**Journal of Information Systems Engineering and Management**
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

**Research Article**

# A Look at Cloud Computing as a Tool for Innovation and Survival in Organizations

[1]Miguel Hernández Bejarano, [2]Fredys A. Simanca H, [3]Luis Eduardo Baquero Rey, [4]Miller Rivera Lozano
[1]Escuela Tecnológica Instituto Técnico Central, Colombia
*Email:* mhernandezb@itc.edu.co
[2]Universidad Cooperativa de Colombia, Colombia
*Email:* fredys.simanca@campusucc.edu.co
[3]Escuela Tecnológica Instituto Técnico Central, Colombia
*Email:* lrey@itc.edu.co
[4]Escuela Tecnológica Instituto Técnico Central, Colombia
*Email:* mriveral@itc.edu.co

**Summary**

This article presents an insight into cloud computing and its critical role in organizations in today's digital age. It discusses the benefits and challenges associated with adopting this technology, as well as the key requirements that organizations must meet to leverage it as a strategic tool for innovation and survival in a competitive and dynamic environment. It is based on the review of scientific articles and relevant literature to support the arguments presented.

**ARTICLE INFO**

Received: 02 Apr 2024
Accepted: 28 Jun 2024

**ABSTRACT**

This article presents an overview of cloud computing and its fundamental role in organizations in today's digital era. It analyzes the benefits and challenges associated with the adoption of this technology, as well as the key requirements organizations must meet to leverage it as a strategic tool for innovation and survival in a competitive and dynamic environment. The discussion is supported by a review of scientific articles and relevant literature to substantiate the arguments presented.

**Keywords:** Cloud Computing, Digital Transformation, Innovation, IT Infrastructure, Cloud Services, Scalability, Data Security, Compliance, Organizational Change, Artificial Intelligence.

## Introduction

### 1.1 Definition

Cloud computing, also known as *cloud computing*, is a widely adopted technology paradigm that enables remote, ubiquitous, on-demand access to a shared set of configurable computing resources, such as storage, processing, applications, and networking, which are provided by providers over the Internet. This model, defined by the National Institute of Standards and Technology (NIST), is characterized by its scalability, immediate availability and minimal management effort or interaction with the provider, allowing users to avoid the need to maintain local infrastructure. In addition, it is based on taking advantage of economies of scale, facilitating access to advanced technology without large investments in hardware or software. (Mell & Grance, 2023)

Journal of Information Systems Engineering and Management
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ Research Article

Cloud computing has evolved significantly, moving from infrastructure-centric (IaaS) and platform-centric (PaaS) models to software-as-a-service (SaaS) delivery, as well as adopting hybrid and multi-cloud approaches that allow organizations to combine resources from different vendors to balance security and flexibility. This advancement has been driven by the growth of public clouds, noted for their accessibility and scalability. In this scenario, various providers have led the market with services that respond to the varied needs of companies and users in multiple sectors. Table 1 below presents some of the most relevant cloud service providers globally, along with a brief description of their key features and strengths.(Zhang, Cheng, & Boutaba, 2011)

**Board 1. Cloud Service Provider**

| Cloud provider | Description |
|---|---|
| Amazon Web Services (AWS) | AWS is one of the largest and most comprehensive cloud service providers in the world. It offers a wide range of services, such as computing, storage, databases, networking, and artificial intelligence tools. It is widely used by businesses of all sizes due to its scale and flexibility. |
| Microsoft Azure | Azure is Microsoft's cloud computing platform. It provides a variety of services, including infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS). Azure is known for its integration with the Microsoft ecosystem and its focus on enterprise solutions. |
| Google Cloud Platform (GCP) | GCP is Google's cloud service, offering a wide range of services, from storage and compute to machine learning and data analytics. Google is renowned for its focus on innovation and artificial intelligence, making it a popular choice for data-driven projects and cutting-edge applications. |
| IBM Cloud | IBM Cloud is IBM's cloud services offering. It offers a mix of public, private, and hybrid services to meet business needs. IBM excels in the field of complex business solutions and has focused its offering on artificial intelligence and data analytics. |
| Oracle Cloud | Oracle Cloud provides a wide range of cloud services, focusing on enterprise applications, databases, analytics applications, and infrastructure solutions. Oracle has expanded its cloud presence to compete with other major vendors in the market. |
| Alibaba Cloud | As one of the leading cloud service providers in Asia, Alibaba Cloud offers a full range of cloud services, from computing and storage to artificial intelligence and big data. It is especially popular in the Asia-Pacific region due to its local presence and focus on the regional market. |
| VMware Cloud | VMware is a vendor known for its virtualization, and its cloud offering focuses on infrastructure-as-a-service (IaaS) solutions. It provides a platform for virtualizing servers, networking, and storage, allowing enterprises to migrate and manage their workloads in the cloud. |
| Heroku | Salesforce-owned Heroku focuses on simplifying the deployment and management of web applications. It is known for its focus on developers and provides a fully managed cloud platform that allows developers to focus on application development without worrying about the underlying infrastructure. |

