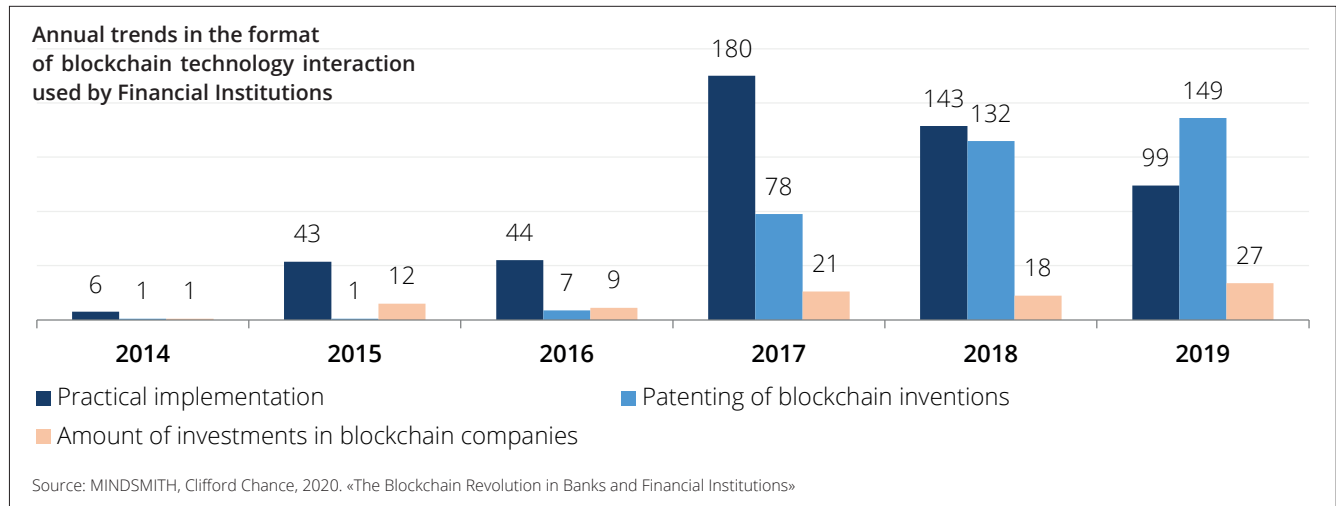
slowdown in the number of the technology implementations, patents taken out, and investments made in blockchain companies by Financial Institutions. We discovered that, while in 2017 the growth rate was 298%, in 2018 and 2019 it slowed to 73% and 40%, respectively.

At present, the main format of blockchain technology interaction used by Financial Institutions is implementation. However, following the surge in interest in blockchain shown by Financial Institutions in 2017, after the cryptocurrency market collapse in 2018 the number of new

blockchain solution implementations by Financial Institutions gradually decreased. At the same time, the focus of Financial Institutions notably shifted from blockchain implementation to blockchain

invention patenting. The positive trends in various blockchain interaction formats used by Financial Institutions are supported by the forecast of Allied Market Research² on the aggressive

growth of the global blockchain solution market for banking and Financial Institutions in the period from 2019 to 2026, with an average growth of 73.8%.



In 2018, it became known that Facebook is engaged in the development of its own cryptocurrency. Facebook and its partners presented the Libra Project in June 2019, and its launch was scheduled for the first half of 2020. Libra is intended to be based on a basket of real currencies. For the purposes of the project development, the company created a consortium composed of Mastercard, Visa, Spotify, PayPal, eBay, and other financial and technology companies.

This Facebook project aroused the concerns of the US regulators. In particular, concerns were expressed that Libra could be used for money laundering and will cause financial instability. The US regulators also pointed out that Facebook has an ambiguous reputation in respect of its ability to maintain the confidentiality of users' personal data.

On 23 October 2019, Mark Zuckerberg assured the Congress that the company would not launch Libra until

it has been approved by all US regulators, though, at that time, PayPal, Visa, Mastercard, eBay, Stripe and Mercado Pago had left the Libra Association.

Libra management had to give up many of its initial concepts due to regulatory pressure. However, in 2020, the project is still moving forward. At the end of April 2020, Facebook announced that by the end of the year it plans to engage 50 experts to continue the development of the Libra stablecoin. In May 2020, Temasek Holdings, a Singaporean state-owned investment company, and Paradigm, a cryptocurrency-focused investment firm, announced that they were joining the Libra Association, and Stuart Levey, the former first Under Secretary of the US Treasury, was appointed as the first CEO of the Libra Association, a non-profit entity engaged in the development of the future cryptocurrency infrastructure on behalf of Facebook.

In December 2017, it became known that Telegram plans to launch a blockchain platform and issue its own cryptocurrency. The company conducted an ICO to finance the development of a new blockchain platform which was named the Telegram Open Network (TON).

The offering was conducted in two stages, each of which allowed US\$ 850 million to be raised. As at April 2018, the company announced that it had managed to raise US\$ 1.7 billion under the ICO.

Telegram Group Inc. was sued by the U.S. Securities and Exchange Commission two weeks prior to the planned offering of the Gram token. On 11 October 2019, the SEC

filed a claim in connection with the alleged unregistered offering of digital tokens in the USA. According to the Commission, the project token should be regarded as a security and the recent ICO as an illegal placement of securities. Despite the fact that Telegram Group Inc. challenged this judgment, on 10 January 2020, the U.S. Securities and Exchange Commission submitted proof of funds raising through intermediaries after the completion of the main stage of the Gram token placement. On 12 May 2020, Pavel Durov announced that Telegram was stopping its active participation in TON. A decision is currently pending on returning payments to the investors.

² Allied Market Research. "Blockchain in BFSI Market Statistics", 2019.



Gerbert Shopnik
Director of Business
Development, S7 TechLab

Financial institutions continue to invest in the technology and the majority of blockchain teams did not stop their development activities. If, in the past, blockchain projects were given wide coverage at the first opportunity, nowadays Financial Institutions are primarily confronted with the task of showing operable solutions with measurable performance. In addition, the increasing competition is having its

effect on the market. Many banks are developing similar solutions based on blockchain technology in factoring, bank guarantees, B2B and interbank payments. Therefore, the results are not generally disclosed until highly effective pilot projects have been developed. The blockchain hype has gone and just talking about blockchain without any results will no longer be taken seriously.



Oleg Shibanov
Director of the Centre
for Research on Financial
Technologies and Digital
Economy, Skolkovo-NES

In isolation from specific business tasks, blockchain has no inherent content that could drastically distinguish this technology from other innovations. Work with databases may be organised in a variety of ways, and the fact that Financial Institutions now realise that business tasks may be dealt with efficiently using blockchain technology is undoubtedly a positive sign. If, in the past, blockchain applications were easily sold for the purposes of business rescue, at present large companies understand that such technology is not a panacea for all the problems, but a specific tool permitting specific tasks to be addressed. The fact that Financial Institutions have come to

understand the scope of blockchain application and started to create working prototypes and to patent blockchain inventions means that technology experts have been heard and the market is maturing. Notwithstanding that, companies are sometimes patenting everything that may be related to certain types of activities, at times without thinking of whether such inventions will be used or not. In this regard, patents do not give a full picture of how business processes will be arranged in the future. But the existence of patents is an important sign that an organisation has significant developments in a particular area.



Anatoly Konkin
Head of Development
of Distributed Ledger
Technology, FinTech
Association

The fact that there is less hype around blockchain does not mean that market has lost interest in blockchain. More likely it shows that players have moved from hype to actions and market has become matured enough. At the current stage of development, blockchain projects are being transferred from innovation departments to business units. While the tasks of innovation departments are market development, publicity of the technologies, drawing media

attention, business units give priority to economic effect and risk management and are concerned with media promotion of projects to a lesser extent. This can explain a certain lull: Financial Institutions are busy with implementation of blockchain into their business processes and indisposed so far to make their business plans public especially taking into consideration the importance of intellectual rights protection, including by patents.



Alexey Arkhipov
CEO, QIWI Blockchain
Technologies

Earlier, in the period of blockchain hype, the management of many Financial Institutions was afraid of missing the explosive growth of the market. At that time, companies needed to show their technological leadership and strong market

position. However, the hype is over now and only those organisations that are really interested in the technology have survived in the blockchain market. And, along with small pilot projects, these organisations now offer patentable developments.



Ainur Zhanturina
Head of the Fintech
Competence Centre of
the Astana International
Financial Centre

The increased number of patents issued regarding blockchain technology inventions and the developments made by in-house R&D departments are an evolutionary process and indicate that the technology has reached its maturity. If, in the past, blockchain was perceived as a «toy in the hand of enthusiasts», now it is rightfully considered to be a commercially efficient solution capable of making all business processes much cheaper, faster, and much more transparent.

Public blockchain development cases were triggered by the desire to verify the application value of the technology. And when the concept was generally confirmed, large companies started their in-house development activities and patented such developments in order to secure their competitive advantages. The closer the technology is to commercial use, the more the developers are concerned with the protection of their intellectual property.

4. LEADERS AND THEIR PREFERENCES

1 VARIOUS GROUPS OF FINANCIAL INSTITUTIONS ARE BEING FORMED WITH THEIR OWN PREFERENCES REGARDING THE FORMATS OF INTERACTION WITH BLOCKCHAIN

Among them, there are the **Scientists** (with a focus on invention patenting), the **Practitioners** (preferring to invest in and implement the blockchain technology), the **Flagships** (that have chosen a cross-blockchain approach and actively use all possible technology interaction formats) and the **Followers** (that have not yet chosen the main interaction format for themselves). The question remains as to which format of blockchain interaction will be the most effective.

2 WE CAN EXPECT INCREASED COMPETITION BETWEEN US AND CHINESE FINANCIAL INSTITUTIONS IN THE USE OF BLOCKCHAIN TECHNOLOGY

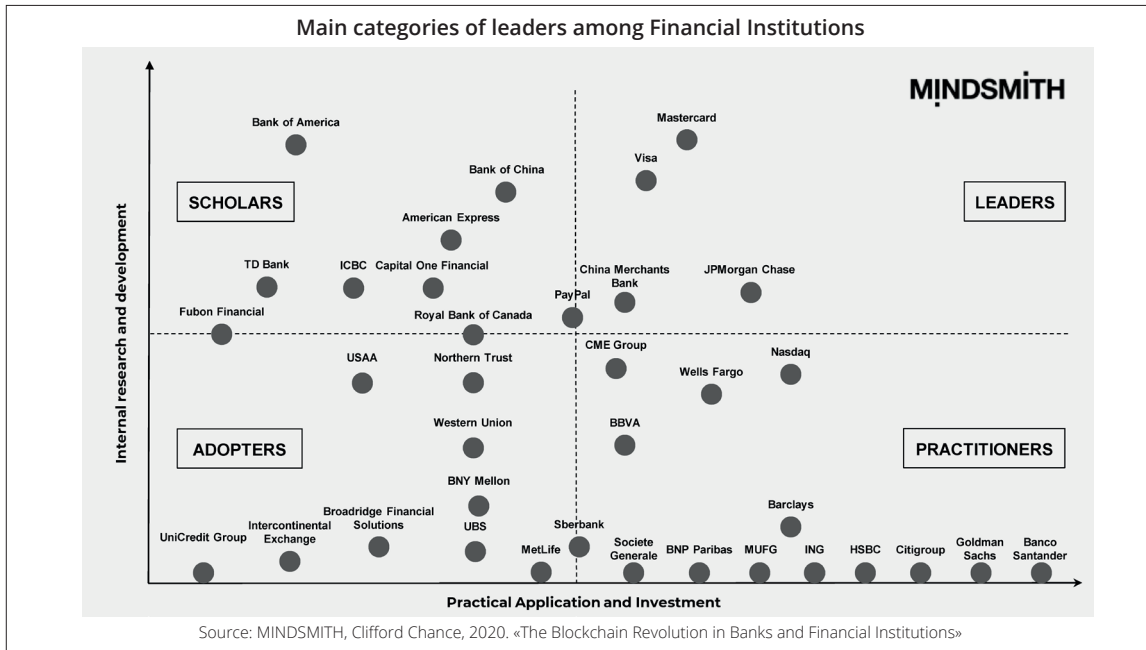
Among the four Flagships is a Chinese bank. This is the expected result of the explosive growth of interest in blockchain in China and the inclusion of blockchain as one of the principal components of the country's technological infrastructure of interest to the Communist Party of China.

