

Cloud Computing in Business

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Abstract: Businesses need the means to enhance their efficiency, productivity, and overall performance in today's modern competitive climate, and cloud technology offers a flexible means of doing that. Cloud computing is the delivery of computing services including servers, storage, databases, networking, software, analytics, and intelligence over the Internet (the cloud or virtual space). This implies that businesses will move their whole operations to the cloud. Many businesses are not willing to make this change because it is an expensive and sometimes complicated operation. The cloud can help a business save money, become more agile, and operate more efficiently. This paper provides an introduction on cloud computing for businesses. It identifies the strengths, weaknesses, opportunities, and threats for the cloud computing use in the business environment.

Keywords: cloud, computing, cloud computing, business.

INTRODUCTION

Cloud computing is the on-demand availability of computer services over the Internet to offer business innovation, agility, and growth. The major motivation behind cloud computing is to enable businesses to get access to data centers and manage tasks from a remote location, the cloud or virtual space. This helps businesses lower their operating cost and run infrastructure more efficiently [1].

The evolution of cloud computing over the past few years is potentially one of the major advances in the history of computing. The cloud computing emerges as the fuel to digital transformation. It represents a convergence of two major trends in information technology: IT efficiency and business agility.

CONCEPT OF CLOUD COMPUTING

Cloud computing is a new means of providing computing resources and services. It is

an on-demand and self-service Internet infrastructure. It offers large scalable computing and storage, data sharing, on-demand anytime and anywhere access to resources. Figure 1 depicts a typical cloud computing model [2], while Figure 2 summarizes the history of cloud computing [3].

Cloud computing presents several characteristics such as [4]:

- Resource pooling
- Better use of resources
- Rapid elasticity

- Measured service
- Dynamic (distributed)
- Scalability
- Virtualized

Some of these characteristics are portrayed in Figure 3 [3].

From a service point of view, cloud computing includes three models: software, platform, and infrastructure [5].

- (1) Software as a service (SaaS): The applications are hosted by a cloud service provider and made available to customers over the Internet. As a SaaS, the cloud can offer organizations on-demand hosted services.
- (2) Platform as a service (PaaS): The development tools (e.g. operation systems) are hosted in the cloud and accessed through a browser. Using a PaaS environment, Microsoft provides a service to supply providers with networks, servers, and storage.
- (3) Infrastructure as a service (IaaS): Cloud service providers set up huge infrastructure like servers, storage devices, hardware, etc. to be used by potential clients.

The cloud computing deployment models are [6]:

- (1) Public cloud: A public cloud is a publicly accessible cloud environment owned by a third-party cloud provider. The service provider makes resources available to the general public over the Internet on a pay-as-you-go basis.
- (2) Private cloud: A cloud infrastructure is owned and operated solely for a single organization. Organizations build their own cloud infrastructure for use by their business units. They can also choose between private cloud or public cloud.
- (3) Community cloud: A community cloud is similar to a public cloud except that its access is limited to a specific community of cloud consumer. The cloud infrastructure is shared by several organizations with common concerns.
- (4) Hybrid cloud: A hybrid cloud is a combination of a public and private cloud.

Figure 4 illustrates these cloud computing types [1]. For example, Microsoft Azure is one of the eminent cloud computing platforms in the market created by Microsoft. Public cloud computing, offered by companies like Amazon Web Services, Microsoft Azure, and Google Cloud, is still viewed by many as a cheaper and more efficient way for companies to store and process data.

A business can improve their efficiency, increase productivity, and save costs by moving their data to the cloud. Today, many business leaders are on the front foot to adapt to digital transformation with cloud computing strategy. Choosing to transfer your company to the cloud is a significant choice that will impact all aspects of business operations. Employees can receive data that will assist them in serving consumers at any time and from any location. They may interact with possible consumers through the cloud using a variety of devices, including mobile, laptop, and desktop computers.

