

## The Principles of Application the Cloud Computing in the Organizations: a Managerial Approach

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### Summary:

In the beginning of the twenty-first century, the technology sector witnessed an amazing development, especially in its digital field. Where many inventions and innovations appeared that changed the essence of many related fields; Including the world of business and management; Perhaps one of the most important of these amazing technological developments is the Cloud computing technology. Therefore, this study came to define the concept and principles of this technique; By defining its definition, characteristics, models, types and in addition to evaluating it in terms of its drawbacks and benefits .

To achieve this, a qualitative approach was adopted by reviewing the latest scientific sources and references specialized in this field, and then summarizing and simplifying their ideas. The study reached many results, perhaps the most prominent of which is that the adoption of the cloud computing technology has a very important impact on costs, speed and reducing technical errors, in addition to the fact that the adoption of the appropriate level of this technology is subject to an economic feasibility study.

Keys words: cloud computing, business organizations, information technology

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## I- Introduction :

### 1-Introduction

Recently, networking and storage technologies have increased in complexity. As a consequence the task to manage them has become harder. Thus, organizations tried to hire IT specialists and acquisition of high-tech equipment. Hence, All of this requires large amounts of capital and operational expenditures, but may not be fully utilized at all hours of a day, over a week, or a year. This has led some people to consider sharing the resources of a IT with other users from other organizations while maintaining data security, application level protection, and user isolation. This has been enabled by operating systems in the past and most recently with hardware-based virtualization. Thus, the so-called cloud computing appeared. That is why this study came to answer the following problem: **what is the Cloud Computing and How is the Cloud Computing apply in the Organizations?**

To answer this problem, we propose the following hypotheses:

- The Cloud Computing is new technology that can help users to managing their data and information.
- Although the much benefits of Cloud Computing but also it has many drawbacks.

Objectives

- Determining the concept of the Cloud Computing;
- Knowing the various characteristics of the Cloud Computing;
- Determining the model and types of the Cloud Computing;
- Evaluation of the Cloud Computing and determine its drawbacks and its benefits.

Methodology:

This study has adopted the qualitative approach. Therefore, descriptive method and the case study method have been also used via reading and summarizing various theory works that related with the topic of study.

### **1. Concept of the cloud computing**

Three decades prior, the personal computers (PCs) brought change in the manner in which individuals worked. Yet, over the ongoing years another technology called the Cloud has pulled in research network since it guarantees to address different information technology (IT) challenges. Physical areas for asset access, gigantic expense to benefit interminable power, improvement in the courses of events

for applications have bothered IT and its customers since long time. Cloud computing guarantees to offer access to gigantic measures of information and computational power, empowering creators to take care of issues in a better approach to accomplish a dependable IT foundation. (Manvi & Shyam, 2021, p. 1) Technological advances such as increasing internet bandwidth and advances in virtualization have given rise to cloud computing; the “cloud” is a metaphor for the internet. (Valacich, Schneider, & Hashim, 2022, p. 147) Cloud computing involves using a network of remote servers hosted on the Internet to store, manage, and process data. These services are offered by data centers around the world (and not within an organization’s offices) and are collectively called “the cloud.” (Noe, Hollenbeck, Gerhart, & Wright, 2018, p. 279) “Cloud computing” allows companies to lease software and hardware and employees don’t even know the location of computers, databases, and applications they are using (they are in the “cloud”). Cloud computing gives companies and their employees access to applications and information from mobile devices rather than relying solely on personal computers. It also allows groups to work together in new ways, can make employees more productive by allowing them to more easily share documents and information, and provides greater access to large company databases. (NOE, HOLLENBECK, GERHART, & WRIGHT, 2017, p. 49)

