A STUDY OF CLOUD COMPUTING SERVICES AND USE IN SMEs

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CHAPTER- 1

INTRODUCTION

1.1 CLOUD COMPUTING

Cloud computing is the emerging technology. Cloud computing provides easy access and high-performance computing on the data.Another major challenge that today software companies face, are storage of data at affordable cost and make available all the time.

Day to day, the usage of data in the computer has been increasing from common man to organization. The question arises where to store the important data, how to share the data, how to access the data globally, how to manage the data, how to make data available all the time, how can all these be achieved with reasonable cost? The answer to all these questions is cloud computing. The National Institute of Standards and Technology defines Cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction.

1.2 BENEFITS OF CLOUD COMPUTING

The factors that make more companies to move cloud are

- Reduces the maintenance cost like no need of licensed software fee for each system, the purchase of new hardware and software is reduced.
- Access to the application can be done anytime, anywhere provided that they should be connected to internet.
- Scalable
- Improves Flexibility
- Disaster Recovery
- As the services are based on" Pay per use", capital expenditure can be reduced
- User Friendly Environment
- Quick Deployment
- Less Energy Consumption

1.3 CLOUD SERVICES

The services of the cloud can be classified into the three categories namely:

1. Software as a Service,
2. Platform as a Service,
3. Infrastructure as a Service.

All the services are based upon the "Pay-per-use" model.

Software as Service: In SaaS, an application is hosted by service provider and then accessed via the world wide web by a client. These are mainly designed for end users. Customers need not install the application on the local computer there by eliminating installation and maintenance cost. The updating of software is taken care by the SaaS provider. Most of the SaaS solutions belong to multitenant architecture. As the software is managed at central location, customer can access to the application at any time and place, the only thing required is access to the web. Usage of SaaS is beneficiary when there is significant need for mobile or web access like mobile sales management software, significant interplay between organization and outside world like email, applications like tax or billing software used once in a month.

Platform as a Service: With this kind of servicing facilities, provided, one can deploy the application without installing the platform on the local system that is software can be deployed in cloud infrastructure. The main benefit of using PaaS is that developer need not worry about the platform updates, storage. These features are taken by PaaS providers. Some PaaS providers provide prebuilt functionality so that users can avoid building everything from the scratch. Some of the PaaS providers also provide online community where developers can share best practices can get ideas, seek advice from others. The implementation of PaaS is different from one provider to another provider.

Infrastructure as a Service: Unlike SaaS and PaaS, IaaS provide hardware resources as service. The resources include memory, servers, networking devices, processing power. These are used to deploy the application. Multiple users can use infrastructure through the use of virtual machines. In order to manage these virtual machines, a governance framework is required,which helps in avoiding uncontrolled access to the user's sensitive information. Utilization of this service will help in reducing the initial investment in company's hardware. The service is based on "pay-peruse" model. Amazon Web Services EC2 and S3 are best examples for IaaS.

1.4 DEPLOYMENT MODEL

The Cloud services can be deployed in any one of the four following ways depending on the customer requirement. Each model has its advantages and disadvantages

1. Public Cloud: In this model, general public can access the services, storage, application offered by the provider. Pubic clouds are owned and managed by the third- party service providers. Flexibility, elastic environment, freedom of self service, pay-per-use, availability, reliability are some of the characteristics of public cloud. The main drawback of this model is lack of high level security. Ex: Amazon Elastic Cloud Compute, Google App Engine, Blue Cloud by IBM.

2. Private Cloud: This model provides access to the systems and services within an organization. Industries like finance mainly opt to this model, where security is the primary concern. Data stored in private cloud can only be shared among the users of an organization. There are two types of private cloud namely, On-Premise Private Cloud, Externally-Hosted Private Cloud .The disadvantage of this model is ,it is difficult to deploy globally. Amazon Virtual Private Cloud, Microsoft Private Cloud are some of the examples of this model.

3. Hybrid Cloud: It is the combination of both public and private cloud. Scalability, cost efficiency, Security, Flexibility are the features of Hybrid cloud.

4. Community Cloud: Organizations with similar interest and requirements share the cloud infrastructure. It provides better security when compared to public cloud. This may be managed by either internally or third party.

