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Modern cloud technologies for business and industry: opportunities and trends for Russian & Global markets

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ABSTRACT

Cloud computing is one of the fastest growing domains of the IT industry, however, the growth rates for each of the models on a global and local (Russian) scale have not been generalized, despite the obvious value of such analysis. Modern business and industry in Russia is going through another period of instability and at the same time is forced to follow the trend of digitalization. That is why a balanced scientific analysis and forecast of the development of cloud technologies is needed, as the main factor in improving business efficiency. *The purpose of the study:* is to review the main models of cloud services for modern business and industry, describing their capabilities separately and the prospects for the market as a whole. The materials for the study were analytical reports of leading consulting companies and materials from specialized web-sites. *Result:* The article considers cloud technologies as the main global technological trend, describes popular models of cloud services, their opportunities for business and industry. Russian and global leaders in the provision of cloud services are also described, the growth rates of these markets for each of the models are indicated. The most popular and promising cloud service models in 2022 are: UCaaS, CaaS, SaaS, IaaS, RPAaaS, PaaS. The cloud technology market will show strong growth until 2030, generating both hybrid and absolutely new service models. The private business, industrial and public sectors will increasingly move to cloud services. The main trends in the development of cloud technologies until 2030 are: hybrid cloud, artificial intelligence (AI) and cloud computing, deployment of cloud services in the planetary orbit. The results obtained are very valuable for analysts and industry experts. The above trend analysis provides valuable predictive data to research economists, investors, business and industry leaders and other stakeholders on how the cloud services market will grow in the next 5-7 years. The results of the study also have a general theoretical nature, substantiating the importance of further forecasting the development of this market (especially using mathematical methods).

KEYWORDS

Cloud technologies; UCaaS; CaaS; SaaS; IaaS; RPAaaS; IaC; PaaS; Models of cloud services; Cloud AI

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1. Introduction

Recent decades have witnessed drastic changes in the organization of business processes of enterprises at all levels. Technology has never before played a more important role in business than it does now. Technologies are increasingly penetrating into the activities of enterprises around the world, automating and simplifying operational, administrative and legal processes. Now modern business is faced with the task of increasing its operational flexibility, regardless of geographical location. That is why the demand for technologies that improve transparency, speed and quality of interaction is constantly increasing. Such business requests over the past 50 years have progressively acted as drivers for the development of distributed technologies, and thanks to increase in network bandwidth and development of new methods they have led the business of the XXI century to the use of cloud technologies, which for now in many areas are the basis for enhancing efficiency and scaling of business. For instance, as of 2022, cloud technologies (distributed platforms, edge computing, cloud-oriented platforms) are on the list of the most promising technologies for business and industry (Bechtel et al., 2022).

Despite the fact that the idea of cloud technologies is not new, real opportunities for its implementation have appeared only in the last 20 years, which is associated with an increase in the speed of computing and data transfer. Cloud computing appeared in the 1950s, when scientists first mentioned the concept of time-sharing (connecting multiple users to a shared processor to perform calculations). It was the optimal strategy, since computers were large and expensive. The implementation of this idea began in 1959, and the first successful commercial service appeared in 1964 at Dartmouth College (Dartmouth Time Sharing System). Gradually, computing power came to be considered as a resource, which led to the emergence of special computer bureaus where users bought the necessary amount of power to perform calculations. This business model was relevant until 1980, and afterwards, the world saw inexpensive personal computers.

However, 30 years later, a new problem has emerged – large amounts of data and applications requiring significant computing power. In this case, a personal computer or even a special corporate server is unlikely to cope with the task. Therefore, the technology of providing additional server capacity for computing tasks has been implemented and scaled again. Modern cloud computing is the provision of computing power, database storage, applications and other IT resources through a cloud services platform over the Internet with payment upon premise (Mirin, 2021). Modern cloud technologies are capable of providing fast and flexible business deployment and data management security, they represent various utility-based resource sharing models, providing access to resource-intensive computing at a low cost. Cloud technologies of the present time are nothing but disruptive innovation, changing and transforming not only business processes, but also business models (Kotarba, 2018). According to forecasts of industry analysts, by 2030, investments in the cloud technology market are expected to grow threefold (Cloud Services Market, 2022), and their exponential integration in the next 5-7 years will lead to the synergetic development of new related technologies: 5G, augmented reality (AR), high-performance computing, artificial intelligence, Internet of Things (Cloud Services Market, 2022).