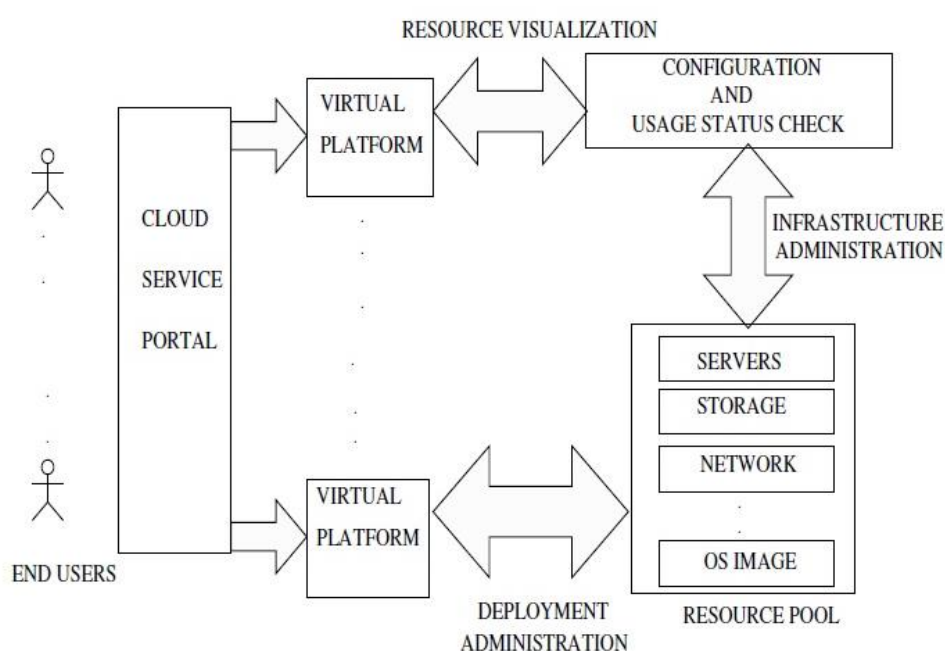
The IT consultancy Gartner was one of the first to define cloud computing in 2008. It has subsequently been slightly updated: “Cloud computing is a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service using Internet technologies.” (Lisdorf, 2021, p. 5) This definition points to some of the key aspects of cloud computing: scalability, elasticity, and delivered as a service over the Internet. Scalability aims at the property of the cloud in contrast to on-premise computing that ramping up computing and storage is very easy. You don’t have to order machines, unwrap them, and connect them to your data center. Anything is easily scaled up. Elasticity, on the other hand, aims at the fact that this scalability goes both ways: it will also scale down when capacity is no longer needed. This definition is quite open and draws the contours of the cloud, but it does not tell us a lot of specifics. (Lisdorf, 2021, p. 5)

The Cloud frame work can be seen as containing both a physical layer and a virtualization layer. The physical layer comprises of the equipment assets that are important to help the Cloud administrations, and regularly incorporates server, stock piling and system parts. The virtualization layer comprises of the product sent over the physical layer which shows the fundamental Cloud attributes. Reasonably, the

virtualization layer is positioned over the physical layer. (Manvi & Shyam, 2021, p. 1) Cloud Computing refers to providing IT services, applications, and data using dynamically scalable pool(s), possibly residing remotely, such that users do not need to consider the physical location of server or storage that supports their needs. According to Armbrust provides another, similar, definition of Cloud Computing as “the applications delivered as services over Internet and the hardware and system in the data centers that provide these services.” (Sehgal & al, 2022, p. 2)

Cloud Computing is rapidly evolving from providing end-user services (e.g., search, email, social networking) to support mission critical business and commercial grade applications as shown in Fig. 1.1. Some services for some companies are already based entirely in Cloud, e.g., Salesforce.com, and coming years will see new emerging trends, such what the following figure illustrates: (Sehgal & al, 2022, p. 6)