In order to identify the main trends in the formats for using blockchain, we have selected 40 leaders among Financial Institutions. All the leaders were studied in terms of their practical activity (examples of technology implementation and investing in blockchain companies) and scientific activity (patenting of blockchain inventions).

We have identified the following four main categories of Financial Institutions.

- **Scientists**, i.e. the companies focused on internal research and development through patenting of blockchain inventions. All the companies of the Scientists group managed to test the blockchain technology in a real-case scenario and proceeded to patenting only after the completion of pilot tests. Among such organisations are the Bank of America, TD Bank and ICBC.
- **Practitioners**, i.e. the companies that prefer investing in blockchain companies and the implementation of blockchain technology. Among them are Wells Fargo, Nasdaq, Citigroup, Barclays and Goldman Sachs.
- **Flagships**, i.e. the Financial Institutions that have chosen the cross-blockchain approach and actively use all possible technology interaction formats. Among them are Mastercard, Visa, JPMorgan and China Merchants Bank. It is worthy of note that these companies are among the most active companies, not only in the context of blockchain study, but also across the entire range of disruptive financial technologies.
- **Followers**, i.e. Financial Institutions that showed a moderate level of activity in studying blockchain technology or have not yet chosen the main technology interaction format. Among them are Western Union, UBS, BNY Mellon and UniCredit Group.

The analysis of the three technology interaction formats used by Financial Institutions (implementation, patenting and investing) showed that the majority of Financial Institutions prefer the blockchain implementation format. Despite this fact, there are Financial Institutions (e.g. the Bank of America, Mastercard, Visa and the Bank of China) that focus on investments in in-house research and development and patent blockchain inventions. This group of Financial Institutions shows a moderate level of activity in blockchain solution implementation and insignificant investments in blockchain companies. In addition, investments in blockchain companies are preferred by those Financial Institutions that have already implemented blockchain solutions and determined the path they will follow in the application of this technology.



Gerbert Shopnik
Director of Business Development, S7 TechLab

The choice of a blockchain interaction model is often based on the company's in-house organisation of business processes used by its blockchain teams. Some companies give priority to the demonstration of products generating profit in the shortest possible period. The policy of other companies permits them to make more investments in long-term research and development. Therefore, the choice of technology

interaction formats depends, to a great extent, on the established historical corporate model. Moreover, many major companies, especially in Russia, have an underdeveloped culture of patenting developments and inventions. In view of the growing competition in the sphere of fintech innovations, this problem will become progressively worse every year.



Alexey Arkhipov
CEO, QIWI Blockchain Technologies

The choice of a technology interaction model depends, to a great extent, on the management position, the maturity of the company, and the company's affordable planning horizon. If the blockchain project pay-back period is limited to a couple of years, the company will be mostly

interested in pilot projects that can be quickly implemented. If a financial institution is in a position to invest in the study of projects which may be implemented in five to seven years, this Financial Institution will have an opportunity to engage in scientific and patenting activity.



Oleg Shibanov
Director of the Centre for Research on Financial Technologies and Digital Economy, Skolkovo-NES

At present, the point in question is not so much the competition between the USA and China, as the beginning of a technological war. Some countries are drafting laws that may impose restrictions on the interaction of countries in the field of artificial intelligence and other innovation technologies. It is reasonable to expect that stringent prohibitions will be imposed on the transfer of any fintech-related technologies.

Despite China's leadership in certain areas, when the USA commences to seriously invest in such areas it will be difficult for China to maintain its leading position and it will be more and more difficult to commercialise and sell solutions abroad. Reduction of the consumers group for testing innovation solutions, which is clearly illustrated by the Huawei example, will not allow such companies to maintain technological leadership.

5. GEOGRAPHICAL HOTBEDS AND COUNTRY-SPECIFIC FEATURES

1 USA IS THE CENTRE OF THE «BLOCKCHAIN REVOLUTION»

By 2020, the main hotbeds of the «blockchain revolution» in the world's largest Financial Institutions are the United States, China, Japan, France and Canada.

2 FUTURE MONOPOLISTS ARE BEING FORMED AT THE COUNTRY LEVEL

Sberbank in Russia, the State Bank of India and ING Group in the Netherlands are examples of companies that single-handedly put their countries among the leaders in the use and study of blockchain. Such Financial Institutions may eventually become fintech monopolists in their countries and begin to capitalise on their position and local market knowledge.

3 TECHNOLOGICAL CHANGES CAN HAVE AN IMPACT ON INTERNATIONAL FINANCIAL CENTRES

Not all traditional financial centres are among the technology leaders. For example, Switzerland and the United Kingdom are lagging behind the countries that are hotbeds of the «blockchain revolution» in the study of blockchain. Moreover, lagging financial centres that publicly declare broad support for the development of blockchain technology, such as Switzerland, may in the future turn from global financial hubs into incubators of innovative startups, whose products can be absorbed by competing Financial Institutions from other countries.

4 COUNTRIES KNOWN FOR WIDESPREAD SUPPORT FOR THE USE OF BLOCKCHAIN AND CRYPTOCURRENCIES WERE NOT AMONG THE LEADERS

For example, Switzerland, Estonia, Australia and South Korea are not among the leaders.

5 DIFFERENT COUNTRIES HAVE THEIR OWN APPROACH TO STUDYING AND IMPLEMENTING BLOCKCHAIN

While Financial Institutions in China and Canada prefer internal research and patenting of blockchain inventions, Japanese and French Financial Institutions have chosen to invest in blockchain companies.

6 INVESTING IN BLOCKCHAIN COMPANIES IS A WAY TO JUMP ON THE OUTGOING TRAIN

After a decrease in the number of public blockchain projects in 2017-2019, a number of countries saw a surge in investment in blockchain companies. Apparently, for countries such as Japan, Spain and the United Kingdom, direct investment in blockchain startups is becoming a way to jump on the outgoing train of the «blockchain revolution» of Financial Institutions and ensure that they are not relegated to the sidelines. Such a scenario may become a reference point for other countries and Financial Institutions.



According to a survey of 600 top managers in 2018, the United States (29%) and China (18%)³ were named among the leaders in the development of blockchain projects. Based on our analysis, Financial Institutions in the United States,

China, Japan, France and Canada interact most actively with blockchain technology. The USA dominates this market. US Financial Institutions are most active in patenting their blockchain inventions. Financial Institutions in

China and Canada give preference to both the patenting of inventions and the practical implementation of technology. Japanese and French Financial Institutions are actively investing in blockchain companies.



Oleg Shibanov
Director of the Centre for Research on Financial Technologies and Digital Economy, Skolkovo-NES

The importance of blockchain as a supporting technology is high, but only for a certain range of tasks. Therefore, blockchain does not play such a radical role for fintech’s development in general. In the landscape of international financial centres, the key aspect is convenience for the end customers of Financial Institutions. The client goes to the place where it is more convenient for it to conduct its business, and innovative technologies certainly help in this. Carefully designed legislation and regulatory support help innovations to be effectively implemented in business activities.

But it is necessary to understand that the models of innovation development differ greatly from country to country. Therefore, global competition is largely determined by the customer orientation of the service provided. From this point of view, we should not overestimate the impact of fintech, blockchain, and other innovative technologies on the customer experience. The degree of protection of modern technologies is relatively limited, so the question of whether large clients of Financial Institutions will prefer innovative solutions to traditional ones remains open.



Alexey Arkhipov
CEO, QIWI Blockchain Technologies

Financial technologies may well change the landscape and role of traditional financial centres, especially if they become widespread, and the greater the number of business processes involved, the greater the influence. Due to its maturity and technological features, blockchain is most effective either for geographically distributed entities, such as the European Union, or where classical banking technologies have not yet become widespread.

Where there is high-quality regulation of flexible technologies, support from the State, and a developed infrastructure for the introduction of new pilot projects and the formation of startups, as, for example, in Switzerland, the need to implement blockchain will probably not arise. Since the main advantage of blockchain is transparency, such a tool may not be so necessary in already transparent systems.

³ PwC. “Global Blockchain Survey 2018”, 2018.



Gerbert Shopnik
Director of Business
Development, S7 TechLab

Switzerland is one of the countries where both legislative and investment initiatives are aimed at developing and implementing fintech innovations. However, the favourable investment climate created in this country often attracts representatives from other countries. The leaders are those countries that are most actively testing and

implementing new technologies. Markets for the exchange of financial assets are moving to where it is most convenient for the end consumer to conduct its business. Therefore, the displacement of the classic financial centres of the «Old World» is, if not the most probable, still quite a possible scenario.



Ainur Zhanturina
Head of the Fintech
Competence Centre of
the Astana International
Financial Centre

There are no obvious reasons why «lagging» countries cannot achieve leading positions in the field of blockchain. To date, the basic principles of the technology and the main areas of blockchain's application are already clear. By itself, this technology is not something exclusive, so countries that are catching up are able to make up for