2. Methodology and data

The materials for the study were analytical reports of the leading consulting companies: «Gartner», «Deloitte», «McKinsey & Company», «EY», «Flexera», «NTT», «Everest Group», «Accenture» and others. Information from modern scientific articles, monographs and publications from specialized news sites is also used. Comparative and analytical methods were used to describe the models of cloud technologies, their market share and the identification of technological trends.

3. Empirical results and discussion

3.1. Trends in the development of cloud services

Cloud technologies (CT) is a fast–growing area of the IT industry with a turnover of ~ $490 billion per year. In 2022, the average growth of business expenses on CT was +19.2% compared to the previous year, and the highest growth was shown by IaaS services (+27.1%) and PaaS (+23.4%). The SaaS service remained the leader in terms of profit ($167.1 billion per year), but showed a more modest growth (+14.4%) (Meghan, 2022). The main players in the cloud services market are the IT giants: «Amazon», «Microsoft» and «Google», accumulating more than half of global revenue (66% in

2022) (Richter, 2022). By 2025, the total turnover of the CT market will reach $917 billion, strengthening the position of IaaS, PaaS, SaaS (Moore, 2022). The services CaaS, DBaaS, RPAaaS will be no less popular. By 2025, 51% of IT spending in the categories of application and infrastructure software, business processes and system infrastructure will be transferred to public cloud services, and cloud platforms will become the basis for more than 95% of digital startups (as compared to 40% in 2021) (Moore, 2022). Such rapid development will stimulate investment in this area of IT services by new players, which will significantly increase competition.

Despite the steady trends of business transitioning to the cloud, in the field of technological processes, the benefits of CT are still offset by the risks of loss of control over production and security (Bechtel et al., 2022). However, in the context of global digitalization and increasing data volumes, cloud services are becoming the only solution. More than half of companies in the US, UK and India are considering moving their confidential data to the cloud, which shows the growing trust in cloud services (State of the Cloud, 2022). The transition of business to the cloud is connected to the trend of "green technologies", improvement of IT architecture and use of shared resources. But three main trends stand out: cloud AI, hybrid cloud and deployment of cloud services in the orbit.

AI technology allows businesses to analyze customer needs faster and create scalable and efficient solutions. For example, the «IBM» Cloud Pak product for business automation allows customers to reduce time spent on manual processes by 97% (Cambridge et al., 2022). «IBM» cloud services occupy only 0.03% of the market, but many well-known companies use these services. The combination of AI and CT has given rise to a fundamentally new concept – cloud AI, which is already being used in many high-tech areas: unmanned vehicles, robotics, healthcare, financial sector, educational platforms, etc. In 2020, the cloud AI market was estimated at $5.2 billion, and by 2026 it will reach $13.1 billion, which implies an average annual growth of +20.3% (Cloud AI Market…, 2021). The growth of the cloud AI market will be provided by the introduction of cloud services and the growing demand for virtualization. High demand for cloud AI services is expected in the retail, automotive and manufacturing sectors (Cloud AI Market, 2021). Additional opportunities for the development of cloud AI are also opening up through the introduction of hybrid cloud services.

Recently, businesses have been choosing a Multi-cloud strategy (multiple cloud services). At the same time, 80% of organizations use a "hybrid cloud" – a combination of private and public services (State of the Cloud, 2022), which is due to rising prices. About 60.9% of organizations in the world already use hybrid cloud services or are in the process of testing such solutions, and 32.7% of companies plan to implement a hybrid solution within 2 years. By 2022, more than 90% of enterprises will rely on hybrid solutions, including on-premises and allocated cloud services (Hybrid Cloud Report, 2021). The reason for this is the complexity of assessing digital risks in public services.

Due to the increase in Internet speed, the emergence of 5G networks and satellite Internet, cloud services will soon go beyond the boundaries of ground infrastructure (Schmidt et al., 2022). The growing speed of data transmission via satellite systems and the new needs of the aerospace industry will bring cloud services to the aerospace level. In the near future, we will witness the emergence of new specialized models of cloud services for SpaceTech projects: orbital stations, space tourism vehicles, military satellites, weather balloons. At the same time, cloud servers can be located in the orbit in order to increase data transfer rate.