**Fig 1.** Principle of the cloud computing



**Source:** (Manvi & Shyam, 2021, p. 3)

Figure 1. depicts the construction and deployment for Cloud service delivery model. End-users access Cloud services such as computing and data center resources via the Internet. The user needs to have an account with the Cloud service provider (CSP) for security and billing schemes. The required resources are specified by the users. The CSP provisions resources in the form of virtual machines directly to user accounts. This offering facilitates users more flexibility in building their own

applications on top of remotely hosted resources. Users essentially rent operating systems, CPU, memory, storage and network resources from the CSP to improve elasticity and scalability of workloads. (Manvi & Shyam, 2021, p. 2)

Cloud computing is bound to be compared with service oriented architectures (SOA), Grid computing, Utility computing and Cluster computing. (Manvi & Shyam, 2021, p. 2) The summary of the features of each of these computing techniques is listed in Table1.

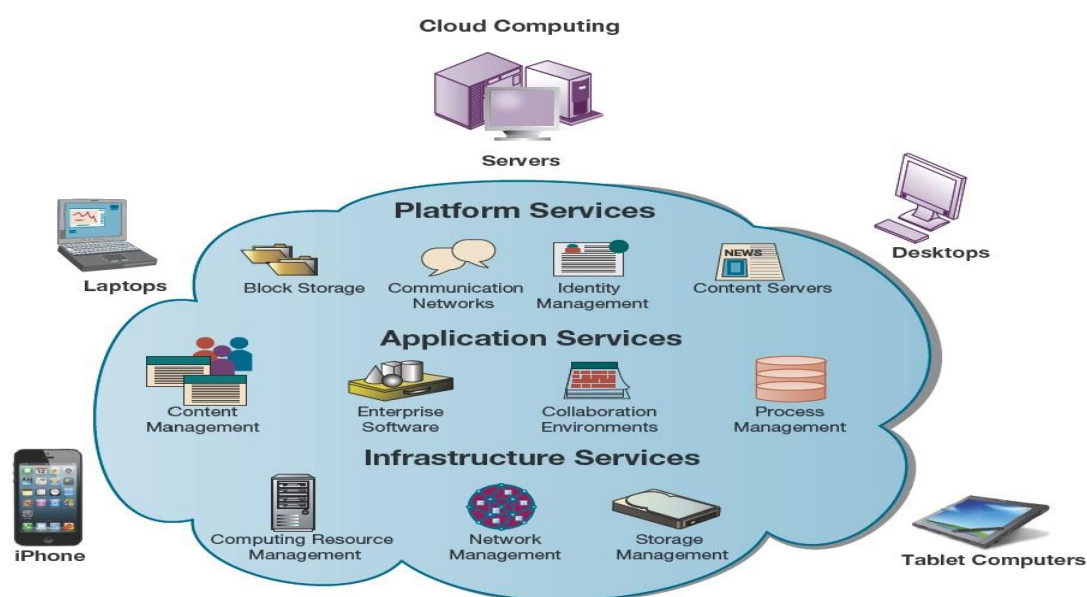
**Table 1.** Computing techniques

| <b>Computing techniques</b> | <b>Features</b>                                                                           |
|-----------------------------|-------------------------------------------------------------------------------------------|
| Cloud computing             | Cost efficient, almost unlimited storage, backup and recovery, easy deployment            |
| SOA                         | Loose coupling, distributed processing, asset creation                                    |
| Grid computing              | Efficient use of idle resources, modular, parallelism can be achieved, handles complexity |
| Cluster computing           | Improved network technology, processing power, reduced cost, availability, scalability.   |

Source: (Manvi & Shyam, 2021, p. 4)

Briefly a Cloud is defined as a space over network infrastructure where computing resources such as computer hardware, storage, databases, networks, operating systems, and even entire software applications are available instantly, on-demand. It is true that Cloud computing may not involve a whole lot of new technologies, but the fact that it surely represents a new way of managing IT cannot be denied. For example, scalability and cost savings can be achieved to the largest extent from Cloud computing. (Manvi & Shyam, 2021, p. 2) Cloud computing includes hardware and software (see fig.2) capabilities that are a pool of virtualized resources provided over a network, often the internet. Businesses and employees have access to applications and IT infrastructure anywhere, at any time, and on any device. (Laudon & Laudon, 2022, p. 214)

