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Chapter 5

Using Cloud Computing in Financial Institutions in Russia

Alexey V. Bataev

Additional information is available at the end of the chapter

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Abstract

The modern economy is developing under the influence of information and communication technologies. Cloud computing, Big Data, cyberphysical systems, here is an incomplete list of new directions, which with huge success is seen in every sphere of management and economy. This chapter deals with innovative ways of development connected with the use of cloud computing in the financial sphere. The history of occurrence and the basic preconditions in the development of cloud technology are analyzed. The major stages of the adoption of cloud computing in world development are considered. The main characteristics of cloud computing are explored: the types of clouds and methods of their provision are presented. The analysis of the Russian cloud technology market is carried out, the basic features and tendencies are revealed, and the further ways of development are defined. The evaluation of the possibility of using cloud computing in the financial institutions of the Russian Federation is given.

Keywords: IT technologies, cloud computing, types of clouds, kinds of cloud services, income of the Russian cloud computing market, cloud services in financial institutions, growth rate of cloud computing, cloud automated banking systems, advantages of cloud computing implementation

1. Introduction

In 2008, the financial and economic crisis began in the form of a strong reduction of the main economic indicators in most advanced economies, which later grew into a global recession (slowing) economy in the world.

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The appearance of the crisis was associated with a number of factors: the general cyclical economic development; overheating of the credit market and the mortgage crisis, which was its consequence; high commodity prices (including oil); and overheating of the stock market.

The mortgage crisis in the USA, which in early 2007 affected the high-risk mortgages, was the predecessor of the 2008 financial crisis. The second wave of the mortgage crisis occurred in 2008, spreading to the standard segment, where banks issued loans refinanced by the state mortgage corporations. Owing to 20% fall in real estate prices, the American owners of housing lost nearly 5 trillion dollars.

In September 2008, the US mortgage crisis provoked the crisis of liquidity banks in the world: banks stopped lending. The crisis threw from banking sphere on real economy, began a recession, and a decline in production.

The global economic recession has resulted in the most developed world economies: the USA, China, and European Union experienced a complicated economic environment. The downturn in industrial production and a full-scale crisis in the financial sector are forced to look for new economic solutions in difficult conditions.

The crisis particularly showed up in the banking sector; financial institutions faced the problem of lowering the cost of doing business. Banks should search for a new innovative model of development; one of these areas could be one of the achievements of the information economy—cloud computing.

For the past 10 years, the topic of cloud computing has gained widespread interest not only among IT professionals but also in business. Cloud services began to take a leading role in the Russian market; they are looking narrowly not only at the big players but also at small and medium-sized businesses. Nowadays, the Russian market of cloud technologies constitutes billions of rubles. More Russian banks do not only discuss the prospects of these technologies but also actively introduce them into their business processes. Such major players in the banking business such as PJSC "Sberbank of Russia," JSC "VTB Bank," and JSC "Alfa-Bank" are actively investing in the cloud.

The implementation of cloud technology to the Russian market has their own specifics, connected both with problems in the law and with imperfect Internet access technologies, hardware and software, and limitations in financial opportunities.

2. Key research findings

2.1. The concept of cloud computing and the stages of development

Cloud computing is a technology of the distributed data processing in which computer resources and power are provided to the user as Internet service. The cloud service represents special client–server technology; a client uses resources (processor time, random access memory, disk space, network channels, specialized controllers, the software, etc.), a group of servers in network interacting in such a way that

- all groups look at the single virtual server for the client;
- the client can transparently and with high flexibility modify the volume of consumed resources in case of changes in their needs (increase/decrease server power with corresponding change of payment for it) [1–12].

The way of cloud computing development was difficult and long. For the first time, the idea of computing virtualization emerged under the optimization of large computers (mainframe) in the 1950s of the last century. At that time, the main problem was to provide maximum load of computers to cut downtime of computing power. The idea of providing temporary remote user access to the mainframe for a possibility of fully loaded computers arose just then.

The progress of personal computers led to a move away from expensive mainframe toward low-cost servers, so the subsequent development of cloud computing technology is not received.

An announcement from John McCarthy, that "the computing power could ever be publicly available resources" and the release of the book "The Challenge of the Computer Utility" by Douglas Parhilla in 1966, in which he described almost all the main characteristics of the existing clouds today, became the following important stage in the history of the concept of cloud computing (Microsoft Windows Azure: Information).

For the first time, the idea of what we now call cloud computing was announced by J.C.R. Licklider in 1970. During these years, he was responsible for the creation of Advanced Research Projects Agency Network (ARPAnet). His idea was that every person on Earth would be connected to the network, from which people receive not only data but also the program. Another scientist, John McCarthy, expressed the idea that computing power would be provided to users as a service [13, 14].

In 90 years, there was rapid development of the global Internet, which had an indirect impact on the development of cloud computing. Network capacity significantly increased and the coverage of geography expanded. Along with computer networks development, the hardware technologies were improved, multi-core processors appeared, and the volume of information warehouses considerably increased. All this has resulted in the development of computer technology, which provides the possibility of cloud services as follows:

- virtualization—process of remote access to computational capabilities;
- ASP—technology for creating web applications and web services;
- SOA—service-oriented architecture for the use of independent services with well-defined interfaces which can be called by some standard way for execution of the tasks;
- Web 2.0—the technique of designing systems that through taking the network interactions into consideration becomes better the more people use them;
- development framework—software development environment multiagent systems and applications;

- the distributed scalable computation—a way to solve time-consuming computational problems by using several computers, often combined in a parallel computing system;
- grid computing is a form of distributed computing whereby a "virtual supercomputer" is presented in the form of clusters connected by a network of loosely coupled, heterogeneous computers working together to perform a huge number of tasks (operations, works);
- utility computing is a service when the service of execution of particularly complex calculations or data storage arrays is ordered;
- open-source software—the source code of the programs available for viewing, study, and change that allows the user to take part in the finalization of the open program, use the code to create new programs, and fix errors in them [15, 16].