It is noteworthy that companies in the space sector have not used cloud services until recently due to unique security requirements. But in 2020, 54% of SpaceTech companies began planning compliance with regulatory requirements for the safety of work in the cloud (Brian et al., 2020). Modern security protocols make it possible to effectively encrypt traffic and protect data, and companies are beginning to perceive the cloud as a necessity, since the effectiveness of this technology in improving security and automating processes has already been proven (Schmidt et al., 2022). As of 2020, only 38% of companies had experience in transferring processes to thecloud, and just over half of them had a roadmap for implementing the cloud strategy. It is also obvious that 86% of SpaceTech companies have allocated the largest share of IaaS-related services for themselves (Brian at al., 2020).

2. Promising models of cloud automation of business and industry

Before we move on to cloud automation models, it is worth noting the reasons for their popularity: cost savings, advanced data management and recovery, process optimization, scalability and flexibility of applications, high computing speed, and increased security. Cloud services reduce dependence on local infrastructure and routine processes, freeing up time to create real significance for the client. The value of cloud services in comparison with traditional IT infrastructure can be seen most clearly with example of SaaS, PaaS and IaaS models (Table 1).

Table 1. Stack of responsibility for traditional IT-solutions and cloud services. (Cloud services market study 2022)

Traditional IT-solutions		IaaS		PaaS		SaaS	
CLIENT CONTROL	Application	CLIENT CONTROL	Application	CC	Application	PROVIDER CONTROL	Application
	Data		Data		Data		Data
	Runtime environment		Runtime environment	PROVIDER CONTROL	Runtime environment		Runtime environment
	Cross-platform software		Cross-platform software		Cross-platform		Cross-platform software
	OS		OS		OS		OS
	Virtualization	PC	Virtualization		Virtualization		Virtualization
	Servers		Servers		Servers		Servers
	Storage		Storage		Storage		Storage
	Networks		Networks		Networks		Networks

Recently, cloud providers have been offering more and more diverse solutions for business and industry. Consider the most promising models of cloud services and the growth rates of markets for each of the models.

2.1. ***Robotic Process Automation (RPA-as-a-Service)*** is a cloud–based automation software that performs and coordinates work processes in an enterprise remotely. Almost any repeatable process can be automated using RPA, and the algorithmization of such processes can be done through the clear actions with visual flowcharts via the web interface. There are several areas of robotics: web automation, desktop automation and mobile automation.

The leading suppliers of RPA solutions for business are «Automation Anywhere», «UiPath», «Blue Prism», «NICE», «Microsoft» (Robotic Process Automation, 2022). Cloud RPA services are also offered by other well-known companies: «IBM», «SAP», «Amazon», «Microsoft Azure», as well as private platforms OpenStack and Cloud Foundry. In 2022, the global RPA market was estimated at $2.8 billion with a growth forecast of +17.5% in 2023.

As for Russia, in 2022, the leading players left the RPA services market, which did not affect the growth of demand, and Russian companies took the place of foreign companies. Now, by 2024, the volume of the Russian RPA services market is estimated at 60 billion rubles. It is expected that by 2024, more than 90% of Russian companies using RPA systems will switch to domestic solutions, although in 2021 their share was less than 10%. The leaders of the Russian RPA services market in 2022 include PIX Robotics, Primo RPA, Robin RPA, Sherpa RPA, ROOMYbots (Shpunt, 2022).

2.2. ***Infrastructure-as-a-Service*** (***IaaS)*** is a model of providing users with a lower-level information and communication structure (the lowest-level of the models under consideration). Unlike other service models, the IaaS provider does not offer the consumer a ready-made set of installed software. The service provides computing power, storage volumes, network resources and communication channels, and the deployment of the necessary software is the responsibility of the consumer. This allows for high flexibility in selecting and configuring the necessary infrastructure parameters for the user.

The leading global suppliers of IaaS solutions are companies: «Amazon», «EMC», «Google», «IBM», «Microsoft», «Oracle». In 2021, the global IaaS market was estimated at $53.7 billion, and by 2030 it will reach $485.1 billion (annual growth +27.7%) (Infrastructure as a Service, 2022). Interestingly, it was computing solutions that prevailed within the IaaS sector in 2021 (41% market share). The region with the largest share of profit was North America (46%), which will continue to lead the market until 2030. The market share of IaaS solutions by region is follows: North America (46%), Europe (25%), Asia-Pacific (22%) (Infrastructure as a Service, 2022).

