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CLOUD TECHNOLOGIES OF THE INFORMATION ECONOMY: ISSUES OF INSTITUTIONALIZATION AND MEASURES OF UKRAINIAN MANAGEMENT IN THE CONDITIONS OF WAR

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Abstract. The article is devoted to the urgent issues of the rapid advancement of cloud technologies in the conditions of the information economy from the standpoint of issues of institutionalization and the success of management measures in the conditions of war. The rapidity of the transition of global and Ukrainian businesses to cloud service systems and the increase of the corresponding service potential on the part of global providers are noted.

The author's definition of the key categories in the information management system and cloud technologies fixation in the studies of practitioners and scientists regarding the development of information activity are given. The relevance of managerial definition and evaluation of the process of institutionalization of the cloud market in the areas of information security, market reproduction of businesses, and information progress has been proven. The groups of advantages that businesses receive from the transition to cloud services, such as: preservation and accumulation of information, scaling of information support and management resources, formation of a new level of information security and unlimited involvement of target products of the global software market, updating the information culture in data processing, communication support, decision-making, are defined.

It has been established that the issue of institutionalization of the cloud market and cloud services becomes a matter of national interest in the conditions of war, business relocations, and systemic cyber threats.

It is proved that due to the use of cloud technologies of the industry, enterprises of both Ukraine and the whole world have received a large number of advantages and acquired the ability to successfully solve existing information, communication and security problems.

It is determined that the institutionalization of cloud services and cloud infrastructure takes place in the system of development of management practice from the position of system involvement of knowledge: legal recognition and management conceptualization; anti-crisis management, new security conditions and critical risks; activities in the conditions of the military economy. Moreover, the requirements for security, simplicity and economy in the maintenance of information resources, high culture in communication equipment become the key prerequisites for the success of cooperation with cloud services.

Keywords: cloud services, cloud market, information security, information management, information and communication technologies, management measures.

Introduction

The years 2022-2023 turned out to be not only extremely difficult and turning points in the activities of Ukrainian business, they also showed the potential of the majority of enterprises, leading management to work in extremely difficult, risky conditions of full-scale war, relocation of factories and offices, work in conditions of shelling and drone attacks. Most of the companies that continued their work actively adapted to wartime business conditions, improved business processes and involved new management technologies to preserve their business, expanded social responsibility towards personnel. New approaches to information provision, digital transformations, targeted updating of IT services, strict control over communications and cyber security are recognized as key conditions for the preservation of companies and improvement of security conditions. Such measures were carried out very quickly, taking into account new opportunities for active integration of businesses and individual projects, with the need to preserve commercial secrecy, increase prospects for cooperation with global markets and key counterparties.

For more than 600 days, Ukraine has been in a difficult state of war, which actually covers all territories. The enemy destroys cities and infrastructure, industrial and agricultural production, social facilities and cultural heritage. In such conditions, the country's government, scientists and educators, leading management and business representatives work in the conditions of a military economy, accumulating recovery potential. However, it is the information sector that ensures the progressiveness of management measures that lay the foundations of a progressive vector movement and balanced, harmonious national economic interests. As a result, it will lead to the formation of stimulating relationships of different groups of the country's population, foreign investors and agents of international cooperation, business and government. Understanding of the rapidity and usefulness of informational progress should be present in every step of the government, business, and population, which simultaneously accelerates the entry of our country into the EU, and makes the model of the national economy compatible with the European market space (Koliadenko, 2023).

Literature review

The idea-concept of the information society, which is an aspiration of an accelerated transition from the industrial form of organization of relations to more highly developed ones that will ensure the harmonious life of society, the stability of economic development, managerial and scientific and technical progress in the future, has gained wide spread in educational and scientific circles. In the conditions of the information society, progress is ensured by active, comprehensive development of the information economy, as a mandatory element in paradigmatic shifts of the transition from material values to information-intensive and virtual ones. The recognition of the priority of information resources over others, the sphere of information services over material production, information progress over technological progress is rapidly taking place.

Studies of information progress and information economy are actively reflected in the works of such outstanding scientists as: F. Machlup, D. Bell, M. Porat, E. Toffler, T. Stoneyer, M. Castells, J. Stiglitz, F. Webster.