The further development of cloud computing technology continued in the middle of the 2000s. Amazon launched a service called Elastic Compute cloud (EC2) in 2006. This web service allowed the users to start up their own applications. Such giants of IT industry as Google, Sun, and IBM offered their cloud services a year later.

In 2008, Microsoft proposed not just a service but also a complete Windows Azure cloud operating system, which currently is one of the largest and most all-embracing projects in the field of cloud services.

In 2010, there were cloud services that were oriented not just to software developers but to simple users.

At the present time, there are three stages of cloud technologies development, suggested by the company "Gartner" (**Table 1**) [15].

The first stage is cloud computing developed by companies in which cloud technology attracted the ability to quickly enter the market and radically improve development efficiency. At this point, cloud computing was the most effective within IT projects, providing a return of investment for 18–24 months.

The main feature of the second phase is market consolidation. The number of cloud proposals exceeded the market needs. The struggle for users among different cloud vendors reached a peak, which led to a series of mergers and acquisitions. At the same time, the cloud offers

Stage	Duration, years	Comments
First projects	2007–2011	Cloud computing is implemented by companies that are willing to take risks.
Market consolidation	2010–2013	People are beginning to pay attention to cloud computing; growing competition and declines the total number of suppliers.
Mass distribution	2012–2015	Cloud computing is becoming the dominant trend; a limited number of suppliers dominate the market.

Table 1. Development stages of cloud computing.

increased and conservative users began to consider the possibility of using cloud computing seriously. The duration of cloud projects rose, and companies launched projects providing a return of investments for the period from 3 to 5 years.

According to prognosis, the accumulation of a critical mass and the mass distribution of cloud computing would come in the third stage. A small number of key suppliers who get an opportunity to offer the market its technology as de facto standards would dominate the market. The understanding of the risks associated with a dependence on specific cloud technology vendors would also grow. It would lead to a rise in popularity of a cloud-based platform with open source [15].

2.2. The main categories of cloud computing

It is possible to carry the following characteristics to the key parameters describing cloud computing:

- pooled resources: clouds very often represent big virtualized infrastructure, but it uses virtualization with functionality addition. Cloud technologies pool resources together and permit the automatic services working in the real mode to dynamically expand and scale user and service resources;
- self service: after the user uses the allocated resources, it should be given the opportunity to manage with the help of self-service mechanisms, for example, in order to transform them to configurations that are more profitable. The cloud-based resources are actually controlled by the user, who has all the possibilities to build them under the requirements;
- elastic—the elasticity of cloud technology is the ability to dynamically scale which is requested in a very short period of time by the user;
- usage-based—model postpaid use is a set of regulations that determine cloud services that the user pays only when using the power provided. It allows reconfiguring the resources, which are used, for example, to pay for the support and maintenance of idle equipment, to solve problems faced by corporation, thereby ensuring the effective use of resources.

The economic benefit is obvious: combining resources into a single unit; allowing to provide the necessary configuration with the possibility of optimal payment and allowing to build the infrastructure, through which the organization can solve economic problems facing it.

At present, there are three main methods of cloud services:

- Infrastructure as a service (Iaas)—the user is given an "empty" virtual server with a unique IP address or a set of Internet addresses and the information storage system. For the management of characteristics, start, and a server stop the provider accommodates the user with the program interface (API).
- Software as a service (Saas)—The SaaS concept enables the user to apply the software application as a service remotely through the Internet. This service does not buy expensive software but is just temporarily used to solve problems.

- Platform as a service (PaaS)—the users are made available to the virtual platform, consisting of one or more virtual servers with pre-installed operating systems and specialized applications. As a result, the user can choose from cloud services, one that is necessary for the decision of business problem.

The following cloud services differ within the focus areas:

- Hardware as a service (HaaS)—the user is provided with the equipment that he/she can use for his/her own purposes. An advantage is cost savings on the maintenance of the equipment and the need of its purchase is excluded. This variant is essentially a kind of IaaS service, characterized in that a user on the basis of the provided equipment may expand his/her own infrastructure with the necessary software.
- Workplace as a service (WaaS)—the customer uses the cloud for the creation of workplaces of employees, configures and installs all the necessary software for personnel work.
- Data as a service (DaaS)—the user is made available to disk space, on which he/she can store large amounts of information.
- Security as a service—the customer quickly installs security systems, ensuring the safe use of web technologies and reliable protection of the local network. This service saves on the expansion of own security.

The line between the methods of cloud services is quite thin, and very often the service is the synthesis of several services at the same time. Therefore, combining all services into one which received the name Everything as a Service (EaaS) has a tendency for the last time. In this case, the user is provided with all the software, hardware, and business process management, including interaction between users; the user needs only Internet access.

There are three types of clouds:

- private cloud—a secure IT infrastructure, controlled and exploited by one organization. The company can independently manage cloud or entrust it to an external organization, and the infrastructure can be located on the territory of the company, the vendor, or mixed. The private cloud deployed on the territory of the organization and fully managed by its employees is best variant;
- public cloud—an information infrastructure, which is also used by many companies. Users of public cloud only receive access to needed services, but are not able to manage, while they have no requirement to maintain infrastructure. Any company or an individual can become the user of this cloud. Owners of public clouds propose an easy and affordable way to deploy the required business systems and large possibilities of expansion;
- hybrid cloud—an infrastructure using the best quality of public and private clouds, in dealing with the task. Most often, this approach is used in companies having their own private cloud infrastructure, but in the case of a growth in their workload, a part of problems spreads to the public cloud, for example, large amounts of information [13, 17, 18].

2.3. Advantages of cloud computing

The use of cloud services has a number of advantages over using a conventional infrastructure:

- the user pays only for the amount of services that it needs and at the same time when there is such a requirement;
- cloud technologies allow for savings in the acquisition, maintenance, and upgrading of software and hardware;
- scalability—the ability to expand the number of servers, applications, and workplaces;
- fault tolerance—ensuring reliable operation of the system that can be duplicated when using cloud services;
- remote access—provides a possibility of access actually anywhere in the world where the Internet is available.