APPLICATIONS OF CLOUD COMPUTING IN EDUCATION

In the wake of the economic slowdown, organizations are increasingly looking for ways to do more with the same resources. Cloud computing allows companies to outsource data and can be accessed anywhere any

time. It provides many options for the everyday computer user as well as large and small businesses. Common cloud computing applications for business are discussed as follows.

- *Management:* Cloud computing has become an imperative for the management of companies of all size. The main way information technology changes management is through changes in how information is gathered. One modern and alternative approach to business management is the use of services based on cloud computing.
- *Cloud Web Hosting:* Cloud hosting is a popular alternative to traditional hosting. A traditional web host uses physical server space to handle the web hosting needs of its clients. Within the traditional hosting space, services are either dedicated or shared, with each option having its merits. Cloud-based hosting dedicates virtual server space for each user. Cloud hosting services use a pay-as-you-go model [7].
- *Enterprises:* An enterprise is a set of different activities, each of which adds marginal value to the final product or service, and these activities constitute a value chain. It can access computing resources hosted by third parties on the Internet instead of building its own IT infrastructure. With cloud services provided online, enterprises must have Internet access to be able to use them.
- *Small Business:* Cloud computing is a technology that medium and large businesses are embracing as the new way of doing business. Many small businesses are not using cloud services and are falling behind the rest of the business world. With the services that are available via the cloud, every small business has the potential to be the next large corporation. After all, every large corporation was, at one time, a small business. Small businesses should take advantage of cloud benefits in order to gain more business and increase profitability. Cloud computing can benefit small businesses because through it they will have access to technologies that before were not accessible and they can start competing with other small businesses or even with big ones.

BENEFITS

There are countless benefits a business can derive from cloud computing, whether it is used for large-scale data storage and analytics, delivering a web-based service, scaling infrastructure, or disaster recovery purposes. Cloud computing offers a cheaper, more flexible and more efficient way to manage corporate IT expenditure. The major innate benefits include the following [8-12].

- *Accessibility:* Cloud computing is an easy-to-access computing system. Businesses use cloud computing to access information anywhere using a digital device connected to the Internet. Information is available from a central web-based hub that gives any authorized person instant access from any location at any time. A cloud computing provider stores data for you without all the downsides.
- *Mobility:* Perhaps the most important advantage of cloud computing is that it provides mobility to the business. Cloud computing provides the employees with the flexibility to work from any location, thereby enabling mobility. With the help of an Internet connection, one can get real-time updates of all operations in the business using cloud computing.
- *Scalability:* This refers to the expansion of infrastructure to handle an increased load for every application. Because of the market's uncertainty, companies have traditionally struggled with scaling. The scalability of cloud computing allows companies to grow effectively. Cloud computing is easy to scale. Cloud computing is a primary driver of meeting the changing demand for computing and development. Computing capabilities like storage, processing power or network bandwidth can be scaled-up almost instantly and scaled-down again depending on demand.

