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ECONOMIC EFFICIENCY ESTIMATION FOR AUTOMATED BANKING SYSTEMS OUTSOURCING

The paper discusses the perspectives for introduction of cloud automated banking systems in financial institutions. Methods of evaluating the implementation of information systems are considered. The efficiency analysis technique of implementation and operation of cloud automation systems is offered. The efficiency estimate of introduction of the cloud automated banking systems (ABS) in comparison with conventional ABS on the basis of the proposed technique using the method of total cost of ownership is given.
Keywords: cloud technologies; bank; automated banking system.

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ОЦІНЮВАННЯ ЕКОНОМІЧНОЇ ЕФЕКТИВНОСТІ АУТСОРСИНГУ АВТОМАТИЗОВАНИХ БАНКІВСЬКИХ СИСТЕМ

У статті розглянуто перспективи впровадження хмарних автоматизованих банківських систем у фінансових інститутах. Проаналізовано методи оцінювання впровадження інформаційних систем. Запропоновано методику аналізу ефективності впровадження та експлуатації хмарних автоматизованих систем. Оцінено ефективність впровадження хмарних автоматизованих банківських систем (АБС) в порівнянні з традиційними АБС на основі запропонованої методики з використанням методу сукупної вартості володіння.
Ключові слова: хмарні технології; банк; автоматизована банківська система.
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ОЦЕНКА ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ АУТСОРСИНГА АВТОМАТИЗИРОВАННЫХ БАНКОВСКИХ СИСТЕМ

В статье рассмотрены перспективы внедрения облачных автоматизированных банковских систем в финансовых институтах. Проанализированы методы оценки внедрения информационных систем. Предложена методика анализа эффективности внедрения и эксплуатации облачных автоматизированных систем. Дана оценка эффективности внедрения облачных автоматизированных банковских систем (АБС) по сравнению с традиционными АБС на основе предложенной методики с использованием метода совокупной стоимости владения.
Ключевые слова: облачные технологии; банк; автоматизированная банковская система.

Problem setting. There has been observed truly dynamic development of cloud technologies in recent years. Cloud technologies found their application practically in all spheres of business. Today the size of cloud technologies market makes dozens of bln USD. The total volume of the world market of cloud computing and the related services will reach about 400 bln USD by 2020, according to expert evaluations (www.tadviser.ru).

Russian business successfully invests in cloud services and technologies; Russian market develops more dynamically in comparison with the world one as well. Today more and more Russian companies invest in this direction. Thus, representatives of

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both large and medium businesses are adopting cloud technologies into their business processes.

Russian banks actively master the market of cloud services. The use of cloud technologies in Russian financial institutions goes in the following directions: data storage, software testing, and creation of cloud data centers.

Providing cloud automated banking systems in Russian financial institutes is now becoming popular too. The advantage of cloud ABS is the ability to install a complete automated banking system on external servers. A side organization provides full servicing and system configuration that allows a bank be engaged only in business development, without going into maintaining and functioning of automated banking business processes.

Introduction of new information technologies is always connected with certain problems, and the main of them is evaluating the economic efficiency of IT projects implementation. There is no unified approach to such assessment; therefore, different techniques to obtain the effectiveness values for new information products are used.

Resent research and publications analysis. Tendencies and development prospects of cloud computing have been widely covered by Bora (2011), Dimitrakos et al. (2009), Iyer and Henderson (2010), Kondratyev et al. (2011), Mell and Grance (2011), Narter (2011), Ruiter and Warnier (2011), Smith (2011), Sriram (2010), Wortmann (2010) and many others. However, it should be noted that cloud technologies implementation is quite a new direction, especially in the financial field, thus requiring further deep studying.

The research objective is the cost-effectiveness evaluation of implementation and operation of cloud automated banking systems in Russian financial institutions.