Along with the advantages, cloud services have several disadvantages:

- the user is not the owner (if the cloud is not completely private) and does not have access to cloud infrastructure; accordingly, the safety of the used data is completely dependent on the company, providing data services;
- to provide high-quality services required for high-speed Internet;
- absence of common standards in the field of cloud services security [12].

2.4. The global cloud computing market

Nowadays, the development of cloud computing occupies a large niche in the field of information technology. According to the prognosis of analytical company Forrester Research, the global cloud computing market would reach 241 billion dollars by 2020 (**Figure 1**), and the market of cloud applications and services available through the Internet would grow to 159.3 billion dollars by that time (**Figure 2**) [19–21]. At the same time, the average annual growth in the cloud computing and services market would exceed 20%.

2.5. Analysis of the Russian cloud computing market

Cloud technologies are developing very rapidly in Russia. According to the research by Orange Business Services analysts, the income of the Russian cloud services market amounted to 19 billion rubles for business in 2016. In parallel with this, the services market on the creation of cloud infrastructure brought more than 20 billion rubles of income. At the same time, the average annual growth was over 50% [22–25].

The market of services based on building cloud infrastructure exceeds the volume of the cloud services market in 2016. It became possible, thanks to the rapid growth of the amount of services in a construction of "clouds," their merge and customization, and movement from conventional infrastructure to cloud one. In total, the share of cloud services is expected to reach 13% of the Russian market of IT services by 2017 [26–31].

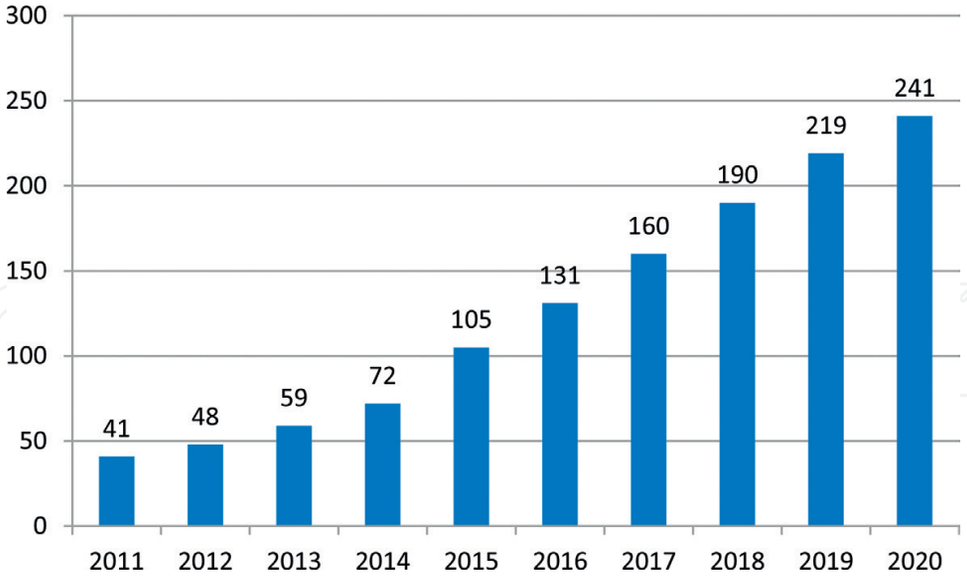


Figure 1. Volume of the world market of cloud computing, billion dollars.

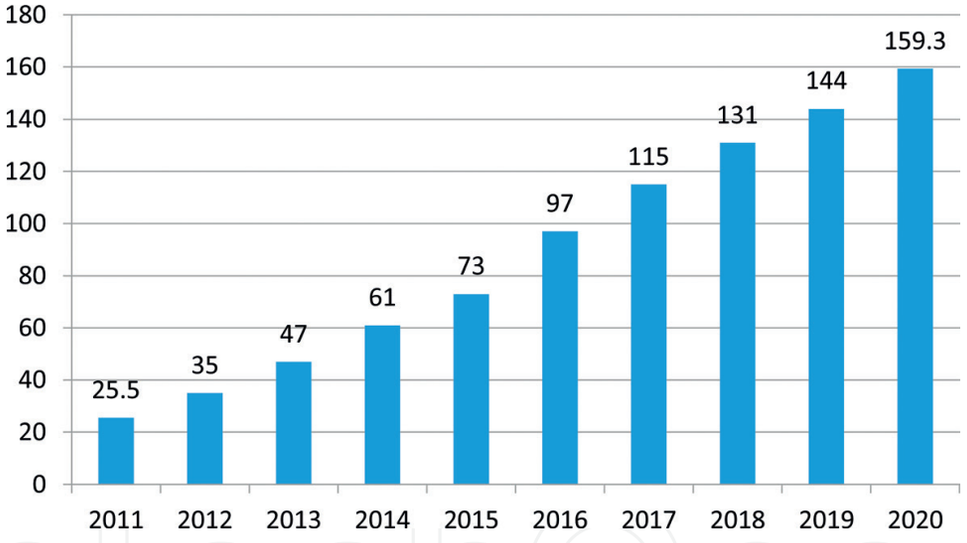


Figure 2. The global market of cloud-based applications and services, billion dollars.

If we consider the dynamics of the Russian market of cloud computing, it is much higher than the global growth rate (**Table 2**). This is explained by the fact that the Russian market lags behind the global cloud computing market and has to be hastened to catch up.

Despite the shortcomings of cloud, perspectives of their introduction are huge in Russia. According to Orange Business Services research, the income of the Russian market of cloud services for business has increased from 4.5 billion rubles in 2012 to 19 billion rubles in 2016 (**Figure 3**). At the same time with this, the service market to build cloud infrastructure brought more than 20 billion rubles of profit. Moreover, the service market based on the creation of cloud infrastructure exceeded the size of the market of cloud services in 2016. It became possible, thanks to the rapid growth in the volume of services for the construction of clouds, their

	2013 (%)	2014 (%)	2015 (%)	2016 (%)
The dynamics of the world cloud infrastructure market	23	25	45	25
The dynamics of the world cloud services market	34	22	13	32
The dynamics of the Russian cloud infrastructure market	75	43	41	32
The dynamics of the Russian cloud services market	81	59	48	37

Table 2. Comparative indicators of cloud services for the Russian market with the world, author development.

merge and customization, and movement from conventional infrastructure to cloud one. In total, the share of cloud services is expected to reach 13% of all Russian markets of IT services by 2017 [26, 30, 31].