Journal of Information Systems Engineering and Management
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ Research Article

| Cloud provider | Description |
|---|---|
| Cisco Cloud | Cisco, a leader in the field of networking and communications, offers cloud services that focus on cloud collaboration, storage, and security. Its focus is on hybrid cloud, which combines on-premises infrastructure with public and private cloud, allowing enterprises to leverage their network and communications solutions in a cloud environment. |
| HP Helion | HP Helion is Hewlett-Packard's (HP) cloud services offering, providing a variety of cloud services, from compute and storage to application development solutions and data analytics. HP Helion is focused on providing flexible and secure cloud options for businesses and organizations of all sizes. |

**Source:** Prepared by the authors based on information from suppliers.

Cloud computing services offer convenient pay-as-you-go models that eliminate costly expenses and maintenance. Cloud providers host a variety of infrastructure, platform, and software offerings on-premises that they rent or rent, giving the organization the flexibility to turn cloud computing services on or off based on changing requirements. Table 2 presents some services that organizations such as Amazon, Amazon and Amazon present. Oracle, Cisco, Microsoft, Google and IBM.

**Board 2. Cloud Service Description**

| Type of service | Cloud Computing Model Description |
|---|---|
| Infrastructure as a Service (IaaS) | It is an instantaneous computing infrastructure, delivered and managed over the network. IaaS adapts to fluctuations and increases or decreases rapidly with demand, allowing you to pay only for what you use. |
| Platform as a Service (PaaS) | It is a cloud development and deployment environment that allows users to build web and mobile applications without having to manage the underlying infrastructure. The PaaS provider offers the resources needed to run and scale the applications, such as servers, databases, middleware, development tools, etc. |
| Software as a Service (SaaS) | The SaaS provider takes care of all hardware and software and ensures the availability and security of both the application and the data it uses. The user only has to pay for the use they make of the application, it allows users to create web and mobile applications. |
| Function-as-a-Service (FaaS) | The FaaS provider provides a serverless environment where functions run on demand, only when invoked by an event or request. The user only pays for the execution time of the functions. |
| Storage as a Service (STaaS) | The STaaS provider manages the physical and virtual space where the data is stored, as well as its security, backup, and recovery. The user only pays for the space and bandwidth they use. |
| Communication as a Service (CaaS) | The CaaS provider is responsible for the maintenance and updating of the platforms and applications that facilitate communication between users. The user only pays for the number and type of services they use. |
| Network as a Service (NaaS) | The NaaS provider offers solutions such as VPN, SD-WAN, firewall, load balancing, etc., which can be configured and managed from a web interface or API. The user only pays for the level and quality of service they need. |

**Journal of Information Systems Engineering and Management**
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**

| Type of service | Cloud Computing Model Description |
|---|---|
| Security as a Service (SECaaS) | The SECaaS provider offers solutions such as antivirus, anti-malware, encryption, authentication, auditing, etc., which integrate with the user's applications and data. The user only pays for the level and type of security they require. |
| Monitoring as a Service (MaaS) | The MaaS provider offers solutions such as alerts, analytics, reporting, diagnostics, etc., which can be customized and visualized from a dashboard or mobile app. The user only pays for the range and frequency of the service they want. |
| Test-as-a-Service (TaaS) | The TaaS provider offers solutions such as functional, performance, security, usability testing, etc., which can be automated and run from the cloud. The user only pays for the number and type of tests they need. |
| Backend as a Service (BaaS) | The BaaS provider offers solutions such as authentication, claims, databases, storage, business logic, etc., which allow developers to build applications without having to code the backend. The user only pays for the use they make of the backend services. |
| Artificial Intelligence as a Service (AIaaS) | The AIaaS provider offers solutions such as facial recognition, natural language processing, sentiment analysis, machine translation, computer vision, etc., which can be integrated with applications and user data. The user only pays for the use they make of artificial intelligence services. |
| Blockchain as a Service (BaaS) | The BaaS provider offers solutions such as creating, configuring, hosting, maintaining, monitoring, and governing private or public blockchain networks. The user only pays for the use they make of blockchain services. |
| Desktop-as-a-Service (DaaS) | The DaaS provider offers solutions such as remote desktops, virtual applications, identity management, etc., which allow users to access their work environments from any device and place. The user only pays for the number and type of desktops they use. |
| Analytics as a Service (AaaS) | The AaaS provider offers solutions such as dashboards, reporting, data mining, business intelligence, etc., which enable users to gain valuable insights from their data. The user only pays for the use of the analytical services. |
| Integration as a Service (IaaS) | The IaaS provider offers solutions such as middleware, enterprise service buses, connectors, adapters, etc., which allow users to connect their applications and data to each other or to external services. The user only pays for the use he makes of the integrator services. |
| Disaster Recovery as a Service | (DRaaS) provider offers services related to recovery and business continuity in the face of adverse situations to users. |

**Source:** Prepared by the authors based on information from suppliers.

Additionally, Table 3 illustrates some cloud providers along with the type of cloud service offered and the exact function of the service.

