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Impact of Cloud on Small Scale Enterprises

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Abstract - **In today's complex and dynamic market environment, Cloud computing is playing a key role and increasing drastically. Cloud computing is important and essential for the business to maintain and reduce their IT infrastructure costs. In this period most of the small enterprises are interested in cloud adoption, to maintain their infrastructure and enable to continue their operations seamlessly. Small Enterprises can access high level and updated IT services by selecting the required cloud services like SaaS (Software as a Service), PaaS (Platform as a Service) and IaaS (Infrastructure as a Service). Aim of this paper is to explain the influence of the cloud computing technologies on small enterprises, which mostly uses Traditional IT methods and impact of cloud in terms of capital expenditure, Availability, Security and Efficiency. These organizations are facing some challenges during migration to cloud and we have included some solutions to overcome those challenges. This research results helps small enterprises to decide whether to adopt cloud for their organization.**

Keywords – Cloud Computing, Enterprises, Productivity, Security, Service models, Cloud Impacts, Cloud Adoption.

I. INTRODUCTION

In today's digital age, cloud computing is a trending technology that is adopted by many companies to grow their business heights. In the era of a swiftly growing remote workforce, shifting to the cloud is almost a no-brainer. Simply, we can say that cloud computing means that we can manage, access, and store data over the internet instead of using a computer's hard drives, data centers. Cloud computing has drastically changed the way of serving the resources from one end to other in delivering on-demand computing resources on a pay-for-use basis. It is a way to store all the future data and run many more activities in almost all kinds of IT sectors. According to the latest statics, the total number of cloud users is about half of the total population of the world.

Cloud computing got popular over the past five years. As a matter of fact, that many people are unaware that cloud technology is being used in their routines. For example, streaming online applications to watch digital content, banking applications to check your details... so on, all these operations are done via the cloud. Due to the evolvement of business technologies and technological sectors There is huge competition in the business sector, where small businesses are less competitive. The main reason for small-scale businesses not being competitive is due to a lack of access to modern technology to perform operations. Small Businesses are one of the backbones of any country's economy, as they provide many opportunities and serve as engines for growth and innovation. They have the ability to produce products at a low cost and they can provide employment to a large number of local people. There are a lot of barriers for this business that can be solved by adopting an advanced and effective IT infrastructure. Cloud computing is the exact way to overcome all these barriers, which will produce efficient output.

II. CLOUD OVERVIEW

Cloud computing is a concept of supplying a convenient set of organized software and hardware services like storage, server, and network on on-demand premises. According to the NIST (National Institute of Standard and Technology), cloud computing has three service models, which are SaaS(Software-as-a-Service), PaaS(Platform-as-a-Service), and IaaS(Infrastructure-as-a-Service). By using cloud services, customer can ultimately reduce the cost of software and hardware, increases adaptability, becomes more flexible and scalable over the data. There are four cloud deployment models, which are public, private, hybrid, and community cloud. These deployment models represent the types of cloud environments so that customers or organizations can adopt them accordingly to their needs.

A. Cloud computing services/ delivery models:

Cloud computing offers various types of service models to cloud customers as on-demand. IaaS (Infrastructure-as-a-Service), PaaS (Platform-as-a-Service), SaaS (Software-as-a-Service) are the three main cloud service/delivery models which cover the basic and primary structure of the cloud. These cloud service models are less cost-effective when compared to the Traditional IT method. Fig 1 shows the outlines of different responsibilities and tasks maintained by the cloud provider and customers.

1. SaaS (Software-as-a-Service) is developed with the needs of end-users to access applications over the internet or web browsers without installing any software or applications into their systems. This service doesn't need any maintenance or control of the primary requirements like network, server, operating system, and storage in cloud infrastructure. Most of the SaaS applications run directly over the internet to eliminate the need for download and installations and, it provides as pay as you use pricing process. This application mainly allows businesses to run fast and scale their operations. Some examples of SaaS are Microsoft Office 365, Salesforce, Cisco WebEx, Google Apps.

2. IaaS (Infrastructure-as-a-Service) is developed with the need of networking and storage to manage their IT infrastructure. Customer manages Operating System, memory, CPU, IP addresses, middleware, deployed applications. It eliminates the capital expenses by building internal infrastructure and, it provides infrastructure on-demand to the customers. Cloud providers manage the physical edge of infrastructure in a data center, but they allow customers to customize those virtualized resources to meet their specific needs. Customers get drastically reduce in their IT expenses while managing highly competitive in their industry. Some examples of Iaas are Amazon EC2 and S3, DigitalOcean, Cisco Metacloud, Google Compute Engine (GCE).