**Fig.2:** Cloud Computing Platform



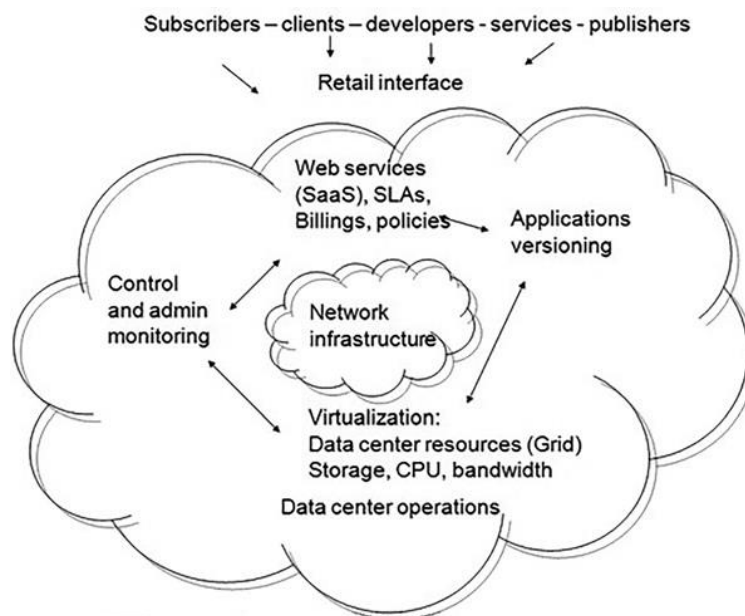
Source : (Laudon & Laudon, 2022, p. 214)

Cloud computing is a model of computing in which computer processing, storage, software, and other services are provided as a shared pool of virtualized resources over a network, primarily the Internet. These ‘clouds’ of computing resources can be accessed on an as-needed basis from any connected device and location. Cloud computing enables companies and individuals to perform all of their computing work using a virtualized IT infrastructure in a remote location. (Laudon & Laudon, 2022, p. 214) A more precise and comprehensive definition is the one by The National Institute of Standards in Technology (NIST). Virtually every exposition of cloud refers to this definition and it has become the de facto standard definition of what is and what is not cloud. (See fig. 3) The work had been going on for more than three years through 15 drafts. The structure of the definition is around three sections: (Lisdorf, 2021, p. 6)

- Essential characteristics—Described five key characteristics that defined cloud computing: On-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service.
- Service models—Concerned with the different ways cloud resources could be consumed: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).
- Deployment models—About how cloud infrastructure could be provisioned.

As defined by the National Institute of Standards and Technology (NIST), “Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction”. (Valacich, Schneider, & Hashim, 2022, p. 147) Using a utility computing model (i.e., organizations “renting” resources such as processing, data storage, or networking from an external provider on an as-needed basis and paying only for what is actually used), cloud computing thus helps transform IS infrastructure costs from a capital expenditure to an operational expenditure. (Valacich, Schneider, & Hashim, 2022, p. 148)

**Fig.3** Concept of Cloud Computing according NIST



**Source:** (Sehgal & al, 2022, p. 6)

At the time the definition was finished, the purpose was clearly stated by NIST computer scientist Peter Mell: “When agencies or companies use this definition (..) They have a tool to determine the extent to which the information technology implementations they are considering meet the cloud characteristics and models. This is important because by adopting an authentic cloud, they are more likely to reap the promised benefits of cloud—cost savings, energy savings, rapid deployment, and customer empowerment” (Lisdorf, 2021, p. 5)

