

regarding the amount of exchange rates differences, formed because of the revaluation of foreign currency available at the accounts of the organizations at the time of devaluation, which will gradually (up to December 31, 2014) written off on financial results and consequently, will be liable for income taxes that will lead to washout of current assets of enterprises;

b) high refinancing rates, which cannot fall below the forecast inflation level for 2012 at a rate of 19-22%, that will significantly reduce the level of credit loans from banks and thus redouble the problem of lack of current assets of enterprises that are required not only for investment but also for the current business activities;

c) substantial lag behind of the inflation level from the existing in the 2011 devaluation of the national currency. In the presence of a negative balance of foreign trade balance the inflation level seems to aspire to be achieved in the 2011 devaluation of currency (unless it is ensured alignment of the foreign trade balance of exports and imports).

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### BUSINESS PROCESSES IN "CLOUDS"

*В цій статті досліджуються економічні аспекти застосування хмарних обчислень для управління бізнес-процесами. Доцільність такого підходу зумовлено намаганням знизити операційну і експлуатаційну вартість, зменшити час прийняття рішень і оптимізувати витрати. Така мета досягається за рахунок широкого використання сервіс орієнтованої архітектури і хмарних технологій, які збільшують цінність для бізнесу за рахунок гнучкості при експлуатації, здатності до швидкої реакції на зміни економічних умов, інформаційного оточення та широкими можливостями повторного застосування.*

*Ключові слова: бізнес аналіз, управління бізнес процесами, хмарні обчислення, сервіс орієнтована архітектура.*

*В этой статье исследуются экономические аспекты использования облачных вычислений для управления бизнес-процессами. Целесообразность такого подхода обусловлена стремлением снизить операционную и эксплуатационную стоимость, уменьшить время принятия решений и оптимизировать затраты. Такая цель достигается за счет широкого использования технологий сервисов, которые увеличивают ценность для бизнеса за счет гибкости при эксплуатации, способности к быстрой реакции на изменения экономических условий, информационного окружения и возможностями повторного использования.*

*Ключевые слова: бизнес анализ, управление бизнес процессами, облачные вычисления, сервис ориентированная архитектура.*

*The paper studies economic aspects of cloud computing for business processes management. The expediency of such approach is caused by aspiration to lower operational costs, to reduce time of decision-making and to optimize expenses. Such purpose is reached due to wide use of service oriented technology and cloudy computing, which one increase the value to the business through flexibility in the operation, the quickly react ability to changes of economic conditions, information environment and opportunities for reuse.*

*Keywords: business analysis, business process management, cloud computing, serves oriented technology.*

The global crisis and recession have dramatically reduced the availability of cheap financial resources. Accordingly, in the absence of sufficient funding the role of governance as a cheap alternative to grow business has increased. This explains the desire of managers to focus more attention on improving of the business processes management which is based on extensive use of computer management systems.

In this paper an economic aspects of service oriented technologies and cloud computing (CC) for business processes management (BPM) are investigated. The purpose of the analysis is the estimation of prospects for introduction of CC in BPM by criteria of value for business. Opportunities of the cloudy management are considered in a direction to increase of economic efficiency and market competitiveness, the analysis of information technologies features and innovations.

In conditions of production curtailment and finance limitation the illusion about a modern economy, for which one

the efficiency of business is not important ostensibly, but very important any intellectual and technical parameters of business computer control systems and scope ranges of their control functions, has disappeared. For example, they are not a depth of business processes modeling, automation of a lot of management functions, introduction of modern expensive systems of types ERP, CRM, SCM, etc. It became clear, they are foreground return of investments, careful expenses analysis and possession cost of business process management technologies. That is those ways which are really capable to raise efficiency of business dealing and to ensure the profit.

The expediency of such approach to management of business processes is caused by aspiration to lower operational costs, to reduce time of decision-making and to optimize expenses on information structure of the enterprise. Such purpose is reached due to wide use of services technologies which are attractive to business due to flexibility at operation, abilities to fast reaction to changes of economic

conditions, full functions of an information environment, and also wide opportunities of a reuse.