**Board 3. Cloud Service Providers**

**Journal of Information Systems Engineering and Management**
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

**Research Article**

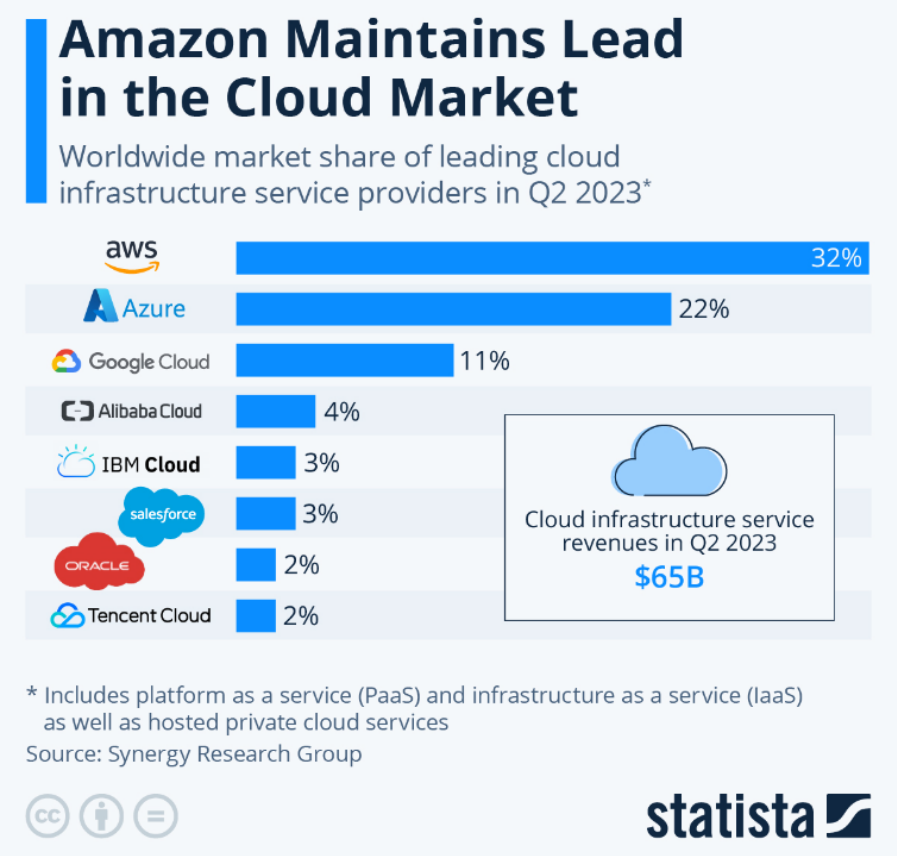
| Cloud Provider | Cloud Storage Service | Service Model | Service Function |
|---|---|---|---|
| Amazon | EC2 | IaaS | Server |
| Amazon | S3 | IaaS | Storage |
| Google | GAE | Paas | Development Environment |
| Microsoft Corporation | Blue window | IaaS | Storage |
| Microsoft Corporation | Office 365 | SaaS | Office Room |
| Sales Force | Salesforce Service Cloud | SaaS | Customer relationship management |
| Software CDC APTEAN | Fundamental CRM | SaaS | Customer Business Relationship (built on Amazon Service) |
| eBid Systems | ProcureWare | SaaS | Procurement System |
| Procore | Procore Construction Project Management Software | SaaS | Project Management System |
| e-constructor | e-constructor | SaaS | Construction Management Software |
| Oracle | Aconex | SaaS | Project Management System |
| Amazon | EMR de AWS | SaaS | Marco Hadoop |

**Fountain:** (Bello, 2021)

With the advancement of cloud computing, information security and privacy have become critical, leading vendors and organizations to implement robust practices such as data encryption, multi-factor authentication, and access controls to safeguard confidentiality. In this context, Figure 1 shows that Amazon Web Services (AWS) has remained the global cloud infrastructure market leader, with a 32% share in the second quarter of 2023, according to Synergy Research Group, although with a slight decrease compared to 34% in the previous year. Its main competitors, Microsoft and Google, recorded more dynamic year-on-year growth, increasing their market share by one percentage point compared to the same period last year. (Sun, 2020) (Statista, 2023) (Richter, 2023)

**Figure 1. Amazon Maintains Leadership in the Cloud Market**

**Journal of Information Systems Engineering and Management**
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**




**Fountain:** (Statista, s.f.)

### 1.2 Context of digital transformation in organizations.

In today's digital era, characterized by volatility, uncertainty and complexity, digital transformation has established itself as a key strategy for organizations, integrating digital technologies into all aspects of the business in order to optimize processes, improve decision-making and strengthen the relationship with customers. Driven by the accelerated advancement of ICTs such as cloud computing, the Internet of Things (IoT), artificial intelligence (AI), and data analytics, this transformation offers unprecedented opportunities for innovation and the generation of new business models. (Pfaff et al., 2023) (Buck et al., 2023) (Dieste, Sauer, & Orzes, 2022)

In addition to its benefits, digital transformation poses significant challenges for organizations, such as change management, data security, technology adoption, and staff training, aspects that require a clear strategy and the commitment of all members of the company to achieve effective implementation. Likewise, this transformation drives a profound change in the organizational culture, which demands an agile, innovative and continuous learning-oriented mentality, fostering collaboration and the ability to adapt in the face of a constantly evolving digital environment. (Schallmo & Williams, 2018) (Ross, Beath, & Quaadgras, 2013)