3. PaaS (Platform-as-a-Service) is developed mainly for application developers. By using Paas, application developers can create, develop, test, deploy, and can maintain their web applications and software's over the internet without installing any software on their computers. It is costly to develop multiple platforms using many tools and software, PaaS provides a cheaper alternative. It is beneficial for any company which develops web-based software and applications. Customers can have access to the development tools and deployed applications by using this service. Some examples of PaaS are AWS Elastic Beanstalk, Apache Stratos, Google App Engine, Microsoft Azure, OpenShift.

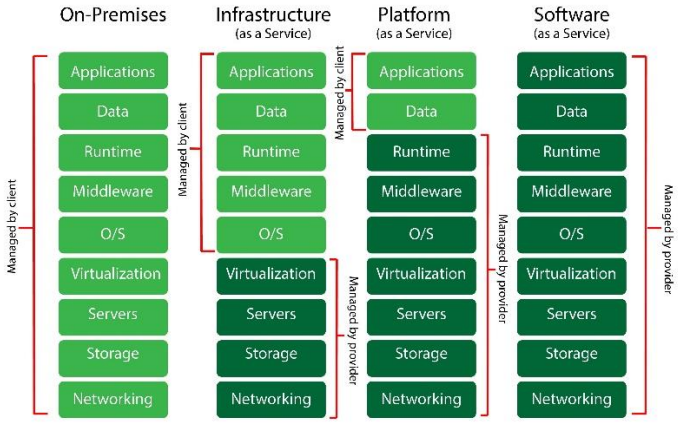

Fig.1 Cloud computing delivery models

B. Cloud development models:

The cloud deployment model characterizes the type of access, size of an organization, elasticity, resource pooling and also narrates the nature and purpose of the cloud. The selection of cloud deployment models depends on organization requirements.[1]

Types of Cloud deployment Models:

1. Private Cloud: It is also termed as "internal Cloud" infrastructure that allows accessibility of systems and services within a specific organization or group and is dedicated to a particular organization that is not shared with other organizations. This cloud platform is implemented in a secure environment that is guarded by advanced IT surveillance and Firewalls. Private Clouds are Flexible, service-based and in the private cloud, there are no additional security regulations, legal requirements, or bandwidth limitations. It can be managed by the organization or a third party and exist on-premises or off-premises which means it is only permitted to only authorized users via Intranet as shown in the figure, providing great control over data and its security. Companies that require dynamic, critical, secured demand-based requirements can adopt a private cloud.

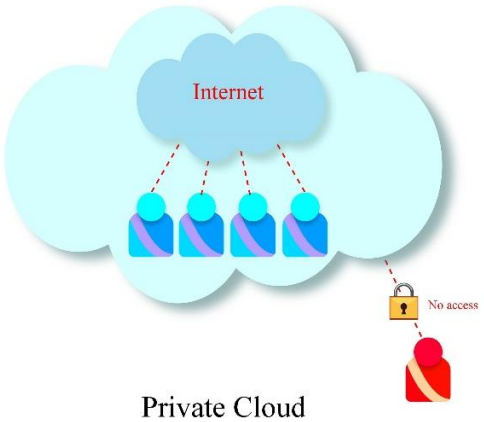

Fig.2 Private Cloud

2. Public Cloud: It is also termed as 'External cloud' infrastructure that allows accessibility of systems and their services to the public or a large industry group, which is offered via web applications as well as web services over the internet as shown in figure [2]. This cloud service is open for use. The public cloud enables an elastic and cost-effective way to deploy IT solutions. From the technical point of view there are only few differences between public and private cloud. Public cloud involves few applications such as Customer relationship Management (CRM), messaging, and office productivity. Public cloud is better suited for business which manages the load and it is economical due to less capital overheads. Some popular companies like Google, IBM, Amazon are providing public cloud facilities to their clients.

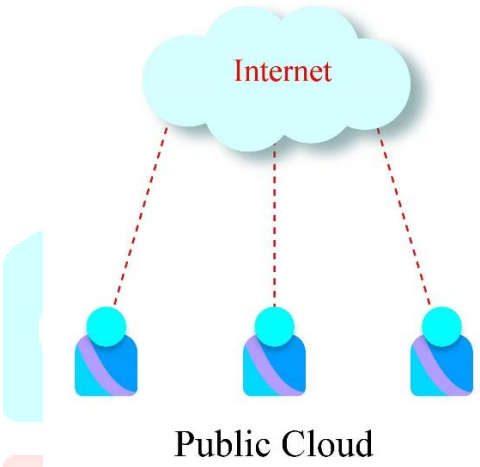

Fig.3 Public Cloud

3. Hybrid Cloud: It is another cloud deployment model type that exists due to mixed requirements of Organization? It is an integrated deployment type i.e. It can be a combination of two or more cloud service deployment models i.e., Private, public, or community combined as one architecture, but remain individual entities as shown in figure [3]. The tasks which are non-critical such as development and test workloads are hosted in the public cloud. In contrast, the tasks which are critical like sensitive data such as organization data are hosted in the private cloud. The purpose of the combination of public and private cloud is to keep business-critical data and services in control of the private cloud and outsourcing less-critical processing to the public cloud.