- *Flexibility*: Many businesses choose the flexibility and convenience of cloud computing over traditional local hosting and on-premise software. Cloud computing promotes flexibility in the workplace. It allows the employees to be flexible enough by accessing the data from anywhere anytime. It enables flexible scheduling of work. Businesses can rent IT equipment and applications as needed, rather than buying hardware and software assets.
- *Cost Efficiency*: The cost-effectiveness or cost reduction is one of the primary reasons why cloud computing is important for business. Cloud computing has become a game-changer in the corporate world. A cloud computing platform allows businesses to access services on a need-basis. Cloud computing makes applications and data accessible through the Internet and cuts down costs.
- *Agility*: In today's business environment, it is necessary to stay competitive. One way to make organization different from others is the ability to respond to customers' fast changing needs. Cloud computing can achieve this in a more effective manner. Due to the availability of the Internet, cloud computing operates around the clock.
- *Effortless Maintenance*: Cloud computing is easy to maintain. The code maintainability in cloud computing is pretty high, enabling organization-wide coordination.
- *Data Security*: Contrary to popular opinion, using a cloud platform is a very secure method for storing your data and operating your business. It is difficult to manage your own data security without substantial resources. Cloud computing provides a high level of security when it comes to both public and private clouds. It saves the data and ensures zero data breaches. Cloud service providers typically invest heavily in security measures to protect their customers' data and applications. This includes firewalls, data encryption, and regular backups, which can help businesses to ensure the security of their critical data and applications.
- *Collaboration*: Collaboration is integral in cloud computing because it enables all the team members to work together irrespective of location. Cloud computing provides an optimal solution to help teams work faster and at ease. It is one of the most effective ways to improve team performance.
- *Quality Control*: Poor quality control is detrimental to the success of a business. In a cloud-based system, all documents are stored in one place and in a single format. With everyone accessing the same information, you can maintain consistency in data, avoid human error, and have a record of any revisions or updates.
- *Automatic Updates*: Nothing is more irritating than having to wait for system updates to be installed. Companies that run their own IT infrastructure have to handle software updates from time to time. Cloud-based applications automatically refresh and update themselves. This saves valuable IT staff time.
- *Innovation*: This is directly tied to business growth. Using legacy technologies can hinder an organization's ability to both experiment with new solutions. Using the cloud as an infrastructure base for innovation can lead to improved performance, lowered costs, and increased agility. Cloud computing has enabled the IoT industry to innovate, create, and produce new products that are changing the world.
- *Rapid Elasticity*: One of the key benefits of cloud computing is the ability to have a flexible computing service which can expand or contract according to business demand. Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in.

- *Disaster Recovery:* As Murphy's law goes, anything that can go wrong will go wrong. One of the problems of old legacy IT infrastructure is that it is likely to be more prone to failing. Downtime is never good for a company. It can result in low productivity, revenue, and brand reputation. Luckily, operating in the cloud will give you peace of mind when disaster strikes because you will still have access to your data since all of it is stored remotely on third-party servers. Regardless of the disaster or setback, cloud applications will give your company a sense of resilience against the elements.
- *Customer Experience:* The customer experience is of vital importance today, and consumers now expect businesses to be much more attentive to their needs. Cloud-based solutions can enable businesses to deliver better customer experience. Businesses that succeed in doing this are much more likely to establish long-term customer relationships.
- *Communication:* This crucial to success in business, and the cloud has made it a lot easier to collaborate with colleagues and clients all over the world. Cloud computing can enhance collaboration by fostering better communication.
- *Reliability:* Many service providers offer round-the-clock service that results in system outages that can cause momentary devastating or monetary losses. To ensure that your system is reliable at any time, it is important to have stringent plans in place to monitor key performance and operational aspects.

Some of these benefits are shown in Figure 5 [13]. Other benefits include [14]:

- Easy to set up and use immediately.
- Easy to share access with multiple staff members in the work environment and remotely.
- Easy to share documents and business records with your professional service providers (e.g. accounting, legal).
- Apps for most common business software are available for tablets, mobile phones, and other devices.
- Software versions are updated regularly.
- Many common business tools are compatible with and interact seamlessly with other tools and digital platforms.
- Does not require expensive networking infrastructure in your business premises (e.g. a network server, backups, highly skilled staff).
- Can provide storage infrastructure and data back-up.
- The software can remain up and running during a natural disaster or other incidents.

CHALLENGES

Cloud computing comes with significant benefits, but also some business challenges. It has led to immense business growth because it makes applications and data accessible through the internet and cuts down costs. While cloud technology can prove to be a great asset to your company, it could also cause harm if not properly implement or used. Other challenges include the following [15,16]:

- *Less Control:* Control is one of the factors that contribute to the success of a business. Using cloud computing implies less control over your company's software, systems, and computing assets. With less oversight and control, it becomes harder to assess security system efficiency. There will always be things that are completely out of your control.