#### Advantages of Cloud Computing

### 1.1 Flexibility, scalability, and cost reduction to adapt to changing needs.

**Journal of Information Systems Engineering and Management**
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**

Cloud computing is characterized by its flexibility, scalability, and elasticity, allowing organizations to dynamically adjust their computing resources according to changing business demands. This ability to provision and release resources quickly makes it easier to manage traffic spikes, quickly deploy new services, and optimize costs through on-demand, long-term pay-as-you-go models, leveraging virtualized environments with low maintenance.(Velte & Velte, 2013) (Chouliaras & Sotiriadis, 2023)

In addition to its flexibility and scalability, cloud computing offers key advantages such as reduced operational costs, agility in implementing solutions, and efficiency in resource management. Through service models such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), organizations can access virtualized resources and levels of technology abstraction that fit their needs. This centralization in management and provisioning allows you to pay only for the resources used, avoiding high initial investments in hardware and software, which significantly improves performance and operational efficiency. (Chouliaras & Sotiriadis, 2023)(Dogani, Namvar, & Khunjush, 2023) (Hassan et al., 2022)

### 2.2 Global access and efficient collaboration.

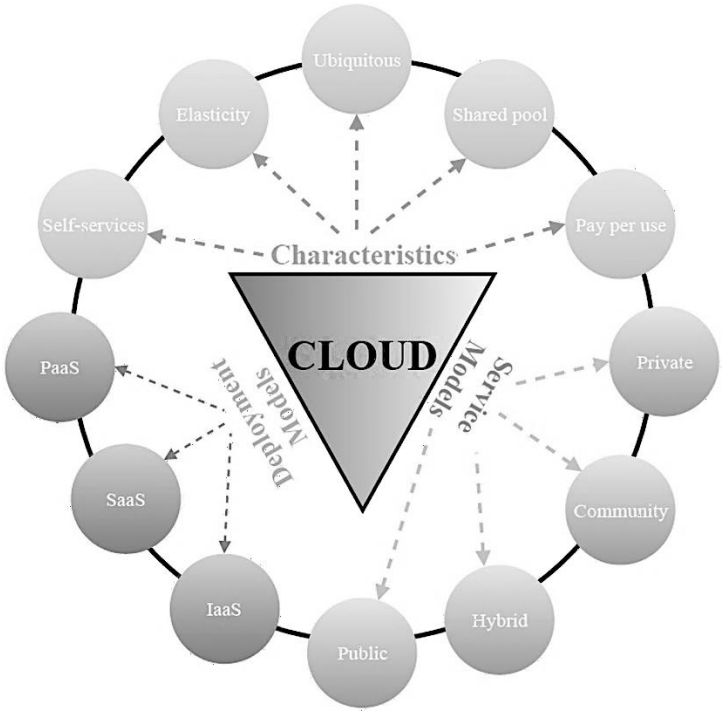
Cloud computing is a model that facilitates remote, on-demand, minimally managed access to shared computing resources, such as networks, servers, and applications. This model is based on five essential features such as self-service, broad access, resource pooling, elasticity and metered service, three service models (SaaS, PaaS and IaaS) and four deployment models (public, private, community and hybrid), making it an efficient solution for globalized business environments by enabling agile access to information and promoting collaboration between geographically distributed teams. (Bello, 2021)

In turn, cloud services can be deployed as a public service, a private service, a community service, or a hybrid service. The deployment models are differentiated by the method of access and also by the category of users eligible to access the service. In the public cloud, the cloud service is accessed by various customers over the Internet, it is a multi-user system, which means that one user's data is processed together with another user's data.(Bello, 2021)

This allows work teams to share and collaborate in real time on documents, projects and tasks, regardless of their location. The cloud offers built-in collaboration tools, such as shared storage, collaborative document editing, and real-time communication, that facilitate cooperation and improve team productivity. This is especially beneficial for organizations with remote employees or teams working on joint projects from different locations. In light of the above, a quick view of cloud computing is presented below:

**Figure 2. A Quick View of Cloud Computing**

**Journal of Information Systems Engineering and Management**
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**




**Fountain:** (Cloud, s.f.)

## Challenges and Considerations

### 3.1 Data security and privacy.

Cloud computing has gained great relevance for offering economical and high-quality services, integrating into the daily lives of companies and people by transforming the way data is stored, processed, and accessed. While its benefits in scalability and efficiency are remarkable, it also poses significant security and privacy challenges, especially in protecting sensitive information both in transit and at rest. To meet these challenges, it is essential to implement robust encryption and authentication mechanisms that guarantee the confidentiality of data in cloud environments. (Parast et al., 2022)(Sun, 2020)(Liu, Liu, & Ma, 2018)

One of the most relevant challenges in cloud environments is the loss of control over data, as customers do not retain physical ownership of their information, which opens up the possibility of unauthorized access or difficulties in ensuring the complete deletion of files, even after their deletion, due to backups in multiple data centers. In the face of these risks, providers have significantly strengthened their security schemes by using advanced encryption, strong authentication, auditing, and cyber insurance to ensure the confidentiality and integrity of information. In addition, with the constant growth in the volume of data and tasks, resource optimization and workload management strategies have been developed that improve efficiency and performance in the delivery of digital services. (Vinoth, 2022)(Zhang, Cheng, & Boutaba, 2011)(Shahzad, 2014) (Feng et al., 2023)