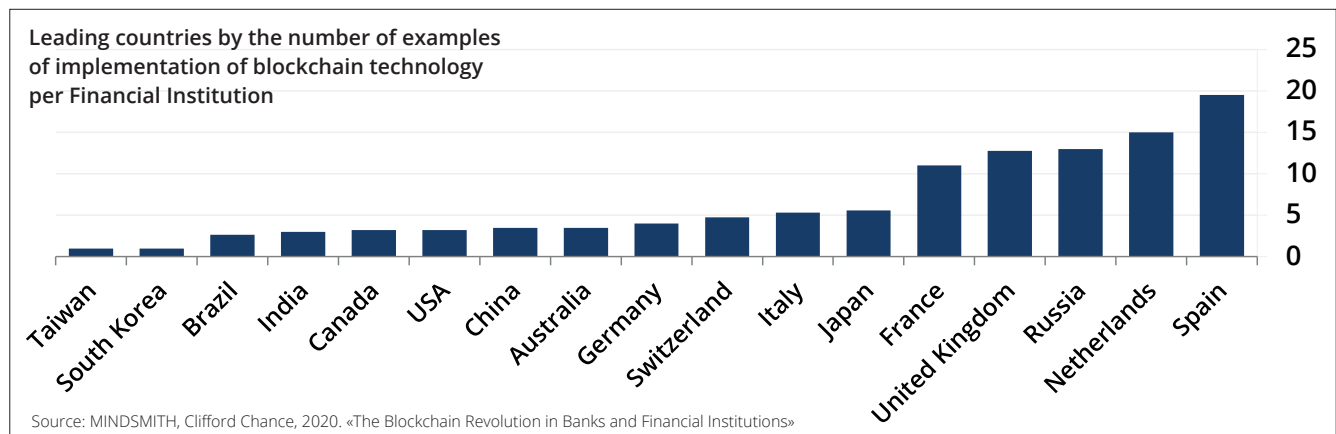
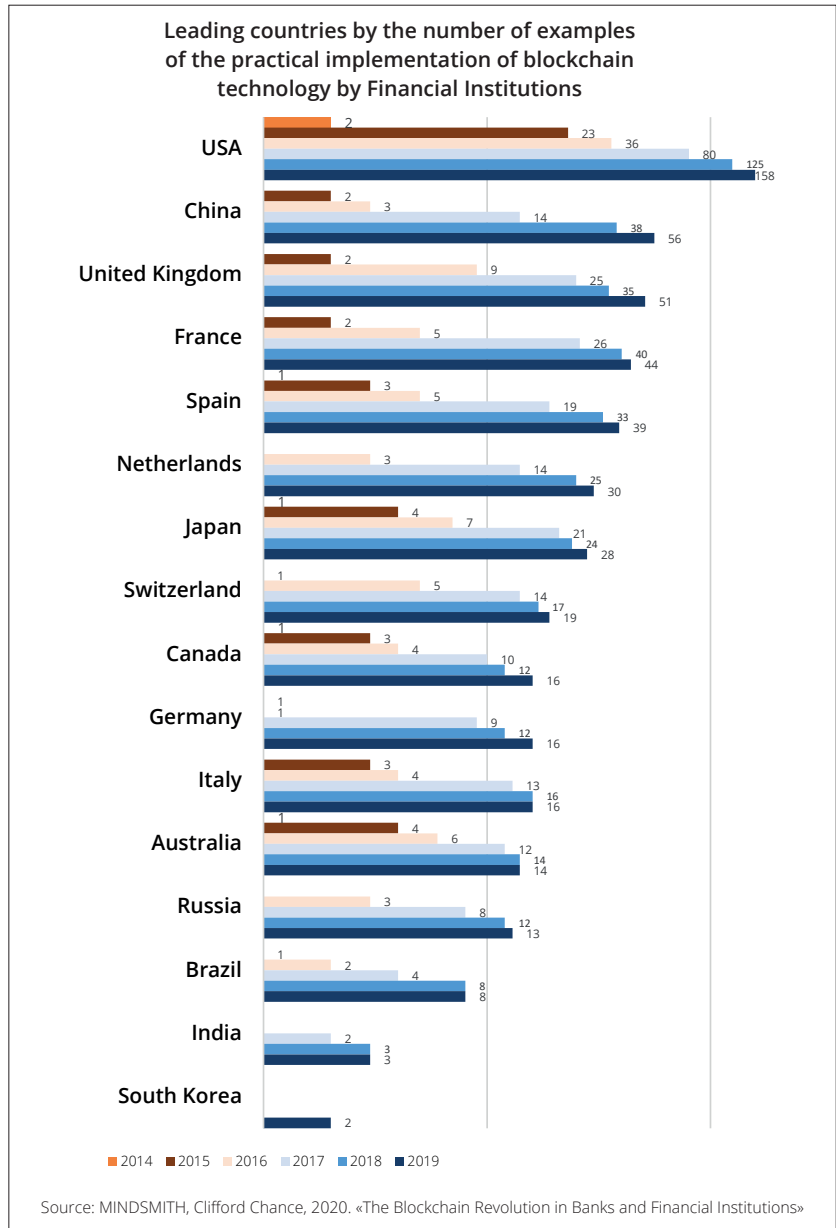
lost development. It is important here that some countries lag behind the leaders of the blockchain revolution in terms of regulation. However, even here, «lagging» countries may use the advantages of «catch-up development», using the successful experience of countries advanced in blockchain and avoiding their mistakes.

5.1 LEADING PRACTITIONERS

In terms of the number of examples of the practical implementation of blockchain technology, Financial Institutions of the United States are ahead of other countries by a significant margin – this country has 158 examples of implementation. Financial Institutions of China (56 examples), Great Britain (51 examples), France (44 examples) and Spain (39 examples) are next, with a slight lag.

The analysis of the absolute number of examples of blockchain implementation, patenting of blockchain inventions, and investments in blockchain companies does not give a clear picture of the activity of Financial Institutions in individual countries, as it is distorted by the uneven distribution of the number of Financial Institutions across countries. We analysed the countries' activity in relative terms and determined how many examples of interaction with blockchain technology are accounted for, on average, by one Financial Institution interacting with blockchain technology in each of the countries.

Thus, the analysis of examples of interaction with blockchain technology per Financial Institution showed that the United States is only in 12th place, with three examples of implementation on average. The leading positions are held by a Financial Institution in Spain (19.5 examples of implementation per Financial Institution) and the Netherlands (15 examples). Thanks to 13 examples of the practical implementation of blockchain technology by Sberbank, Russia was in third place.





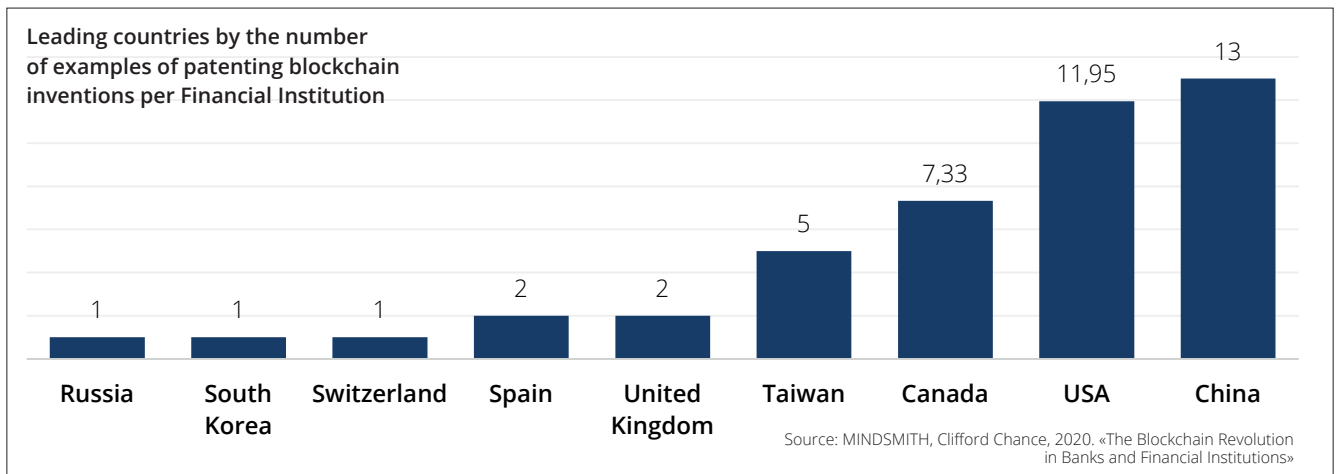
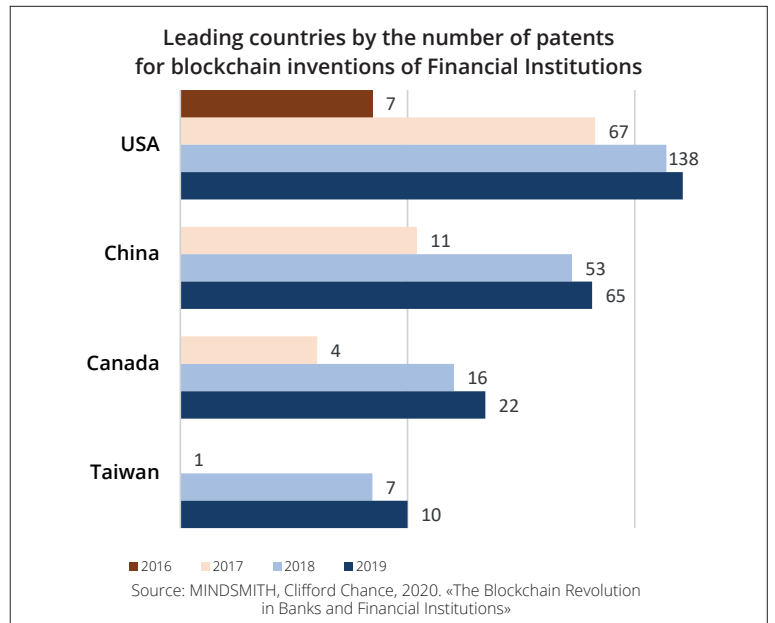
Oleg Shibarov
Director of the Centre for Research on Financial Technologies and Digital Economy, Skolkovo-NES

It is highly likely that many fintech companies will become multinational in the future, and not so much at the expense of the financial sector, but rather at the expense of tech giants. The likelihood of an increase in regulatory restrictions is much higher in the financial industry, so international fintech companies will have a better chance of bypassing local players from among Financial Institutions. Therefore, international tech giants can be expected to have a stranglehold on many local markets.

Most likely, many Financial Institutions will be ready to sell their blockchain solutions. In addition, as a result of government programmes for the development and implementation of innovative technologies, the final market may be occupied by a small number of major players. This market concentration and government attempts to do everything possible to implement fintech will lead to the emergence of several key players who will seek to impose their own conditions on the market.

5.2 LEADING INNOVATORS

In absolute terms, in the field of patenting blockchain inventions, Financial Institutions in the United States also outperform Financial Institutions in other countries by a wide margin. Thus, US Financial Institutions have patented four times more blockchain inventions than Chinese Financial Institutions and 12 times more than Canadian Financial Institutions. Despite this, when recalculating this indicator per Financial Institution that interacts with blockchain technology, it was found that, in relative terms, Chinese Financial Institutions are leading in the field of patenting blockchain inventions. In this country, there are an average of 13 inventions per Financial Institution. US Financial Institutions are slightly behind the leader: 12 inventions on average per Financial Institution.

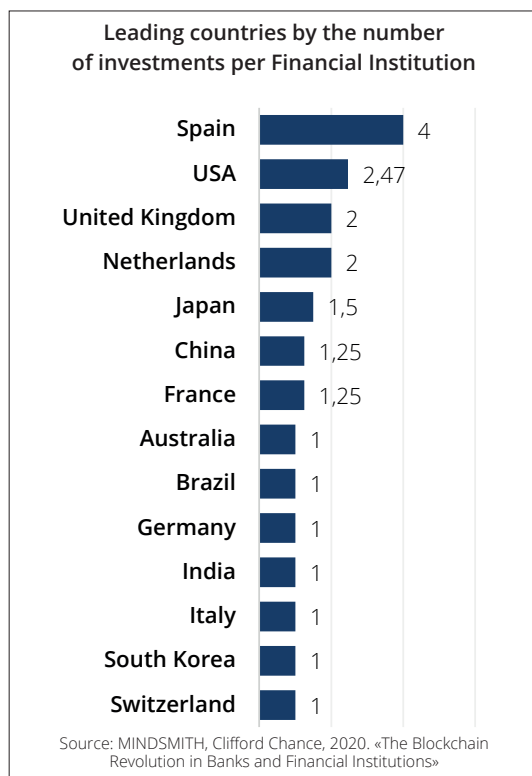
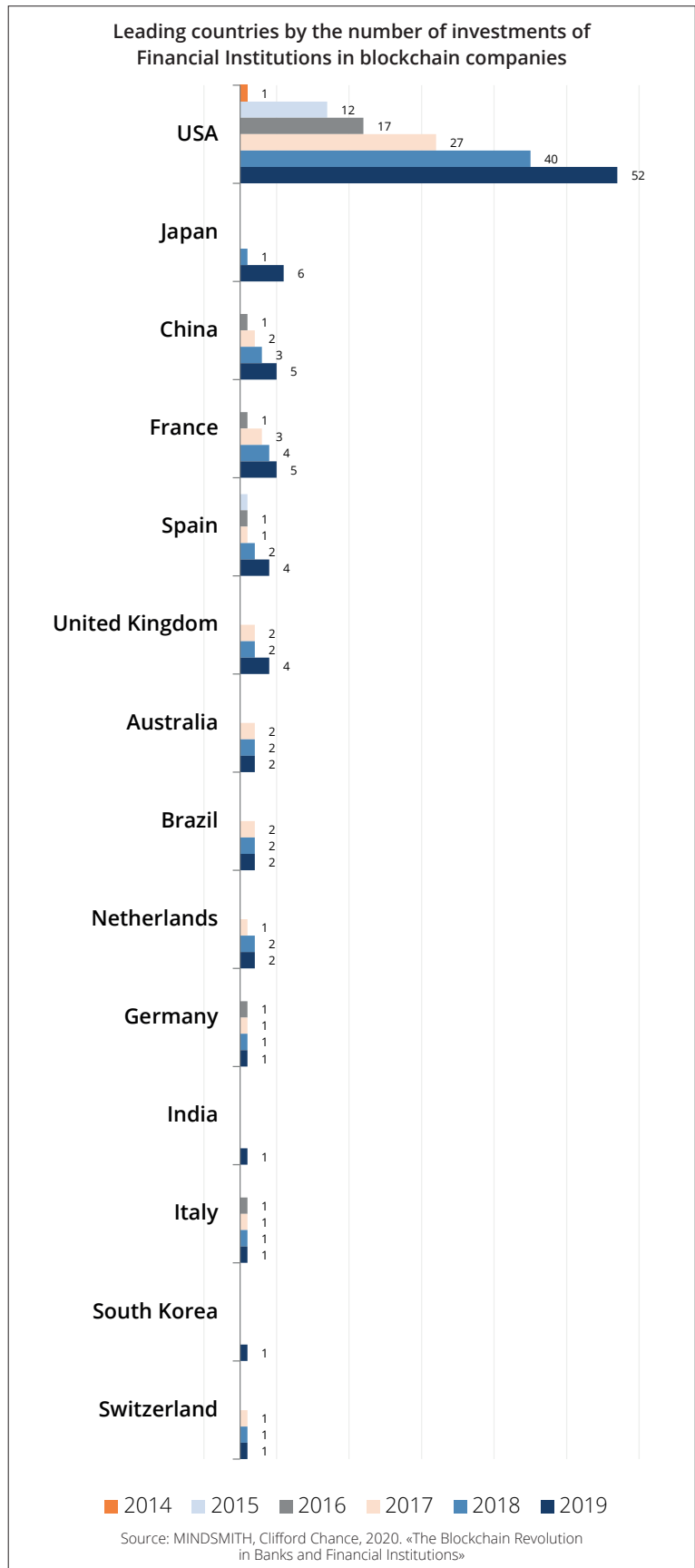