As for Russia, in 2022, the volume of the Russian IaaS services market amounted to ₽86.6 billion, which is 41.6% more than in 2021. The active transition of Russian customers from foreign IaaS services to Russian analogues occurred due to sanctions. With the departure of foreign providers in 2022, the leaders of Russian IaaS market became the companies Cloud and
«Rostelecom» Data Center with a market share of 17.2% and 25%, respectively. Other companies occupy a smaller market share: «Selectel» (9.5%), «MTS» (9.3%), «Yandex.Cloud» (6.3%),
«Krock» (5.6%) (Ershova et al., 2022). It is worth noting that after the decrease in competition in the Russian market, there is a tendency to increase prices for services (Lebedev, 2022).

2.3. ***Infrastructure-as-Code (IaC)*** is a way to manage the IT infrastructure through the transmission of a configuration file over the network, and not through individual configuration of computers. The IaC concept is a modification of the IaaS model. Enterprise engineering teams can manage a group of their servers through a special configuration file, regardless of the hardware configuration or geographical location of the server network. Thus, it becomes possible to use your computing resources, distributing them as needed for virtual machines, containers, data warehouses, VPNs and other services.

Over the past 10 years, there has been strong competition in the IaC solutions market, which is changing the set of services offered, and the IaC solutions market is a very dynamic vertical of the DevOps industry. The leading suppliers of IaC solutions are the following companies: Microsoft, Broadcom, Google, Amazon, Oracle (Infrastructure as Code Market, 2022). In 2021, the IaC market volume was $0.64 billion. By 2030, its turnover will reach $4.45 billion. Steady profit growth is explained by the emergence of a modern cloud architecture based on the IaC concept. Thanks to this, the configuration and distribution of cloud resources is much faster and cheaper. The region with the largest share of profit in 2021 was North America (+ 43.2%) (Infrastructure as Code Market, 2022).

2.4. ***Container-as-a-Service (CaaS)*** is a cloud service model that allows developers and IT departments to load, organize, launch, scale, and manage containers using virtualization. A container in this context is a software package that can be run on any host system. This package includes code, runtime, configuration, and system libraries. CaaS is considered as a type of IaaS, but the main resource for CaaS is a container, not a virtual machine or a hardware component of the server, unlike IaaS. The container can run on operating system emulators or on computer hardware. CaaS allows specialists to focus on more complex processes rather than wasting resources on infrastructure management, which simplifies the entire development process.

It is worth noting the latest trends in the market of IaaS services in DevOps: Azure Container as a Service, Docker Run Container as a Service, Container as a Service «Kubernetes». For example, the «Kubernetes» platform is an open-source container management platform originally developed by «Google». «Kubernetes» distributions are used to automate the development, management and scaling of applications by grouping containers (running on «Linux») into clusters. «Kubernetes» provides the ability to deploy containers on multiple servers with multiple security levels and the ability to manage their state (Annual Survey, 2021). Another example of CaaS is the «OpenShift» platform, from «Red Hat Inc.». This is an enterprise-level container platform (from the «Kubernetes» family of distributions) with open-source code, which allows to scale containers without compromising the uptime of applications.

In 2022, the container transportation market was estimated at $2 billion, and by 2027 it will reach $5.6 billion (Containers as a service market, 2022). The leading positions of the regional CaaS market are North America (32.2%), Europe (22.1%), Asia-Pacific region (17.2%). It is expected that North America and Europe will maintain a dominant position in the market for 5 years, but the Asia-Pacific region will be the fastest growing. This is due to the rapid economic growth of China, India and Indonesia due to the increased digitalization of all types of production. The world leaders of the CaaS server market in 2022 are the following companies: «Cisco», «HP», «Huawei», «Oracle», «IBM», «Microsoft», «Google» (Container as a Service, 2022).

As for the Russian segment of CaaS solutions, there is very little data on this topic. However, the CaaS market can be considered as part of the fast-growing IaaS market (+41.6% in 2022), which means that a similar growth can be assumed in this segment. Until 2022, services from «Red Hat Inc.» were very popular in Russia, but in March 2022, the company stopped servicing its solutions for Russian customers. In 2020, 56% of Russian companies from the TOP500 list used CaaS technologies, and the popularity of services was as follows: «Open Source Kubernetes» (44% of companies), «Red Hat OpenShift» (13%), other vendors (5%), and those who did not use CaaS services (33%) (Andronov, 2022).