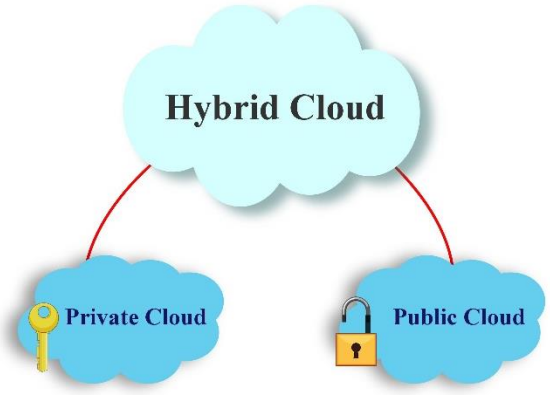

Fig.4 Hybrid Cloud.

4. Community Cloud: Community cloud is another type of cloud deployment model which is a shared infrastructure by several organizations that belong to the same community or area and support a specific community that has shared concerns government agencies[2]. It can be managed by a third-party by developing a multi-tenant setup using cloud among different organizations that belong to a particular community or area.

III. Positive Imapact of Cloud

Automatic Upgraded in software/ hardware: The main problem for IT organizations is financing the high cost of purchasing and maintaining the hardware and software. The organization can shift its capital expenses to operating expenses[3]. It not only reduces the cost, but it can also help in better relationships. Having advanced technologies can increase profit and provides low-cost services to the customers.

1. Cost Reduction: By using cloud computing, the organization can reduce the expenses of the resources, which are used when they are needed. The organization pays only for what they use when they are access to cloud services. There is also no need for infrastructure to purchase, thus it reduces the maintenance and also initial expenses.
2. Flexibility: Clod providers different types of flexibility to their customers. Customer can access the data whenever and wherever they want as long as they have an internet connection. Customers can decide which services they need and suitable for their organizations and, they can pay accordingly. There is also easy testing and deployment of services over the cloud.
3. Scalability: It allows the customer to adjust their resources based on their need of organization's needs [4]. It helps to solve and increase customer satisfaction and, also resources are available quickly. Especially for the small organizations, they can expand the resources and additional services when they need them.
4. Increased storage: Some cloud offer storage as a service so that an organization can store a lot more data on the cloud. They can scale up their business effortlessly by getting more storage from cloud providers whenever business grows and need more storage.
5. Disaster Recovery: Companies that are using cloud services need not worry about any failure recovery

plan or complex disasters because cloud providers take care of such issues [5].

IV. CHALLENGES

One of the challenges which impact while migrating to the cloud is interoperability. It speaks about the capacity of at least two devices or applications connected to migrate their services, data from one end to another. The problem comes here in the capability of the cloud that it can stand and be compatible with most of the service providers. In another case, if we move some data or any service from one end to another, then whole data is transferred which depends on the capability of the cloud. The proper security and safety should be provided when the data is transferring from one cloud to another [7].

A. Security and privacy:

Security is the main problem in the cloud, even though it has various features to provide, but it is still lagging when it comes to security. Everyone is using the cloud to store their sensitive and valuable data files. The cloud service providers are responsible to keep our data safe and secure. As we are accessing the cloud over the Internet, there are many chances of our data getting hacked or it may undergo many attacks like data breaches, cyber-attacks. So, to overcome all these things, we must ensure that our cloud service provider is following all security policies and, we should have proper agreements related to their security services.

B. Portability:

It is also one of the biggest challenges that the cloud is facing nowadays. Portability defines the moving of the applications or information from one CSP to another CSP. The migration may include software or any applications, so they should be potable in the environment provided by the cloud. It is sometimes exceedingly difficult that language or standards used by one cloud service provider are different from another cloud service provider where we lose our portability feature.

C. Vendor Lock-in:

Vendor Lock-In is another big issue where a situation comes that the customer wants to become dependent. So due to some reasons, they want to quit the use of cloud, they wanted to move or transfer from one cloud service provider to another cloud service provider but, they cannot do anything in that situation. If the system and services of the cloud are from the same place and if licensed data protocols, rules are applied between system and cloud service provider, then the client may be tied to a particular cloud, stopping the use of another cloud [6].