### 3.2 Network Availability and Performance.

Network availability and performance represent key challenges in cloud computing, as connection quality directly impacts service efficiency and user experience. Accelerated demand growth and application diversity have put pressure on existing infrastructure, demanding more scalable and flexible

Journal of Information Systems Engineering and Management
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ Research Article

networks. Scalability, understood as the ability to efficiently increase the provision of services through improvements in hardware or network infrastructure, is essential to respond to these demands. However, the geographical distribution of data centers introduces additional risks, such as network failures or single points of failure, making it imperative to implement redundancy and fault tolerance strategies to ensure high availability and continuity of services. (Li et al., 2015) (Shah et al., 2017) (Chen et al., 2016)

### 3.3 Integration with existing systems.

The cloud computing paradigm allows businesses to access on-demand technology resources, reducing infrastructure investments and improving operational agility and flexibility, especially in modernizing legacy applications. However, migrating to the cloud presents technical challenges such as lack of standardization, incompatibilities between on-premises systems and cloud platforms, and the need for careful adaptations. Added to this are organizational challenges linked to change management and cultural adoption, as the transition often involves transformations in processes and mindsets within companies. (Hafiz et al., 2023) (Xu et al., 2022) (Ma et al., 2020)

### 3.4 Regulatory and Legal Compliance.

To address regulatory compliance in the cloud, it is key for organizations to implement a robust risk management and information security policy, identifying threats and applying appropriate controls. In addition, adopting industry standards and frameworks facilitates this compliance, covering areas such as security, data protection, and service management. Table 4 presents some of these frameworks, which may vary by cloud service provider.

**Board 4. Cloud Standards**

| Standard Name | Description |
|---|---|
| ISO/IEC 17788 | Cloud definitions and taxonomy |
| ISO/IEC 17789 | Cloud Architecture Reference |
| ISO/IEC 27017 | Code of Practice for Cloud Security |
| ISO/IEC 27018 | Code of Practice for Cloud Data Protection |
| NIST SP 800-145 | NIST's Definition of Cloud Computing |
| NIST SP 800-146 | Security Framework for Cloud Applications |
| NIST SP 500-291 | Cloud-related terms and definitions |
| ITU-T Y.3502 | Taxonomy and Terms for Cloud Computing |
| ETSI GS NFV-IFA | Network Functions Virtualization Architecture Framework |
| IEEE P2301 | Cloud Framework |
| dRAMP | U.S. Government Cloud Security Program |
| ISO/IEC 27001 | Standard for Information Security Management |
| ISO/IEC 27002 | Code of Practice for Information Security Controls |
| PCI DSS (Payment Card Industry Data Security Standard) | Rules for protecting payment card data |
| COBIT (Control Objectives for Information and Related Technologies) | Framework for IT governance and management |

Journal of Information Systems Engineering and Management
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ Research Article

| Standard Name | Description |
|---|---|
| AWS Well-Architected Framework | Best Practice Framework for AWS Cloud Architectures |
| Microsoft Azure Well-Architected Framework | Design framework and best practices for Azure cloud architectures |
| Google Cloud Architecture Framework | Design Framework for Google Cloud Solutions |
| ISO/IEC 31000 | Standard for Risk Management |
| ISO/IEC 38500 | Standard for IT Governance |
| ISO/IEC 21827 | Framework for Information Systems Architecture |
| IEEE 2675 | Cloud standard for application portability |

**Source:** Authors' elaboration based on available standards.

Collaborating with cloud service providers is another important facet of regulatory compliance. Organizations should negotiate contractual agreements that clearly specify the provider's responsibilities in terms of security, privacy, and compliance, allowing them to have greater control and visibility over their data.

### 1.5 Implementation of security policies and risk management.

Security and risk management policies are essential to ensure the protection, confidentiality, integrity, and availability of data and resources in cloud computing environments. These policies focus on defining sound security practices, as well as identifying, assessing, and mitigating the risks associated with the adoption of cloud services. Key considerations addressed by standards and frameworks such as ISO/IEC 27017, , include the following:(ISO, 2023)(alliance, 2023) (CIS Critical Security Controls, 2023)

- **Cloud Security Policies:** include robust access controls, encryption of sensitive data, constant monitoring to detect threats, backup and recovery strategies, protection against malware and cyberattacks, as well as training programs to promote good practices among users.
- **Cloud Risk Management: involves** identifying and assessing technical, operational, and compliance risks, implementing mitigation measures, continuously monitoring and updating such risks, and establishing incident response plans. It is also critical to assess the security and compliance of suppliers before they are hired.

### 3.6 Adequate organizational culture for the adoption of new technologies.

A proper organizational culture is critical to a successful adoption of cloud computing, as it involves a proactive attitude towards technology, committed leadership, effective communication, and adaptability. To do this, organizations must implement clear policies and training programs that address issues such as data privacy, security, availability, jurisdiction, ownership, and trustworthiness, as well as overcome cultural resistance and technical challenges associated with change. (Chen. et al., 2023)

## 2. Organizations that have adopted Cloud Computing

### 4.1 Examples of companies that have leveraged the cloud to drive innovation and efficiency.

Table 5. Some organizations that have been adopting cloud computing are presented.