According to Yuri Semenyukov, director of the center for the design of computing systems of the

Jet Infosystems company, in 2023 the most popular options for replacing «Red Hat OpenShift» for Russian business will be Deckhouse platform, Helm platform, Vanilla Kubernetes and OKD public services (Kubernetes distributions). At the same time, the replacement of not only Kubernetes is now relevant for Russian business, there is also a question of replacing more basic infrastructure components (virtualization platforms). Previously popular «VMware» services are now unavailable, and the market is starting to switch to domestic products (Andronov, 2022).

2.5. ***Unified Communications-as-a-Service (UCaaS)*** is a unified communication cloud service model, where the service is an outsourced communication solution rented in the provider's cloud. Such a solution may include corporate IP telephony, video conferencing, messaging system, communication business processes, PBX functions and more. Typically, UCaaS infrastructure devices are located in data centers that are remote from each other, which ensures high communication quality and network fault tolerance. The infrastructure of the UCaaS solution provider includes redundant switching, network, connection point, channel separation and customer equipment.

In 2022, the leading global providers of UCaaS solutions are «Microsoft», «Zoom», «RingCentral», «8x8», «Cisco», «GoTo». Cloud communication services are also offered by other well-known companies: «BCM One», «Google», «Lumen». It is expected that in 2023 the UCaaS market will become oligopolistic – only 5 leading suppliers will control more than 70% of this market, which will force small providers to leave. Over the past 3 years, the UCaaS market has shown high growth of +29.2% per year, which is explained by the transition of companies to cloud platforms (Wright, 2022). By 2024, 75% of companies will no longer use wired phones, and the number of remote workers will double, which will increase the demand for UCaaS services (Tsipursky G, 2021). In 2020, the global UCaaS market was estimated at $25.8 billion, and by 2028 it will reach a turnover of $69.9 billion (Wright, 2022).

Considering the Russian segment of the UCaaS market, it is worth noting its small share – only 0.4% of the global market volume and 1% of the virtual PBX market volume. Until 2022, the dominant position was occupied by the services of global providers – «Microsoft», «Avaya», «Cisco», and «Unify» accounted for 90% of the market. But in 2022, the situation changed drastically, and Russian companies took the place of the departed global companies. The current leaders of the Russian market include: «MTC», «Informtechnika», «Krock», «Aiteco», «Satel». Their total revenue for 2021 amounted to ₽11.3 billion and will continue to grow by 11% per year (Unified Communications, 2022).

2.6. ***Software-as-a-Service*** (***SaaS)*** is a cloud service model in which the client gets remote access to the application software. SaaS services are designed for both ordinary users and companies. Access to remote software is carried out using a "thin client", via a web interface or through the program interface. When using SaaS services, the client pays a subscription fee to the provider for software rental. As a result, the customer does not have to install and maintain the software, as well as invest in software and hardware resources to deploy this software.

SaaS services are "the largest segment of the market", which in 2022 accounted for 39% of the total market (Meghan, 2022). The world's leading suppliers of SaaS solutions are the following companies: «Salesforce», «Oracle», «IBM», «Microsoft», «Google» (Software as a service market, 2022). From 2011 to 2020, the global SaaS services market showed rapid growth (+25% annually) (Pu et al., 2021). It is expected that by 2027 the profit of the SaaS market will reach $344 billion with average market level +7.89% (Software as a service, 2023).

Compared to the USA and Europe, China from 2011 to 2016 experienced modest rates of development of SaaS services with an annual profit of $0.5 billion. But after 2016, the Chinese market began to grow rapidly and in 2021 reached a profit of $2.9 billion (Pu et al., 2021). The following leading regions stand out in the SaaS solutions market: North America, Europe, Asia- Pacific region (Software as a Service, 2023). In the USA, the share of firms' spending on SaaS services increases annually by 5%, and in China - by 1.3% (Pu et al., 2021). The increase in the number of small and medium-sized enterprises that do not have the means to develop their own software solutions is the main incentive for the development of SaaS services (Software as a Service Market, 2022). The main players in the SaaS segment are concentrating on partnerships and launching new products to gain competitive advantages. So, in 2019, «Google» launched the cloud platform «Cloud Talent Solution» – a platform for finding and hiring personnel (Software as a Service Market, 2022).