One prime example of a cloud computing provider is Amazon Web Services (AWS) which is a collection of web services that Amazon provides to users of its cloud platform. AWS is the largest provider of cloud computing services in the United States. (Laudon & Laudon, 2022, p. 215) having built an immense infrastructure (in terms of both information technology and logistics) for supporting its online store, Amazon has decided to use these resources to generate additional revenue streams. (Valacich, Schneider, & Hashim, 2022, p. 148) For example, individuals and organizations can rent storage space on Amazon's Simple Storage Service (S3) or computing time on Amazon's Elastic Compute Cloud (EC2), all on an as-needed basis. The ability to create an entire infrastructure by combining Amazon's various services has facilitated many successful startup companies, such as the social scrapbooking site Pinterest and the community travel marketplace Airbnb. As Airbnb grew in popularity with travelers all over the globe, the company found itself being limited by challenges and constraints imposed by its original service provider. (Valacich, Schneider, & Hashim, 2022, p. 148) Moving to Amazon Web Services allowed Airbnb to quickly obtain 200 servers without needing to negotiate service contracts or commit to minimum usage. Flexibly scaling the infrastructure would have been close to impossible were Airbnb using its own data center because of both the time and the money needed to acquire this number of servers, and at the time, who knew whether Airbnb's business would actually take off? With a traditional in-house infrastructure, Airbnb would have had to add capacity in "chunks," leading to either having too many unused resources or not being able to satisfy its users' demand; using a cloud infrastructure, Airbnb can elastically scale the resources to be just above what is needed to keep the users satisfied. (Valacich, Schneider, & Hashim, 2022, p. 149)

**Fig.4:** Amazon Web Services (AWS)



**Source:** (Laudon & Laudon, 2022, p. 215)

## 2. Cloud Computing Characteristics

In the extreme case, Cloud Computing can be defined as a service-oriented architecture (SOA) that provides any type of computing component. An example is Internet-based email providers, where the content for each user resides in the Cloud and the primary interface is via a browser. A user who may be travelling can access her email from any location in the world by simply typing a URL, without caring about the location of a service provider's database. However, the response time may vary depending on the physical distance and latency between the user and service provider's locations. To overcome this limitation, some international service providers use a distributed database replicating each user's email information among multiple data centers in different locations. One of these is picked by intelligent routers to provide the shortest response time. At any given time, the user doesn't know which physical location is providing her email service and thus considers it to be residing in a Cloud. Another advantage of Cloud Computing is the economy of scale. The utilization of servers inside an enterprise, a small-medium business, or even on a home computer can vary widely but rarely reaching a near 100% level at all times. In fact, averaged over 24 hours, and 7 days a week, an IEEE study recently showed that most servers will show CPU utilization between 10% and 15%, and the same is true of network bandwidth. Storage is also underutilized. Combining the usage of several such customers served from a single large data center enables the operators to spread their capital investment and operational costs over a large set of

customers. The sharing of resources can drive the utilization higher. Such higher utilization meets the need to fill the installed capacity with new users by allowing a flexible Cloud environment. Amazon uses this concept for their Elastic Compute Cloud. This allows them to rent their servers with a reduced total cost of ownership (TCO) for their customers. This is the broadest definition of Cloud Computing, that information is stored and processed on computers somewhere else, “in the Cloud,” and results are then brought back to the end users’ computer.

The trend toward Cloud Computing continues due to financial benefits accrued to both the users and providers. As the trend continues, Cloud-specific security issues are added to the existing security issues. In a Cloud, services are delivered to the end users via the public Internet or via enterprise networks in case of a Private Cloud, without any user intervention. Private Cloud are deployed behind a firewall for an organization’s internal use and enable IT capabilities to be delivered as a service. Companies often resort to using Private Cloud as they do not want to trust the Public Cloud with their confidential or proprietary information. (Sehgal & al, 2022, p. 4)

Cloud computing is really becoming popular worldwide as it offers innumerable benefits to the clients. Most of the companies have realized the importance of this technology as it offers plenty of storage options. This type of a storage process permits all the organizations to take benefit without actually having to reimburse any additional costs that are usually connected with such type of storage resources. The characteristics and benefits of Cloud computing are as follows: (Manvi & Shyam, 2021, pp. 5-6)

**On-demand self-service:** A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

**Broad network access:** Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops and workstations).

**Resource pooling:** The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to

specify location at a higher level of abstraction (e.g., country, state, or data center). Examples of resources include storage, processing, memory and network bandwidth.

