

Management of BAIS: Technological Trends and Digital Initiatives 4.0

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Received: April 20, 2021 | **Revised:** May 24, 2021 | **Accepted:** June 16, 2021

JEL Classification: D80, L86, M11, O14, O32.

DOI: 10.38188/2534-9228.21.2.11

Abstract

Successful operation of modern banking institutions significantly depends on the use of the latest information and communication technologies in process management, from motivation and communication with staff, to remote control of banking operations. Purpose of scientific research is a study of the principles and features of banking automated information system in terms of implementation of the latest information and cloud technologies by banking institutions. The object of scientific research is banking automated information system of banking institutions. The result of the article: research proved that the creation and selection of banking automated information system of banking institution is based on the planning of all systems related to the functioning of the complete infrastructure of the bank, built on information technology; the causes and consequences of various risk situations by channels of their occurrence in the banking sector as a result of using a bank automated information system are substantiated; main requirements for information support of banking institution and the main criteria for choosing banking automated information system of a banking institution are identified. Practical implications: priority ways of overcoming the risks of introduction of banking automated information system are offered, taking into account the scope and spread of risks. Value/originality: the introduction of a banking automated information system of a banking institution today is impossible without the use of cloud technologies, each of which has a number of strengths and weaknesses.

Keywords: banking institution, information technologies, banking automated information system, cloud technologies.

Introduction

The issue of information processing in banking structures today, in the context of digitalization and automation of most business procedures and operations, is becoming increasingly relevant. The widespread use of modern digital technologies in daily practice of banking institutions has long been a reality. Their successful operation now depends on the use of information technology in process management, ranging from motivation and communication with staff to remote control of

banking operations. The activities of banking institutions are always associated with information, which is the subject and product of their work. In them automation of main production is reduced to automation of operations of processing of corresponding documents and information. The use of banking information systems reduces the cost of servicing real-time banking operations, which improves the quality of operational, tactical and strategic financial decisions.

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The use of modern digital initiatives 4.0, in which the informatization of banking sector is a set of interconnected organizational, legal, socio-economic, scientific and technical, production processes aimed at creating conditions to meet information needs, the

realization of citizens' and society's rights to finance based on the creation, development, use of information systems, networks, resources and information technology, built on the use of modern ICT.

Material and methods

Research and coverage of current issues in the field of ICT in management is devoted to the work of such Ukrainian and foreign experts and scholars, in particular I. Zakharova, V. Traineva, A. Karminskyi, A. Poliakova, V. Tsvetkova, V. Razumova, I. Rozenberg, L. Bershchtein etc. However, most of the issues considered by authors concern either the field ICT or management, and only in isolated cases do these concepts appear together. This isn't to mention the application of both concepts in the context of banking. All this indicates an insufficient level of research of key elements together in understanding the single relationship.

In ICT management, an important role is played by information flows that affect management (reverse flows) and are used in management (direct flows). In essence, information management is concerned with the

analysis and management of information flows. Part of these flows is passed through an automated information system (AIS) (Rozenberg, Tsvetkov, 2010), and part – passes through a person, due to the imperfection of ICT. Banking automated information systems (BAIS), which are one of digital initiatives 4.0, should provide the ability to comprehensively use all information flows to solve management problems. To do this, the system should be based on the concept of a single information space (Boisoi, 2013).

In the process of research, the following methods are used: generalization – in studying the nature and principles of banking automated information system; formalization – when comparing characteristics of banking automated information system in particular in terms of the use of cloud technologies.

Results and discussion

In banking institutions, as a rule, there is one or more informative-analytical systems to support individual units. Sometimes these systems are integrated into one. In this case, use an integrated banking information system. BAIS is a single software and technology complex, which is a means of improving the efficiency of banking services, return and balance of resources subject to control under the specified conditions of financing and lending. An integrated BAIS is designed to solve the whole set of banking problems comprehensively, reflecting the complexity of their relationships. Development of integrated BAIS requires the analysis of a large number of factors. BAIS supports the strategic management of the bank, coordinates the work of various departments and disparate information and analytical systems.

The basis of information processing in BAIS are information models of different levels. For the compatibility of models, they should be based on standardized elements – information units (Bjork, 2009). They ensure the integration of technologies in banking sector. An integrated BAIS is designed to solve the whole set of banking problems comprehensively, reflecting the complexity of their relationships. The use of IT of modern digital initiatives 4.0 in BAIS is to apply systems analysis and general systems theory. The design of model structures is based on the application of structural analysis and model theory based on the analysis of functions and tasks. In management of the bank an important role is played by information flows that affect management. This is due to the fact that in modern banks there are almost no single

information documents, and there is a continuous flow of documents.