By the end of 2021, the revenue of the 20 largest Russian providers of SaaS solutions reached ₽83.8 billion, which is 18.4% more than in 2020. The leaders of the Russian SaaS market were the companies: «Softline», «SKB Kontur», «Tensor», «Mango Telecom», «Rostelecom» (Lebedev, 2022). In 2021, a significant share of turnover was accounted for by system integrators and providers who acted as resellers of SaaS products from foreign vendors (33% of total revenue). So, the main income in 2021

was brought by Microsoft 365 products and services based on Communi Gate Pro. Until 2022, the total revenue of foreign SaaS service providers in Russia exceeded ₽700 billion per year, but now the SaaS market has begun to rebuild, and soon Russian companies will occupy the main share of it. Office packages, electronic document management and communications tools will remain the most promising segment for domestic SaaS developers (Lebedev, 2022).

2.7. ***Platform-as-a-Service (PaaS)*** is a cloud service model where the client gets access to technological platforms: the operating system, database management system, application development and testing tools. The platforms are accessed via the web interface. Depending on the type of PaaS service, solutions are divided into Application PaaS, Integration PaaS and Database PaaS. The PaaS model is based on container virtualization technology and intended for developers and programmers who need a virtual environment to create their own software. PaaS is usually used for web development (mobile applications and complex business software).

The leading global suppliers of PaaS solutions are companies: «Amazon», «Salesforce», «IBM», «Microsoft», «Google». In 2022, the volume of the global PaaS investment market amounted to $55.94 billion and will grow to $85.92 billion by 2027 with an average annual growth rate of 8.8%. The leading regions for the PaaS server market in 2022 are North America, Western Europe, Asia-Pacific region (Global Platform as a Service, 2023). The global development of the network will stimulate the growth of the PaaS technology market, since when compressed by an actor, security levels are formed. For instance, in 2021 global purchases from the so-called ransomware program cost businesses $6 trillion. PaaS service manufacturers easily adapt to such scales as a non-strict conguration of applications for silence and security in SSL (Global Platform as a Service, 2023).

The difference between the Russian PaaS market and the global one lies in its weak development. In 2021, the volume of this segment of cloud solutions in Russia amounted to ₽7.2 billion, which is 7 times less than revenue from IaaS services, although on a global scale, the PaaS market turnover is only 4% inferior to IaaS (Meghan, 2022). In 2020-2021, the main consumers of PaaS services in Russia were medium and large enterprises. As for the industry structure of PaaS clients, the maximum share was recorded among OT companies (31.5%), financial institutions (26.3%) and trade enterprises (16.4%). In 2020, a review of the leaders of the Russian market of "functional" PaaS services was published. By the end of 2020, the volume of this market amounted to ₽2.26 billion, and the leaders were the companies «SberCloud», «Yandex.Cloud», «CDNvideo», «NGENIX». These companies accounted for more than 70% of the market, and a significant share was occupied by the « League of Digital Economy » and «Krock» (Mirin, 2021). Until 2022, there was an annual growth of the PaaS services market: 2019 (₽5.1 billion), 2020 (₽6.1 billion), 2021 (₽7.9 billion) (Mirin, 2021). Despite the sanctions, by the end of 2022, the Russian market of PaaS services was estimated at ₽11.8 billion (Volume of the PaaS, 2022), and during this year there was an increase in consumption in the segment of cloud databases and Kubernetes clusters. Thus, in 2022, the number of DBaaS users increased by 250% compared to 2021. However, already in 2023, the development trends of the Russian PaaS market have changed a lot, and now the transition to PaaS solutions from Russian providers is visible (Cloud infrastructure in Russia, 2022).

Table 2. Cloud services models and the global market leaders of cloud services (2022).