**Rapid elasticity:** Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

**Measured service:** Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g. ,storage, processing, bandwidth and active user accounts). Resource usage can be monitored, controlled and reported, providing transparency for both the provider and consumer of the utilized service.

### 3. Models of cloud Computing

Cloud computing consists of three different types of services; where various services are provided in the cloud. Whereas some users require access only to certain software, others want to have more control and be able to run the software of their choice on a server in the cloud. (Valacich, Schneider, & Hashim, 2022, pp. 150-151)

1. Infrastructure as a Service In the infrastructure as a service (IaaS) model, only the basic capabilities of processing, storage, and networking are provided. Hence, the customer has the most control over the resources. For example, using Amazon Web Services, customers can choose computing power, memory, operating system, and storage based on individual needs and requirements, thus being able to build (almost) their entire infrastructure in the cloud. The IaaS model provides the customer with the greatest flexibility; on the other hand, while the infrastructure is provided, managing software licenses is still the responsibility of the customer, and setup costs are relatively high.
2. Platform as a Service In the platform as a service (PaaS) model, customers can run their own applications, which are typically designed using tools provided by the service provider. In this model, the user has control over the applications but has limited or no control over the underlying infrastructure. As the underlying computing platform is provided, the customer does not have to worry about purchasing software licenses, for example, for the web servers' operating systems or for database management systems and the service provider manages the functioning and updating of the platform provided. A

new trend is serverless computing. The service takes care of all management of the underlying platform, enabling continuous scaling, and the user is charged on the basis of usage time. (Valacich, Schneider, & Hashim, 2022, p. 150)

3. Software as a Service In the software as a service (SaaS) model, the customer uses only applications provided via a cloud infrastructure. Typically, such applications include web-based email services (e.g., Google's Gmail) and web-based productivity suites (such as Zoho or Google Docs) but also advanced applications such as CRM systems, as provided by Salesforce.com. Typically, the customer cares only about the application, with no knowledge or control over the underlying infrastructure and typically has only limited ability to control or configure application-specific settings. Applications under the SaaS model are typically easiest to deploy because the customer does not have to worry about maintaining or updating the software, the underlying platform, or the hardware infrastructure. Some companies have started offering entire solutions as a service, providing not only software, but also other aspects such as expertise. (Valacich, Schneider, & Hashim, 2022, p. 151)

Because of its various benefits, cloud computing has gained much popularity, especially among executives who try to harness the potential of scalability and increase the business' agility. However, there are also various issues management should consider when moving infrastructure to the public cloud. The first consideration is which applications, services, or data to move to the cloud. (Valacich, Schneider, & Hashim, 2022, p. 151)

Typically, there is no single cloud computing provider that can meet all needs of an organization. Rather, organizations often have to partner with different service providers, selecting IaaS, PaaS, and SaaS models based on the business's needs and often combining public and private clouds; as there is not one solution that fits all, organizations must carefully weigh the benefits and downsides of cloud computing. In addition, organizations must carefully consider which cloud services provider to choose. Some of the long-term, strategic issues that management should consider when evaluating different public cloud service providers include availability, reliability, scalability, viability, security, privacy, compliance, diversity of offerings, openness, and, not least, cost. (Valacich, Schneider, & Hashim, 2022, p. 152)

#### 4. Different types of Cloud Computing providers

A cloud can be private or public. A public cloud is owned and maintained by a cloud service provider, such as Amazon Web Services, and made available to the general public or industry group. Public cloud services are often used for websites with public information and product descriptions, one-time large computing projects, developing and testing new applications, and consumer services such as online storage of data, music, and photos. Google Drive, Dropbox, and Apple iCloud are leading examples of these consumer public cloud services. (Laudon & Laudon, 2022, p. 218)