Key research findings. Within Russian banking sector the interest in cloud ABS began to show itself only in the last 5 years. The leader on cloud technologies provision is the Centre of Financial Technologies (CFT), the company which provides complete cloud automated CFT bank systems. This system allows for comprehensive automation of an entire bank. 10 Russian banks have moved to this cloud platform, for example, (commercial banks) CB Monolith, Expobank, Miraf Bank, BaykalBank, Moscow Financial Club and others for the last three years (Bataev, 2014; CFT structure of cloud services, 2013).

The main problem is the evaluation of economic efficiency of an information product under the information technologies implementation. There are various approaches and techniques, allowing estimating the efficiency of information technologies implementation which can be divided into 3 groups: financial, high-quality, probabilistic (Figure 1).

During the initial stage of introduction the most effective method is TCO (total cost of ownership) related to the financial group methods. This method is the most effective mechanism for instant assessment of enterprise's total costs within IT-infrastructure. It was first developed by the Gartner Group in the 1980s (Ellram, 1995; Hirschhein and Klein, 1991; Kuznetsova and Shimansky, 2012; Real cost of ownership, 1997; Walker, 2004).

TCO of information system (IS) is the expenses associated with acquisition, implementation and usage of IS. TCO methodology provides for the evaluation of expenses on IT-infrastructure and its separate components.
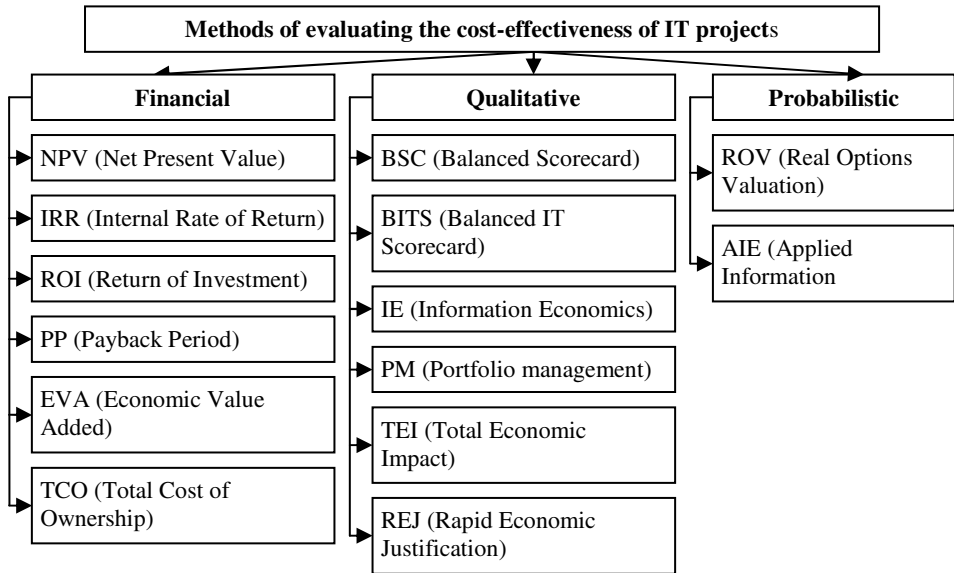
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│        Methods of evaluating the cost-effectiveness of IT projects     │
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Financial	Qualitative	Probabilistic
NPV (Net Present Value)	BSC (Balanced Scorecard)	ROV (Real Options Valuation)
IRR (Internal Rate of Return)	BITS (Balanced IT Scorecard)	AIE (Applied Information
ROI (Return of Investment)	IE (Information Economics)	
PP (Payback Period)	PM (Portfolio management)	
EVA (Economic Value Added)	TEI (Total Economic Impact)	
TCO (Total Cost of Ownership)	REJ (Rapid Economic Justification)	

Figure 1. **The classification of methods for assessing the effectiveness of investments in information projects,** *author's development*

For an approximate estimate of the effectiveness of cloud automated banking system implementation we can propose a method on the basis of total cost of ownership, which allows making cost analysis of the system implementation.