5.3 LEADING INVESTORS

In the context of the investments of Financial Institutions in blockchain companies, US Financial Institutions are also the absolute leaders, surpassing Japan by more than eight times and China by 10 times in the number of examples of investing in blockchain companies. It should be noted that the Financial Institutions of Japan have made a significant leap, rising from ninth place in 2018 to second place in 2019, overtaking the Financial Institutions of China and France – the countries following Japan by the number of investments of Financial Institutions in blockchain companies.

However, when calculating the indicator per Financial Institution investing in blockchain companies, Banco Santander, the sole representative of the Financial Institutions of Spain, knocked US Financial Institutions from the leading position.

Investing in blockchain companies can be an effective solution for Financial Institutions and countries that have not had time to effectively test blockchain in practice and do not have sufficient internal expertise for new inventions. It is likely that Financial Institutions from Germany, Australia, India and Brazil may soon start investing more actively in companies developing blockchain solutions.





Gerbert Shopnik
Director of Business
Development, S7 TechLab

Fundamentally, two approaches to interaction with innovative technologies can be distinguished: either a company creates its own research division, is at the origin of technology research, and has been working on solutions for many years, but eventually may not become a market leader; or it carefully studies the market and enters it only when the market has been formed and the initial leaders have already

been identified. In such a case, the company, often through investments in small innovative companies, creates its own solution for this market and occupies not the first but one of the leading positions. Such a model is quite workable, and it also saves time and money for those companies who do not claim absolute leadership in the sector but want to get their market share.



Anatoly Konkin
Head of Development
of Distributed Ledger
Technology, FinTech
Association

Doing research and development on innovative technologies from scratch is extremely costly. Moreover, companies meet difficulties in finding qualified employees and evaluating their work because nobody knows the right answers when it comes to future technologies and. Due to this, sometimes it is more efficient for major companies to form a consortium and jointly invest in developments. This is particularly true for blockchain since it allows to create trusted environment for data exchange between different organisations. And blockchain platforms become valuable when more participants

join them. Formation of consortium allows to solve this issue at the stage of commencement of project works. If companies invest in the platform, then they are likely going to use it in the future. For financial companies the issue of trust in a counterparty is especially pressing and in this very sector we notice the highest demand. The most popular blockchain consortium in the world is R3 which has included the largest Financial Institutions. There are similar examples in Russia where banks have joined to create Masterchain platform.



Oleg Shibarov
Director of the Centre
for Research on Financial
Technologies and Digital
Economy, Skolkovo-NES

Regarding fintech, there are three main models for creating and implementing innovations. First, there are countries like the United States and China where much is determined by large technology corporations, in which active research and development is carried out and young companies are actively bought up. Second, there is a European model in which fintech innovations

are born in individual companies and only then begin to interact with the financial sector. And there is a model in which fintech innovations emerge initially in banking and Financial Institutions. The landscape of financial technologies is extremely diverse, so we cannot say that one model is obviously better than another.



Ainur Zhanturina
Head of the Fintech
Competence Centre of
the Astana International
Financial Centre

Support and investments in blockchain startups are one of the main incentives for the development of this technology in different countries. However, the most effective and universal approach for blockchain development is an integrated approach that includes support for startups and creation of a favourable legal and regulatory environment for their development. Kazakhstan is now actively supporting technology startups, including in the field of blockchain: acceleration and

incubation programmes have been created on the basis of the largest technology platforms, Astana Hub, Most, Techgarden, and Nuris; the State encourages the development of the necessary venture investments through the creation of the QazTech Ventures Fund and the draft law on the development of venture capital. In addition, the blockchain communities, the National Association of Blockchain and Cryptotechnologies and the BlockchainKZ Association, are actively functioning.

6. INDUSTRY SPECIFICS

1 DIFFERENT INDUSTRIES TAKE DIFFERENT APPROACHES TO THE STUDY AND IMPLEMENTATION OF BLOCKCHAIN TECHNOLOGY

Banks are the leaders in engagement and support of blockchain technology and are the most active in practical implementation of blockchain solutions. Payment systems and fintech service providers prefer patenting to the practical implementation of blockchain technology

and investments in blockchain companies. Insurance companies are less active in the patenting of blockchain inventions, preferring instead to invest in blockchain companies and the practical implementation of the technology.

2 COMPETITION WILL INTENSIFY AND THE BOUNDARIES BETWEEN FINANCIAL INSTITUTIONS WILL CONTINUE TO BLUR

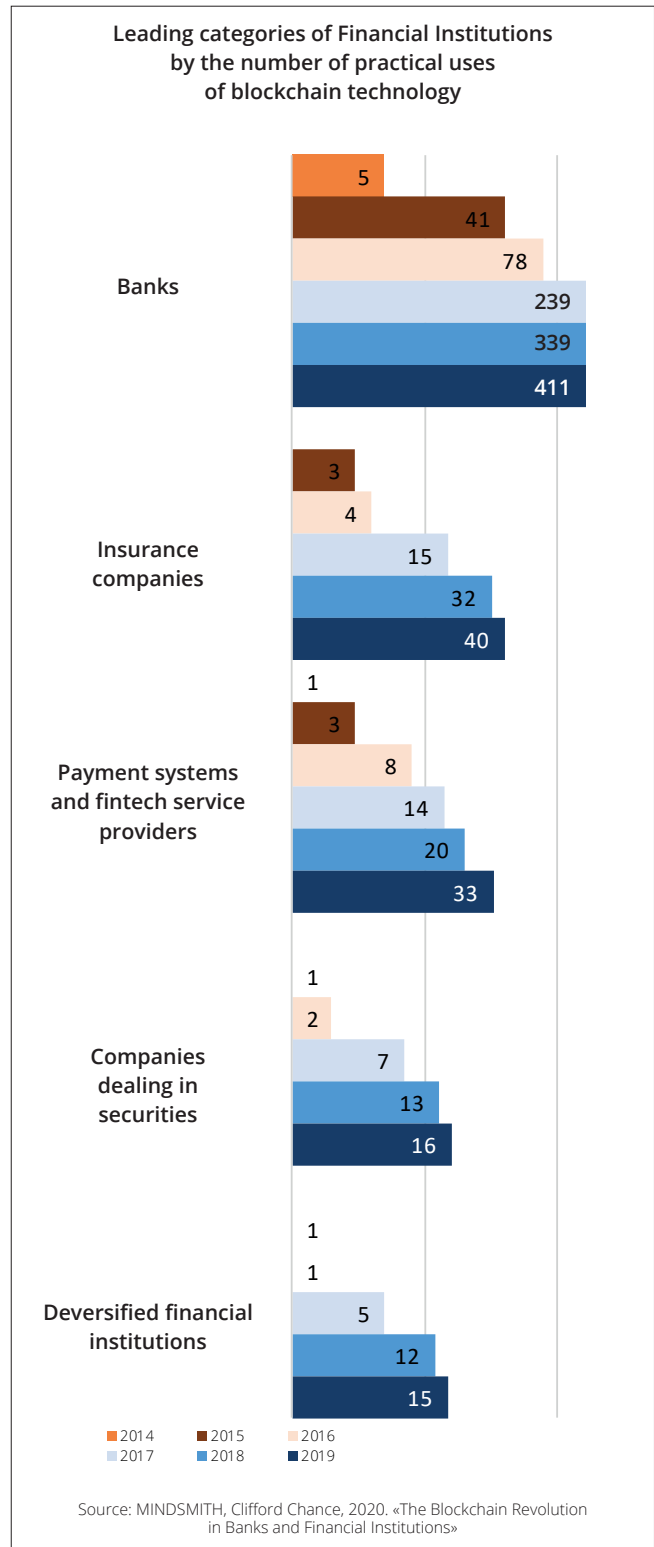
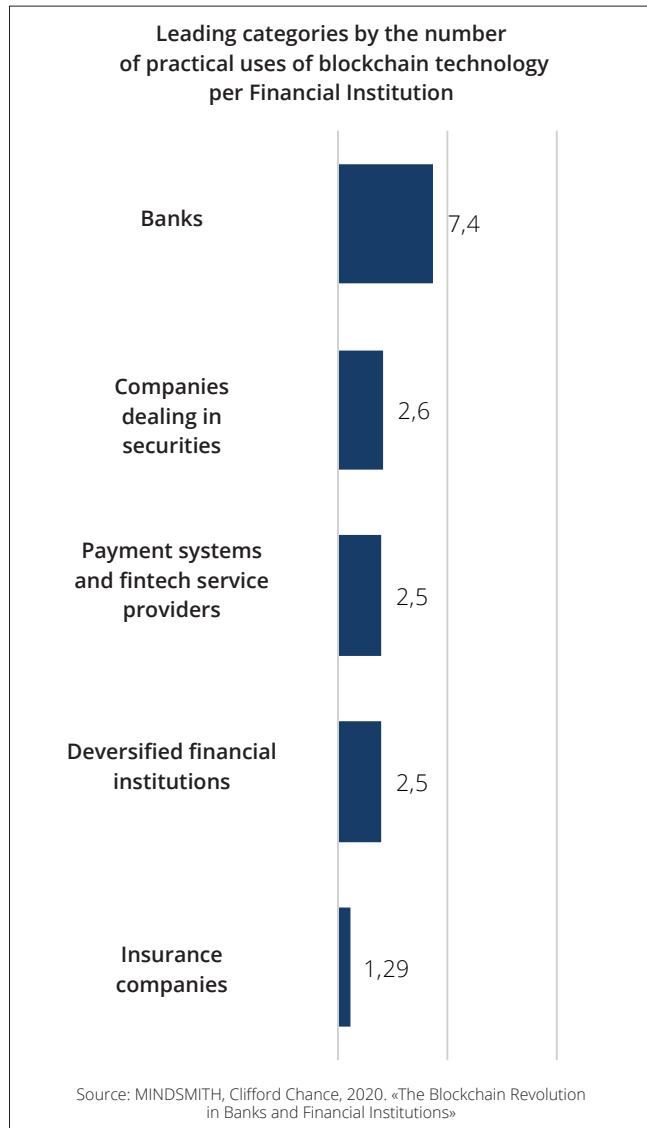
The largest global banks have clearly shown that they do not plan to remain on the sidelines of the «blockchain revolution» and, if necessary, are ready to innovate and reinvent themselves. These efforts by the banks do not, however, guarantee them technological and blockchain leadership: other Financial Institutions are hot on their heels.