The decisions in the IaaS infrastructure are most preferred for Russian customers. This kind of service is the most demanded, and the annual growth of these services is about 40% (**Figure 4**). It is explained by the desire of clients to administer the systems independently that is caused by feature of the Russian market, a large number of programs of own development, and also the general mistrust of customers to the cloud computing market. At the present time, 11 major players represent IaaS market: ActiveCloud, Clodo, Cloud One, Croc, Parking.ru (Group Inoventica), Selectel, "I-Teco," "Oversun," "Scalaxi," Cloud4Y, and Dataline (**Figure 5**). The penetration of IaaS was about 4% in Moscow and St. Petersburg, in other regions, less than 1% at the beginning of 2013 [27, 28].

Software SaaS is the second most important service in the field of cloud computing. It shows an annual growth of 50% and in the future will only increase the volume according to analysts' prognosis (**Figure 4**). There are five main players on the Russian SaaS service market, who occupy more than 90% of all markets (**Figure 6**).

The use of PaaS services, which is not very popular in Russia, is the next step in the development of the cloud market; however, the first proposals from the foreign supplier began to appear. According to different estimates, the market size of PaaS and BPaaS (business

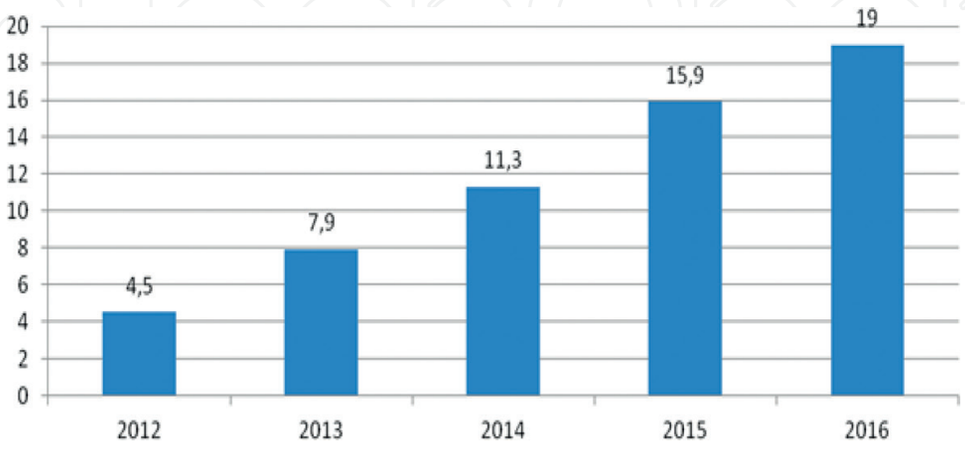


Figure 3. The volume of the Russian market of cloud services, billion rubles.

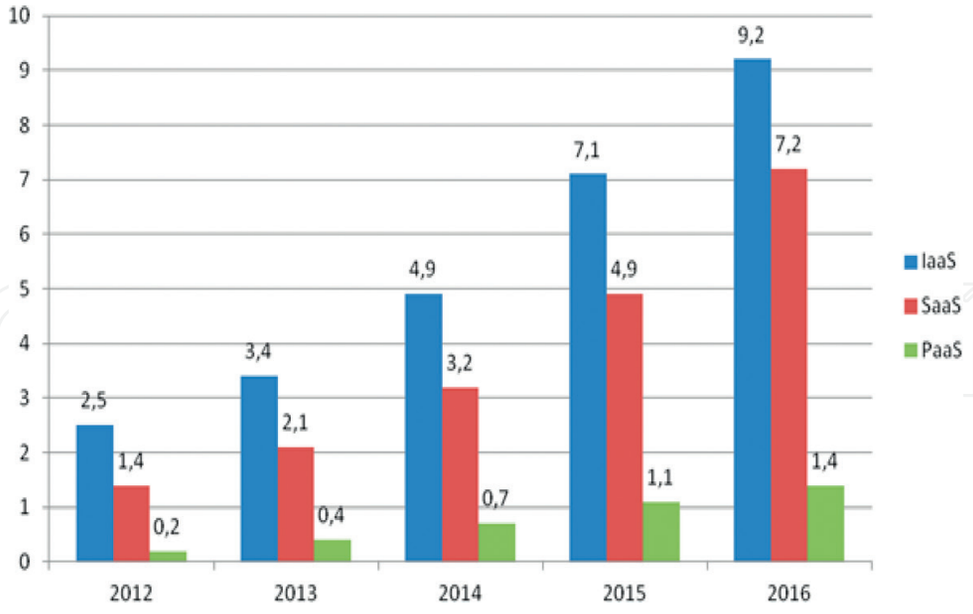


Figure 4. The volume of the Russian cloud technologies market on types of service, billion rubles.