**Cloud computing.** The cloud computing concept represents services as some virtual tanks which one contain universal program resources and data storage places. Using these resources it is possible to take computing services and data services through the Internet for creation own processes of business management.

Cloudy technologies and the concept of service oriented architecture (SOA) in the automated systems raise value for business due to flexibility of management structure and relative cheapness of technical decisions. They allow to break usual business – applications into separate business – functions and processes which are represented as services and then to connect them through well certain interfaces and contracts. Interfaces are defined in neutral style. That is irrespective of a platform of computing means, operational system and the programming language on which this service is realized. Such approach allows services which were created for work in different systems; it is easy to cooperate among themselves under uniform universal protocols.

Such decisions allow the companies to study closely expenses, planned schedules, resources, technological processes and other factors which influence efficiency and viability business processes, to define the most effective ways of their change and improvement.

The next logical directions of development of technologies of management business by processes on basis SOA was the decision of a problem of creation of a working environment for new services.

The companies have restrictions in budgets on support in working state their existing complex information structures. Therefore introduction of new services cannot be frequently quickly executed by efforts of the own IT personnel. It is necessary to invite specialized IT companies for performance of such works. This way is not fast and not cheap.

More attractive alternative of the decision of these problems is to use of modern cloudy technologies. According to the concept of "clouds", the company refuse own development and possession of necessary services for management of the business by processes. They take these processes in a mode of real time in rent from the specialized companies on granting cloudy services and only for that time while they are necessary need. In this case own personnel requirements becomes simpler and the payment expenses are decreased considerably because an abonent payment made as a tariff time and only for time use of services necessary to the company. Cloudy calculations are services on demand.

Principles SOA naturally assume for clouds transformation of all supporting technologies into services, in that case any application, starting from the elementary office and up to corporate business of SCM, CRM, ERP types can be placed somewhere in a cloud and be delivered through the Internet.

Generally, cloud computing services are on-line applications, access to which is provided by means of usual internet browser. There is no special difference what that is, or already good familiar for us entertaining services are, or the specialized business applications for business processes realization are. They have one essence: the user does not need to possess powerful computers and networks, it is not necessary to buy licenses for the specialized software for start of the specific program applications. It is enough to him, the user addresses through the Internet to a provider and he pays on demand services simply. In an ideal case, it is possible to receive these services free-of-charge, but thus there can be advertising from the pro-

vider as a kind of payment. Everyone use such conditions of the provider resources and it is already good to them have got used. For example, it is such familiar to us services as e-mail.

Services of cloudy technologies are the way to organize and simplify an information environment. They allow understand IT without borders, delete barriers in fast statement of new services, expand opportunities of economic efficiency and market competitiveness of the companies.

Occurrence of cloudy model became the objective phenomenon, which one connected to the global tendency. Both on individual level, and at a corporate level there is a displacement of performance business processes in online.

Cloud computing represent dynamically scaled way of access to external computing resources as a service, which one is given by means of the Internet. Thus it is not required to the user of any special knowledge of an infrastructure of a cloud or skills of management by this cloudy technology.

The cloud is meant not as the Internet, and it is all that set hardware and a software which provides processing and execution of client applications on the side of the provider. That is even the simplest action by means of the Internet, for example, inquiry of page of a site, to some extent represents an example of cloud computing. The Internet, as a matter of fact, also has arisen to give the removed access to various computing resources.

Also we shall note technologies which do not concern to cloud computing. These are independent calculations (local computing) where the user independently establishes and maintains hardware, the software, keeps results on the local resources. Further, it is custom-made calculations (utility computing). Here services of execution of complex calculations, storages of data files it is ordered on the party. And it is so-called collective calculations (grid computing). The big computing problem, for which performance significant resources are necessary, it is distributed between computer sets, which are connected in virtual network in computing clusters.

The modern company has the information environment which covers all sides of business and will consist of various information actives and technologies. All of them demand essential staff of experts and the significant budget.