Today, the banking industry and traditional major players among other Financial Institutions find themselves under significant pressure. On the one hand, strict regulation of the financial sector and the narrow interest rate spread in

most developed countries have led to an overall decrease in the profitability of the banking business. On the other hand, competition from non-traditional players has increased greatly in recent years. Whereas before banks had to compete with other banks for clients, now, after the blurring of the boundaries between banks and fintech companies, both innovative startups, euphemistically called «disrupters» (innovators that think outside the box), and major fintech service providers have enthusiastically joined the fight for market share.

6.1 LEADING PRACTITIONERS

Banks, which can point to eight times more examples of practical implementation of blockchain technology than their closest competitor, the insurance companies, are the unquestioned leaders in the practical use of blockchain technology among Financial Institutions. Banking organisations maintained their leading position when the figures were recalculated per Financial Institution making use of blockchain. However, insurance companies, which have applied blockchain in actual practice 1.7 times on average, found themselves at the bottom of this rating among the various categories of Financial Institutions.

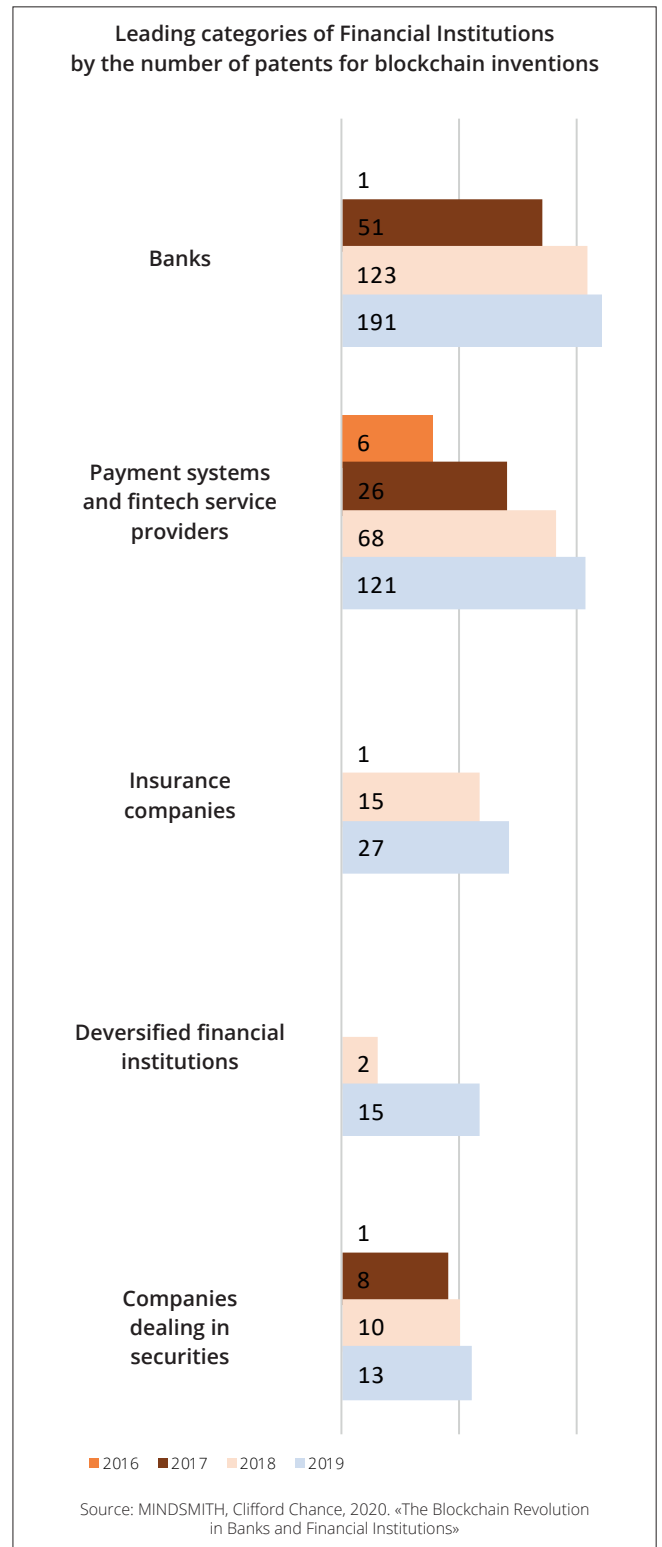
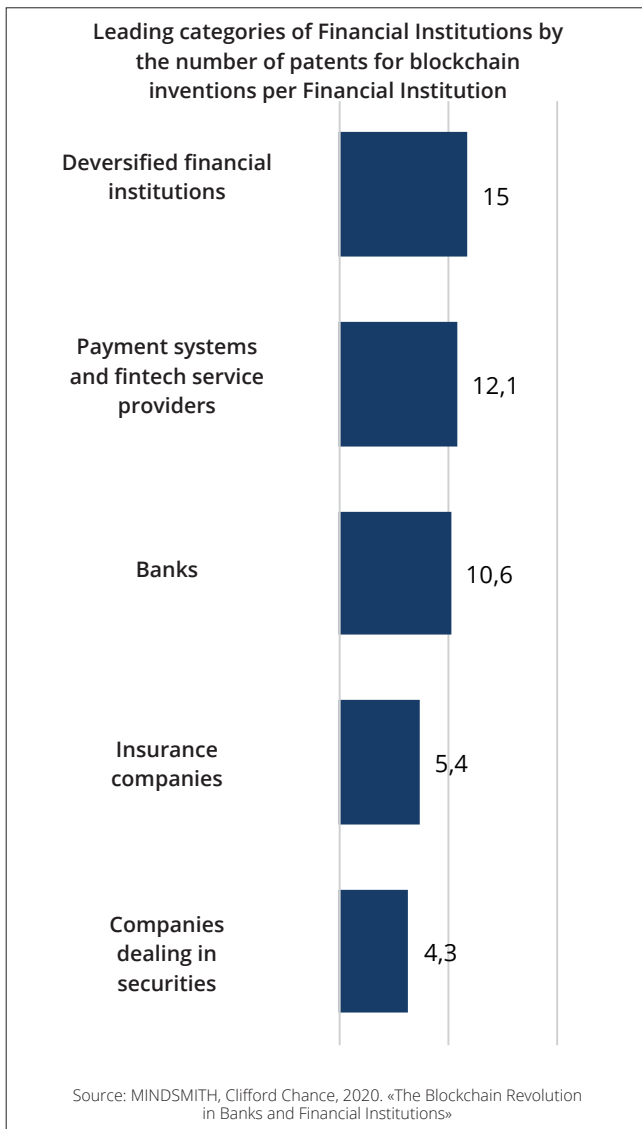


6.2 LEADING INNOVATORS

In addition to banks, payment systems and fintech service providers are also active in patenting of blockchain inventions.

Payment systems and fintech service providers overtook banking organisations when figures were recalculated per Financial Institution.

American Express is the only diversified Financial Institution actively involved in the patenting of blockchain inventions. Nevertheless, it brought this category of Financial Institution into first place when looking at per unit values.



6.3 LEADING INVESTORS

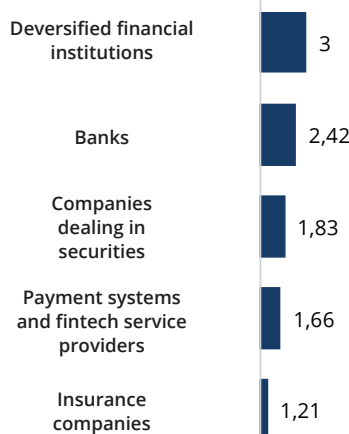
Banks and insurance companies also lead all Financial Institutions in the number of investments in blockchain companies in absolute terms.

However, when the indicators are recalculated per Financial Institution, American Express again secures first place for diversified Financial Institutions. Banking organisations, represented by 19 Financial Institutions, took second place.

Since information on the amount of investments of individual Financial Institutions in blockchain companies is often not readily available or is not made public, it is impossible to give a monetary assessment of the activity of Financial Institutions in this form of cooperation.

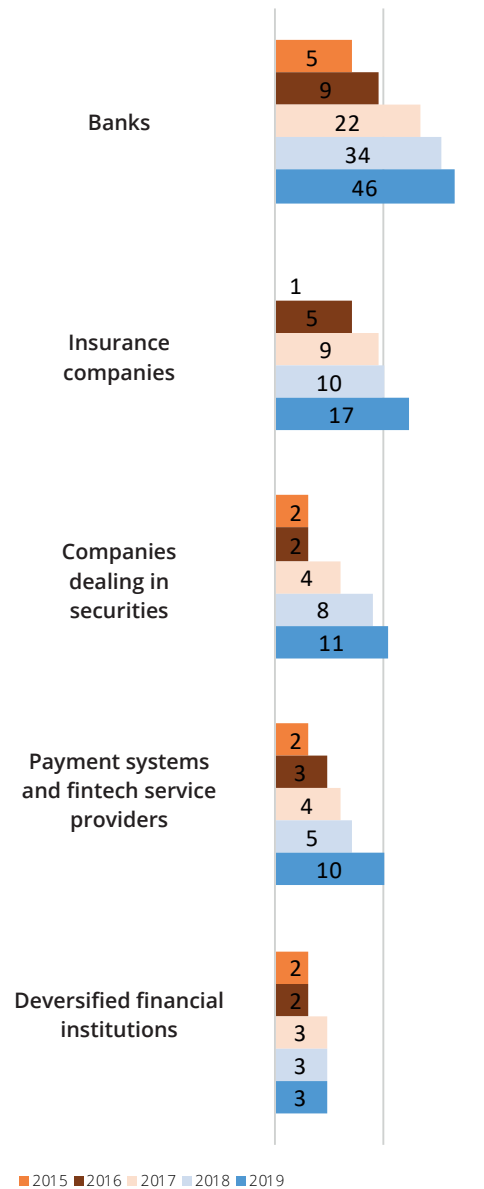
Despite this fact, we were able to pinpoint the funding rounds in blockchain companies in which Financial Institutions prefer to participate.

Leading categories in investments in blockchain companies per Financial Institution



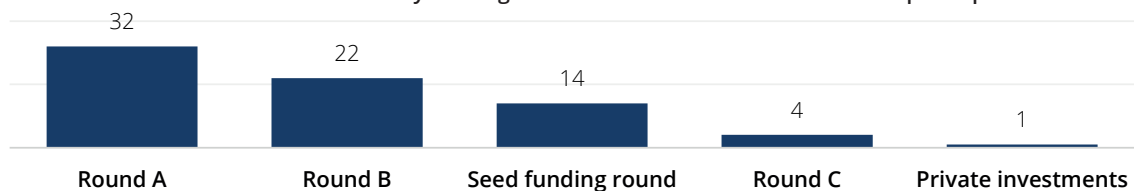
Source: MINDSMITH, Clifford Chance, 2020. «The Blockchain Revolution in Banks and Financial Institutions»

Leading categories of Financial Institutions in investments in blockchain companies



Source: MINDSMITH, Clifford Chance, 2020. «The Blockchain Revolution in Banks and Financial Institutions»

Distribution of investments by funding rounds in which Financial Institutions participated



Source: MINDSMITH, Clifford Chance, 2020. «The Blockchain Revolution in Banks and Financial Institutions»

7. SCOPE OF BLOCKCHAIN APPLICATION

1 THE INFORMATION SECURITY SCENARIO IS COMING TO THE FORE, PREVAILING OVER TRANSACTION PROCESSING MATTERS

Information security application scenarios have recently gained the strongest foothold. Banks appear to consider data security issues as being of vital importance. We may assume that after building up internal blockchain expertise in terms of information security, banking institutions may

set out to use the blockchain technology for establishing complete internal control over all matters of compliance with AML/CFT procedures (anti-money laundering and combating the financing of terrorism) and their own data security.