The Ukrainian school of the theory of information economy and information management is represented by the works of S. Kolyadenko, Yu. Kovalenko, R. Mann, L. Pankova, O. Prygodyuk, O. Finagina, O. Kolomytseva, O. Zinchenko, I. Bitiuk, V. Heyets.

Materials and methods

The purpose of the article is to study the peculiarities of the involvement of cloud technologies in the course of the development of the information economy of Ukraine in the context of issues of institutionalization of management measures in wartime conditions. Systematic processing of literary sources, analysis and assessment of open sources regarding the development of the information economy and information management, providing of independent definition of categories and processes have become the key methods for researching the theory of the information economy.

Results and discussion

Economic and management interests of most countries of the world in the conditions of active digitization are changing, moving into the realm of urgent needs for accelerated updates, recognition of digital processes, which are key ones in progressive management projects, government and management measures. Ukrainian top management and business representatives do not just update these issues, they solve a number of tasks in extremely difficult conditions of a full-scale war, threats to the cyber security of business activities, losses not only of communications, information and databases, but also of real agents of cooperation.

The modern world system of economic interests is dynamic one and undergoes evolutionary changes under the influence of the following key factors: scientific, technical and technological progress;

informational progress and, accordingly, the next stage of digitization, which make it possible to form a global information environment, in which the speed of circulation and movement of financial capital between countries increases, the global financial market functions, the information society develops, the processes of improvement and use of innovative potential are intensified; threats to national security (wars, civil conflicts, or situations like Covid-19); mastering of the sixth technological innovation system, in which the network economy, virtualization of production and service spheres, digitalization of national economy management, knowledge progress, artificial intelligence systems and quantum technologies are its drivers (Pankova *et al.*, 2021).

Information security of Ukrainian business appears to be a primary task, a priority in management measures and decisions, an urgent interest in preserving the amounts of activities, and in some cases, expanded reproduction, entering new markets. Such issues form new platforms for top management actions, research on the current state of enterprises, outlining of new methods of management analysis of information activities, communications, resource provision, integrated platforms for cooperation on domestic and foreign markets. Cloud services, which are recognized as a guarantee of integrity and effective use of large volumes of information, help in the protection and preservation of information resources of Ukrainian enterprises.

For academic interest and chronological integrity of history, we will evaluate the results of 2021, which turned out to be very successful for the Ukrainian market of cloud services. Compared to 2020, the increase was more than 48%, as a result, the total volume of the IaaS services segment in the country exceeded \$50.1 million for the first time. Of course, if compared with global indicators, the figure is quite modest - one not even too large project of a cloud operator from the world's "big three" will easily exceed the indicated volumes - however, it was a significant achievement for the Ukrainian market. By the end of 2021, it seemed that in 2022 the segment should grow by at least forty percent - this conclusion could be made by analyzing information about current contracts and plans of service providers. But the great prospects were immediately destroyed by a large-scale Russian invasion (Cloud technologies, 2023).

At the beginning of the war, it was expected that some businesses would stop due to the gradual restriction of Russian software, which would either be banned or simply stop working in Ukraine. However, consolidation of actions and understanding of problems on the part of business and the state gradually formed new perspectives. Firstly, products appear on the market that can replace the software of the aggressor country. GigaCloud has 150 partner companies that develop and implement software that is an alternative to Russian one. Secondly, the Security Service of Ukraine has recognized the danger of using the products, and the National Security and Defense Council of Ukraine is introducing sanctions against development companies from the Russian Federation, including Bitrix24 (Cloud technologies, 2023).

In Ukraine, in 2022, the Cloud First state strategy finally started working. This was facilitated by the Law on cloud services signed by the president, which entered into force in September 2022. Both private business and public sector rapidly scaled and began to entrust the most critical services to the cloud (Cloud technologies, 2023). These are the initial processes of entering the national cloud market into the circle of global providers, recognizing the presence of demand from Ukrainian corporations for relevant services, and understanding the strategic vision of future services.