The total cost of ownership method for information system realization includes both the initial investment I and the costs of the current work E_{month} during the evaluated period T_{plan}, calculated by the following formula (Kuznetsova and Shimansky, 2012; Real cost of ownership, 1997):

$$TCO = I + E_{month} \times T_{plan}. \tag{1}$$

The initial investment includes:

$$I = I_{SIS} + I_{ASS} + I_H + I_{NI} + I_{integr} + I_{training}, \tag{2}$$

where I_{SIS} — the acquisition value of software and information system; I_{ASS} — the acquisition value of additional software: database management system (DBMS), web server, encryption tools etc.; I_H — the acquisition value of hardware (servers, automated workplace of support personnel etc.); I_{NI} — the value of network infrastructure (setting a channel to access the Internet, the cost of network equipment etc.); I_{integr} — the value of carrying out integration operations on system splicing with information systems; $I_{training}$ — the value of recruitment and personnel training.

Monthly expenses E_{month} include the following:

$$E_{month} = E_{support} + E_{OC} + E_{integr}, \tag{3}$$

where $E_{support}$ — the value of support system provider; E_{OC} — operation costs of the system (staff salaries, payment of communication links, indirect costs); E_{integr} — expenses for providing integration of system work with the banking information systems.

When implementing an automated banking system the formula (1) can be represented in the following form:

$$TCO = I + E_{year} \times T_{plan}, \tag{4}$$

where E_{year} — annual operation costs of ABS; T_{plan} — planning period in years.

When implementing an automated banking system the initial costs can be described by a simplified formula based on the formula (2):

$$I = I_{ABS} + I_{intrABS}, \tag{5}$$

where I_{ABS} — the cost of the automated banking system; $I_{intrABS}$ — the cost of ABS implementation

Introduction of the automated system costs can be estimated from ABS value:

$$I_{intrABS} = K_{com1} \times I_{ABS}, \tag{6}$$

where K_{com1} — compensation factor which according to statistical data lies within the range of 10−20% (www.absonline.ru).

Annual operation costs of the automated banking system can be assessed also through ABS value by the following formula:

$$E_{year} = K_{com2} \times I_{ABS}, \tag{7}$$

where K_{com2} — second compensation factor which according to statistical data lies in the range of 10−20% (www.absonline.ru).

Then the formula for *TCO* calculation for an automated banking system will take the form:

$$TCO = I_{ABS} + K_{com1} \times I_{ABS} + (K_{com2} \times I_{ABS}) \times T_{plan}. \tag{8}$$

We will carry out the comparative analysis of economic efficiency between traditional and cloud ABS for "CFT Bank" the cost of which is about 3 mln USD.

The design data are summarized in Table 1, showing the dependence on the compensation factors in two variants: the first variant is for the compensation factor of 20%, the other one is for the value of 10% for the introduction of conventional ABS.

Table 1. **The costs of introduction and operation of ABS CFT-bank per year,** *mln USD, author's development*

	Variant 1	Variant 2
ABS value	3.0	3.0
Introduction costs of ABS	0.3	0.6
Operation costs of ABS	0.3	0.6

We will calculate *TCO* by the formula (8) for Tplan equal 5 years, the results are summarized in Table 2 and two variants are given in Figure 2.

Table 2. **Calculation of TCO for implementation of conventional ABS CFT-bank for 5 years,** *mln USD, author's development*