2 THE INFORMATION SECURITY MARKET MAY FACE MATERIAL CHANGES

Financial Institutions may gradually start choosing investments in their own solutions over the data security services of third-party providers. We may witness banks trying to enter the market as vendors of such solutions. Financial Institutions have far more expertise in the financial sphere, which, in combination with their internal

background and their own information security solutions, is likely to result in the loss of market share by external providers and the entry of new competitors. Such scenarios should be taken into account both by providers of data security solutions and blockchain solution vendors.

3 PAYMENT SYSTEMS MAY BECOME GLOBAL PROVIDERS OF INFRASTRUCTURE BLOCKCHAIN PAYMENT PLATFORMS

Payment systems and fintech service providers are persistent in using alternative blockchain-based payment solutions. We have found a wide range of products connected with the development of breakthrough payment infrastructures which go beyond the customary transactions with fiat money and cryptocurrencies. As early as June 2019, Mastercard, Visa and PayPal were

declared members of the Libra Association. It is obvious that a new market is emerging with leading Financial Institutions rushing to occupy their niche there. In the future, such products will be used by Financial Institutions for establishing global infrastructure blockchain payment platforms.

4 PAYMENT SYSTEMS CREATE A MARKET OF CROSS-BLOCKCHAIN SOLUTIONS

Active development of blockchain solutions by various Financial Institutions will require new cross-blockchain technologies and infrastructures for building connections across solution families. We have discovered that the major players in the market of payment systems acknowledge the need for, and are pressing forward with, interoperability

projects. Companies which have traditionally been viewed as intermediaries and mediators of financial markets, are now willing to continue their activities in the emerging market of cross-blockchain solutions, which may be occupied by major payment systems even before it gets official standing.

5 FINANCIAL INSTITUTIONS WILL COMPETE WITH TECHNOLOGY COMPANIES ON THEIR HOME TURF

The prospect of the largest payment systems and fintech service providers acting as vendors of infrastructure blockchain platforms raises the issue of the future status of the providers of platform blockchain solutions, including,

but not limited to, Microsoft, IBM and SAP. Mastercard may not turn into a new Microsoft on the market of cross-blockchain infrastructure platforms, but the traditional IT-players are sure to be pushed aside.

6 THE EFFECTS OF THE «BLOCKCHAIN REVOLUTION» MAY FIRST BECOME OBVIOUS IN THE INSURANCE INDUSTRY

The analysis of activities of insurance and reinsurance companies in terms of blockchain technology shows that the Financial Institutions of this category are focused on the complete automation of the life cycle of insurance operations by means of smart contracts and on the application of self-sovereign identity technologies and tokenisation of identity data, from client details to the

medical data of insurance policy holders. The insurance market is a market of both high opacity and high fraud risks, on the one hand, and an array of transactions which are easy to unify and digitise, on the other hand. The insurance industry is quite likely to witness the first results of the «blockchain revolution».

7 INSURANCE COMPANIES MAY BECOME THE DRIVING FORCE FOR THE INTRODUCTION OF TECHNOLOGIES IN VARIOUS INDUSTRIES

We may expect new offers to create multi-industry identification platforms from major insurance companies. Insurance companies themselves may act as providers of such blockchain solutions and make offers to the market to introduce boxed identification blockchain systems. Insurance and reinsurance services are in demand across all industries. If insurance companies become

the driving force behind the large-scale introduction of boxed blockchain systems, the «blockchain revolution» will spread quickly in the related industries, including medicine and logistics. This may consequently open new market opportunities for blockchain vendors and customary system integrators.

Given the variety and the wide scope of application of blockchain technology, the scientific community, in analysing its advantages and capacities, tends to distinguish four core objectives of the blockchain technology application:

1. reduced need in trust between interested parties;

2. creation of a secure system of value transfer;

3. easier communication; and

4. higher data and audit transparency.

In order to determine the trends in application of blockchain technology by Financial Institutions and to assess what impact it may have on the transformation of business

models of major Financial Institutions worldwide, we have classified the objectives which Financial Institutions pursue in applying blockchain technology and the blockchain application scenarios to be implemented for achieving such objectives.

Clifford Chance Implementation of anti-money laundering laws (AML/CFT) in the crypto industry

Implementation of anti-money laundering laws (AML/CFT) in the crypto industry

In July 2019, the Financial Action Task Force on Money Laundering (FATF) adopted at its plenary meeting the Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers³ (the «Guidance»). In its Guidance, FATF introduced a detailed approach to taking efficient regulation and supervision measures for anti-money laundering and combating the financing of terrorism (AML/CFT).

Pursuant to the Guidance, a virtual asset is a digital representation of value that can be digitally traded, or transferred, and can be used for payment or investment purposes. As for the virtual asset service provider, it means any natural or legal person who as a business conducts one or more of the following activities or operations: (1) exchange between virtual assets and fiat currencies, (2) exchange between one or more forms of virtual assets, (3) transfer of virtual assets, (4) safekeeping and/or administration of virtual assets or instruments enabling control over virtual assets, and (5) participation in and provision of financial services related to an issuer's offer and/or sale of a virtual asset. In its Guidance, FATF requires that countries should introduce mandatory licensing or registration of virtual asset service providers and develop effective systems for supervision and control of their activities.

In July 2020, the Russian Federation adopted the Federal Law «On Digital Financial Assets, Digital Currency and Amendments to Certain Legislative Acts of the Russian Federation» (the «DFA Law») which, among other things, extended regulatory requirements to embrace digital financial assets⁴ and the activities of the persons conducting certain business in relation to digital financial assets. For example, the Federal Law «On Anti-Money Laundering and Combating the Financing of Terrorism» (the «AML/CFT Law») was amended to include in the list of organisations performing operations with money and other property, to which organisations the provisions of such law apply: (1) operators of information systems through which digital financial assets are issued, and (2) operators of a digital financial assets exchange⁵. The list of operations under mandatory control in accordance with the AML/CFT Law was also extended to include operations with digital financial assets in the amount equal to or exceeding 600,000 roubles (or its equivalent in a foreign currency).

In developing blockchain projects involving the use of digital tokens, Financial Institutions should bring their AML/CFT rules and procedures into conformity with the new regulations, including foreign regulations in the case of international projects. In addition, the projects shall be developed in accordance with the applicable regulations to ensure the required level of AML/CFT process automation. For example, it is necessary, whenever possible, to perform technical integration of the AML/CFT internal system into the blockchain system and ensure their effective interaction.

³FATF. «Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers», 21.06.2019.

⁴Digital financial assets mean digital rights, including money claims, the possibility of exercising rights under equity securities, interests in a closed joint-stock company, the right to claim transfer of equity securities, ... whose issue, recording, and trading is only possible by means of making (changing) entries in the blockchain information system and other information systems.

⁵Pursuant to the DFA Law, such operators shall be registered in the relevant registers kept by the Bank of Russia.

7.1 MAIN APPLICATION SCENARIOS

In reviewing the types of interaction of Financial Institutions with blockchain technology (introduction, patenting, investing), each case such

interaction was analysed in terms of its objectives. Then each particular case of the actual introduction and patenting of a blockchain invention

and investment in blockchain companies was assigned one or more relevant application scenarios.

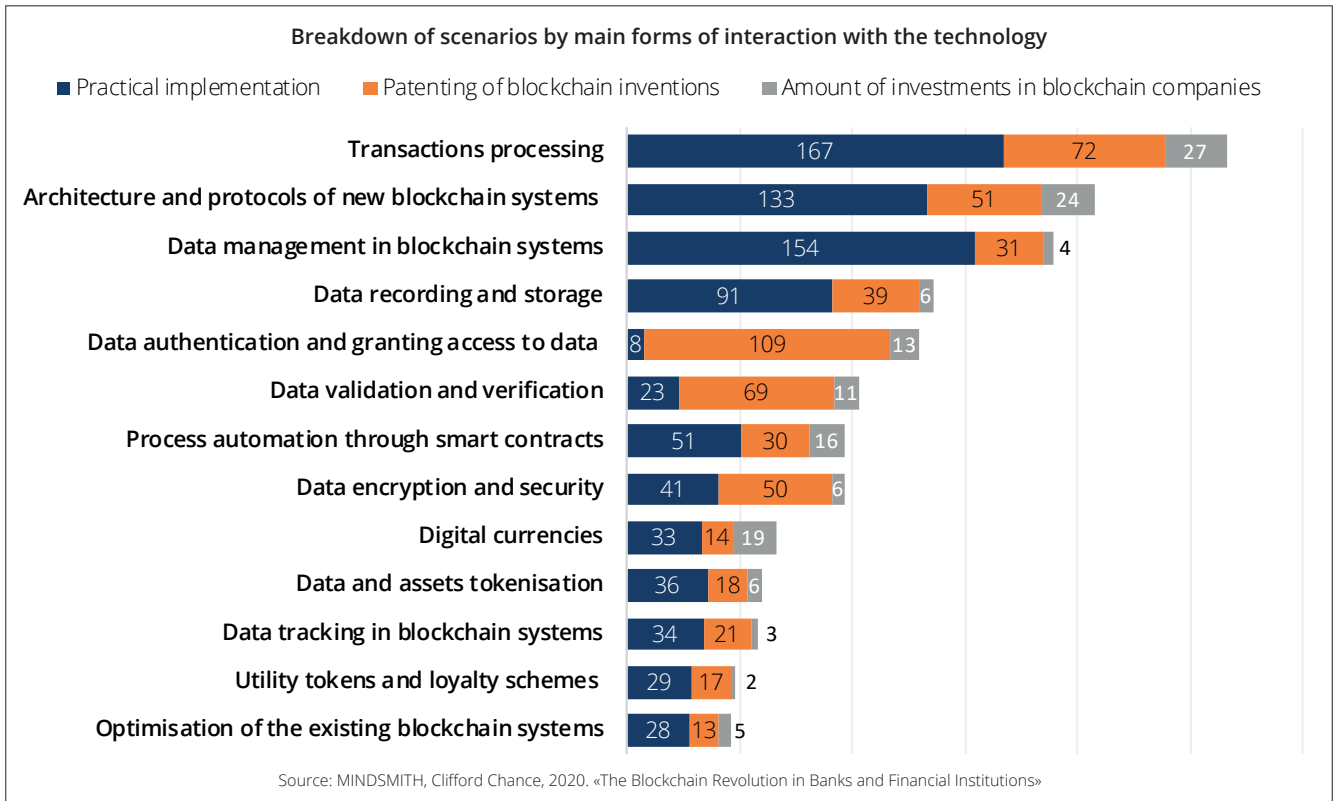
Objectives	Application scenarios
Reduced need in trust between interested parties	Data encryption and security Data authentication and granting access to data Data validation and verification
Creation of a secure system of value transfer	Data and assets tokenisation Transactions processing Digital currencies
Easier communication	Utility tokens and loyalty schemes Process automation through smart contracts Optimisation of the existing blockchain systems Architecture and protocols of new blockchain systems
Higher transparency and data audit	Data recording and storage Data management Data tracking

Table 1. Classification of application scenarios for blockchain technology
Source: MINDSMITH, 2020. «The Blockchain Revolution in Banks and Financial Institutions»

Our analysis has revealed that Financial Institutions are active in dealing with the issues of transaction processing, data management in blockchain systems, and creation of architecture and protocols of new blockchain systems in relation to all three forms of interaction with blockchain technology (introduction, patenting, investing). This is because Financial Institutions place emphasis on such basic operational characteristics of the

blockchain technology as the issues of compatibility of different blockchains, the scalability of blockchain solutions, and improvement of their throughput capacity. Thus, according to Cognizant research, the major challenges for introducing blockchain by an organisation include the issues of confidentiality and security, compatibility of different blockchains, and scalability. The aspects of information security of blockchain systems (data

authentication and granting access to data, data validation and verification, data encryption and security) also rank high in priority. So, it may be assumed that the overarching priority for Financial Institutions in interacting with blockchain technology is the issues of information security. Basically, Financial Institutions intend to deal with such issues by means of internal studies and products.



