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CLOUD TECHNOLOGIES IN BUSINESS MANAGEMENT

Abstract. The modern world is in the phase of active implementation of digitalization of most processes, including cloud technologies, which is also associated with the introduction of quarantine measures in most countries. Over the past decade, the average annual growth of the cloud services market has expanded by about 50% to more than \$ 220 billion. This figure is projected to exceed \$ 500 billion in the near future. Currently, a large number of cloud service companies are concentrated in the market. All companies can be classified into national, operating within one country, and international, operating in many countries simultaneously. In Ukraine, the leader is the high-tech company De Novo, which provides services in the segment of corporate clients based on VMware, EMC, Microsoft Azure solutions. Competitors are well-known foreign IT giants, namely: Oracle, IBM, Google, Microsoft, Amazon, HP and others. The Ministry of Digital Transformation of Ukraine plays an important role in this area. The latter signed an agreement with Microsoft to implement the Azure Expansion Program and accelerate Ukraine's digital transformation, including the development of Azure cloud services for the sum of more than \$ 500 million. The transition from physical, outdated IT technologies to new cloud services will allow companies to significantly reduce the cost of maintaining their own staff of IT professionals and engineers, reduce dependence on IT equipment suppliers and increase productivity and efficiency of the decisions made. The management of the enterprise can choose one of the offered models from the companies-providers: IaaS, PaaS, SaaS. The choice will depend on the immediate management needs and financial capabilities of the enterprise. In Ukraine, the biggest share of users of cloud services belongs to large utility companies and state enterprises, namely: Dija, Ministry of Internal Affairs, Kyiv Municipal Enterprise "Informatics", Prozorro, Ukrposhta, E-Health (National Health Center of Ukraine), Naftogaz and several other organizations. Thus, the introduction of cloud services involves digital business transformations, namely: optimization of business processes, acceleration of innovation, cost reduction and so on.

Keywords: IT technologies, cloud technologies, cloud service providers, management, business.

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ХМАРНІ ТЕХНОЛОГІЇ В УПРАВЛІННІ БІЗНЕСОМ

Анотація. Сучасний світ перебуває у фазі активного запровадження цифровізації більшості процесів, у т. ч. хмарних технологій, що також пов'язано із запровадженням карантинних заходів у більшості країн світу. За останнє десятиріччя середньорічний ріст ринку хмарних сервісів зростав на близько 50 % і досяг понад 220 млрд дол. США. Прогнозується, що у найближчій перспективі ця цифра перетне позначку 500 млрд дол. США. Наразі на ринку зосереджено велику кількість компаній-провайдерів хмарних послуг.

Усі компанії можна класифікувати на національні, що діють у рамках однієї країни, і на міжнародні, що функціонують у багатьох країнах одночасно. В Україні лідером виступає високотехнологічна компанія De Novo, що надає послуги в сегменті корпоративних клієнтів на базі рішень VMware, EMC, Microsoft Azure. Конкуренцію становлять відомі іноземні ІТ-гіганти, а саме: Oracle, IBM, Google, Microsoft, Amazon, HP та інш. Немалу роль у цій площині відіграє Міністерство цифрової трансформації України. Останнє підписало договір із Microsoft щодо реалізації програми Azure Expansion Program і прискорення цифрової трансформації України, включаючи розвиток хмарних сервісів Azure в розмірі понад 500 млн доларів США. Перехід з фізичних, застарілих ІТ-технологій на нові хмарні сервіси дозволить підприємствам суттєво скоротити витрати на утримання власного штату ІТ-фахівців та інженерів, зменшити залежність від постачальників ІТ-обладнання і забезпечить підвищення продуктивності та ефективності ухвалених рішень. Менеджмент підприємства може обирати одну із запропонованих моделей від компаній-провайдерів: IaaS, PaaS, SaaS. Вибір залежатиме від безпосередніх потреб управління та фінансових можливостей підприємства. В Україні лівова частка користувачів хмарних сервісів належить великим комунальним

і державним підприємствам, а саме: «Дія», МВС, Київське КП «Інформатика», «Прозоро», Укрпошта, E-Health (НЦЗУ), «Нафтогаз» і ще кілька організацій. Таким чином, упровадження хмарних сервісів передбачає цифрові трансформації бізнесу, а саме: оптимізацію бізнес-процесів, прискорення інноваційних розробок, зниження витрат тощо.

Ключові слова: IT-технології, хмарні технології, компанії-провайдери хмарних сервісів, управління, бізнес.

Формул: 0; рис.: 1; табл.: 2; бібл.: 21.