- *Security*: This has always been a major concern with the cloud especially when it comes to sensitive medical records and financial information. While regulations force cloud computing providers to shore up their security and compliance measures, security still remains an ongoing issue. Many organizations have security concerns when it comes to adopting a cloud-computing solution. It is hard to know that files, programs, and other data are protected. If you can remotely access your data, then what is stopping a cybercriminal from doing the same thing?
- *Training*: Implementing any new technology requires training personnel. Initially, one may also encounter resistance among some employees, especially those unfamiliar with cloud technology.
- *Data Loss*: Data loss and leakage are the biggest cloud computing security concern. Cloud data can be lost if the cloud provider accidentally deletes it, if there is a physical catastrophe like a fire or earthquake that damages remote servers, or if an encryption key is lost.
- *Costs Incurred*: The cloud can be a costly affair and then you would have no choice but to keep the big bucks coming in order to maintain your virtual presence. Due to budget constraints, you may have to think twice before adopting a cloud platform.
- *Inflexible Nature*: Migration can become difficult for an entrepreneur who would like to move from provider to provider.
- *Lack of Expertise*: One of the challenges companies face is using cloud computing is a lack of expertise. The need for expertise continues to grow. This challenge can be minimized through additional training of IT and development staff.
- *Compliance*: This is an issue for any business that uses backup services or cloud storage. Every time a company moves data from the internal storage to a cloud, it must be compliant with official regulations and laws. Every business must ensure compliance standards and regulations are respected and carried out.
- *Compatibility*: Not all applications and data are compatible with cloud computing, which can result in compatibility issues for businesses.

These challenges must be addressed if cloud computing is to achieve its potential in the business environment.

CONCLUSION

Cloud computing is the latest major evolution in computing. It is one of the main technologies driving the way we work and play. More and more companies are increasingly rely on cloud services and data centers for their daily operations. Most companies are accessing the cloud to enhance their ability to share files internally to employees or externally to customers. Today, cloud computing is revolutionizing businesses and their operations. It is receiving a great deal of attention from individuals to the US government. It has captured the attention of today's CIOs, offering huge potential for more flexible and cost-effective IT operations. For more information about cloud computing in business, one should consult the books in [17-26].

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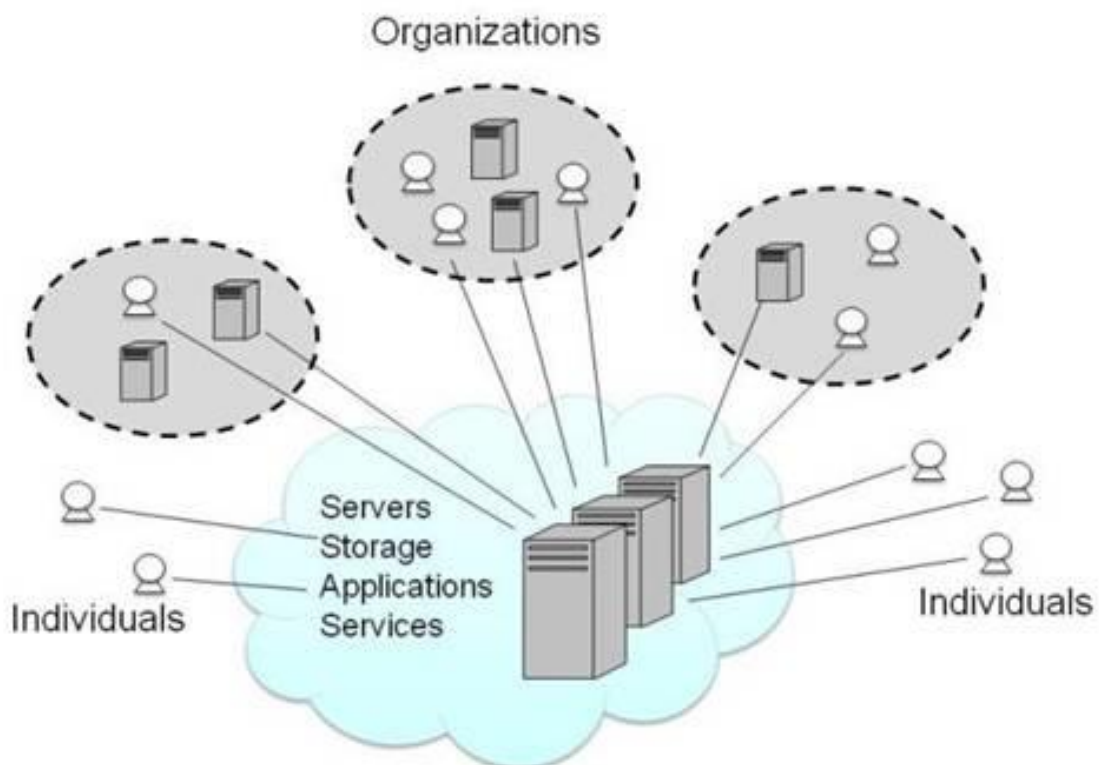