Clifford Chance
Blockchain oblivion: personal data

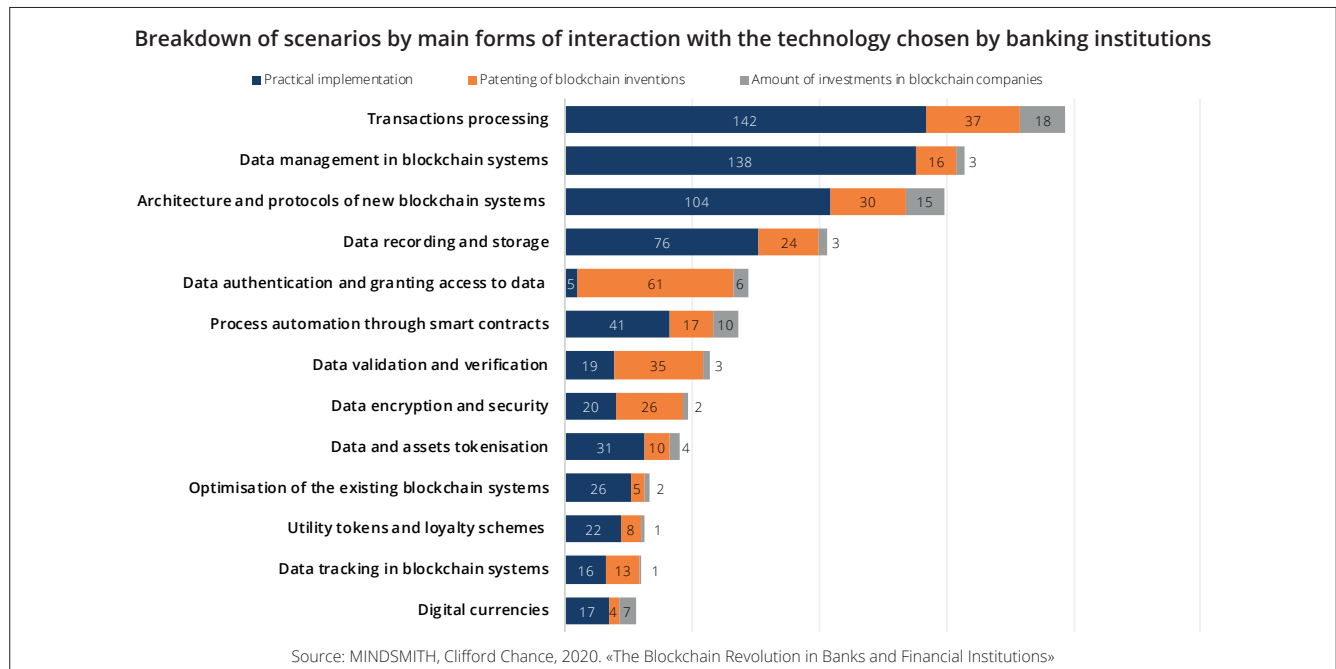
While different countries have a specific approach to the regulation of personal data processing, it is still based on the fundamental principles observed by most of the developed legal systems.

One of the basic rights available to individuals is the right to require the destruction of personal data in certain circumstances (the ‘right to be forgotten’ in accordance with the EU Regulation on personal data protection, also known as GDPR). In addition, one of the core principles to be complied with by operators processing personal data is to process only those personal data which are relevant to the purpose of data processing while leaving intact the personal data inconsistent with the purpose of their collection (the ‘principle of storage limitation’ in accordance with the GDPR).

The unchangeability of the stored data as one of the

basic principles of traditional blockchain may contradict the regulatory requirements applicable to personal data processing. For example, in the event of a decentralised system, the personal data operator may have no actual opportunity to delete information in accordance with the requirements of the individual. While this issue may not be the most urgent one in terms of projects being implemented on the basis of centralised blockchain, it should be taken into consideration at the stage of developing the technical architecture of the project. It seems possible to argue for retaining personal data in the blockchain on the premise that perpetual data storage ensures blockchain transparency and accuracy of the information stored in blockchain by providing information of all the transactions made. However, such an approach may apply almost to all blockchain systems and as such may be viewed as being too general in the absence of other reasons for retaining personal data in the blockchain.

7.2 APPLICATION SCENARIOS FOR BANKS



The most popular blockchain application scenarios for banking institutions are transactions processing, data management in blockchain systems, and architectures and protocols of new blockchain systems. The most common form of interaction under almost all these scenarios is putting blockchain solutions into practice.

We have found that banks choose another format, namely the format of internal research and

development, only in relation to three application scenarios, including data authentication and granting access to data, data validation and verification, data encryption and security.

Banks appear to consider data security aspects as being of vital importance. According to the cases under study, we may assume that after building up internal blockchain expertise in terms of information security, banking institutions may set out to use blockchain technology

for establishing complete internal control over all matters of compliance with AML/CFT procedures and their own data security.

In the near future, we are likely to see services of third-party providers gradually losing their market share and we may witness banks trying to enter the data security market as vendors of the solutions for the information security of banking operations.

Clifford Chance Secure blockchain

In the context of large-scale digitalisation, the issues of cybersecurity come to the fore. This concern is also relevant for organisations acting in the financial sector. Currently, Financial Institutions are stepping up to study the opportunities of blockchain in the sphere of data security and data transfer and the security of transactions. The development of the relevant blockchain solutions should be carried out in accordance with the regulations applicable to the issues of information security in the financial sector. For example, in the Russian Federation the information security of the banking system and the relevant data security recommendations are governed by the standards of the Bank of Russia. They should never be dismissed by those developing blockchain solutions,

including security solutions.

It is also necessary, while at the stage of solution design, to assess in terms of the law whether any authorisation or licence from, or certification by, a government body is required, especially in relation to the encryption-based data protection facilities, their marketing, or the provision of the related services to third parties.

In general, the list of regulatory requirements applicable to the blockchain technology used for ensuring security in the financial sector may vary on a case-by-case basis and become quite extensive from time to time. Therefore, it is vital for the development stage of a solution or a product to determine the scope of its application and analyse the potential legal requirements to be complied with at the stage of project implementation.



Gerbert Shopnik
Director of Business
Development, S7 TechLab

We may expect the banks to start bringing their products to the information security market. When it comes to the security of blockchain solutions, currently there is, in fact, a significant gap left. Today various major companies are trying to close this gap by using customary methods, with blockchain

teams creating solutions subject to the authorisations of special information security units. There are very few separate structures dealing exclusively with the security of blockchain solutions. However, this issue is sure to gain significance sooner or later.



Anatoly Konkin
Head of Development
of Distributed Ledger
Technology, FinTech
Association


Financial Institutions focus on the following three aspects: interaction with the customer, creation of the internal risk model, and development of their own information security solutions. In general, banks make every effort «to shield» these three aspects and are unwilling to share their achievements. As for the other solutions, including infrastructure solutions, banks are perfectly fine



with outsourcing. With rising cyber risks and growing digitalisation banks will make efforts to increase their own qualification in data security sector. However, this will unlikely affect the market and challenge vendors specialising in this area. I do expect so fast growth of this market that it will rather face a gap in resources than rising competition for earning a place in the sun.



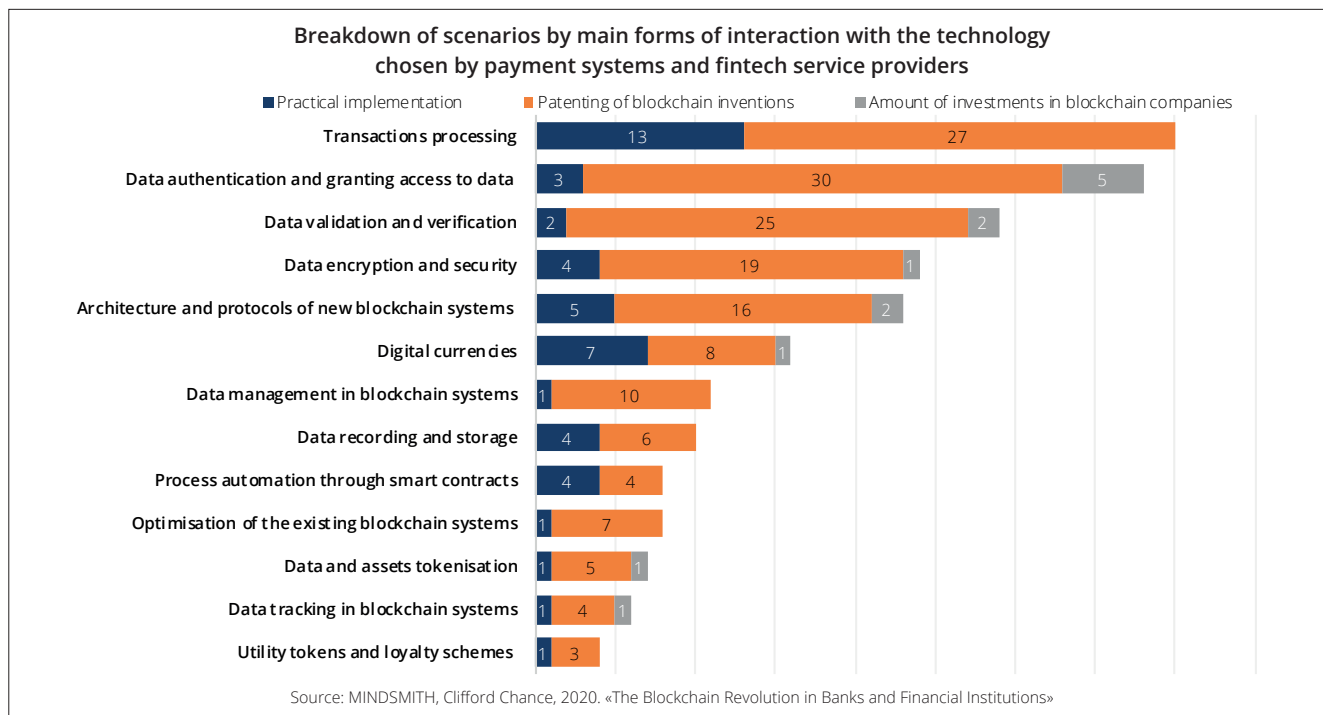
INDICATIVE EXAMPLES:

Practical implementation		
Financial Institutions		
Year	2016	2017
Description	Mizuho Bank and Fujitsu Laboratories Ltd. announced the successful completion of three months of tests of a blockchain technology for secure cross-border transactions. The experiment showed that the use of blockchain rules out the possibility to falsify the transaction history and reduces transaction processing time from three days to one day.	Establishment of non-commercial Enterprise Ethereum Alliance. Targets of the alliance: introduction and adaptation of Ethereum technology for engineering business processes with emphasis on security, confidentiality, and scalability.

Patents		
Financial Institutions		JPMORGAN CHASE & CO.
Patent ID	WO 2018/195644 A1	US 2019/0188652 A1
Year	2018	2019
Description	A blockchain-based payment processing system with biometric authentication of the user.	A system of an interbank cloud blockchain network for processing client payments and exchange of client data.

Investments		
Financial Institutions		
Investment target	BitGO	Silot
Year	2018	2019
Description	The company develops solutions for the secure storage and exchange of cryptocurrencies on the basis of a multisignature split-key technology.	The main product of the company is a platform for the automation of commercial banks' processes with the help of digital intelligence and blockchain, including payment solutions, transaction management units, and automation of AML/CFT procedures.