Introduction. The development of modern digital communications is inextricably connected with the use of cloud technologies, which have become relevant in business management. Nowadays, almost no company can imagine its work without the use of cloud technologies. Outdated approaches based on the use of physical servers are disappearing. Creating such a model of work not only reduces the costs of entrepreneurs, but also provides quick remote access to all commercial information. In addition, cloud technologies serve as a platform for installing software packages, working with them and so on. The intensity of the development of cloud technologies can be inferred from the following data. According to experts, the volume of income in the market of cloud technologies has almost reached the size of the market for sales of servers and data storage systems of industrial class, which was nonsense a few years ago [1]. According to Gartner, the volume of the global cloud market in 2019 amounted to \$ 227.8 billion [2], and in the near future should grow to \$ 300 billion or more, which will be a further trigger in its development.

Analysis of research and problem statement. The dynamics of changing economic conditions in a pandemic around the world and in Ukraine in particular, has led to a reorientation to distant (remote) labor organization. Although cloud technologies began to be introduced in the 2000s, they became most widespread in late 2020. This is evidenced, in particular, by the adoption in Ukraine as the basis of the Law «On Cloud Services» (№ 2655 of 20.12.2019) [3], which defines the basic terms and procedure for providing cloud services and acts as a driver of information and communication technologies based on cloud computing. The market of cloud services in Ukraine, says M. Ageev [1], is growing every year, and the ratio of national and foreign IT service companies is 1 to 3. N. M. Lavrenchuk, R. Yu. Korolkov and S. V. Kutsak, O. Latysheva et al., L. Soroka and K. Kurkova emphasize that the modern world is characterized by the rapid development of IT technologies that can significantly improve the business [4—7]. Cloud services are especially in demand by corporate companies. Why is this happening? The answer is that cloud technologies meet the diverse needs of IT management solutions and have a high level of efficiency, including the right use of resources, high security standards, flexible pricing system, deep integration with own IT systems, user-friendly management interfaces, and support services for the use of IT infrastructure [8]. In this context, there is a revival in the development of outsourcing companies [9—11]. Thus, cloud services are becoming more widespread in business and serve as a guarantee of its effective management.

The purpose of the article is to evaluate the development of business digitalization processes and their management using cloud technologies.

Unsolved aspects of the problem. Scholars focus on specific issues without focusing on the managerial component of business. Therefore, this study may become more comprehensive, in terms of coverage of existing models of cloud services to meet the growing needs of business management.

Research results. The transition of the enterprise to the use of cloud technologies can take place using three existing models: Infrastructure as a Service (IaaS); Platform as a Service (PaaS); Software as a Service (SaaS) (*Fig.*).

Each of the models has its own characteristics, which need to be paid attention to by the management of the enterprise (*Table 1*).