A private cloud is operated solely for an organization. It may be managed by the organization or a third party and may be hosted either internally or externally. Like public clouds, private clouds are able to allocate storage, computing power, or other resources seamlessly to provide computing resources on an as-needed basis. Companies that want flexible IT resources and a cloud service model while retaining control over their own IT infrastructure are gravitating toward these private clouds. (Laudon & Laudon, 2022, p. 218)

Because organizations using public clouds do not own the infrastructure, they do not have to make large investments in their own hardware and software. Instead, they purchase their computing services from remote providers and pay only for the amount of computing power they actually use (utility computing) or are billed on a monthly or annual subscription basis. The term on-demand computing has also been used to describe such services. (Laudon & Laudon, 2022, p. 218)

Large firms are most likely to adopt a hybrid cloud computing model where they use their own infrastructure for their most essential core activities and adopt public cloud computing for less critical systems or for additional processing capacity during peak business periods. Table.1 compares the three cloud computing models. Cloud computing will gradually shift firms from having a fixed infrastructure capacity toward a more flexible infrastructure, some of it owned by the firm and some of it rented from giant computer centers owned by computer hardware vendors. You can find out more about cloud computing in the Learning Tracks for this chapter. (Laudon & Laudon, 2022, p. 219)

**Table 2.** Cloud Computing Models Compared

| TYPE OF CLOUD | DESCRIPTION                                                                                                                      | MANAGED BY                                       | USES                                                                                                                                            |
|---------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Public cloud  | Third-party service offering computing, storage, and software services to multiple customers and that is available to the public | Third-party service providers                    | Companies without major privacy concerns<br><br>Companies seeking pay-as-you-go IT services<br><br>Companies lacking IT resources and expertise |
| Private cloud | Cloud infrastructure operated solely for a single organization and hosted either internally or externally                        | In-house IT or private third-party host          | Companies with stringent privacy and security requirements<br>Companies that must have control over data sovereignty                            |
| Hybrid cloud  | Combination of private and public cloud services that remain separate entities                                                   | In-house IT, private host, third-party providers | Companies requiring some in-house control of IT that are also willing to assign part of their IT infrastructures to a public cloud              |

Source: (Laudon & Laudon, 2022, p. 219)

There is also another type which is called by **Edge Computing**. Having all the laptops, smartphones, tablets, wireless sensor networks, and local on-premise servers used in cloud computing systems interacting with a single central public cloud data center to process all their data can be inefficient and costly. Edge computing is a method of optimizing cloud computing systems by performing some data processing on a set of linked servers at the edge of the network, near the source of the data. This reduces the amount of data flowing back and forth between local computers and other devices and the central cloud data center. (Laudon & Laudon, 2022, p. 219)

Edge computing deployments are useful when sensors or other IT devices do not need to be constantly connected to a central cloud. For example, an oil rig in the ocean might have thousands of sensors producing large amounts of data, perhaps to confirm that systems are working properly. The data do not necessarily need to be sent over a network as soon as they are produced, so the local edge computing system could compile the data and send daily reports to a central data center or cloud for long-term storage. By only sending important data over the network, the edge computing system reduces the amount of data traversing the network. (Laudon & Laudon, 2022, p. 219) Edge computing also reduces delays in the transmitting and processing of data because data does not have to travel over a network to a remote data center or cloud for processing. This is ideal for situations where delays of milliseconds can be untenable, such as in financial services, manufacturing, or autonomous vehicles. (Laudon & Laudon, 2022, p. 219)

## **5. Benefits and Drawbacks of Cloud Computing**

The benefits and some potential risks of Cloud Computing may be classified as follows:

