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PROSPECTS FOR IMPLEMENTING CLOUD TECHNOLOGIES IN STATISTICAL ACTIVITIES

Begalov Bakhodir Abdusalomovich

DSc., Professor, Tashkent Oriental University, Tashkent, Uzbekistan

Djanadilov Shakhboz Uktamovich

PhD, International Nordic University, Tashkent, Uzbekistan

Abdusalomov Abdusamadjon Bakhodirovich

PhD, Senior Researcher, Tashkent University of Applied Sciences, Tashkent, Uzbekistan

Abstract. This article examines the possibilities and practical directions for the wide and effective use of cloud technologies in statistical activities under the conditions of the emerging digital economy. Particular attention is paid to the role of cloud computing in improving data collection, processing, storage, and dissemination processes, as well as enhancing the efficiency, flexibility, and reliability of statistical systems. The study highlights how cloud-based solutions contribute to real-time data access, integration of large and heterogeneous datasets, and the automation of analytical procedures. In addition, the paper emphasizes the importance of ensuring data security, scalability, and cost efficiency when implementing cloud technologies. The findings demonstrate that the adoption of cloud-based infrastructure can significantly strengthen institutional capacity, support evidence-based decision-making, and improve the overall quality and timeliness of official statistical information in a digitalized economy.

Keywords: digital economy, digital technologies, information technologies, statistics, method, cloud technologies, information systems, digital strategy.

1.Introduction

In today's era of digital technologies, fast and efficient processing of information is becoming one of the important areas of public administration and economic analysis. Especially since state statistical bodies are engaged in the collection, processing and analysis of large volumes of data, the introduction of modern technologies is becoming an urgent issue. In this regard, the use of cloud technologies allows for further optimization of statistical processes, ensuring data security and increasing efficiency.

Therefore, important decisions are being made at the state level on the widespread introduction of cloud computing technologies in the processes of data storage and processing in economic sectors. In particular, within the framework of the Decree of the President of the Republic of Uzbekistan No. PF-6079 “On approval of the “Digital Uzbekistan - 2030” strategy and measures for its effective implementation”, approved on October 5, 2020, it is envisaged to introduce digital technologies, including cloud technologies, in various sectors of public administration and the economy.

In addition, by the Resolution of the President of the Republic of Uzbekistan No. PQ-357 dated August 22, 2022 "On measures to bring the information and communication technologies sector to a new level in 2022-2023", the "Roadmap" for further improvement of the information and communication technologies sector in 2022-2023 was approved, which sets out the tasks of launching the data processing center of the "Electronic Government" system and gradually

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deploying, storing and processing state information systems and resources based on cloud technologies.

2.Literature review

Many scientific works of our and foreign scientists are devoted to the problems of effective use of information and communication technologies and information systems in various sectors of the national economy and in the field of statistics.

Foreign scientists such as S.Kenneth, P.Jane[10], K.S. Laudon, J.P. Laudon[11], N.Viner, Michael Brecher, Frank P. Harvey[13] have made a great contribution to further improving the theory and methodology of management processes, solving socio-economic problems, and effective use of information systems with their scientific research.

K.S. Laudon, J.P. Laudon proposed a methodology for the development of information systems and their effective use in economic sectors in their research works. Their scientific works considered issues such as information systems infrastructure, network technologies, design and development of information systems, and information technology infrastructure. [11]

S. Kenneth and P. Jane conducted their research in areas such as the use of information systems in management processes, the optimal design of their subsystems, and the effective use of information systems in solving various functional problems. [10]

Michael Brecher and Frank P. Harvey studied the possibility of collecting, analyzing, and disseminating statistical data using information systems, monitoring data in real time, and taking necessary measures, and made recommendations for taking necessary measures. [13]

3.Analysis and ressults

Cloud computing technologies are one of the leading trends in the global information technology market today. Cloud computing is a highly effective revenue and sales channel tool for independent software vendors and carriers, allowing them to resell existing products to end users. The cloud approach allows for the provision of dynamic services, in which users can pay for their resources based on real needs without long-term commitments.

Cloud computing has a number of advantages over traditional solutions for building corporate infrastructure, offering services and services, etc. Among these advantages:

- flexibility. Flexibility is a flexible response to changing business conditions - one of the characteristics of a successful business. For example, current market conditions and competitive actions may require the rapid introduction of a new product or service during the full cycle of planning, design and development of an information system. Flexibility allows you to quickly increase the capacity of the infrastructure without requiring initial investments in hardware and software. Elasticity is related to the scalability of applications, as it solves the problem of instantly changing the amount of computing resources allocated for the operation of the information system;

- scalability. The introduction of new products and services, the expansion of the sales channel and the number of customers require that the organization's information systems withstand increasing loads and process large amounts of data. Fast and reliable operation, eliminating denial of service, system response delays and failures, increases customer loyalty and satisfaction. A scalable application allows you to handle a larger load by increasing the number of simultaneously running instances. Typically, shared hardware is used to run multiple instances at the same time, which reduces the total cost of ownership and simplifies infrastructure maintenance;

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- payment for resources actually used. Payment for resources used is another attribute of cloud computing, which allows you to shift part of the capital costs to operating costs. By purchasing only the required amount of resources, it is possible to optimize the costs associated with the operation of an organization's information systems. In combination with multi-tenancy, sharing resources between different consumers can further reduce costs. Elasticity allows you to quickly change the amount of resources up or down, thereby adjusting ICT costs to the actual needs of the organization;

- multi-tenancy. This is one of the ways to reduce costs by maximizing the use of common resources to serve different user groups, different organizations, different categories of consumers, etc. Multi-tenancy can be especially attractive for application development companies, as it allows them to reduce their own costs for paying for cloud platform resources and maximize the use of available computing resources.