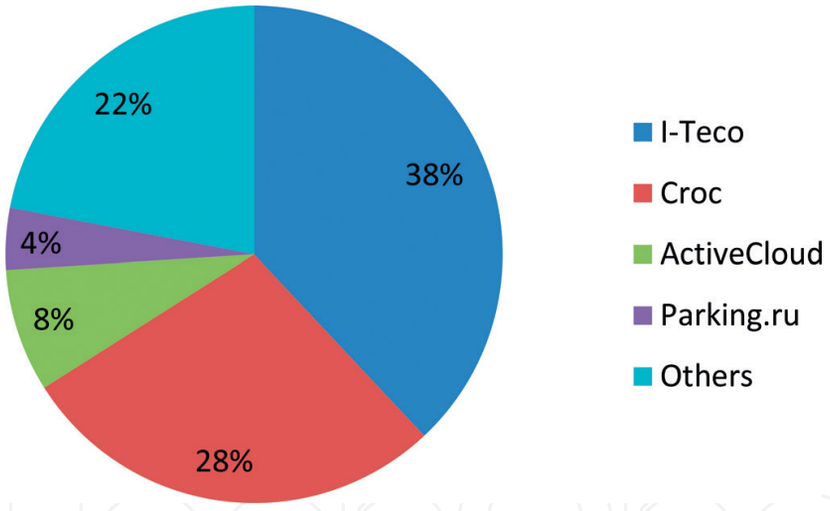


Figure 5. The largest SaaS providers in Russia.

processes as a service) was about 100 million rubles in 2012 each one, and they would make 700 million rubles by 2017 (**Figure 4**) [24, 26].

The preference is given to private clouds in the Russian cloud computing market, because they provide a higher level of safety, allow to integrate easier non-standard decisions, and achieve the best controllability, in comparison with public clouds. In recent years, the designing of hybrid clouds has gained development that is caused by the presence of well-developed IT infrastructure and data-processing centers at many companies. Therefore, the creation of a hybrid cloud is the most appropriate way (**Figure 7**) [32, 33].

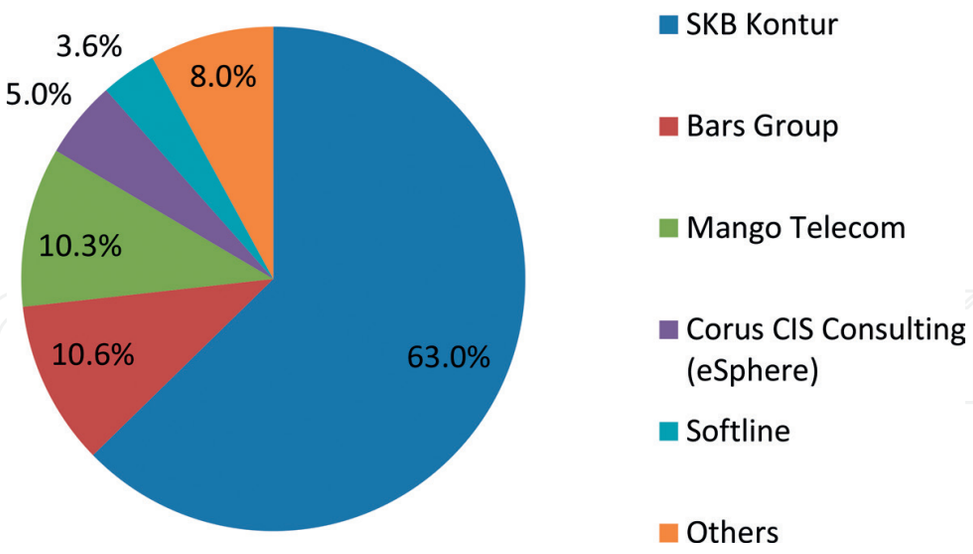


Figure 6. The greatest SaaS service suppliers on the Russian market.

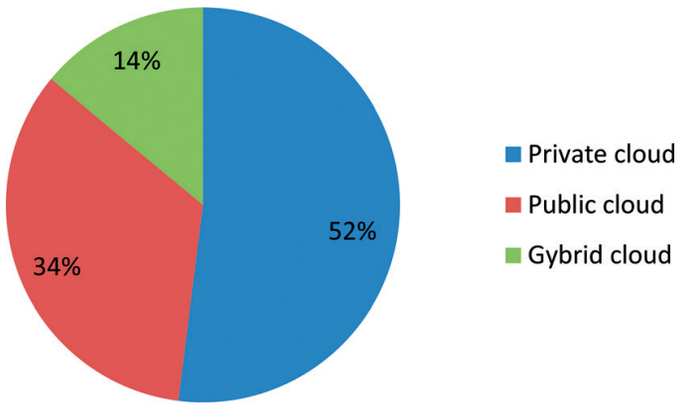


Figure 7. The distribution of cloud types in Russia.

2.6. Cloud computing in the global financial system

Cloud computing becomes more and more demanding for the world financial market. According to the Information Week study, a large number of financial institutions in the world actively use cloud services when running the business. More than 40% of the world financial institutions use software testing as a cloud service, 28% of banks—cloud business applications, 24%—cloud data centers, and 21%—cloud storage (**Figure 8**) [33–38].

In recent years, financial institutions around the world are faced with difficulties in adapting outdated banking systems, launched 20–30 years ago, to modern requirements. Built systems are designed on the basis of a closed architecture, and integration of automated banking systems with new applications is a difficult task, so such solutions are more expensive to use and maintain. In addition, these automated banking systems do not support modern business strategy, because in their heart, the transaction rather than the client.