### **5.1. Cloud Computing Benefits**

In contrast to the traditional computing environments, with Cloud Computing, users can order and get new capacity almost immediately. (Sehgal & al, 2022, p. 4) With the cloud there is no more expensive, capital-intensive hardware and infrastructure and no more expensive, time-consuming, staff-intensive upgrades. Cloud computing permits businesses to buy and use what they need, when they need it. It allows large organizations to move away from managing their own computer centers and focus on the core competencies of the firm. Cloud users have the ability to access the application securely from anywhere in the world. HR professionals can be virtually anywhere and access the cloud, all through any standard Web. (Mondy & Martocchio, 2016, p. 34) Cloud Computing is based on many prior innovations, e.g., the ability to do task consolidation and VM migration using virtualization for dynamic load balancing. It enables a service provider to optimize their data center usage by booting new servers and migrating some of the existing users to new machines to meet the expected response time. (Sehgal & al, 2022, p. 5)

**In addition to these benefits:** (Sehgal & al, 2022, p. 5)

- Shared infrastructure reduces cost.
- Pay as you go or only pay for what you use.
- On-demand elasticity, from a large pool of available resources.
- Increased focus on the application layer.
- Let someone else worry about the hardware.
- Seamless scaling: Pay as you go, instead of making an upfront investment in hardware and software, allows customers to get on-demand applications and services and then pay for only what they use.
- Increased multi-tenancy: With the advent of multicore computers and virtualization, it is possible for several customers to share a single server with each being isolated in a separate virtual machine (VM).

## ***5.2 Cloud Computing Potential Risks***

Cloud computing has some drawbacks. Unless users make provisions for storing their data locally, the responsibility for data storage and control is in the hands of the provider. Some companies worry about the security risks related to entrusting their critical data and systems to an outside vendor that also works with other companies. Companies expect their systems to be available 24/7 and do not want to suffer any loss of business capability if cloud infrastructures malfunction. Nevertheless, the trend is for companies to shift more of their computer processing and storage to some form of cloud infrastructure. Startups and small companies with limited IT resources and budgets will find public cloud services especially helpful. (Laudon & Laudon, 2022, p. 218) However, this also opens up potential security threats as mission critical applications and confidential data from different users are co-located on the same hardware. Current methods of disk encryption are no longer deemed sufficient if one can get physical access to a competitor's servers in a third-party data center. Physical access controls are placed on the employees working in such a data center, but there is no line of defense if one can gain access to the contents of main memory on a server. An example is the launch plan for next-generation product kept behind the firewalls, lest some competitors can access it, while sharing the same server in a Public Cloud. Someone with physical access to a shared server can simply copy the files, and in a virtualized environment, even though the VMs are isolated, their run-

time images are backed up at regular intervals to enable recovery or migration of a session. Hence, the back-up images also need to be protected. (Sehgal & al, 2022, p. 5)

**In addition to these benefits:** (Sehgal & al, 2022, p. 6)

- You lose direct knowledge and control of underlying hardware.
- Noisy neighbors or other VMs sharing the same hardware can affect your performance.
- Hard to diagnose performance issues, due to limited visibility and virtualization.
- Potential security risks of placing your mission critical data on remote servers.
- Vendor lock-in, means getting stuck with a Cloud provider who has your data.

### **Conclusion:**

Managing the IS infrastructure can be a challenge for many organizations due to the evolution of hardware and software, the demand for more storage and networking bandwidth, and the rising costs of energy. Further, organizations need dedicated staff to support their infrastructure, which incurs further costs; often, managing the IS infrastructure is not among the organization's core competencies, so others may be better at managing the infrastructure for them. The best solution of this case is adopting **the Cloud Computing**.

Cloud customers often choose a Cloud service on the basis of their needs: (Sehgal & al, 2022, p. 3)

1. Workload attributes:

- (a) Performance
- (b) Security
- (c) Integration complexity
- (d) Data size

2. Business needs:

- (a) Time to deployment
- (b) Compliance regulatory
- (c) Geographical reach
- (d) SLA (service-level agreements)

3. Ecosystem available:

- (a) Maturity of SaaS offerings

- (b) Viability of alternate services
- (c) Availability of resellers/system integrators.

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