Figure 1 A typical cloud computing model [2].

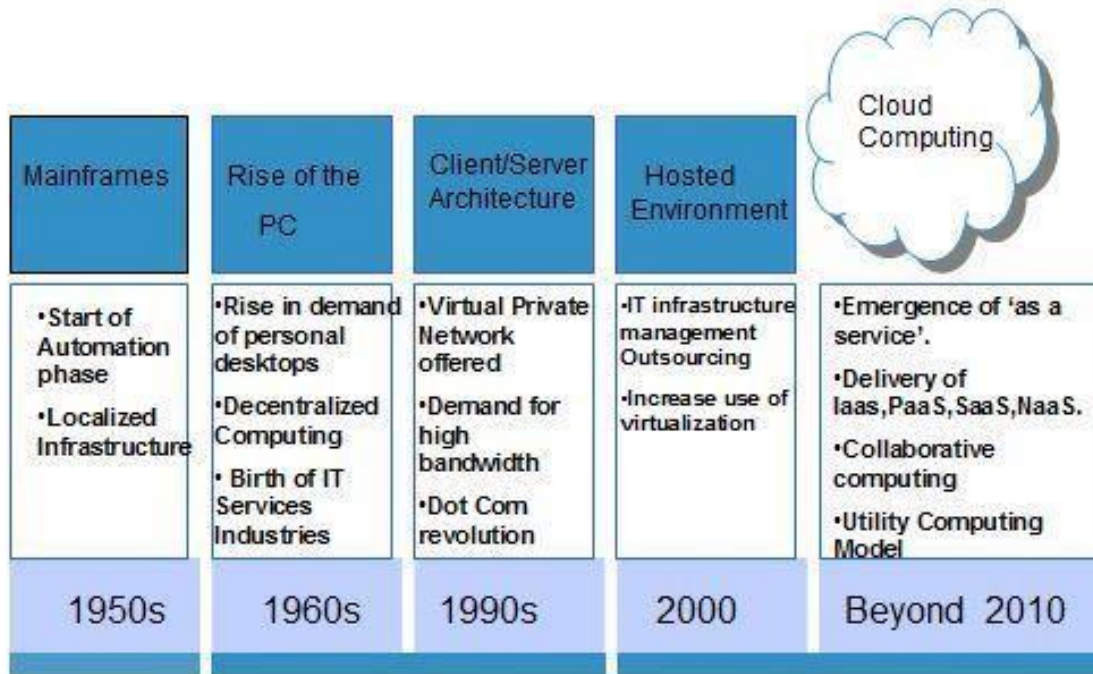


Figure 2 A brief history of cloud computing [3].