Uzbekistan was one of the first countries in Central Asia to introduce "cloud" technologies. The Resolution of the President of the Republic of Uzbekistan "On measures to develop the digital economy in the Republic of Uzbekistan" of July 3, 2018, identified the introduction of various types of "cloud" technologies into the economy as one of the main directions.

The national communications operator “Uzbektelecom” JSC has created a “cloud” data center UzCloud (providing videoconferencing and remote work services) to meet the growing demand of state bodies, institutions, business entities, and the population for storing and transmitting information.

“Uzbektelecom” JSC is developing “VDC Virtual Data Center”, “VDI Virtual Desktop”, “VKS – Videoconferencing”, “Colocation”, “Webhosting”, “Cloud video surveillance” and a number of other “cloud” services on the basis of the “cloud” data center.

Before introducing cloud computing technologies into the field of statistics, it is necessary to pay attention to where the information systems of the sector are located. Currently, there are three main models:

- in the infrastructure of the organization;

- in the hosting company;

- in the cloud.

Colocation in the organization's infrastructure (building) is the most traditional model of information systems deployment, which requires investment in the purchase of additional hardware (servers), software, network infrastructure and the involvement of specialists.

This model requires high direct financial costs, but it provides complete control over the infrastructure, hardware and software.

This model of information systems deployment, simply called "hosting", has existed for several years and is one of the most popular ways to reduce costs for information technology. It

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is based on renting a hardware platform, software, related infrastructure and staff to maintain it. This model has less control over the infrastructure, hardware and software and is based on paying for a certain amount of resources, which usually means paying even when the rented resources are not used.

As a result of the development of digital technologies, the cloud deployment model has emerged. This model involves the use of rented hardware and software resources on a fee-based basis, which significantly reduces initial costs and shifts from capital investments to operating expenses. This model is characterized by the almost complete lack of control over the infrastructure and hardware, and the lack of control over the software when renting it.

Each approach has its advantages and disadvantages, but from an economic point of view, the most important feature is the payment made through cloud computing.

Cloud computing is an approach to deploying, providing and consuming applications and computing resources, in which applications and resources are provided over the Internet as services that are consumed on various platforms and devices. Payment for such services is made based on their actual use.

Cloud infrastructure allows for joint initiatives in the field of statistics with other sectors and organizations of the economy. In statistics, cloud services are divided into models for using basic infrastructure services, such as providing multiple services, statistical accounting, and integration services.

Cloud services are also very popular in ensuring the security of primary statistical data. Today, various cloud computing solutions are being offered that can protect statistical data from various threats. Antivirus services, anti-spam services, information storage protection services, as well as DDos protection services allow you to operate without worrying about the security of statistical data.

The main advantages of introducing cloud technologies in the field of statistics are as follows:

1. Availability and mobility. Organization employees are provided with the opportunity to access their workplace computers via the Internet from anywhere at any time.

2. Reduction of capital and operating costs. Cloud technologies allow you to reduce the organization's daily costs for maintaining IT infrastructure.

3. Operational control. It allows you to automatically fully monitor the health of online services and integrations, as well as take the necessary measures in case of the slightest malfunctions, thereby ensuring their stable and trouble-free operation.

4. Scalability. Cloud computing allows you to almost instantly increase or decrease the size of server resources based on the specific needs of the organization and pay only for the resources you use.

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5. Security. Cloud technologies provide high security by pooling computing resources, minimizing the "human factor" and strictly taking into account access to the service.

In addition, cloud technologies can also be used to establish electronic document flow between statistical system employees. By introducing a cloud text editor based on modern web standards into the field of statistics, it is possible to create electronic documents from anywhere in the world on any operating system with a browser (Figure 1).