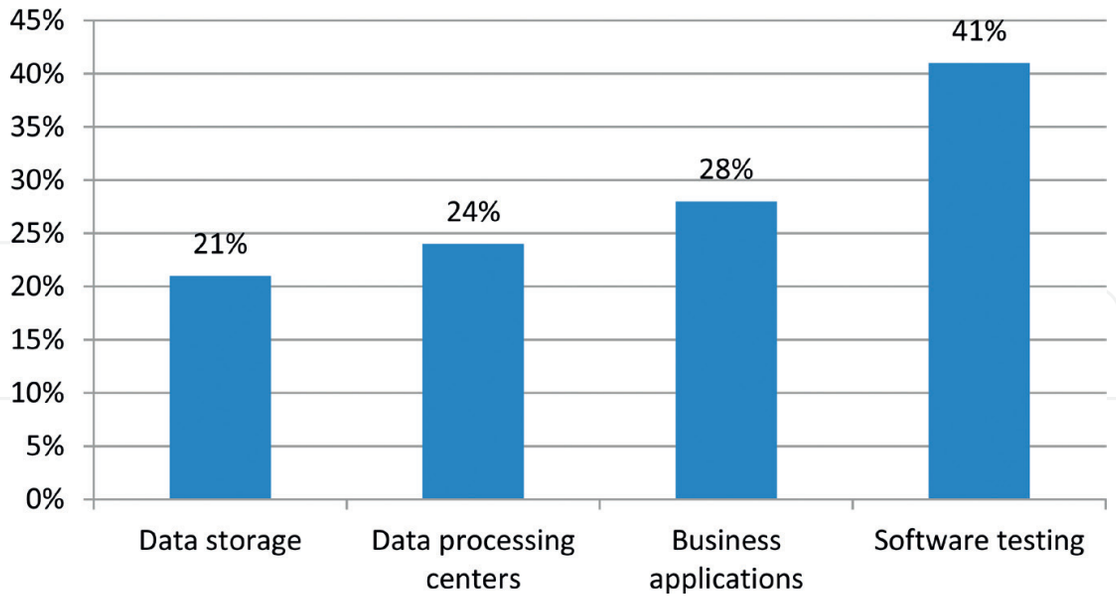


Figure 8. Distribution of cloud services by type of use in financial institutions in the world.

For example, in the United States according to an Aite Group research, more than one-third of banks use ABS older than 16 years and more than half, older than 10 years. A possible replacement of automated banking systems within the next 2 years is called by 13 banks with assets 100–249 million dollars and highly probable 8% of banks with assets between $500 million and 5 billion dollars [39, 40].

Thereby, banks face a choice of implementation, a traditional or cloud automated banking system.

The advantage of cloud automated banking system is the ability to deploy a complete automated banking system on external organization servers, which fully meets the maintenance and configuration of the system, allowing the bank to engage only in the development of business, without going into the features of maintenance and operation of the automation of banking business processes.

The tendency associated with the provision of cloud automated banking systems in financial institutions, in spite of the risks related with the need to ensure the confidentiality of banking information, grows.

Research showed that the introduction of cloud automated banking system goes down in expenses on an average of 20% compared with the conventional automated banking system [39, 40]. This indicator is caused by the following reasons:

- lack of capital costs—no need to spend money for the acquisition of servers and software simultaneously, instead, fixed monthly payments for the rental of equipment and cloud automated banking system are made;
- economy on processes of implementation and technical support of software;
- quick results from the use of the necessary software—no delays related to the implementation;

- the possibility, if necessary, quickly changes the functionality of the system available to a bank;
- a decrease in the number of employees of the IT department, required for interoperability with bank departments' cloud automated banking system;
- absence of expenses for the maintenance of data security; they are placed on servers located in a professionally equipped data center.

As a result of the conducted research of the American banking sector, the Aite Group Company obtained the following results: the cloud used 30% of all US banks in 2006 and about 50% in 2012. According to forecasts, about 90% of all US banks will move to cloud automation systems by 2020 (**Figure 9**) [40].

2.7. Using cloud computing in Russian financial institutions

The use of cloud technologies in the Russian banks did not find such distribution as in the world. There are a number, both objective and subjective, of reasons, for limiting the spread of cloud technologies in the banking sector in Russia.

Firstly, the banks imposed restrictions such as requirements of state regulators in the field of personal data and state secrets and the conditions of the external regulators—the international payment system. All this greatly complicates the transition to cloud computing, especially to hybrid and public clouds.

Secondly, requirements for saving data hold back the development of public cloud technologies. Data security cannot always be provided in public services at the proper level.

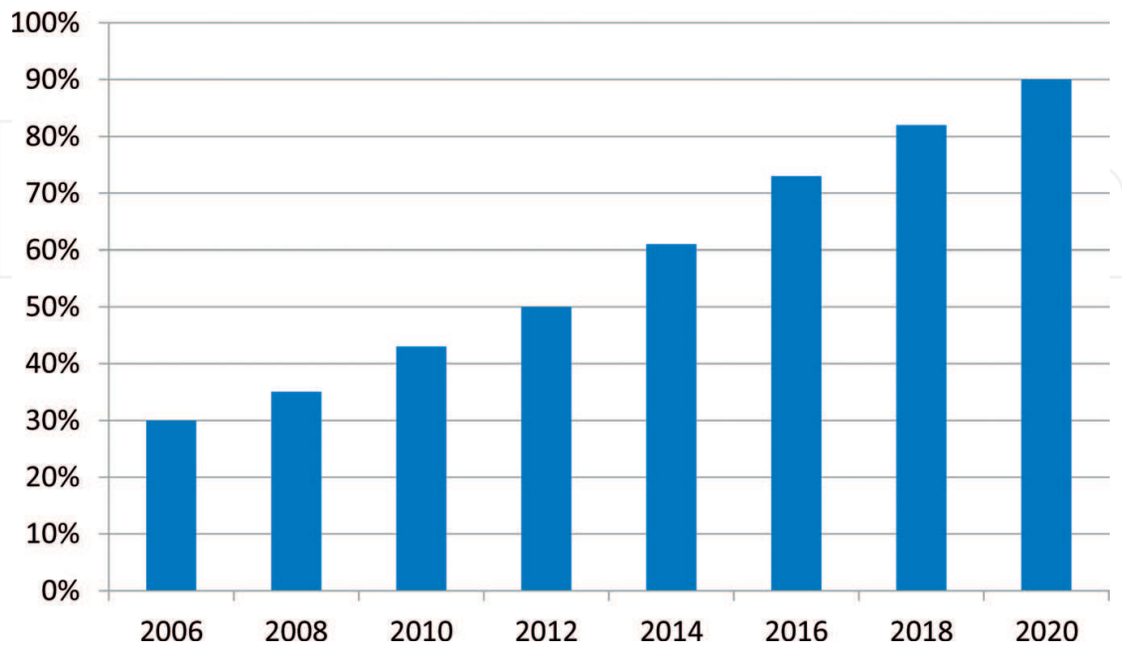


Figure 9. The share of US banks that use the cloud automated banking systems.

Thirdly, the impossibility of self-administration in the clouds is a negative factor for the deployment of cloud services.