This leads to the concept of information management. Currently, information management is based on the synthesis of technical information management and organizational management (Tsvetkov, 2012). Information management uses organizational models that are poorly formalized and depend on the entity that creates them. Information management is based on the creation of management structure that uses organizational management. Information technologies and models are selected and adjusted to this structure. Information management uses the ideas of organizational management, which create: information units, information models, information structures, information processes and information systems. In the design aspect, this approach is called "counter-flow design".

Information management is concerned with the analysis and management of information flows. If we consider BAIS as information, located in some environment, we can distinguish between external and internal information flows. In essence, information management is concerned with the analysis and management of information flows. If we consider the automated banking system as information, located in some environment, we can distinguish between external and internal information flows. Part of the information flows is passed through BAIS, and part – passes through a person, necessitates the development and application of cognitive information management models (Tsvetkov, 2014). That is, current management of the bank and the use of BAIS require human participation and the use of cognitive models to reduce workload and increase the operational performance of the manager.

BAIS must provide the possibility of integrated use of all information flows to solve management problems. To do this, it must use the concepts of internal and external unified information space (Boisot, 2013). External information space is created on the basis of information systems of analysis of the external environment, market and

competitors, and internal space – on the basis of its creation within the bank and "electrification" of information resources and technologies. BAIS in the management of banking is an indispensable means of management. This provision is generally accepted. However, man still plays an important role in this area. This requires the introduction of cognitive management models and cognitive management technologies. Information technologies in banking management increases the efficiency and productivity of management processes and there are no alternatives.

BAIS should be integrated – built on system-wide principles and cover the whole set of banking tasks, as well as solve automation issues comprehensively, taking into account information and functional connections (Education.ua, 2011). Like any system, BAIS can be represented as a set of subsystems – providing and functional. Supply subsystems combine all the types of resources needed for the system to function. They include subsystems of information, software, mathematical, linguistic, technical, organizational, methodological and ergonomic support (Studopedia.su, 2014).

Functional subsystem is a part of general control system which is allocated according to commonality of functional signs of management. Functional part is considered as an independent system, characterized by purpose, subordination, separation of the information base, methodological orientation of calculations of economic indicators and specialization of works.

Development of the automation process has led to the emergence of various BAIS, due not only to the large number of developers, but also a wide range of functions performed by banking institutions, a variety of structures and sizes of banking (Refine.org, 2015). The creation and operation of BAIS is based on systems principles that reflect the most important provisions of theoretical framework, which covers a number of related scientific disciplines and areas, such as economic cybernetics, systems theory, information theory, economic and mathematical modeling of banking situations and processes, analysis and decision-making.

The creation and selection of BAIS is based on the planning of all systems related to the functioning of the complete infrastructure of the bank, built on information technologies. Under the information infrastructure of BAIS is understood the totality, ratio and content of individual components of bank's activities based on the automation of banking technologies (Wikipage.com.ua, 2013). Automated banking technology, along with system-wide principles requires consideration of the structure, specifics and scope of banking activities. Features of the

automated banking information system significantly depend on the type of activity and nature of the operations performed by banking institution. Speaking of BAIS, we mainly mean the automation of traditional services, ie the actual automation of tasks (functions, operations) of main production. But there are also management functions that can also be effectively automated (for example, maximizing loans (because bank's profit is higher, the higher the share of loans) and minimizing balances) (Figure 1).

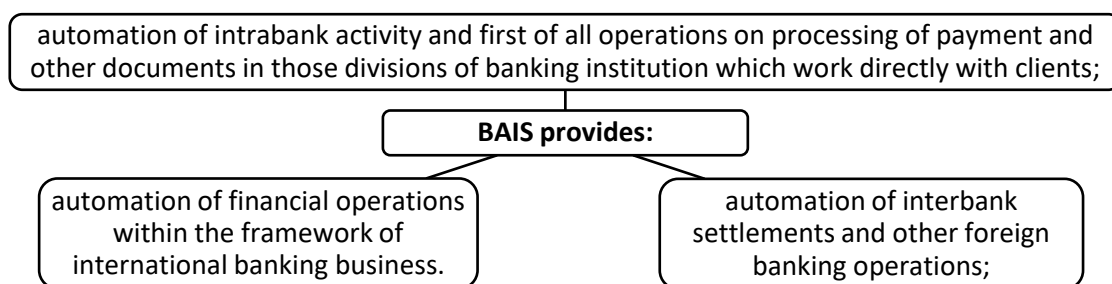


Figure 1. Areas of provision of BAIS (authors' development)

BAIS is constantly evolving along with the improvement of banking structure. With all advantages of using information technologies in

banking, the probability of risk situations specific to automated information processing increases (Table 1).