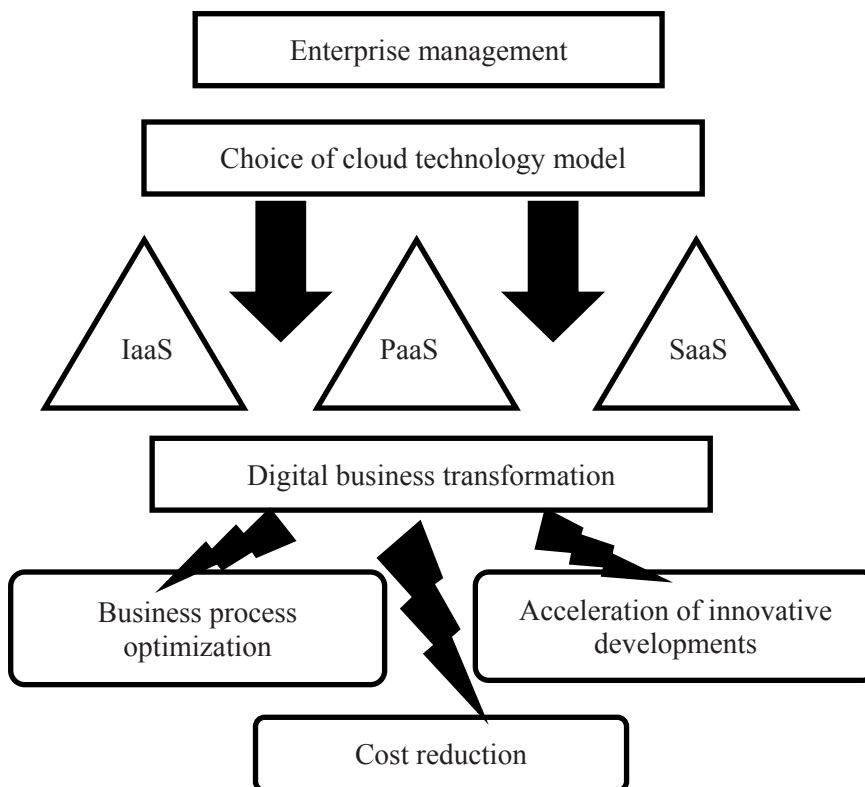


Fig. Introduction of ICT based on cloud services

Table 1

Features of cloud service models

	Management	Cost reduction	Benefits	Business model	Examples of systems
IaaS	IaaS users independently manage applications, operating systems and specialized software, and the provider supports servers, SRS and other physical equipment	Elimination of own local data centers; no need for own server equipment	Allows businesses to increase computing resources as needed, instead of buying expensive equipment for their own infrastructure	Startups, small companies and big businesses	- Amazon Web Services (AWS); - Cisco Metacloud; - Microsoft Azure; - Google Compute Engine (GCE)
PaaS	Customers gain access to a platform or set of tools for creating applications over the Internet		Allows optimizing the process of developing various types of software; speed of development, testing and delivery of applications increases; multiple users can access the project through the same platform, which in turn can work with different web services and databases	Software developers	- AWS Elastic Beanstalk; - Windows Azure; - Google App Engine; - IBM Bluemix; - VMWare Cloud Foundry; - OpenShift
SaaS	Providing customers with pre-configured programs for various business tasks via the Internet. CRM, ERP, ITSM systems, task trackers and other software can be provided as SaaS solutions		CRM-systems help to automate the company's interaction with customers, ERP-systems — to optimize the management of enterprise resources, ITSM-systems — to simplify the provision and support of IT services	Small companies with limited financial resources and large companies for short-term projects	- Salesforce; - GigaCloud; - Service Now; - Google Workspace; - IBM Softlayer; - SAP; - Cisco WebEx; - HetznerCloud; - 1C в облаке; - Amazon EC2; - SimpleOne

Source: built using <https://itglobal.com/ru-ru/company/blog/iaas-paas-saas/>;
<https://gigacloud.ua/ru/blog/navchannja/hmarna-piramida-iaas-paas-i-saas>.

A study conducted by Synergy Research Group estimated the development of cloud infrastructure in 2020. According to its estimates, global corporate spending increased by 35%, reaching almost \$ 130 billion. It should be noted that, at the same time, corporate spending on hardware for data centers and related software decreased by 6% to \$ 90 billion. The corresponding increase occurred against the backdrop of a pandemic, which forced most companies to switch to remote operation. Cloud services (IaaS, PaaS, SaaS) in 2010—2020 showed an average growth of over 50%, while the level of spending on data centers grew by about 2%. Among the above-mentioned cloud services, the greatest growth was shown by PaaS solutions, especially databases, IoT and analytics, with a constant level of IaaS and a decrease in the share of private cloud services [12]. In Ukrainian realities, the volume of the IaaS market in 2019 reached 29 million dollars, i.e. 45% more than in 2018 [1].

Currently, there are well-known global IT companies offering cloud services in various segments (*Table 2*).

Table 2

Major IT companies, aaS Solution providers

	Basic aaS Solution / Vendor
IaaS	Oracle Cloud Infrastructure Services (Oracle), HP Cloud (HP), Amazon Web Services (Amazon), Azure Virtual Machines (Microsoft), IBM SmartCloud (IBM), EMC (EMC Corporation), SoftLayer IaaS (IBM), Google Compute Engine (Google)
PaaS	Microsoft Azure (Microsoft (ASP.NET, Java, PHP, Python, Django, Node.js and Azure SQL Database)), AWS Elastic Beanstalk (Amazon (Java, .NET, PHP, Node.js, Python, Ruby and Apache HTTP Server, Apache Tomcat, Nginx, Passenger, and IIS)), Google App Engine (Google (Python, Java, PHP, Go and our MySQL)), IBM Bluemix (IBM (IBM Bluemix cloud platform offers a single solution environment and a wide range of languages and frameworks for building applications, such as Liberty for Java™, SDK for Node.js™, ruby \u200b\u200bon rails, ruby \u200b\u200bsinatra)), Salesforce Platform Cloud application development ((Salesforce combines Force.com, Heroku and ExactTarget into one cloud service network and provides tools for developing various applications)).
SaaS	Cloud PBX (Vonage Business Solutions), Oracle Cloud Applications (Oracle (HR, CX, ERP, EMP, SCP, Business Intelligence)), IBM SmartCloud Docs (IBM), Microsoft Dynamics CRM (Microsoft), OneDrive (Office Online, file storage)), Office 365 (Microsoft (Office Web Apps, Lync Online, Exchange Online, SharePoint Online)), Zoho Docs (Zoho (online office suite)), Google Apps (Google is an office suite of cloud services (Google Docs, Google Drive, Google Sites, communication: Hangouts, Gmail, Google Calendar and others)), Zoho Reports (Zoho (Business Intelligence)), Zoho CRM (Zoho), Informatica Cloud MDM (Informatica), MaaS360 (Fiberlink), Salesforce Sales Cloud (Salesforce (CRM)) etc.