**Journal of Information Systems Engineering and Management**
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**

**Board 5. Some organizations that have migrated to the cloud**

| Organization | Description of Service and Provider |
|---|---|
| Netflix | Netflix used Amazon Web Services (AWS) to scale its streaming platform and deliver content to millions of users. They used services like Amazon S3 to store data and Amazon EC2 to run applications. (Amazon, Solutions, 2023) |
| Airbnb | Airbnb migrated much of its infrastructure to the AWS cloud to handle traffic spikes and scale quickly. They used services such as Amazon RDS for databases and Amazon Redshift for data analytics. (Amazon, 2023) |
| Fish trap | NASA uses the Microsoft Azure cloud to process and analyze large amounts of data collected from space missions and telescopes. Azure provides a scalable and secure platform for your compute-intensive needs. (Microsoft, 2023) |
| General Electric (GE) | GE migrated more than 9,000 applications and systems to AWS to optimize costs and improve operational efficiency. They used services like AWS Lambda to run serverless code and Amazon DynamoDB for databases. (Amazon, 2023) |
| Spotify | Spotify uses Google Cloud Platform (GCP) to store and stream millions of songs to its users around the world. GCP provides a reliable and scalable infrastructure to support your music streaming platform. (Google, 2023) |
| Siemens | Siemens used Microsoft Azure to create an Internet of Things (IoT) platform that collects and analyzes sensor data in real-time. Azure IoT Hub and Azure Stream Analytics were critical for real-time data processing and decision-making. (Microsoft, 2023) |
| Pinterest | Pinterest migrated its infrastructure to AWS to handle its growing user base and increased traffic. AWS provided a flexible and scalable infrastructure, and services such as Amazon S3 and Amazon EC2 were used for storage and execution of applications. https://aws.amazon.com/solutions/case-studies/pinterest/ |
| Coke | Coca-Cola implemented a hybrid cloud solution using Azure and AWS to improve global collaboration and increase operational efficiency. Hybrid cloud allowed them to keep sensitive data in their on-premises data centers while taking advantage of the scalability and flexibility of the public cloud (Amazon, 2023) |
| National Geographic | National Geographic uses AWS to store and manage large amounts of multimedia content, including images and videos used on its digital platforms and television programs. AWS S3 and CloudFront are some of the key services used for content distribution and delivery. (Amazon, 2023) |
| Johnson and Johnson | As the healthcare environment continues to change rapidly and with the ever-increasing role of digitalization, Johnson & Johnson is transforming its business by incorporating intelligent automation into the fabric of the organization. (Microsoft, 2023) |
| NASA Earthdata | NASA Earthdata uses Google Cloud Platform (GCP) to store, access, and analyze Earth data and imagery collected by satellites and space missions. GCP provides a robust infrastructure for large-scale geospatial data processing and analysis.(NASA, 2023) |

Journal of Information Systems Engineering and Management
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ Research Article

| Organization | Description of Service and Provider |
|---|---|
| Samsung | Samsung Electronics uses AWS to develop innovative applications and services in its smart devices and connected appliances. AWS enables them to quickly and reliably scale and deliver services to millions of users around the world. (Amazon, Samsung Case Study, 2023) |
| Pfizer | Pfizer used the Microsoft Azure cloud to accelerate drug research and development, enabling them to perform complex data analytics and collaborate more efficiently with global research teams. (Microsoft, 2023) |
| BMW | BMW implemented a hybrid cloud strategy using AWS and Microsoft Azure to support its global operations. Hybrid cloud allows them to scale resources as needed and keep sensitive data in their own data centers. (Amazon, BMW Case Study, 2023) |
| McDonald's | McDonald's implemented a hybrid cloud strategy using Azure and GCP to modernize its infrastructure and streamline its operations. Hybrid cloud allows them to keep certain services in the public cloud and others on-premises for greater flexibility. (Microsoft, 2023) |
| The Washington Post | The Washington Post uses AWS to host its website and digital publishing platform. AWS gives them the ability to scale quickly to handle spikes in news traffic and ensure fast load times for readers. (Amazon, 2023) |

**Source:** Authors' elaboration based on information from the organizations

## 3. Challenges and future of cloud computing

The growing migration of companies to cloud computing is due to its advantages in costs and management, although it also poses new challenges in information security, different from those of traditional infrastructures. In the future, the integration of artificial intelligence with the cloud will enhance automation, data analysis and decision-making, allowing organizations to optimize resources, personalize services and improve their efficiency and competitiveness in the market. (PI, 2023)(Mohammed, Fang, & Ramos, 2023)

Machine learning and deep learning, key components of artificial intelligence, make it possible to process large volumes of data in the cloud using trained and scalable models, facilitating the analysis and efficient distribution of workloads. AI also optimizes the use of cloud resources by dynamically adjusting them and supporting fault tolerance mechanisms, such as automatic server migration. In addition, it improves data management and enhances solutions such as digital assistants, integrating advanced capabilities for the efficient storage and retrieval of information. (Belgaum et al., 2018) (Belgaum, 2019)