Table 1. The system of risk situations that arise in banking sector as a result of the use of BAIS (generalized by authors on the basis of (Ukrbukva.net, 2014))

Risky situation	Causes and consequences of a risky situation
information web-site	used for advertising purposes may be damaged by unauthorized access by third parties
E-mail	confidential or private information may also be damaged by the
network systems	directly connected to banking operating system or main database may be accessible to unauthorized persons who have access to data or software
system failures	due to power outages and systemic defects. Caused by connected computer systems. The effects of system failures can spread rapidly beyond the circle of stakeholders. Comprehensive risk management programs are especially important in identifying and responding to any incidents
electronic payment systems and data forwarding systems	hope for third parties (technology developers) and uncertainty in legal issues are the cause of unique risks in electronic delivery systems and payment systems
electronic channel	used to deliver products and services is the cause of unique risks due to the increased speed of systems and access to data related to geography, user groups, databases and especially peripheral systems. In the event that a banking institution lends or attracts a deposit via an electronic channel, credit and liquid risks should be taken into account in the context of a high-speed electronic environment. Risks are associated with high transaction speed and wide access associated with electronic delivery channels

Traditional risk management programs need to adapt to new aspects of the electronic environment, which may include the speed of the transaction, take into account the geographical reach, anonymity of the user. Such aspects create new tasks for management systems designed to monitor activity in the system. Thus, questionable activities carried out electronically may not be defined by traditional surveillance processes, which may limit or harm the quality of the information on which effective management decisions are based.

Risk management of a banking institution is an ongoing process of identifying, measuring, supervising and eliminating the potential consequences of risk situations. Given electronic delivery systems and payment systems, this process should include all important operational, legal and reputational areas of risk exposure.

Thus, a clear definition of the nature of the origin of risks is one of the necessary

preventions of their implementation, and the use of model experimentation with the study of the possibility of manifestation of a particular of them provides opportunities for training those responsible for making biased decisions. The risk of BAIS stems from the possibility of errors or distortions in the documentation of banking operations, their incorrect display in the registers (Table 2). This means that BAIS will be inefficient and not completely reliable (Wikipage.com.ua, 2013). Systematization of risk situations of a banking institution that may arise during its activities with the use of IT digital initiatives 4.0, contributes to the creation of specialized monitoring systems and the use of methods to eliminate these situations, developed by bank's specialists. Such systematization also allows to determine the priority directions of bank's activity depending on the defined strategy and as a result of timely elimination of risk situations or prevention of their occurrence.

Table 2. Key risks of BAIS and priority ways to overcome them (*authors' development*)

Type of risk	Scope and dissemination of risk	Ways to overcome
errors when entering data	unverified data origin; errors were made when transferring data to machine media or overwriting data	put responsibility on employees for the resources used (physical means, information arrays, communication lines, documentation, etc.); ensure constant quality verification of data protection measures; use cryptography; control the destruction of unnecessary information; to ensure legal protection of data protection measures; classify information by its value;
invalid code	customer data, bank transactions in the system are displayed as codes, so entering an erroneous code causes errors in the processing of data	
undefined data	it is not known: to whom, from whom and the purpose of transferring money; the presence of false details in the record; the inability to identify the information entered into the computer, because the data is written before entering the id	
unapproaded operations	performed banking operations do not meet the requirements of the bank's management	
record (loss) violation	loss of information before entering into the computer, during processing or after their call from the system for adjustment	
errors in output	data in the report is erroneous, the information is late and has lost its value, the user did not understand the presented data, report was not received for its intended purpose	
errors processing data	incorrect input is being processed	
discrepancies in totals	inconsistency of individual information with checksums due to programming errors, lack of standard programs to check the balance of data, incomplete or inaccurate data entered into the system, the time interval between manual and automated data processing	