Fourthly, the transition to cloud computing requires a significant investment in the restructuring of information infrastructure.

According to a Symantec study among Russian banks, almost three-quarters of respondents are discussing the possibility of moving to the cloud, but most of them have not yet transferred to action. Forty-three percent of respondents expected a sharp increase in the flexibility of IT infrastructure, having been solved on the application of cloud services, but expectations were not fulfilled. In addition, 48% of respondents in vain hoped to improve the efficiency of IT systems, 46% to reduce operating expenses, and 35% to improve safety [23, 28, 30].

These results indicate that the problem is not in the very cloud technologies but an imbalance between what banking institutions expect from these technologies and their real possibilities.

Meanwhile, nowadays, significant changes are traced in the use of financial products because of consumer preferences. In all the banks, remote access to the system of self-service with a warranty of high speed and customer convenience of work was necessary. In addition, the emergence of new financial intermediaries in the market of traditional banking services leads to the growth of competition and the need to find new channels of banks offering their services to customers.

Therefore, in spite of the open questions in the field of security, banks are among the most active consumers of cloud solutions.

Despite the fact that the banks covered their success in using the cloud a little, we can mark several projects of recent years, where cloud technology helped to achieve clear results in terms of efficiency [41–45].

One of the most interesting projects is “Pilot” associated with deploying a private cloud in the Central Bank (the contractor—the company “Jet Infosystems”). A full IaaS platform with a self-service portal was created and used by the means of minimizing the major banking information risks in the cloud. The project result is the considerable increase of processing speed of user requests, greatly reducing the load on the system administration.

Today, global financial business structure, owing to the clouds, may provide services to its offices around the world. For example, the data processing center of “Citibank” in Frankfurt is certified to the highest class and can provide services not only to the western branches of the bank but also to its Russian departments.

PJSC “Sberbank of Russia” also places a high emphasis on the centralization of back-office systems of the territorial banks and introduces the next generation of three-level systems. In the future, the financial institution assumes their transfer to the cloud model.

JSC Gazprombank and PJSC Ak Bars bank are engaged in cloud projects at the present time (the contractor—the ICL-KPO company). JSC Raiffeisenbank positively considers the perspectives of private “cloud” creation for itself. The effective provision of computing power for the solution of specific objectives is the task, which it plans to accomplish in such a way.

JSC "Bank Intesa" is mastering the basic techniques for working with IaaS cloud and tries to use it as a backup data center. The partner is a company "Croc." The bank will examine clouds as one of the main directions of the IT infrastructure development, if cloud technology significantly saves resources and thus the information safety be provided.

The project on transfer in the cloud automated banking system (ABS) appeared in Russia in 2013. "Group of companies CFT" conducts the project in the bank JSC JSCB "International Financial Club." Initially, the bank moved on the use of basic banking applications with cloud technology. Further, the company "Group CFT companies" provided the bank AKB "Moscow Financial Club" cloud ABS, which included not only the virtual computing power but also elements of the security infrastructure, access control, authentication, means to ensure failure, and disaster sustainability. It is expected that the project will enable the bank to cut costs for equipment and maintenance [46–49].

The interest in cloud automated banking systems had been shown in the banking sector in Russia only for the last few years. The only leader in providing cloud technologies is the company "Center of Financial Technologies," which delivers totally automated cloud "CFT-Bank" system, which allows to ensure the comprehensive automation of the entire bank (**Figure 10**).

The first cloud automated banking systems were introduced in the Russian market in 2010 (**Figure 11**).

At the present time, 10 Russian banks introduced cloud platform "CFT-Bank," among them the company "Expobank," JSC "Miraf Bank," JSC "BaykalBank," JSC "International Financial Club," and others.

Any cloud automated banking systems were not implemented in the Russian financial institutions since 2013, and it speaks about the difficult economic situation caused by the

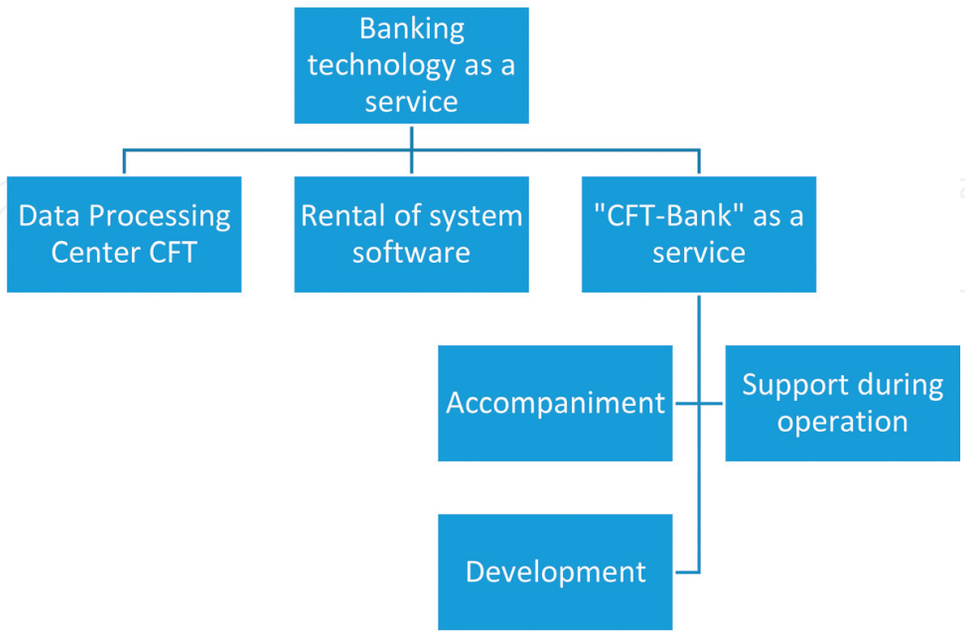


Figure 10. Complex automation of banking services based on cloud computing.