V. SOLUTIONS TO OVERCOME THE CHALLENGES

- To avoid the problems related to the multi-tenant architecture, the cloud provider must execute the idea of segmentation and isolation in their cloud infrastructure.
- Every time the data shifts from the local server to the cloud server. To avoid snooping while sharing the data, we have to encrypt it first. If our data is in encrypted form, then hackers can only see trash if they hacked it.
- By implementing the honey pot systems into the cloud infrastructure, we can avoid Distributed Denial of Service (DDoS) attacks. By developing dedicated applications of cloud services by the cloud providers, avoids phishing attacks and also other threats which arise due to defects in the web browsers.
- The companies should hire skill and experience cloud experts because when the companies are migrating to the cloud, there should be a skilled team who can handle the technologies efficiently.
- To choose a cloud provider, we need to understand the business requirements and which services we want. Also, customers need to understand the services offered by cloud providers. Cloud providers must prepare a valuable Service Level Agreement (SLA) that needs sign by the customers after proper verification. The SLA builds trust and communication between the cloud customer and the cloud provider [8].

VI. CASE STUDY

As technology becoming more advanced day by day, but small businesses are lacking in the advancement of technology. There is a company called "X" where it wants to provide the latest technology products to customers, so after a lot of research, they decided to migrate to the cloud. There is a difference in the quality of the product after migration. Previously when are using a traditional technology where most small-scale businesses were using, there were a lot of challenges in developing a product for employees. There is no platform to share the details with the employees. The speed of data transfer was extremely low, and they used to do it in person. There were very few opportunities for employees if they wanted to work from home. The cost of storage was very high and limited. After migrating to the cloud, the production level has been raised and delivering quality products. There are numerous ways for employees to communicate and transfer files. In pandemic times, cloud computing provided many possibilities for employees to work from home.

The positive impact of cloud on above small-scale enterprises:

- When these organizations rely heavily on the cloud, for instance, a software organization can use google mail/ slack for communication, Figma for design, GitLab for code. If they wanted to run their infrastructure to manage these, they would need a dedicated server. It is cheaper and better to use cloud services per month.
- Organizations host their client apps and the software they build for clients on lower-cost servers that they rent from various cloud providers such as Digital Ocean, Amazon, and Google. If they want to run these services again, the cost is high, especially if they want to run a complete data center.
- Since most of the data is on the cloud, it significantly decreases the risk of losing all data. Now we can expect that data is easy to access by simply inviting a colleague or client.
- Cost-wise, to set up everything from scratch would easily be 100x our monthly cost. With many disadvantages, it is extra overhead to take care of everything, even basic things like 24/7 power with multiple virtual backups.
- Small businesses can get started quickly with lower (in some cases it is free) prices, which earlier needed for big businesses (like Infosys has its servers they had to set up earlier).
- Businesses are far more competitive now - clients do not care too much about infrastructure and expect everything to move quickly online. Telling a client that you will post a DVD or USB drive is not

acceptable. They expect an email with a 10 GB file to arrive in minutes.

- Building an application is also easy (or at least the physical layer is easy), and they now have the expertise in running off the cloud and focusing more on solving clients' problems than infrastructure ones.
- In pandemics like corona, cloud computing is being used heavily by businesses. While working remotely, all businesses rely on cloud services for communication.
- Cloud computing is used for collaboration at work because it provides a common platform for working and managing the workforce and for communication with clients and for presenting the work to the clients.

The challenges of cloud on a small-scale enterprise:

- Data confidentiality is low because we are storing data on a cloud server. User data can be accessed by other people, hacking chances are high compared to traditional servers.
- Internet dependency is high on the cloud. Cloud computing machines will be disconnected if the internet connection is lost. The drawback of the public cloud is that everyone can access the same server, which increases the risk of attack and down the server.
- You must contact customer support if you have technical difficulties. We have no other option to help resolve the problem.

VII. CONCLUSION

Cloud providers offer many services like infrastructure, software, storage, security, etc. to the customers. It offers more flexibility, scalability, reliability, and security to cloud customers. Cloud providers regularly upgrade their services to provide the best quality of services to their customers.
By using cloud computing, a company easily cuts down its expenses and increases its profits. The company which uses cloud services has the benefit that they can access their information anywhere and at any time from any device. Security is the main problem in the cloud even though it has various features to provide, it is still lagging when it comes to security. There are different challenges by adopting to the cloud but can minimize by using some encryption techniques, proper selection of cloud provider, implementing and executing developed applications, etc. Small scale businesses are equally important as large-scale businesses, where they provide many opportunities to local people. But the productivity level of small businesses is less due to a lack of awareness and access to the cloud. There are numerous benefits for small businesses if they are using the cloud or want to adopt the cloud services, especially in times of pandemic, where employees work seamlessly from their homes. In contrast to benefits, there are some challenges also in adopting the cloud. But these small businesses will have less impact of challenges where security is the major challenge for cloud computing which will create less impact when compared to large-scale business. Overall, there is a positive impact on small-scale businesses while adopting the cloud.

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