Type of risk	Scope and dissemination of risk	Ways to overcome
inappropriate ways to control	method of control does not allow to reproduce the process of data processing	to familiarize the company's personnel with the problems of data protection and the need to carry out information security measures.
error chains	an undeveloped error in one area produces incorrect results in another area that uses poor-quality data	
recurrence errors	during the constant processing of data, errors may be repeated due to poor-quality development of the program, through repeated recording of the same operation, due to the introduction of incorrect variable information or incorrect constant information	
subtasking data	the program enables the theft of the bank's capital	
inconsistency with the policy of the administration	management policies and methods are inconsistent with the computer data processing system	
non-compliance of the quality of services with the requirements of users	users do not get the desired results on time due to: insufficient power of the computer, consumption by users of a greater share of services than they own, inefficiency of automated systems and methods, inaccurate determination of priority works, outdated equipment or software, lack of understanding between users and staff serving computers	

Banking computer systems differ from others primarily in that the information they process must be securely protected from outside interference, and the system itself must have the properties of increased vitality and reliability. Competition in the banking market is quite high, respectively, should be responsible for the timely adoption of the right strategic and tactical decisions at each level of hierarchy of banking branches. And this requires automation, and that is why banks use the achievements of information technology.

Assessing the effectiveness of the management of banking institution by means of ICT, we understand that in modern information technologies banks cover all aspects of banking. Its automation involves the use of computer information systems in banks, automation of payment document processing in customer service departments, operational departments, as well as automation of financial transactions in the international banking business.

It is important to understand that ICT allows to perform electronic payment transactions with minimal involvement of people and reduction of organizational costs and, accordingly, to minimize typical types of banking risk: loss of documents,

erroneous addressing, falsification of payment documents. The most important advantage of using ICT in the management of banking institution is the ability to provide managers with strategic assessments of the bank's position in terms of competition, organization of work and personnel policy.

It so happened that all the existing areas with which most modern banking institutions interact in their work are already actively involved in ICT systems. They are constantly evolving and changing, so there is no doubt that management of banking institution works as automatically as possible. That is why it is difficult to find any new areas of application of ICT banking. But still, there is one area in which you can work better – information support subsystem for the formation of a portfolio of securities. The process of work in this subsystem is not fully automated, it is complex and time-consuming compared to other areas of the bank.

Information support of the subsystem of securities portfolio formation is a method of classification and coding of information on the formation of the securities portfolio, methods of organizing regulatory information, construction of data banks, including the construction and

maintenance of information base. The principles of creating information support of banking institution include: integrity, reliability, control, protection against unauthorized access, unity and

flexibility, standardization and unification, adaptability, minimization of input, output of information (Figure 2).

Requirements for information support of a modern banking institution:
<ul style="list-style-type: none"> • Information support must be sufficient to perform the functions of the information system, which are automated. • Classifiers must be used to encode information used only in this information system. • Forms of documents created by the information system must meet the requirements of standards or regulatory and technical documents. • Forms of documents and video frames that are entered, displayed or corrected through the terminals of the information system must be consistent with the relevant technical characteristics of the terminals. • The set of information arrays of the information system should be organized in the form of a database on machine media. • The forms of presenting the source information of the information system must be agreed with the customer (user) of the system. • The terms and abbreviations used in the original messages must be generally accepted in this subject area and agreed with the customer of the system.

Figure 2. Basic requirements for information support of a modern banking institution
(summarized by the authors)

It is important to build a system of classification and coding of information subsystem for the formation of a portfolio of securities. This is a mandatory step in the preliminary preparation of economic data for automated processing, as well as a prerequisite for the rational organization of the information base and modeling of information processes. Classification is a component of information support of any information system and the classification division of a set of objects into subsets according to their similarity or difference, according to the accepted methods of classification, is the basis for coding information.

Therefore, it becomes clear that the process of information support of the subsystem of securities portfolio formation in banking institution is quite long. The information from the beginning to the end passes through many points of the system and is processed by a large number of bank employees. The information is processed in various software, which can lead to failures. This process could be improved by minimizing

the path of information during its processing. This can be achieved with new software that combines the functionality of its predecessors. It will also reduce the burden on certain employees of banking institution and save more time.

BAIS Bank's automated information system allows to automate practically all sites of this sphere. Among main features of BAIS, which are based on the use of modern network technologies, should be noted: e-mail systems, databases based on the "client-server" model, interconnection software for interbank settlements, etc.