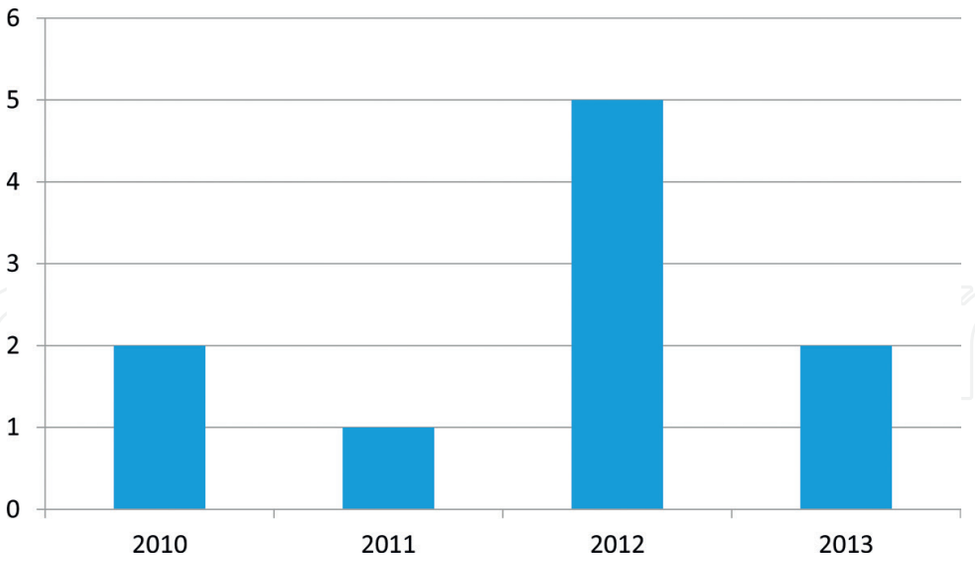


Figure 11. Dynamics of cloud implementations of automated banking systems "CFT-Bank.".

global financial and economic crisis, which led to the closing of major infrastructure projects in the banking sector.

It is possible to achieve considerable cost savings when implementing cloud automated banking system "CFT-Bank" in comparison with the traditional one of the same firm only in one of the parameters associated with a reduction of the number of employees of the IT department. The typical configuration of staff includes 68 people when using the conventional automated banking system; in transition to the cloud automated banking system,

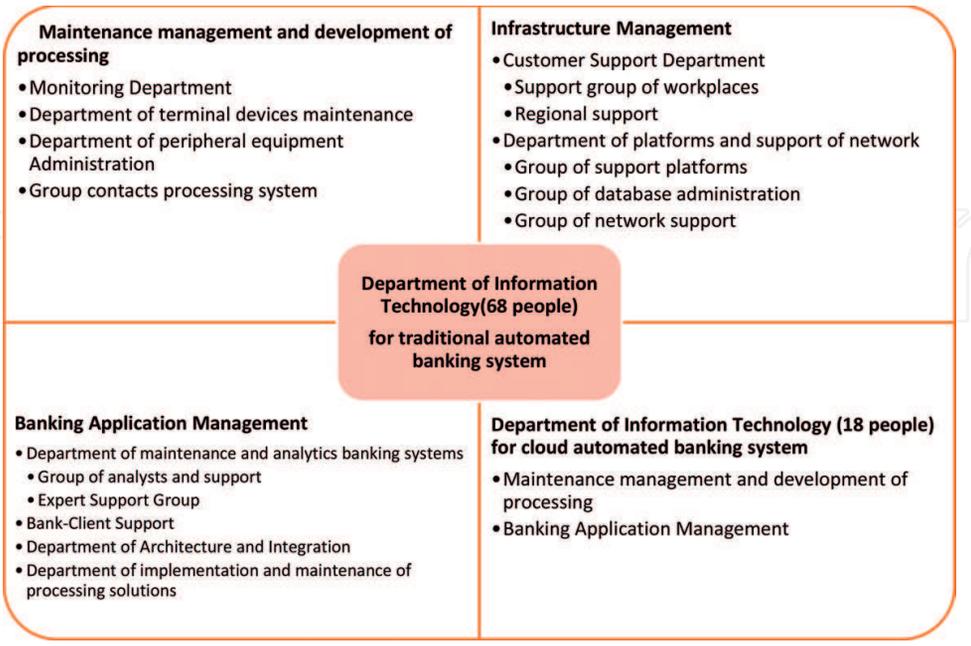


Figure 12. Restructuring of the bank's IT department during the transition to cloud automated banking system of CFT-Bank.

the number of employees can be laid off to 18 people (**Figure 12**), whose main task is to ensure interaction between the departments of the bank with the cloud automated banking system [24, 40, 50–52].

3. Conclusions

In conclusion, the main trends for the implementation of cloud services in the banking system are as follows:

- banks are wary of the use of cloud technology, first of all because of information security;
- implementation of cloud technology takes places in large financial institutions, because the transition requires large investments in the reconfiguration of the bank's IT infrastructure;
- preference will be given to private clouds, capable of providing the required level of information security and the independence of the system configuration; however, the development of hybrid cloud has its perspectives associated with the removal of secondary operations in public clouds;
- the next few years, IaaS model, providing the necessary bank's infrastructure, will develop as cloud technology in the Russian banks; as for SaaS and PaaS models, their development prospects in the financial institutions are unlikely due to the specifics of banking software;
- the use of cloud computing in the field of data storage, data centers, and workplace virtualization is the application of cloud technologies in Russian banks;
- dynamics of cloud services in Russia is ahead of leading indicators by its characteristics in cloud infrastructure an average of 18% per year, and in the cloud services, 30% per year;
- the use of cloud technologies in the banking sector goes in the direction of the use of cloud storage, data centers, business applications, and software testing. There is a tendency of introduction cloud automated banking systems in recent years, which is due to the cost reduction in the implementation compared to conventional ABS, on average 20%;
- introduction of cloud automated banking systems in the Russian financial institutions is slow, only about 1% of Russian banks use cloud ABS.

Author details

Alexey V. Bataev

Address all correspondence to: bat_a68@mail.ru

Higher Engineering and Economics School, Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia

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