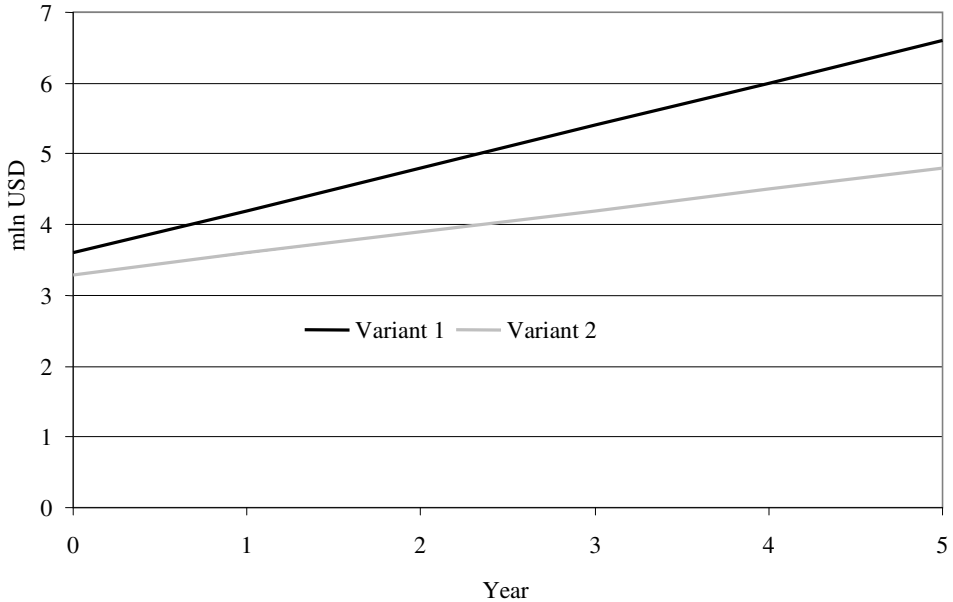| Years	0	1	2	3	4	5
Variant 1	3.6	4.2	4.8	5.4	6.0	6.6
Variant 2	3.3	3.6	3.9	4.2	4.5	4.8

Figure 2. **Range of TCO costs for introduction and operation of conventional ABS CFT-bank,** *author's development*

TCO for introduction a cloud automated banking system can be calculated by the following approximate formula, obtained from the formula (8) and adjusted to reducing costs and increasing shadow cost while operating the cloud ABS.

$$TCO = I_{ABS} + K_{com1} \times I_{ABS} + K^i_{com2cl} \times (K_{com1cl} \times K_{com2} \times I_{ABS}) \times T_{plan}, \qquad (9)$$

where K_{com1cl} — the first compensation factor. It determines the cost cutting on operation of cloud ABS which according to statistical data lies in the interval from 30% to 80% (www.absonline.ru); K^i_{com2cl} — the second compensation factor. It determines the shadow operating costs of cloud ABS according to expert data (www.cnews.ru). This factor is defined by growth expenses for cloud ABS due to inefficient management of automated banking system; $i = 0, n$, where n — the years of planning period.

We will consolidate the calculated data in Table 3, where two variants are provided depending on compensation factors: the first is for compensation factors equal to 30%, the second variant — for the value of 80% in implementation of conventional ABS. Taking into consideration that at implementation cloud ABS K_{com1} will be 10%, because the deployment of cloud ABS is happening on outside servers, the effect is saving. The value K_{com1cl} equal to 30% is considered for the first variant of conventional ABS implementation, as the most costly one from the viewpoint o of operation, for the assessment of all costs range for cloud ABS.

We calculate TCO by formula (9) for Tplan equal to 5 years, the results are summarized in Table 4 and two variants are given in Figure 3.

Now will find the minimum value of cost cutting on implementation of cloud ABS CFT-bank in comparison with conventional ABS, having determined it as a difference in minimum borders between costs for cloud and conventional ABS

(Figure 4). From the obtained calculations, the cost cutting will be about 25% in 5 years of operation.

Table 3. **The costs of introduction and operation of the cloud ABS CFT-bank per year,** *mln USD, author's development*

	Variant 1	Variant 2
Cloud ABS value	3.0	3.0
Introduction costs of cloud ABS	0.3	0.3
Operation costs of cloud ABS	0.06	0.42

Table 4. **TCO calculation for implementation of cloud ABS CFT-bank for 5 years,** *mln USD, author's development*