In the world market there are many ready-made BAIS. Main task facing the automation service of banking institution is to choose the optimal solution and maintain the efficiency of a particular system. With the rapid emergence of automation, most banks have gone the way of creating their own systems. This approach has its advantages and disadvantages. The advantages include: no need for large financial costs for the purchase of automated banking information system, its adaptation to operating conditions, the

possibility of constant modernization of the system. The disadvantages of this approach are obvious: the need to maintain an entire computer staff, the incompatibility of different systems, the inevitable lag behind current trends and much more. But there are examples of the acquisition and successful operation of banking systems. The most popular today are mixed solutions, in which part of the modules of BAIS is developed by computer department of banking institution. And some are bought from independent manufacturers.

All existing today in the world of electronic banking processing systems can be divided into banking messaging systems and payment systems. The former provides for the prompt forwarding and storage of interbank documents, while the functions of latter are directly related to the fulfillment of mutual requirements and obligations. In our opinion, BAIS should provide: automation of internal banking activities, and especially internal banking operations related to the processing of payment and other documents in those departments of banking institution that work directly with customers; automation of interbank settlements and other foreign banking operations; automation of financial transactions within international business.

BAIS differs from each other both in

structure and in a set of functional tasks. Today there is no typical structure of bank's automated information system, which would be guided by banks in the development of their systems, there are virtually no elements of standardization and unification of banking technologies. BAIS – a technological system that should ensure the functioning of banking institution. In addition to internal information links, BAIS is characterized by a wide range of information links with the external environment, which is played by bank's customers, other banks, financial and government agencies.

The choice of certain automation systems by banks is related to the price-reliability-return ratio. As already mentioned, the requirements for a complex banking system significantly depend on the volume of operations conducted by the bank. The aim is to create BAIS that would provide staff and customers of the bank with the necessary services, provided that the cost of creation and operation does not exceed the profit from the introduction of a BAIS. BAIS must be integrated, ie the system is built on system-wide principles of automation and covers a non-fragmentary set of banking tasks, and solves automation issues comprehensively, taking into account information and functional relationships (Table 3).

Table 3. Criteria for selecting a BAIS of banking institution (*author's development*)

System selection criterion	Priority areas that should be taken into account when choosing a criterion
The cost of banking automated information system	it is necessary to pay attention to the choice of computing platform, network equipment and software, as well as the cost of maintenance and maintenance of the system
Possibility of modernization	it is necessary that the selected computing platform allow for a gradual increase in resources
Effectiveness of using existing resources	the effectiveness of the use of existing computer networks and communication channels significantly depends on the cost of building banking automated information system
Availability of information security system	data security is one of the main requirements for banking automated information system

System selection criterion	Priority areas that should be taken into account when choosing a criterion
System reliability	failure of certain elements of banking system should not lead to its complete exit from operation. Ensuring uninterrupted operation of banking automated information system in conditions of destabilizing factors (for example, damages on communication lines or erroneous actions of bank personnel), as well as the possibility of forecasting and localizing various emergency situations
Ability to work in real time	at the present stage of the OLTP – Online Transaction Processing system is becoming increasingly common when creating banking automated information system. The implementation of OLTP systems requires large investments from the bank and the advantages of such systems justify all costs

As a result of scientific research, we came to the conclusion that today only one way to improve management of banking institution by means of ICT is to modernize towards cloud technologies. But it is also the most dangerous option for the development of existing BAIS. Cloud computing is a distributed data processing technology in which computer resources and capabilities are provided to a user as an Internet service. The development of cloud technologies has received new impetus in the last decade and now occupies a large niche in the field of information technologies. According to the analytical company Forrester Research, the global cloud computing market in 2020 will reach \$ 241 billion (Figure 3), and the market for cloud applications and services provided over the Internet – \$ 159.3 billion (Figure 4). At the same time, the average annual growth in the market of cloud computing and services is more than 20 % (Tadviser.ru, 2016).