All employees should be provided with fast access to IT resources. They are scaled dynamically. As against dominating today in BPM client – server technologies, CC have simple scalability, self-service on demand, fast access to a network, the distributed location of virtually incorporated resources. These characteristics are key to receive an optimum and effective cloud, and for the end user to receive the maximal value for business.

Between components of any information systems it is possible to distinguish interaction on management and interaction under the information.

Now days there are some basic cloud models of integration principles. Someone declare integration at a level of applications and program services. At this matter, the integration is given as program resources by providers, but own program resources of users are supposed too.

Other companies offer integration at an infrastructural level with use of programs of intermediaries which usually name Cloud Services Brokerage (CSB). In this case it is realized a virtualization of any cloudy resources and the binding of the consumer to the concrete provider. That is such undoubtedly market advantage to carrying out of any business – the right of a free choice.

According to recommendations of the National institute of standards and technologies cloud computing is a model for enabling convenient, on-demand network access to a

shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [1, p. 2-3].

This cloud model promotes availability and is composed of three service models (Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), Cloud Infrastructure as a Service (IaaS)); five essential characteristics (On-demand self-service, Broad network access, Resource pooling, Rapid elasticity, Measured Service); and, four deployment models (Private cloud, Community cloud, Public cloud, Hybrid cloud). Service models:

1. SaaS – model of a cloud for the so-called finished products which the consumer cannot independently modify. The opportunity of use of the applied software of the provider working in a cloudy infrastructure and accessible from various client devices by means of the program interface is given him. The control and management of the basic physical and virtual infrastructure of a cloud, including a network, servers, operational systems, data storages, or even individual opportunities of the applications is carried out by the cloudy provider.

As an example it is possible to result post services well familiar to us, on-line services of computer viruses search or on-line language translators.

2. PaaS – model of a cloud in which the opportunity of use of a cloudy infrastructure for accommodation of own, developed to order or got duplicated applications developed to order is given the consumer. The structure of such platforms includes tool means of creation, testing and performance of the applied software – control systems of the databases, the binding software and environments of execution of programming languages. These tools are given by the cloudy provider who reserves the control and management of the basic physical and virtual infrastructure of a cloud, including networks, servers, operational systems, files of storage of the information, except for the developed or installed applications, and also, whenever possible, parameters of a configuration of a platform.

As examples of similar services for developers scaled and automatically controlled resources of hosting App Engine from Google, Windows Azure from Microsoft and WebSphere Cast Iron from IBM can serve.

3. IaaS – hosting of virtual machines. In this case the opportunity of use of a cloudy infrastructure for resource management of processing and storage of data files, managements of networks and computing resources independent is given the user. The consumer can install and start own software which can include operational systems, the platform and applied software. It can supervise operational systems, virtual systems of data storage and the established appendices. The control and management of the basic physical and virtual infrastructure of a cloud, including network, servers, types of used operational systems, systems of storage is carried out by the cloudy provider.

Company IBM to these models adds one more model. Business Process as a Service (BPaaS) – a cloudy environment for creation of full business processes [2, p. 10]. In this case all components of business processes can be present at a cloud. The provider suggests their consumers for creation of structure of management on demand.

For all models of cloudy calculations the obligatory set from five essential characteristics is declared.

Self service on demand, the consumer independently defines and changes his own computing needs, such as server time, speeds of access and data processing, volume of the stored data without interaction with the representative of the supplier of services.

Broad network access, services are accessible to consumers of a data transmission networks without dependence from the used terminal device. Convenience and universality of access is provided with wide availability of services to different classes of devices: personal computers, mobile terminals, tablets.

Resource pooling, the supplier of services unites resources for service of the big number of consumers in a uniform pool for dynamic redistribution of capacities between consumers in conditions of constant change of demand for capacities. Thus consumers supervise only key parameters of service. For example, the volume of the data and speed of access, but actual distribution of resources which are given the consumer, carry out the supplier.

Rapid elasticity, services can be given, expanded, narrowed at any moment and without additional costs on interaction with the supplier, as a rule, in an automatic mode.