Cloud service model	Applications in business and industry	Leaders of the global cloud services market	Leaders of the Russian cloud services market
RPAaaS	Automation of processes requiring human participation (including routine ones)	«Automation Anywhere», «UiPath», «Blue Prism», «NICE»,	«SherpaRPA», «PrimoRPA», «Robin RPA», «ROOMY bots», «PIX Robotics»
UCaaS	Automation of communication processes, mailings and file sharing	«Microsoft», «Zoom», «RingCentral»,	«MTC», «Aiteko», «InformTekhnika», «Croc», «Satel»

CaaS	Hosting and developing scalable container-based applications	«Cisco», «Huawei», «Microsoft», «Google», «HP», «Oracle», «AWS», ««IBM»»	«Flant», «Numerator Laboratory», «Vanilla Kubernetes», «OKD»
SaaS	Application software provided remotely via web interface	«Salesforce», «Oracle», ««IBM»», «Microsoft»,	«Softline», «Rostelecom», «SKB Kontur», «Mango Telecom», «Tensor»
PaaS	Access to platforms, OS, databases, development and testing tools	«Amazon», «Google», «Salesforce», ««IBM»», «Microsoft»	«OnCloud», «CDNvideo», «Krock», «NGENIX», «Yandex.Cloud», «Cloud»
IaaS	Rental of hardware infrastructure: server and network equipment	«Amazon», «EMC», «Google», «Oracle», ««IBM»», «Microsoft»	cloud, «Selectel», «Krock», «MTC», «Yandex.Cloud»

The presented models of cloud services are popular among companies with high rates of digitalization (Table 2). Currently, the most promising technologies for improving business efficiency are: the Internet of Things (77%), cybersecurity systems (65%), AI systems (65%). Next on the list are cloud services: development of cloud applications (50%), migration of processes to the cloud (44%), connection to data centers (34%) (Hybrid Cloud Report, 2021).

It is worth noting that the main consumer in the public cloud services market is a medium business that has serious needs related to the sustainability of critical IT services (cloud PBX, databases, CRM, ERP). Medium-sized businesses are willing to spend decent amounts to pay for the necessary solutions, increasingly choosing hybrid services. At the same time, there is a clear trend of companies migrating from public cloud services to private ones.

There is also a clear migration to cloud solutions for managing production and logistics processes in the industry. It is expected that by 2027, more than 50% of all enterprises will use cloud platforms to improve process efficiency (Moore, 2022). For example, the auto giant «Volkswagen» in cooperation with «AWS» in 2019 announced the creation of an "industrial cloud" in its network of 30,000 offices and 1,500 suppliers in order to change supply chains and production processes using data. The «VW Industrial Cloud» platform collects and analyzes data in real time. The company uses «AWS» neural networks that analyze information from sensors in the production shop and expects that its "industrial cloud" will be a factor in reducing production costs by 30% by 2025 (as compared to 2016) (Volkswagen Group, 2021).

4. Conclusion

Cloud services for modern business are much more than a data storage platform. Today, the cloud is a unique and necessary solution for starting and running a business. Most modern companies have already adopted digital transformation strategies, where the transition to the cloud is one of the main priorities. Moreover, CTs are increasingly being included in digital development strategies at the state level. So, the government of Canada back in 2018 adopted the state strategy "cloud-first", according to which cloud services are defined and evaluated as the basis for the start and development of IT projects and their financing (Cloud AI Market, 2021). It is expected that the cloud will allow Canada to use innovations from private sector to make public sector IT more flexible. Similar strategies have also been adopted in Japan, Singapore and the UAE.

Recent years have fallen on the pandemic and have become an important milestone in the development of CT, showing the practicality of remote process management. This allowed businesses of all levels to combine and link their organizational processes with CT in order to provide flexibility in conditions of instability. Cloud services have already become an integral part of a successful business, and in the next 10 years they will remain the main factor in the sustainable growth of companies. In the next 5 years, global spending on cloud services will grow significantly, turning this market into a giant industry (Moore, 2022).

It is worth noting that CT is a complex innovative technology scaled to meet current market demands. And, like any technology, the cloud also obeys the law of the S-shaped life cycle. It is obvious that currently this technology is at the point of growth and will be there for a relatively long time, generating the development of new complementary technologies (for example, cloud AI), which in the near future will become innovations that change business processes and business models.

To sum up, one can argue that the Russian cloud services market has strongly felt the departure of foreign providers, which has affected the reduction of competition, price growth, loss of functional diversity in some market segments. However, the demand for cloud services remains high, which contributes to the growth of public and private investment in this sector. The most promising models of cloud automation in Russia and the world for the period up to 2030 are the following service models: RPAaaS, UCaaS, CaaS, SaaS, IaaS, PaaS (Cloud Services Market, 2022).

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