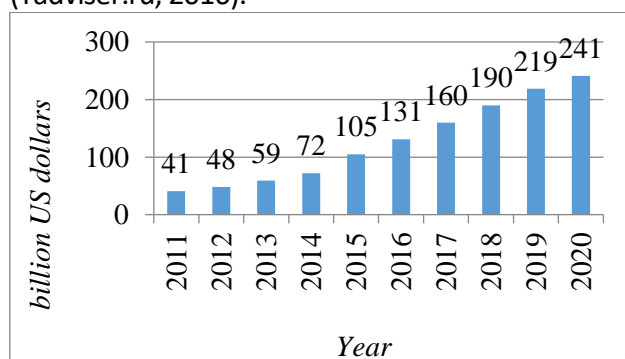


Figure 3. The volume of global cloud computing

market, billion dollars USA (summarized by author based on source (Tadviser.ru, 2016))

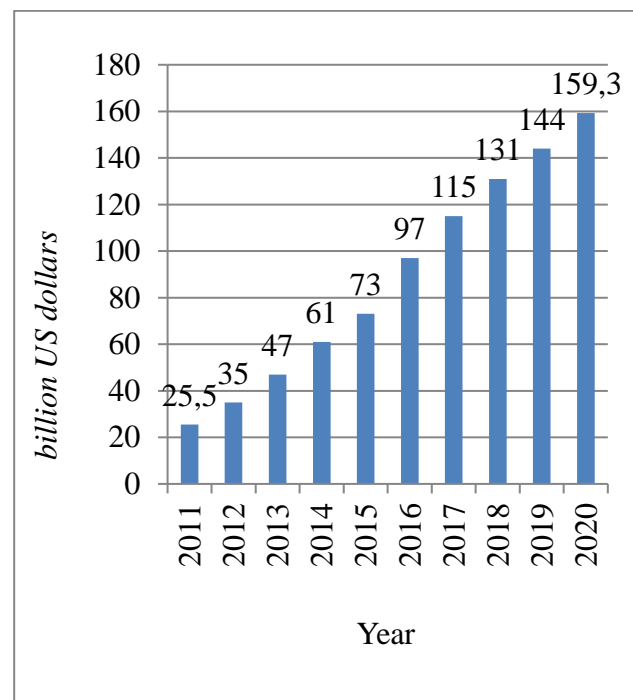


Figure 4. World market for cloud applications and services, billion dollars USA (summarized by author based on source (Tadviser.ru, 2016))

Main methods of providing cloud services in banking institutions and their types are shown in Table 4, and advantages and disadvantages of using cloud services in modern BAIS are presented in Table 5.

Table 4. Basic methods of providing cloud services and types of cloud technologies used by banking institutions (*generalized by authors on the basis of (Ukrbukva.net, 2014))*)

Methods of providing cloud technologies	Types of cloud technologies
infrastructure as a service (IaaS) – users are provided with an “empty” virtual server with a unique IP address or a set of Internet addresses and a part of information store system. To manage characteristics, start, server stop, the provider provides the user with a software interface (API)	private cloud – secure IT infrastructure, controlled and operated by one organization. Bank can independently manage the cloud or entrust it to an external organization, the infrastructure can be located both on the territory of bank and the vendor or mixed, ie partly in the bank and the external company
software as a service (SaaS) – provides the user with the opportunity to use the software application as a service remotely via Internet. This service allows you to not buy expensive software, and temporarily use it to solve the problem	public cloud – information infrastructure, which is simultaneously used by many banks. Users of public clouds only get access to the necessary services, but do not have the ability to manage, they do not need to maintain infrastructure.
platform as a service (PaaS) – in this service, the user is provided with virtual platform consisting of one or more virtual servers with pre-installed operating systems and specialized applications. The user can choose from provided cloud services the one that is necessary to solve the business task	hybrid cloud – infrastructure that uses the best qualities of public and private clouds when solving the task. This approach is used in banks that have their own private cloud infrastructure, but in case of increasing its workload, some tasks are transferred to the public cloud, for example, large amounts of information

Table 5. Advantages and disadvantages of using cloud services in the activities of banking institution (*author's development*)

Advantages of using cloud services	Disadvantages of using cloud services
the user pays only for the amount of services that he needs and when such a need exists; allow to provide cost savings for the purchase, support, modernization of software and hardware; scalability – the ability to expand the number of servers, applications, workplaces used; fault tolerance – ensuring reliable operation of the system, which can be blown out when using cloud services; remote access – provides the ability to access virtually from anywhere in the world where there is Internet.	the user is not the owner (unless the cloud is completely private) and does not gain access to the cloud infrastructure, respectively, the storage of the data used depends entirely on the company providing these services; high-speed Internet is required to get high-quality services; lack of generally accepted standards in the field of cloud services security.