The adoption of cloud computing implies a profound change from the beginning, as data is no longer in a closed environment to be hosted in shared infrastructures managed by third parties, which requires implementing robust security controls to ensure a secure transition. At the same time, the future of this technology contemplates the integration of emerging solutions such as quantum computing, whose high processing potential will allow complex problems in data analysis and cryptography to be addressed, although it will also generate new challenges in security and algorithm design. Likewise, improving the user experience will be key, with growing expectations for more fluid, personalized and interconnected services, where artificial intelligence and machine learning will play a central role in anticipating needs, optimizing interactions and solving problems proactively (Gokul et al., 2022) (Alam, Pandey, & Rautaray , 2015)

**Journal of Information Systems Engineering and Management**
2024, 9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**

## Conclusions

Digital transformation has become a strategic priority for organizations, with cloud computing being a key enabler due to its ability to reduce operating costs, improve efficiency, and facilitate access to advanced technologies. However, its adoption implies facing challenges related to infrastructure, data security, integration with existing systems and regulatory compliance. Careful planning, implementation of sound policies and collaboration between technical and business areas, as well as active management of cultural change, are essential to ensure a successful transition.

On the other hand, security and privacy in the cloud require a continuous and comprehensive approach, combining techniques such as encryption, access management and regulatory monitoring. As cloud computing evolves, greater integration with emerging technologies, an expansion of hybrid and multicloud models, and an increasingly decentralized infrastructure are projected. This advancement will enable organizations to achieve greater agility, scalability, and efficiency, while delivering more personalized, secure, and connected experiences for users.

## Bibliographic References

[1] Alam, I., Pandey, M., & Rautaray , S. (2015). A Comprehensive Survey on Cloud Computing. *I.J. Information Technology and Computer Science*, 68-79.
[2] alliance, C. s. (31 de 7 de 2023). *Security, Trust, Assurance and Risk* .
[3] Amazon. (25 de 7 de 2023). *BMW Case Study*. Obtenido de https://aws.amazon.com/solutions/case-studies/bmw/
[4] Amazon. (2023, 6 10). *Customer story*. Retrieved from https://aws.amazon.com/solutions/case-studies/airbnb/
[5] Amazon. (2023, 8 of 2). *Customer success story*. Retrieved from https://aws.amazon.com/solutions/case-studies/washington-post/
[6] Amazon. (10 de 7 de 2023). *https://aws.amazon.com/es/solutions/case-studies/ge/*. Obtenido de https://aws.amazon.com/solutions/case-studies/ge/
[7] Amazon. (20 de 7 de 2023). *National Geographic Speeds Innovation with Serverless Computing on AWS*. Obtenido de https://aws.amazon.com/solutions/case-studies/national-geographic/
[8] Amazon. (2023, 8 1). *Samsung Case Study*. Retrieved from https://aws.amazon.com/es/solutions/case-studies/samsung/
[9] Amazon. (10 de 6 de 2023). *Solutions*. Obtenido de https://aws.amazon.com/solutions/case-studies/netflix/
[10] Amazon. (2023, 7 of 21). *The Coca-Cola Company on AWS*. Retrieved from https://aws.amazon.com/es/solutions/case-studies/innovators/coca-cola/
[11] Belgaum et al. (2018). Cloud service ranking using checkpoint-based load balancing in real-time scheduling of cloud computing. *in Progress in Advanced Computing and Intelligent Engineering, Springer*, 667-676.
[12] Belgaum, M. R. (2019). Integration challenges of Artificial Intelligence in Cloud Computing, Internet of Things and Software-defined networking. *019 13th International Conference on Mathematics, Actuarial Science, Computer Science and Statistics (MACS), Karachi, Pakistan*, 1-5.
[13] Bello, S. A. (2021). Cloud computing in construction industry: Use cases, benefits and challenges. *Automation in Construction*, 103441.
[14] Buck et al. (2023). Digital transformation in asset-intensive organisations: The light and the dark side. *Journal of Innovation & Knowledge*, 100335.