Due to hacking attacks and shelling, data storage has become an even more painful issue for businesses. After all, physical vulnerability of the infrastructure has increased - the risk of destruction due to hostilities or damage during the evacuation process has actualized. This has exacerbated the need for cloud migration and data backup. The solution to the problem consists in backup to the cloud. Data is protected by encryption and stored at a remote site in Ukraine or abroad. In the event of storage failure, the infrastructure can be rapidly deployed from backups (Cloud technologies, 2023).

Administrative and legal support, institutional consolidation of the systemic development of the information economy involve the formation of theoretical knowledge, the accumulation and

development of basic categories, the outline of principles and a holistic methodology, the development of measures that accelerate the consolidation of effective technologies, desirable and rapid processes in the activities of government, business, and the population. Particular attention is paid to the issues of the institutionalization of security measures as an element of stability of activities, quality performance of various tasks, effective decision-making (especially under conditions of uncertainty in the conditions of warfare).

Categorical and conceptual provision, accumulation of the theory of information management and information economy is rapidly expanding due to the following terms: cloud service (clouds), cloud technologies, cloud market (cloud services). We will interpret these categories from the standpoint of already accumulated management experience and the study of the primary assets of scientists.

The most widespread and used in practice category "cloud" has a double use, firstly, as a system product for computing large volumes of data on the Internet; secondly, a cloud service with the characteristic of saving, accumulating, receiving data processing services on the Internet in the conditions of targeted remoteness.

Cloud services are functional Internet networks (or server networks, data centers) in the system of providing various services to users of large volumes of information on a centralized, paid basis, which ensure the institutionalization of new forms and rules for preserving valuable content in the activities of the global information market.

The existing categories of cloud services as target networks on the basis of separation have a clear functional purpose and features of customer service. Thus, infrastructure services provide maintenance services for the corresponding environment (IaaS service), services of software developers (DevOps) and related management of information resources, saving data and the corresponding set of training as functions of knowledge management (TransferNow). All of them include backup, file sharing, identification and localization of downloads, synchronization of user actions (the list of services and information-analytical procedures is constantly expanding). It is fundamental that information processing centers are located in Europe, Asia, America, close to customers (or customers' wishes), which is an element of corporate security, an option for double and triple storage of important information.

Cloud technologies are targeted information and communication technologies, software that processes, accumulates, saves, systematizes, does primary processing of large volumes of information and provides auxiliary data processing services on the Internet platform in a remote work format.

The cloud market (the market of cloud services, simplified cloud storage with conditions for providing certain additional services) is the services of IT companies that have targeted specialization as providers of cloud services, developers of cloud technologies, collectively form service offers, study demand and engage in pricing for their products. It is a new segment of the IT market that is growing quite quickly, does not have a clear national location, performs a number of functions (security, scaling, centralization of information activity) in all segments of social reproduction of human activities.

Institutional recognition of the cloud market is taking place on a global scale, its functional consolidation is being formed in quite different areas of human activities. The institutionalization of the cloud market has already been recognized in the field of information security, market reproduction of businesses, and information progress. It is necessary to identify and actively research the independent stage of the development of the information economy, which is already associated with cloud technologies and the expansion of the information market into a large, influential segment of cloud services.

The statistics of cloud growth on a worldwide scale proves that in 2020, 40 zettabytes of information were stored here, and the forecast for 2025 is already 100 zettabytes. And this, according to experts, will be 50% of the world's volume of information. The following providers were the largest and recognized ones in the first quarter of 2023 by market share: Amazon Web

Services – 32% (offering more than 200 services and covering 31 regions, each with several availability zones), in second place Microsoft Azure – 23%, and closing the top three Google Cloud with a 10% share. The top providers also include cloud services from Alibaba Cloud, IBM, Salesforce, Oracle and Tencent (Top 5 cloud providers, 2023).

Modern processes of active, progressive reproduction of humanity's vital activities are connected and conditioned by information and communication technologies, knowledge of the universe and its features of management and information support, social and cultural progress. In Ukraine, the information economy is actively being built as an innovation-oriented model with various transformations and improvements for the future, which characterizes the general progress and the corresponding movement towards a new vision of knowledge management.