Financial institutions around the world have recently faced difficulties in adapting outdated BAIS launched 20-30 years ago. Built systems based on a closed architecture, and the integration of such BAIS with new software is a difficult task, so such solutions are increasingly

expensive to use and maintain. BAIS of a banking institution is also formally obsolete, because despite its excellent functionality, it was connected about 10 years ago.

In USA, according to a study by Aite Group, more than a third of banks use an automated

banking system over 16 years, and more than half – over 10 years. A possible replacement of BAIS in the next two years is called 13 % of banks with assets of \$ 100-249 million, and highly probable – 8 % of banks with assets ranging from \$ 500 million to \$ 5 billion. In this regard, banks face the choice of implementing a traditional or cloud automated banking system. The advantage of a cloud automated banking system for a banking institution is the ability to deploy a full-fledged BAIS on the servers of a third-party organization, which fully provides service and configuration of the system, allowing the bank to engage only in business development, without particularly avoiding the support and functioning of automation of banking business processes (Tadviser.ru, 2016).

Studies show that the introduction of cloud BAIS of digital initiatives 4.0 reduces costs by an average of 20 % compared to the traditional automated banking system. This indicator is due to: the absence of capital expenditures (there is no need to spend money once on the purchase of servers and software, instead fixed monthly payments for equipment rental and cloud automated banking system are made); savings on software implementation and technical support processes; the ability, if necessary, to quickly change the functionality of the system available to bank; reducing the number of IT department employees; no data security costs, they are stored on servers located in a professionally equipped data center.

As a result of a study conducted by Aite Group on the US banking sector, the following results were obtained: in 2006, cloud technologies were used by 30 % of all US banks, and in 2012 – about 50 %. In 2020, about 90 % of all US banks switched to cloud automated

systems (Figure 5). With the introduction of cloud BAIS compared to traditional automated banking system, only one of the parameters associated with the reduction of the number of employees of IT department, you can achieve significant cost savings.

The use of cloud technologies in the management of banking systems is the future. Unfortunately, in Ukraine this technology is not as popular and relevant as in developed countries. The reason for this is outdated automated banking systems, which are difficult to adapt to new cloud technologies. The introduction of cloud technologies in such BAIS can be an expensive procedure, but in the long run may not be justified. But if modern banking institutions still try to use cloud technology, it will be in the direction of using cloud storage, data centers, business applications and software testing. In the long run, this may lead to a 20 % reduction in maintenance costs compared to traditional BAIS.

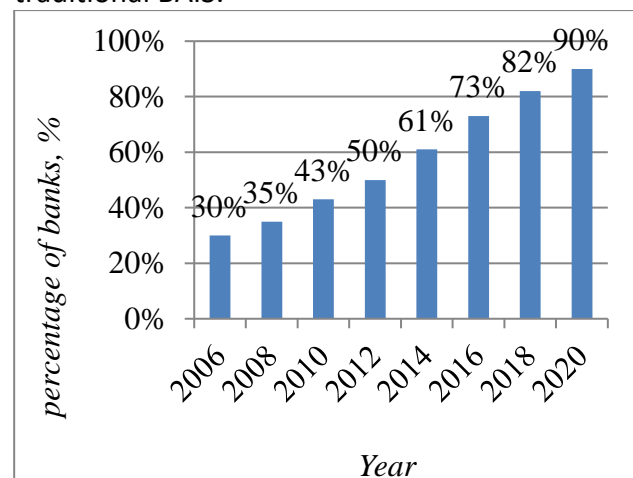


Figure 5. Proportion of US banks using cloud automated banking systems
(summarized by authors based on (Tadviser.ru, 2016))

Conclusions

Information technology in the management of banking has long been an indispensable tool. However, man still plays an important role in this area. Obviously, the future lies in information technologies. According to the laws of competition, only those who develop remain. In modern economic conditions, only those banks and

financial institutions that are already widely developing and investing in their information technology activities will be able to survive and remain. New ICT of digital initiatives 4.0 is helping banking institutions improve customer relationships and find new ways to manage their business. It is important to understand that banking

computer systems are currently one of the fastest growing areas of application network software. By using ICT in its activities, banking institution can spend its resources more optimally and minimize losses from inefficient investments. The introduction of new technologies significantly

affects the quality of banking services and banking operations, stimulates the development of new channels of banking products and ensures a decent level of competition in the market of banking products and services.

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