[15] Chen et al. (2016). Confidentiality protection of digital health records in cloud computing. *Journal of medical systems*, 1-12.
[16] Chen. et al. (2023). et and configurational effects of determinants on cloud computing adoption by SMEs under cloud promotion policy using PLS-SEM and fsQCA. *Journal of Innovation & Knowledge*, 100388.
[17] Chouliaras, S., & Sotiriadis, S. (2023). An adaptive auto-scaling framework for cloud resource provisioning. *Future Generation Computer Systems*, 173-183.
[18] CIS Critical Security Controls. (1 de 8 de 2023). *Critical Security Controls*. Obtenido de https://www.cisecurity.org/controls
[19] Dieste, M., Sauer, P., & Orzes, G. (2022). Organizational tensions in industry 4.0 implementation: A paradox theory approach. *International Journal of Production Economics*, 108532.
[20] Dogani, J., Namvar, R., & Khunjush, F. (2023). Auto-scaling techniques in container-based cloud and edge/fog computing: Taxonomy and survey. *Computer Communications*, 120-150.
[21] Feng et al. (2023). A task processing efficiency improvement scheme based on Cloud-Edge architecture in computationally intensive scenarios. *Journal of Parallel and Distributed Computing*, 104742.
[22] Gokul et al. (2022). Quantum Computing in the Cloud: Analyzing job and machine characteristics. *arXiv*, 1-13.
[23] Google. (11 de 7 de 2023). *Spotify: The future of audio. Putting data to work, one listener at a time*. Obtenido de https://cloud.google.com/customers/spotify
[24] Hafiz et al. (2023). Legacy systems to cloud migration: A review from the architectural perspective. *Journal of Systems and Software*, 111702.
[25] Hassan et al. (2022). To adopt or not to adopt? The determinants of cloud computing adoption in information technology sector. *Decision Analytics Journal*, 100138.
[26] ISO. (2023, 7, 28). *Information technology — Security techniques* . Retrieved from https://www.iso.org/standard/43757.html
[27] Li et al. (2015). Distributed Data Mining Based on Deep Neural Network for Wireless Sensor Network. *International Journal of Distributed Sensor Networks*, 7-11.
[28] Liu, S., Liu, K., & Ma, J. (2018). Distributed parameter estimation in wireless sensor networks in the presence of fading channels and unknown noise variance. *International Journal of Distributed*, 1-14.
[29] Ma et al. (2020). Advances, Systems, and Applications. *Journal of Cloud Computing*, 1-10.
[30] Mell, P., & Grance, T. (15 de 4 de 2023). *The NIST Definition of Cloud Computing. National Institute of Standards and Technology*. Obtenido de https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf
[31] Microsoft. (2023, 8 of 4). Retrieved from https://customers.microsoft.com/en-us/home?sq=&ff=&p=0
[32] Microsoft. (2023, 6 of 11). *Microsoft Research: Advancing science and technology to benefit humanity*. Retrieved from https://www.microsoft.com/en-us/research/
[33] Microsoft. (2023, 8 of 3). *Mott MacDonald*. Retrieved from https://www.wired.com/insights/2014/06/mcdonalds-goes-hybrid-cloud-microsoft-azure/
[34] Microsoft. (5 de 7 de 2023). *Pfizer, Microsoft And IBM Collaborate To Deliver Comprehensive Software Solutions To Physician Practices*. Obtenido de https://news.microsoft.com/2001/03/29/pfizer-microsoft-and-ibm-collaborate-to-deliver-comprehensive-software-solutions-to-physician-practices/
[35] Microsoft. (22 de 7 de 2023). *Siemens and Microsoft drive industrial productivity with generative artificial intelligence*. Obtenido de https://press.siemens.com/global/en/pressrelease/siemens-and-microsoft-drive-industrial-productivity-generative-artificial-intelligence

[36] Mohammed, S., Fang, W. C., & Ramos, C. (2023). Special issue on "artificial intelligence in cloud computing. *Computing*, 507-511.
[37] FISH TRAP. (2023, 8 of 2). *Earthdata Cloud Evolution*. Retrieved from https://www.earthdata.nasa.gov/eosdis/cloud-evolution
[38] Parast et al. (2022). Cloud computing security: A survey of service-based models,. *Computers & Security*, 102580.
[39] Pfaff et al. (2023). How digital transformation impacts organizational culture – A multi-hierarchical perspective on the manufacturing sector. *Computers & Industrial Engineering*, 109432.
[40] PI, P. (2023, 6 d. 20). *Cloud computing, controls, and security*. Retrieved from https://repositorio.21.edu.ar/handle/ues21/16157
[41] Richter, F. (2023, 8, 8). *CLOUD INFRASTRUCTURE MARKET*. Retrieved from https://acortar.link/9vFs4Z
[42] Ross, J. W., Beath, C. M., & Quaadgras, A. (2013). You may not need big data after all. *Harvard Business Review*, 92-100.
[43] Schallmo, D., & Williams, C. A. (2018). Digital Transformation of Business Models-Best Practices, Enablers and. *ISPIM*, 1-14.
[44] Shah et al. (2017). Computing hierarchical summary from two-dimensional big data streams. *IEEE Transactions on Parallel and Distributed Systems*, 803-818.
[45] Shahzad, F. (2014). State-of-the-art Survey on Cloud Computing Security Challenges, Approaches and Solutions,. *Procedia Computer Science*, 357-362.
[46] Statista. (15 de 8 de 2023). Obtenido de Amazon Maintains Lead in the Cloud Market: https://acortar.link/9vFs4Z
[47] Sun, P. (2020). Security and privacy protection in cloud computing: Discussions and challenges. *Journal of Network and Computer Applications*, 102642.
[48] Velte, A. T., & Velte, T. J. (2013). *Cloud computing, a practical approach*. New York: McGraw-Hill Education.
[49] Vinoth, S. (2022). Application of cloud computing in banking and e-commerce and related security threats. *Materials Today: Proceedings*, 2172-2175.
[50] Xu et al. (2022). EdgeWorkflow: One click to test and deploy your workflow. *Journal of Systems and Software*, 1-17.
[51] Zhang, Q., Cheng, L., & Boutaba, R. (2011). Cloud computing: state-of-the-art and research challenges. *Journal of Internet Services and Applications*, 7-18.
[52] Zhu, J. (2019). Research on data mining of electric power system based on Hadoop cloud computing platform. *nternational Journal of Computers and Applications*, 289-295.