The processes of changes in the information environment, the formation of the national model of the information economy in our country are consistent in nature, accumulate and receive international recognition at the level of global markets, transnational companies, large and medium-sized IT clusters, projects funded by international institutions. The needs for competitive positioning of Ukrainian enterprises based on the identification of knowledge resources is being recognized (Vartanova *et al.*, 2021).

Today, it is necessary to state the completion of the stage of complex informatization and automation of state and regional institutions, enterprises, and form a vision of a new stage related to the cloud transformation of Ukraine. Let us emphasize that the cloud market in the world has been actively growing for the past five years, according to forecast data from international consulting companies, the costs of public cloud services will reach \$597 billion by the end of 2023, compared to 2022, the growth will reach 21.5%. The forecast for 2024 is not just optimistic, the cloud market will grow to \$725 billion (Top 5 cloud providers, 2023).

Due to the use of cloud technologies of the industry, enterprises of both Ukraine and the whole world have received a large number of advantages and successful solutions to existing information, communication and security problems:

Improvement of the functioning of the information infrastructure, service management on one platform;

New speed of processing (calculation) of large volumes of data and accumulation of the potential of not only information, but also knowledge;

Reduction of service maintenance costs (technical and technological simplification), payment only for used resources (with leading providers, top five);

Increase in the potential of services, updating of services (ranging from 200 to 600 types of services on large cloud platforms) and software development;

Flexibility and speed in decision-making, involvement of targeted knowledge, the ability to process industry analytics, conduct electronic commerce in a simplified manner;

Growth in demand for information products in the system of cooperation with artificial intelligence, innovative technologies;

New scaling of activities and market opportunities, primarily analysis and assessment of the competitive environment;

Increase in the effectiveness of remote work and global online processes, natural language processing and data management capabilities;

New level of information security and unlimited involvement of target products of the global software market;

Gradual transition to the model of knowledge management and simplification of IT management activities in matters of processing large volumes of information;

New level of information culture in data processing, transparency of actions, communication support, decision-making (Zinchenko *et al.*, 2021).

For each Ukrainian company, such a list of advantages will be its own, but the vector of the movement is common, which has a large number of specific assessments and manifestations, and

requires management coherence in the system of corporate and industry management analysis. Scientists and leading management of IT companies record and analyze an interesting fact - during the war, cloud services and the corresponding market did not collapse, but withstood risks and changes in working conditions, formed safety and security zones, placed their information resources in clouds or commercial data centers. Such a movement was quite fast and effective from the point of view of preserving business processes, assessing the growth in demand for cloud services in special cybercrime conditions not only in Ukraine (Pankova *et al.*, 2022; Vartanova *et al.*, 2021).

Cluster formations of groups of enterprises, which formalized relevant initiatives and formed integrated platforms for the simultaneous use of cloud services, also had a positive effect on Ukrainian business. Such experience needs its systematic study and further implementation in the activities of small and medium-sized businesses.

Scientists emphasize that in accordance with the conditions of the post-military recovery of the national economy of Ukraine, key management concepts and strategies for the promotion of national economic interests should be formed in the form of accelerated formation of a new stage of information market development with a cloud service segment based on a successful cluster combination of businesses on Ukrainian platforms. The national system of information security must be in accordance with the requirements of the future states of the information economy, innovative and security-oriented institutions of economic activity, harmonious relations between business and government (Koliadenko, 2023; Prygo diuk, 2023; Uzbek, 2022; Bityuk, 2023).

The institutionalization of cloud services and cloud infrastructure takes place in the system of the development of management practice from the position of system involvement of knowledge: legal recognition and managerial conceptualization; anti-crisis management, new security conditions and critical risks; activities in the conditions of the military economy. The requirements for security, simplicity and economy in the maintenance of information resources, high culture in communication equipment are key prerequisites for the success of cooperation with cloud services. The decision regarding the cloud service is made under the following conditions: guarantee of security and commercial secrecy for the client; quality and innovation in maintenance; high image of the service from the point of view of professionalism and understanding of security needs.