Measured service, the supplier of services automatically estimates the consumed resources at the certain level of abstraction (for example, volume of the stored data, throughput, quantity of users, quantity of transactions), and on the basis of these data estimates volume of the services given to consumers.

For the provider, due to automatic procedures of updating of allocation of resources, expenses for service of subscribers are essentially reduced.

For the consumer it is possible to receive services with a high level of availability (high availability) and with low risks not serviceability to provide fast scaling the computing system due to elasticity without necessity of creation, service and modernizations of own hardware infrastructure.

Principles of use are defined by deployment models. There are some models.

Private cloud. An infrastructure intended for use by one organization, including some consumers. For example, branches, departments of one company. The private cloud can be in the property, management and operation of the company, the foreign organization or their combination. Can physically exist as inside, and outside of a zone of management of the owner.

Community cloud. The kind of an infrastructure intended for use by concrete community of consumers, which are the organizations, having the common problems. For example, missions, safety requirements, a policy according to various requirements. The community cloud can be in the joint property, management and operation of one or more of the organizations of community or the third party, or their any combination. It can physically exist as inside, and outside of jurisdiction of the owner.

Public cloud. An infrastructure intended for free use by general public. The public cloud can be in the property, management and operation of the commercial, scientific and governmental organizations or their combinations. The public cloud physically exists in jurisdiction of the owner, which is the supplier of services.

Hybrid cloud. It is a combination of private, public or community two or more various cloudy infrastructures. They remain unique objects, but connected by among themselves standardized or individual technologies of data transmission and appendices.

**Expenses.** When cloud computing technology is used, consumers of information technologies can lower capital charges essentially: on construction of data-processing centers, purchase of the server and network equipment, hardware and software decisions on maintenance of processes for a continuity and serviceability. These charges are absorbed by the provider of cloudy services. Besides long time of construction and commissioning of large objects of an infrastructure of information technologies and their high

initial cost limit ability of consumers flexibly to react to requirements of the market. Cloudy technologies provide alternative and, the main thing, rather cheap decision of these problems. There is a real opportunity practically instantly to react to increase in demand at computing capacities.

For manufacturers of the software who sell the products in the markets with a high level of a piracy, cloud computing is the model extremely attractive for business because it reduces a level of a piracy in many times.

When cloud computing technology is used, expenses of the consumer are displaced aside operational expenses. Payment of cloudy providers services are classified as charges on an abonement payment.

For an explanation of an economic component of cloudy approaches to calculations of expenses the analogy to electro supply services of consumers is used frequently. For an explanation of an economic component of cloudy technologies the analogy to granting services on electro supply of consumers frequently is used. Suppliers independently create a necessary infrastructure of power generating capacities and networks of delivery which are readily available for consumers and services are paid on the fact of their use. It is easy to compare expenses of the consumer for our example: regular, but rather insignificant rent, or problems of creation of the own power stations and power networks.

To cloudy applications, except for declared advantages, the certain problems are inherent. Among them it is necessary to note problems in speed of work, reliability of storage and data transmission.

Business management efficiency of the company is defined substantially by creation and use of effective cloudy technologies of management which should have good competitive characteristics. Among them: decrease in expenses for licenses for use of the software, comprehensible cost of possession, efficient control the resources, a guaranteed degree of service of users and a comprehensible level of safety.

**Safety of the data.** According to models of expansion of clouds the consumer can bear the part of the responsibility independently or pays services of the provider of services which guarantees the share of the responsibility for safety of the data of the client. The ideal does not exist. Losses can be at any variant of delimitation of the responsibility. The customer only minimizes the risks and cost by criterion price – quality. Any system of safety is the compromise, and it is important only that it was intelligent.

The organization of system of the data protection can be based on several principles: principle of successful business – the supplier of cloudy services is interested in a safety of the client data, which are processed in his date center. That is safety of the client data is the important consumer quality and the basic requirement of the services buyer. For this reason realization of a principle of information security in cloudy systems creates a basis for successful business dealing and economic prosperity. Principle of legality of business dealing – in the market of cloudy computing suppliers and consumers of services make out legal agreements as license or contractual conditions of granting of services where mutual relations of the sides and a degree of their responsibility are detailed. Principle of additional protection – consumers can use additional levels of safety which are built in the Internet applications. It can be systems of authenticity, enciphering, safe data transmission, reliable differentiation of the given various users and their rights, and also other mechanisms.