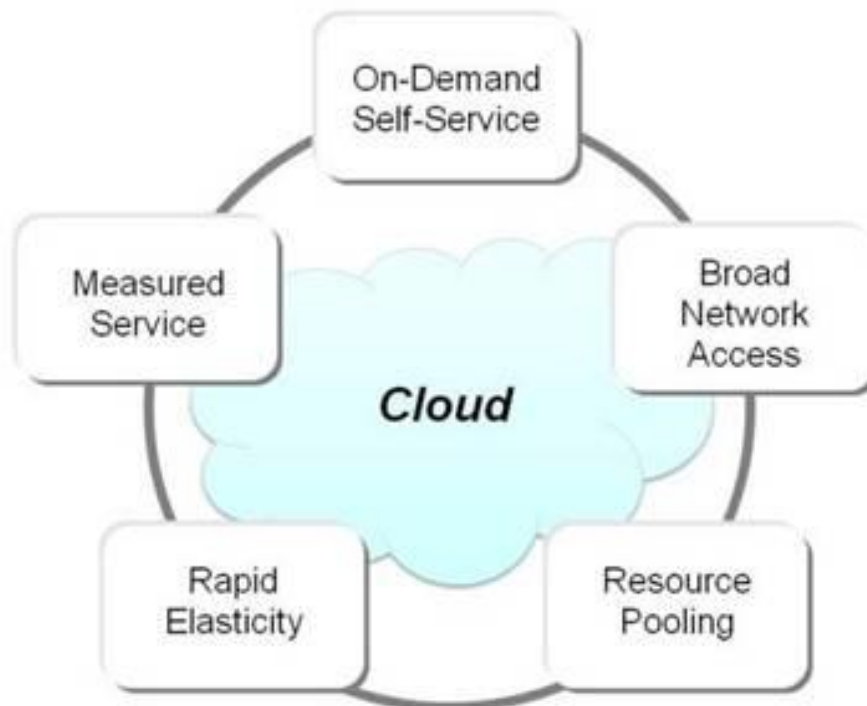


Figure 3 Essential characteristics of cloud computing [3].

Cloud Computing Structure

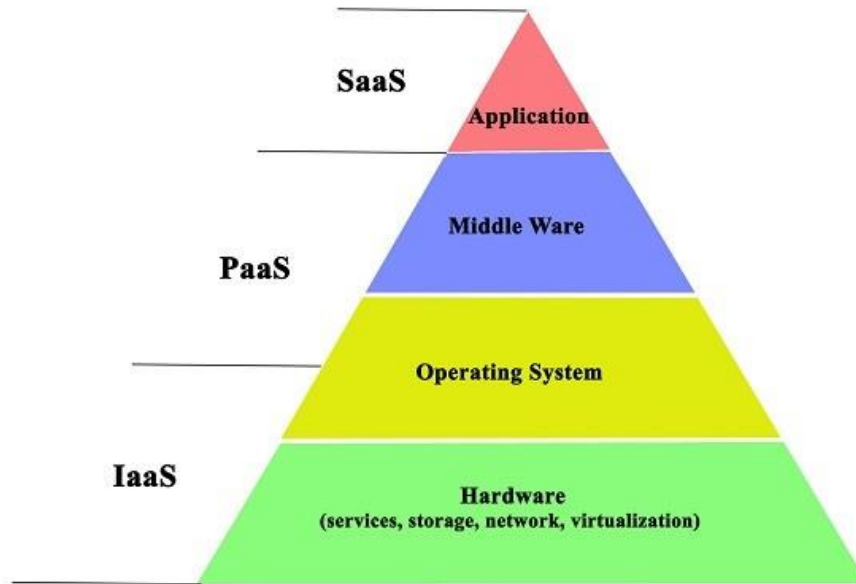


Figure 4 Cloud computing types [1].



Figure 5 Some of the benefits of cloud computing in business [13].

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