Conclusions

Scientists and leading IT management clearly outline that cloud technologies have become an integral part of modern business. They reduce infrastructure and maintenance costs, increase productivity and operational efficiency, and improve data security. In addition, the use of cloud technologies allows more flexible configuration of business operations. Due to the ability to scale resources in the cloud, companies can easily manage the load on their servers and quickly scale when necessary. In this regard, more and more companies are implementing cloud technologies in their activities and are gaining significant advantages over competitors, which is a national economic interest from the standpoint of business security.

The modern model of informational progress is complex and ambiguous - both from the standpoint of informational and technical-technological asymmetry (unevenness), and from the standpoint of impact on society. This especially applies to managerial innovations, updating cultural standards. A critical attitude to the manifestations and prospects of informational and innovative progress should be recognized and systematically investigated, studied and taken into account of various experiences: both successes and failures, optimistic and pessimistic expectations.

The cloud market is becoming a new business institution for ensuring successful economic activity, protection of information resources in the conditions of instability, proxy and cyber wars in the world. Cloud technologies in their diversity expand the prospects for the development of information management and information economy, they need their recognition and institutionalization in order to improve the performance and compliance of management measures.

It is also worth noting that the increase in demand for cloud services will lead to the appearance on the market of new IT companies that will be providers of such services. Foreign developers and providers who can provide outsourcing services to Ukrainian companies should be attracted to the Ukrainian market. In addition, it is advisable to actively use cloud services not only in business, but also in government structures. The market of data services is developing quite rapidly and changes under the influence of the external environment, and along with it, the requirements for effective business models for the provision of cloud services, the constant study of which is the subject of further scientific research, also change.

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Conflict of interest

None.

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ХМАРНІ ТЕХНОЛОГІЇ ІНФОРМАЦІЙНОЇ ЕКОНОМІКИ: ПИТАННЯ ІНСТИТУЦІОНАЛІЗАЦІЇ ТА ЗАХОДІВ УКРАЇНСЬКОГО МЕНЕДЖМЕНТУ В УМОВАХ ВІЙНИ

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Анотація. Статтю присвячено актуальним питанням стрімкого просування хмарних технологій в умовах інформаційної економіки з позиції питань інституціоналізації та успішності заходів менеджменту в умовах війни. Відзначено стрімкість переходу світового та українського бізнесів в системи хмарних сервісів та нарощення відповідного потенціалу послуг з боку світових провайдерів.

Дано авторське визначення ключових категорій у системі інформаційного менеджменту та закріплення хмарних технологій у дослідженнях практиків та науковців щодо розвитку інформаційної діяльності. Доведено актуальність управлінського визначення та оцінювання процесу інституціоналізації хмарного ринку в сферах інформаційної безпеки, ринкового відтворення бізнесів, інформаційного прогресу. Визначено групи переваг, що отримують бізнеси від переходу в хмарні сервіси: збереження та акумуляція інформації, масштабування інформаційного забезпечення та ресурсів щодо управління, формування нового рівня інформаційної безпеки та необмеженості залучення цільових продуктів світового ринку програмного забезпечення, оновлення інформаційної культури в опрацюванні даних, комунікаційному забезпеченні, прийнятті рішень.

Встановлено, що питання інституціоналізації хмарного ринку, хмарних сервісів постає питанням національного інтересу в умовах війни, релокації бізнесів, системних кіберзагроз.

Доведено, що за рахунок використання хмарних технологій галузі підприємства як України, так і всього світу отримали велику кількість переваг і набули можливості успішного вирішення існуючих проблем інформаційно-комунікаційного та безпекового характеру.

Визначено, що в системі напрацьовань практики менеджменту має місце інституціоналізація хмарних сервісів та хмарної інфраструктури з позиції системного залучення знань: правового визнання та управлінської концептуалізації; антикризового менеджменту, нових станів безпеки та критичних ризиків; діяльності в умовах мілітарної економіки. Причому, ключовими передумовами успішності співпраці з хмарними сервісами постають вимоги щодо безпеки, простоти та економії в обслуговуванні інформаційних ресурсів, високої культури в комунікаційному забезпеченні.

Ключові слова: хмарні сервіси, хмарний ринок, інформаційна безпека, інформаційний менеджмент, інформаційно-комунікаційні технології, заходи менеджменту