Concepts of leading players of the CC market are approximately identical. Nevertheless, variants of its realization strongly differ. On the one hand, the companies con-

sider a network the Internet as a cloud, whence users will receive all necessary resources. Already such services as Google Apps and Microsoft Azure function today. They allow transferring problems of office applications (that is e-mail, office packages) in date centers of providers.

On the other hand, some companies suggests to receive services on demand from a foreign cloud only at deficiency of own resources. If the set criteria of quality of services in an internal cloud cannot be executed, for example, because of overloads then there is a dynamic migration of virtual machines on the side of the cloudy provider. When loading falls down, they come back in the data-processing centre.

According to company Forrester Research, 44 % of the companies (basically, average and large business) are interested in creation of internal clouds [3]. Advantages and lacks of these two approaches are obvious enough. In the first case advantages is absence of high capital expenses for purchase of the equipment and the software. It is not necessary to care neither of reserve copying, nor about fault tolerance of a data-processing centre, even about its installation and adjustment. All this qualities are given by the reliable cloud provider.

Lack will be that the strong binding of the user to the concrete services provider is created. If it is necessary to commission the new applications from other provider there can be technical and financial difficulties as providers compete with each other.

The second variant also has pluses and the minuses. On the one hand, there is a guaranteed access to the infrastructure even in case of breakage of a liaison channel, reliability and safety of data storage, a predicted level of availability and known capacity of hardware capacities are provided. Thus is absent bindings to the concrete external provider. Necessary capacities can be received on demand from any other supplier.

It is possible to relate the big investments to lacks. Both initial and operational are. For an external cloud parameters of quality of service can be fixed in service level agreement and are the financial responsibility of the provider of services.

## Results

The analysis of prospects of development of cloudy technologies and their opportunities in perfection of management technologies, decrease in capital and operational expenses can be executed on the basis of forecasts of the market of cloudy technologies from leading three of analytical companies Forrester, Gartner, IDC.

According to research Gartner the segment of the market of cloud services brokerage (CSB) by 2015 will reach the size 100 billion dollars [4]. Such forecast is based on ability CSB considerably to speed up distribution of cloudy technologies due to three main advantages of CSB technologies:

1. CSB will relieve cloudy technologies of doubt in safety, which today still is the certain obstacle of their wide use.

2. Cloud computing become accessible to the enterprises of small and average business due to wide development of hybrid clouds. Thus a break existing between the private clouds created by the large enterprises and public clouds with which end users work will be overcome.

3. The enterprises of small and average business which are guided by hybrid clouds as the compromise between big and small, the needs through effective can realize "service of one window" for services which are given by different providers. It will allow removing a rigid binding to one provider.

Forrester analytics predict that there will be certain transitive a period from models of simple cloud broker

models up to a level of full brokers. Such automatic brokers (fixer) will be capable to solve problems independently.

By estimation of the IDC Company the market of public cloud computing in 2009 has made \$17 billion or about 5 % from all market of information services [5].

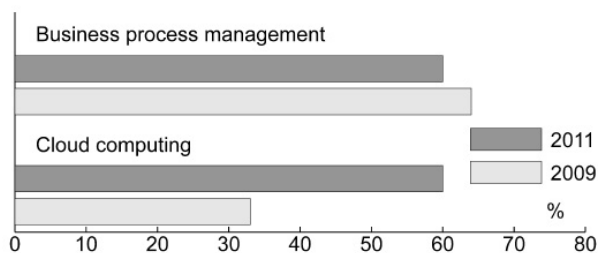


Fig.1. Prospects IT technologies for business

Source: authorial calculation

JEL classification C53, C45, G01, G17

Among IT technologies for increase of business efficiency CC show the best dynamics of development. More than 3 000 global Chief Information Officer responded in the IBM CIO 2011 study and it showed that 60% of organizations view cloud computing as a way to grow their business and increase their competitiveness, as depicted in Fig. 1 [2, p. 2].