7.3. APPLICATION SCENARIOS FOR PAYMENT SYSTEMS AND FINTECH SERVICE PROVIDERS







Some of the most popular blockchain application scenarios for payment systems and fintech service providers include transaction processing and a number of scenarios related to information security: data authentication and granting access to data, data validation and verification, data encryption and security. Unlike banking institutions, the Financial Institutions of this category choose the patenting of blockchain inventions as the prevailing form of interaction with the blockchain technology. The analysis of the blockchain application options which are



of interest to payment systems and fintech service providers and the case study of practical use, blockchain patents, and investments in blockchain companies have revealed the main trends which such companies find most promising in the context of blockchain application. A more detailed analysis of the cases of practical use, blockchain patents, and investments in blockchain companies shows that on many occasions the blockchain technology is used not only to optimise the existing payment systems, but also to create totally new payment infrastructures which go beyond

the customary transactions with fiat money and cryptocurrencies. Payment systems and fintech service providers are active in applying alternative blockchain-based payment solutions both for interbank and client payments. In the future, such products may be used by the Financial Institutions of this category to establish global infrastructure blockchain payment platforms and as an opportunity to create global providers of such solutions.

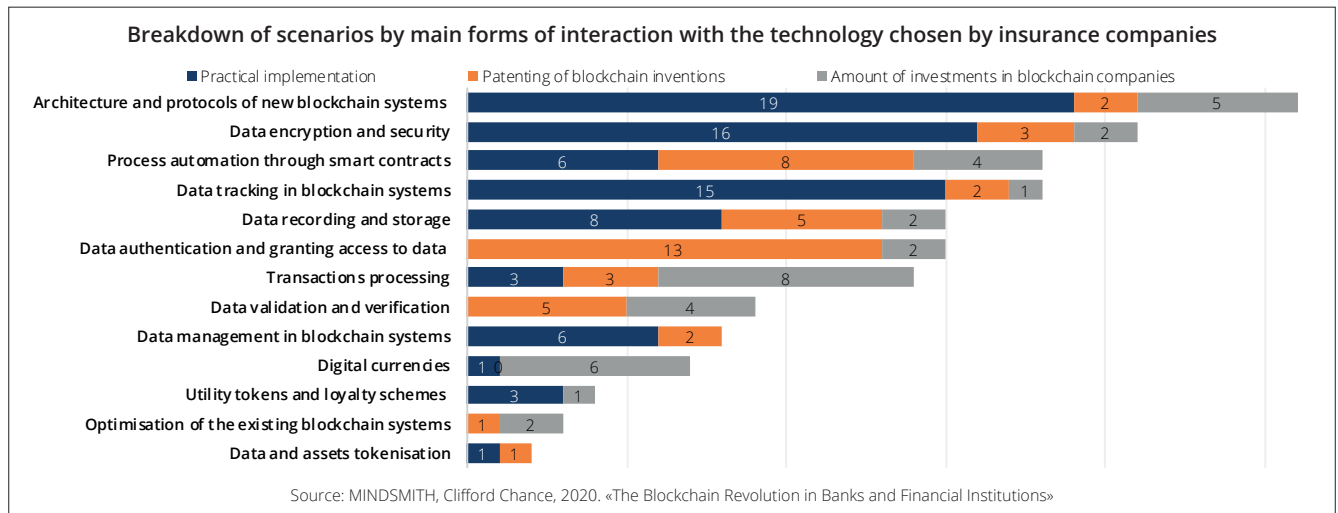
INDICATIVE EXAMPLES:

Practical implementation		
Financial Institutions		
Year	2017	2019
Description	The company opened access to its blockchain solution for payment operations between banks and sellers designed to provide an alternative method of paying for goods and services with common fiat currencies.	Visa launched the B2B Connect blockchain platform for corporate payments. The network is created to improve the efficiency of cross-border settlements between Financial Institutions. For example, B2B Connect may be used for fast payments of moderate amounts without involving mediators.

Patents		
Financial Institutions		
Patent ID	WO 2017/139060 A1	US 2019/0205849 A1
Year	2017	2019
Description	A system of blockchain-based transactions with automatic off-line verification of transactions.	A decentralised system of bank machines with a built-in user authentication mechanism, with each bank machine being a nodus within a trusted blockchain environment.

Investments		
Financial Institutions		
Investment target	HYPR Corp	Anchorage
Year	2017	2019
Description	HYPR Corp develops solutions to produce biometric tokens for consumers and enterprises to ensure secure access to full-featured, mobile, and IoT systems. The solution decentralises the storage of biometric credentials for secure authentication through the recognition of fingerprints, voice, and faces.	The company provides services of secure storage of cryptocurrencies and makes it possible for users to receive interest income and vote on investment issues. Anchorage also provides solutions for behavioural analysis and security and corporate management systems.

7.4. APPLICATION SCENARIOS FOR INSURANCE COMPANIES



As with payment systems and fintech service providers, insurance companies take a keen interest in data encryption and security and reveal a low level of interaction with the scenarios of optimisation of the existing blockchain systems and tokenisation of data and assets. However, the insurance industry is the only one relying to a great extent on the development of new blockchain systems and automation of business processes with the help of smart contracts.

It should be noted that insurance companies choose different formats depending on the scenario. For example, in the event of encryption, data tracking, and data management in blockchain systems insurance companies choose the format of putting into practice. Such implementation seems to have been carried out in cooperation with other Financial Institutions acting as the clients of insurance companies.

At the same time, insurance companies choose the formats of patenting of blockchain inventions and investments in blockchain companies under the scenarios of data authentication and granting access to data, data validation and verification, and optimisation of the existing blockchain systems.

A more detailed analysis of the cases of practical use, blockchain patents, and investments in blockchain companies shows that the Financial Institutions of this category are mostly focused on the complete automation of the life cycle of insurance operations by means of smart contracts, from primary insurance to making insurance claims and providing reinsurance services.

Another remarkable focus area chosen by insurance companies when dealing with blockchain technology is the active application of self-sovereign identity technologies and tokenisation of identity data, from client details to the medical data of insurance policy holders.

The development of these trends will predictably result, in the near future, in proposals from major insurance companies or alliances of insurance and reinsurance institutions to create multi-industry identification platforms. In the long run, Financial Institutions, namely insurance companies, may act as integrators of such blockchain solutions and enter the market with their services of introducing multi-industry identification systems.







Oleg Shibанov
Director of the Centre for Research on Financial Technologies and Digital Economy, Skolkovo-NES



Insurance is to a great extent a sideline activity and the type of protection which is often unnecessary for a wide range of customers. For this reason, it is hard to state that insurance will become a fully functional driving force for the introduction of blockchain solutions in the financial sector. However, market commoditisation and creation

of boxed products is sure to result in the growth of the blockchain market. If you offer the end user a simpler and more transparent product which meets the user's requirements, you will get a higher effect from its sales and introduction. Therefore, as soon as solutions are standardised, the market is likely to grow extensively.

INDICATIVE EXAMPLES:

Practical implementation		
Financial Institutions	 中国人寿 CHINA LIFE	 RGA® Mutual of Omaha
Year	2017	2019
Description	Deloitte and China Life Insurance announced the successful development of the first cross-border blockchain-based platform for bank insurance in Greater China (PRC together with Hong Kong and Taiwan).	RGAX, a subsidiary of Reinsurance Group of America, and Mutual of Omaha carried out successful tests of a blockchain-based project for the automation of reinsurance processes. The project allows a carrier and a reinsurance company to introduce automation into reinsurance operations by means of blockchain and smart-contract technology.

Patents		
Financial Institutions	 富邦金控	 國泰金控 Cathay Financial Holdings
Patent ID	TW 201901584 A	TW 201913519 A
Year	2019	2019
Description	A system for resolving disagreements on the marking of tokenised data in KYC-forms by means of multisignature and secret key distribution.	A blockchain service system for the holders of medical insurance involving the tokenisation of client medical data on the hospital side and the automation of the insurance claims procedure by means of smart contracts.

Investments		
Financial Institutions		 MetLife
Investment target	Blockstream	Blockclaim
Year	2019	2019
Description	The company focuses on sidechain solutions and develops new cryptocurrencies, digital assets, and smart contracts. The solutions are designed for the developers and issuers of digital assets and their users. The products created by the company include infrastructure platforms and application development platforms for the implementation of industrial blockchain solutions.	The company offers a blockchain platform for the automation of protection against fraudulent claims based on digital intelligence and blockchain technologies. The platform analyses the user's data, provides guidance in the event of suspected fraud, and introduces automation into the process of making claims.

8. METHODOLOGY

8.1. METHODS OF SELECTING INSTITUTIONS

The selection of Financial Institutions for the purposes of research is based on the methodology of the Fortune 500 and Fortune Global 500 ratings.

Fortune 500 and Fortune Global 500 are ratings of the largest companies compiled annually and published by the Fortune Journal. The Fortune Global 500 includes the 500 largest corporations in the world, while the Fortune 500 includes the 500 largest US corporations. The companies included in the ratings are ranked by total income and comprise both public companies and private companies whose revenues are open to the public.

The Fortune 500 and Fortune Global 500 ratings feature the following industries related to banks and finances:

1. Banks: banking and credit institutions. For example: Bank of America, JPMorgan Chase, Toronto-Dominion Bank, Bank of China.
2. Diversified financial institutions: investment companies and providers

of universal financial services. For example: American Express, CITIC Group, Blackstone Group, INTL FCStone.

3. Payment systems and providers of financial and technological services: companies providing payment and technological services for the financial sector. For example: Mastercard, Visa, First Data, Equifax.

4. Insurance companies: insurance brokers and companies providing insurance and reinsurance services. For example: Allstate, Zurich Insurance Group, Allianz, Cathay Life Insurance.

5. Companies dealing in securities: asset management companies and stock exchanges. For example: Nasdaq, Affiliated Managers Group, CME Group, TD Ameritrade Holding. The Financial Institutions in the Fortune 500 rating include 28 banks, 17 diversified financial institutions, 20 payment systems and fintech service providers, 63 insurance companies, and 20 institutions dealing in

securities. In total, the Fortune 500 rating includes 148 Financial Institutions.

The Financial Institutions in the Fortune Global 500 rating include 54 banks, nine diversified financial institutions, and 50 insurance companies. In total, the Fortune Global 500 rating includes 113 Financial Institutions.

Apart from the companies featured in both ratings, the companies in the Fortune 500 and Fortune Global 500 include 234 Financial Institutions.

In studying blockchain application scenarios, we analysed the five finance industries represented in the Fortune 500 and Fortune Global 500 ratings and chose to draw our conclusions in relation to banks, payment systems and fintech service providers, and insurance companies. We chose not to focus on diversified financial institutions and companies dealing in securities because of the small sample size.

8.2. METHODS OF DATA COLLECTION

Our research team has collected data on blockchain patents from public databases, including Google Patents and the register of the World Intellectual Property Organisation (WIPO). We selected patents containing the word «blockchain» and directly relating to this technology. Then we selected patents and patent applications of Financial Institutions and excluded patents which had no relation to blockchain technology (for

example, patents with only occasional references to the keyword or patents which only refer to the blockchain technology as an embodiment of an invention).

Information on the blockchain technology being put into practice by Financial Institutions was collected from public data sources, the websites of Financial Institutions, companies' press releases and reputable economic news media.

Information on the investments of Financial Institutions in blockchain companies was received from public databases related to startups. Our research team compiled and analysed a database containing information on the investments of Financial Institutions, their subsidiaries, and investment offices in the companies which offer blockchain-based products or announced the development of blockchain solutions.

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The background is a dark blue gradient with a complex, glowing network of white and light blue lines and nodes. The lines are thin and intersect to form a mesh-like structure that appears to be in motion or vibrating. The nodes are small circles of varying sizes and brightness, some appearing as bright white points while others are fainter. The overall effect is that of a digital or neural network visualization.

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info@mindsmith.io

www.mindsmith.io

71, 74B, Mosfilmovskaya st.,

Moscow, 119192, Russia