Note. [13]

In the IaaS segment in Ukraine, De Novo has begun to provide cloud infrastructure for enterprise customers based on VMware, EMC, Microsoft Azure, etc. solutions. VoliaCLOUD cloud IT infrastructure from VMware (based on VMware cloud solutions), which has more than 500 virtual data centers, was built on the basis of the largest Ukrainian data center VOLIA. De Novo's clients are Diya, FUIB, Naftogaz, Oschadbank, Dniprovska City Council, Ukrspirt, Prozorro, E-health, Terrasoft, Kernel, Shell, Inter Cars, ARX, Winner, Uniq, Ukrsibbank, Raiffeisen Bank Aval, APK-Invest, Oschadbank, Nova Poshta [14].

The most rational for ensuring the work of Ukrainian operators is a technological solution from VMware (American cloud software manufacturer). This makes it possible to build one's own (national) cloud services, compared to closed software platforms from such giants as AWS or Microsoft Azure. And, most importantly, the quality of such services is on a par with global trends [1].

Experts predict a stable development of the cloud market, which will reach \$ 500 billion worldwide in 2023 [15]. According to Deloitte, revenue growth rates of provider companies will remain at more than 30% over the period 2021—2025, as companies migrate to cloud platforms to save money, provide more flexibility and innovations [16].

With the comprehensive introduction of cloud services in the world, Ukraine does not show similar development indicators as the United States, the EU or China. Thus, national expenditures on IT solutions amounted to UAH 18—19 billion, of which only 0.22% is allocated to cloud services [17]. In Ukraine, the lion's share of users of cloud services belongs to large utility companies and state enterprises, namely: Dija, Ministry of Internal Affairs, Kyiv Municipal Enterprise «Informatics», Prozorro, Ukrposhta, E-Health (National Health Center of Ukraine), Naftogaz and several other organizations. The others continue to use the traditional approach to IT [1].

The Ministry of Digital Transformation of Ukraine is engaged in the processes of digital transformation on the territory of Ukraine. The latter signed an agreement with Microsoft to implement the Azure Expansion Program and accelerate Ukraine's digital transformation, including the development of Azure cloud services in the sum of more than \$ 500 million. The introduction of Microsoft Azure will enable employees of ministries and state-owned companies to use Azure's comprehensive cloud technology solutions, namely: artificial intelligence, analytics, cloud, communications, Big Data, security, Internet of Things, data management, including logistics and legal solutions as well as the possibility of using integrated cloud solutions Azure for industries: E-government, E-health, Ed-tech, Ag-tech, Fin-tech, IT, manufacturing, energy, infrastructure, gaming industry [18—20].

In order to enhance the digital transformation, it is advisable to use the experience of EU countries. Back in 2012, the continental strategy of the Digital Single Market was approved, part of which was the European Cloud Initiative (ECI). A non-profit advisory group, the European Cloud Partnership (ECP), has been set up to implement and coordinate the cloud initiative. The fundamental function of the ECP is to implement the Cloud-for-Europe model, which aims to increase confidence in cloud infrastructure in the EU and ensure its efficiency in the public sector. In turn, ECI is aimed at providing government, scientific and industrial organizations with cloud services for the work of the Central Office, etc. ECI's funding is approximately € 6.7 billion in both private and public investment [2]. It is also possible to use the experience of the United States, where one can choose one's service provider from a list of private companies' resident in the country that have the appropriate permits; of Great Britain, where a special online platform has been created, where private companies can offer cloud services to official structures; of Israel, where the cloud is built and operates throughout the country and is serviced by leading global companies, etc. [17; 21].

Conclusion. The development of a business based on cloud technologies is important in increasing efficiency and reducing operating costs for the maintenance of IT technologies. Currently, the company's management can focus on companies providing national and foreign cloud services. In Ukraine, the leader is De Novo, which competes with such well-known global giants as Oracle, IBM, Google, Microsoft, Amazon, HP and others. Choosing the provider company has the following nuances: if the business is concentrated only in Ukraine, one can use the services of national operators, but if business is operated in several countries, the best choice would be a company operating internationally. Thus, the transition to new IT technologies based on cloud services is an alternative to physical, outdated in-house IT services. This is evidenced, in particular, by the annual growth of the cloud services market of about 50% with an average profitability of providers of 30-35%. There are currently three main models of cloud services in demand in the world. The choice of model depends on the size of the enterprise and the needs of management. The introduction of cloud services involves digital business transformations, namely: optimization of business processes, acceleration of innovative developments, cost reduction and so on.

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