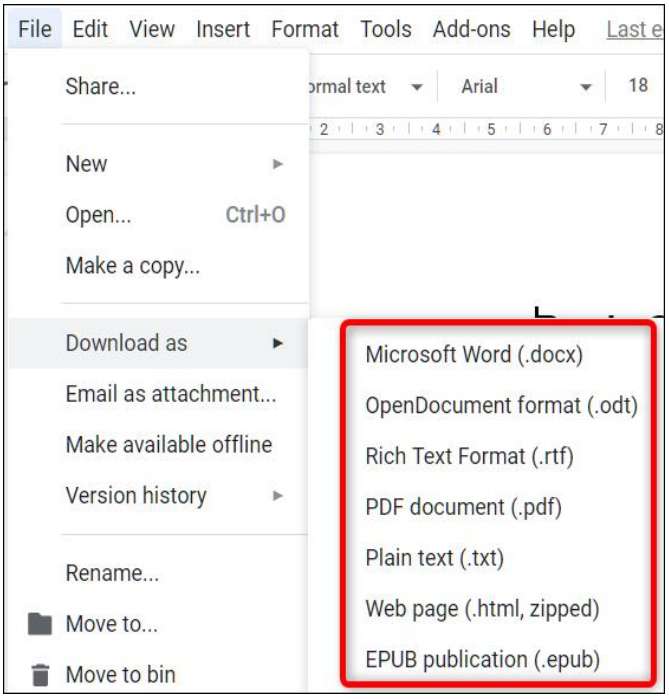

Figure 1. Cloud-based text editor window.

Users of cloud-based text editors can use them through a web browser without installing the program on a computer. Documents and tables created by the user can be stored on special cloud servers or exported to a file.

Today, cloud-based text editors support various file types, such as .doc, .docx .txt, .rtf and .odt, which makes it easy to view and convert Microsoft Office files directly in the cloud. Since such text editors are online word processors, they can track edits, changes and suggestions in real time, share and collaborate with several people on the same document.

One of the best features of cloud-based text editors is the ability to create a shareable link that allows each employee to view, edit, or modify individual documents. Instead of sending a file between employees, they can edit it as if it were prepared on one computer at the same time. The only difference is that each person will have their own text input cursor for use on their personal computer.

Today, reliable storage of information is the most important requirement of our time. However, the proliferation of computers and mobile gadgets with Internet access has led to another problem - ensuring that information is publicly available. In this case, the ideal solution is to store files on cloud file servers. Then you can connect to it from any computer or other device, read or modify and save documents. Since the data on such servers is backed up, the

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risk of losing it is almost zero. Such services are called cloud file server services, and they are now very common due to their convenience.

Cloud file server services are one of the services that allow you to store any file on a remote server. Simply put, this is cloud storage. An ordinary user needs it to access files from any device. In the future, employees of the statistical system will be able to connect to the server from a regular home computer and view all folders, documents, photos, videos and everything else stored in this cloud. In addition, a file sharing function will be available, which will allow you to get a link to any file from another user. Cloud file server services have a web interface, so employees can log in and perform all actions directly on the site, in their personal account. Cloud storage is convenient to use as a small file sharing service.

Employees can simultaneously work with files and use the copied link to share with other employees. Through it, they will immediately go to the storage and, if available, download this folder or copy it to their account.

Among digital technologies, cloud computing technologies are considered an excellent solution for implementing such tasks. Microsoft Azure SQL Server provides a large, fast and fully managed cloud database with a high level of data security.

In the field of statistics, working with large volumes of primary statistical data, collecting, storing, processing and presenting them in the required form requires highly efficient database management systems and server devices. However, the formation of such an infrastructure requires additional financial costs and qualified specialists to manage these systems.

Azure SQL Database is a reliable, scalable database that also has fully automated artificial intelligence-based techniques and resilience. Using Azure SQL, you can deploy a statistical database without installing hardware or software and manage the database using its tools.

Azure SQL Database provides modern cloud-based tools with a wealth of resources to support relational and non-relational data types such as XML, graphs, and JSON.

4.Conclusions

The introduction of cloud technologies in the activities of the Statistics Committee and its regional departments is one of the important directions of digital transformation. As a result of the transition to cloud infrastructure, the high capital and operating costs associated with the purchase, storage and maintenance of traditional server equipment will be significantly reduced. At the same time, the use of computing power and storage resources is based on the principle of "pay as you need", which allows for more rational use of budget funds.

Cloud technologies increase the quality and reliability of data by automating and centralizing the processes of collecting, processing, storing and analyzing statistical data. Modern cloud platforms provide a high level of information security, backup and rapid recovery mechanisms from accidents, strengthening the continuity and protection of statistical information.

Also, the use of cloud solutions reduces the constant need for highly qualified specialists and allows service providers to shift a significant part of technical maintenance to service providers. As a result, the organization's employees will be able to focus more on the main statistical tasks - analysis, forecasting and decision-making processes. In general, the introduction of cloud technologies will serve to increase the efficiency of the Statistical Committee's activities, enhance the economic efficiency of digital technologies and form a modern management system.

Proposals for the introduction of cloud computing technologies in the activities of the Statistical Committee:

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1. It is necessary to analyze the existing information systems of the Statistical Committee and develop a clear "roadmap" for their gradual migration to the cloud environment.
2. When choosing cloud platforms, it is necessary to establish compliance with international information security standards as the main criterion, and to introduce data encryption, authentication and constant monitoring mechanisms.
3. It is proposed to organize regular training and advanced training programs for statistical system employees in cloud technologies, data analysis and information security.
4. Technical stability and service quality are ensured by establishing long-term partnerships with providers offering reliable and cost-effective services that meet state requirements.
5. It is necessary to regularly evaluate indicators such as cost savings, productivity, and data quality achieved as a result of the implementation of cloud technologies, and improve the strategy based on the results.

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