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### MODELING OF EUROPEAN STOCK INDEXES RETURNS USING WAVELET ANALYSIS

*Проведено кластеризацію доходностей європейських фондових індексів за допомогою методів вейвлет-аналізу. Запропоновано модифікований метод прогнозування доходностей фондових індексів на основі вейвлет-декомпозицій, нейронних мереж та методу SSA.*

*Ключові слова: вейвлет-аналіз, прогнозування, доходності фондових індексів.*

*Проведена кластеризация доходностей европейских фондовых индексов при помощи методов вейвлет-анализа. Предложен модифицированный метод прогнозирования доходностей фондовых индексов на основе вейвлет-декомпозиции, нейронных сетей и метода SSA.*

*Ключевые слова: вейвлет-анализ, прогнозирование, доходности фондовых индексов.*

*The paper considers the clustering of European stock indexes returns using the methods of wavelet analysis. The modified method of forecasting of stock index returns based on wavelet decomposition, neural networks and SSA method, is proposed.*

*Keywords: wavelet analysis, forecasting, stock indexes returns.*

Analysis of the financial crises of 90 years of the twentieth century shows that the dynamic of crises displaying in structurally different macroeconomic systems has certain common features. Typically, they are characterized by universal mechanisms of emergence and system instability source. The character of the progress of world crises has some local features at the level of individual national economies. The research of these features allows to estimate the stability of economic systems under exogenous shocks and the ability to quickly recover after the crisis. Systemic problems of economies significantly influence on the behavior of stock markets that is expressed in non-linearity and non-stationary of stock index time series.

Effective modeling of such time series assumes the application of modern methods of nonlinear dynamics, including the techniques of wavelet transform of signals with complex structure. Wavelet functions are compact waves localized in the time. The decomposition coefficients of waves store the information about the drift parameters of approximated function.

R. Gencay [1], E. Capobianco [2], H. Lee [3] and P. Crowley [4] used the methods of wavelet analysis in the research of behavior of financial markets. The papers of M. Gallegati [5], A. Subbotin [6], K. Minu [7] and T. Kravets [8] are the latest researches of wavelet analysis.

The goal of this paper is to analyze the dynamic of stock indexes in Ukraine, Poland, Russia, Germany, France and the UK using wavelet technology, to localize and describe the identified crises in time and scale, and to forecast stock index returns using a modified method.

The object of the research is returns of European stock indexes such as UX, WIG20, RTSI, DAX30, CAC40 and FTSE100. Research methods are the discrete wavelet

transform (DWT), neural networks and Singular Spectrum Analysis (SSA) method.

Time-frequency analysis of the wavelet theory is the fundamental tool to research the frequency domain characteristics of nonstationary signals. Wavelet analysis involves the projection of a signal onto an orthogonal set of components named wavelets. A wavelet fluctuates around zero, the fluctuations of a wavelet's function go rapidly down to zero and they are localized in time and space. Wavelet representations have finite energy over the entire real line. The functions used in wavelet analysis have wide support. More importantly, they are not necessarily homogeneous over time. Hence, wavelets are a very powerful tool in handling dynamic patterns that may change rapidly over time.

Wavelet decomposition of the signal allows to delete a noise and to make a forecast. Neural networks and SSA [9,10] method are used to make the forecasts in the considering research.

A number of assumptions and significant simplifications, demonstrating the properties of the study through the experience, generalization, getting significant data from the redundant information are made in the process of neural networks definition. Neural networks can change their behavior depending on the state of their surrounding environment. After analyzing the input signals, the neural networks can self-adjust and train to provide the correct response. The trained network can be stable to some deviations of output that allows the correct identifying of the image that contains a variety of barriers and distortions.

The basic version of SSA method is to convert a one-dimensional time series in the multivariate one using one parametric procedures of the shift and to research the received multidimensional procedure using the method of