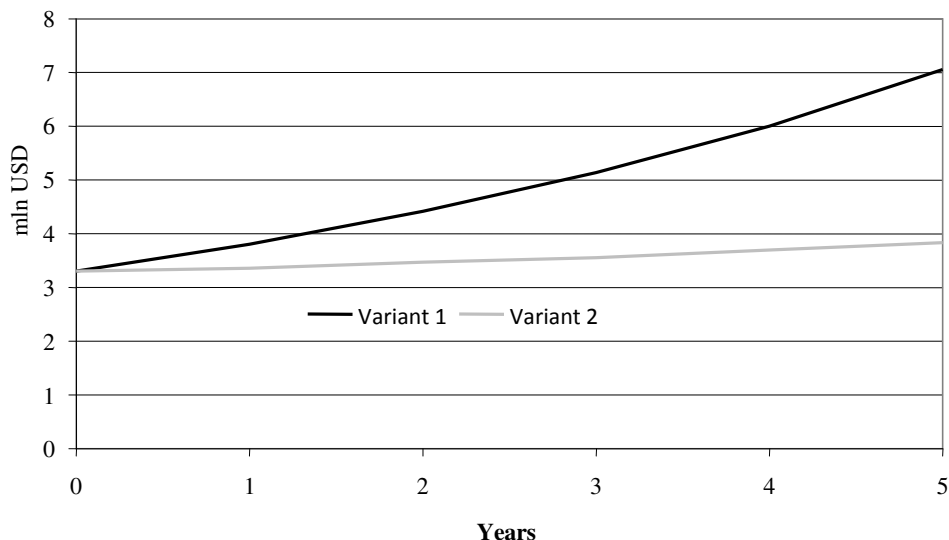| Years	0	1	2	3	4	5
Variant 1	3.3	3.8	4.41	5.13	6.0	7.05
Variant 2	3.3	3.37	3.46	3.56	3.67	3.84

Figure 3. **Range of TCO costs for introduction and operation of cloud ABS CFT-bank,** *author's development*

As a result of this research we can draw the following **conclusions**:

- to estimate the economic efficiency of the cloud automated banking system implementation a technique is proposed, basing on the method of total cost of ownership;

- we introduce the parameters: K_{com1cl} — estimated cost cutting due to implementation of cloud ABS in comparison with conventional one; K^i_{com2cl} — determines the growth of operating expenses of the cloud automated banking system as compared to the conventional one, caused by shadow expenses, arising because of inefficient management of cloud ABS;

- the received results of the study show a decline in the costs of implementing the cloud automated banking system as compared to conventional ABS on the level of at least 25% for 5 years.
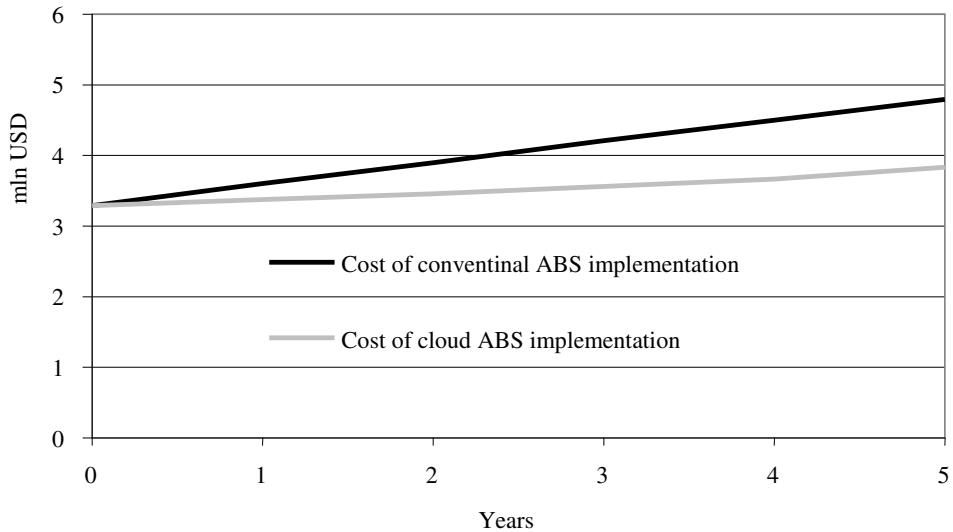
Figure 4. **TCO calculation for introduction of conventional ABS and cloud ABS,**
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