1.5 CLOUD STORAGE

Cloud storage is a service that maintains data, manage and backup remotely and made data available to users over the network.There are many cloud storage providers. Most of the providers provide free space up to certain gigabytes. For ex: DropBox provide free space up to 2GB, Google Drive, Box, Amazon, Apple Cloud provide free space up to 5GB, Microsoft SkyDrive provide free space up to 7GB.Customer have to pay amount according to the plan if they cross the free space limit. Features like maximum file size, auto backup, bandwidth, upgrade for limited space differ from one provider to another provider like maximum file size in DropBox is 300MB where as maximum file size in Google Drive is 1TB . By using cloud storage service, customers need not invest on storage devices, even technical support is not required for maintenance, the storage, backup, disaster recovery. The concept of cloud storage in not worth when the client is able to store and manage the data at low cost when compared through the use of cloud .So, the cloud should be designed in such a way that it is cost effective, autonomic computable, multi-tenant, scalable, available, control, efficient.

1.6 CLOUD STORAGE STANDARDS

Storage Network Industry Association TMpublished CDMI in the year 2009.This supports both Legacy and New applications. Cloud storage standards define roles and responsibilities for archiving, retrieving, data ownership. This also provides standard auditing way so that calculations are done in consistent manner. These are helpful to the cloud storage providers, cloud storage subscribers, cloud storage developers, cloud storage service brokers.By using CDMI, cloud storage subscribers can easily identify the providers according to their requirements. Even, the CDMI provides common interface for providers to advertise their specific capabilities so thatsubscribers can easily identify the providers.

1.7 GENERAL CLOUD STORAGE ARCHITECTURE

Cloud storage architecture consists of front end, middleware, back end. The front end can be webservice frontend, file based front end, and even more traditional front ends. The middleware consists of storage logic which implements various features like replication, data reduction, data placement algorithms. The back end implements the physical storage for data. The access methods for cloud are different from traditional storage as the cloud holds different type of data of different customers. Most of the providers implement multiple access methods.

1.8 VIRTUAL STORAGE ARCHITECTURE

An important part of the cloud model is,the concept of a pool of resources that is drawn from upon the demand in small increments.The recent innovation that has made this possible is virtualization. Cloud Storage is simply the delivery of virtualized storage on demand. This architecture is based on Storage Virtualization Model. It consists of three layers namely

1.Interface Layer: In Interface Layer, Administrator and users are provided with the interface modes that may include icommands, client web browsers. In the client interface, user requests are sent to the Resource Based Services and Meta-Based Services. These services are present in the Under layer. Resource based service control resource scheduling, whereas Meta-based Service manages the Meta data.

2.Rule and Metadata Management: The Rule and Metadata Management layer consists of 2 parts-Upper layer and Under layer. The upper layer consists of separate interface for client and admin. Both interfaces have different rights. Rule is created from the Operating Transactions.

3. Virtual Storage Management: Physical device virtualization and data/ file request load balancing is taken care by the Virtual Storage Management layer. Parameters like bandwidth, rotating speed etc are maintained by URM. System maintains a table holding these parameters and also routing table. After analysing all resource nodes, system will assemble the collection in logic space and structure a global space at last. If there is data/file write request, system invokes write operation. Similarly, Replica routing module is invoked when there is need to balance the load. Replica module is implemented by using Fair-Share Replication algorithm. Based on the access load factor, this algorithm will identify the best candidate nodes for replicas replacement.

This paper presents the key technologies and virtual storage architecture in cloud. Cloud storage is more advantageous than traditional storage because of its availability, scalability, performance, portability and its functional requirements. Implementing virtualization in the cloud storage improves the scalability, availability but at the same time providing security in the virtual environment is complex. So apart from virtualization, emphasis should be given regarding security in virtual storage.

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RESEARCH OBJECTIVES

2.1 To the study on introduction to cloud storage and virtual storage architecture.

2.2 To study the reasons behind the successful market presence of amazon web services.

2.3 To study which factor affects the usage of amazon web services amongst other web services providers more.

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RESEARCH METHODOLOGY

The purpose is to identify the crucial factors that affect the continuous use of cloud computing services.

For the participants to participate in the study, they were invited via Google forms, the consent form and the interview questions were mentioned in the google form. In this phase, 23 experts were selected. 14 experts from academia and 9 IT practitioners. Experts with considerable and at least three years of experience were sourced for in order to fill the google forms. The identity information of the respondents was detached as, each participant was included for the purpose of confidentiality.

The interview questions are developed based on the existing literature. In order to continue the use of cloud computing services, the expected responses are meant to authenticate and pinpoint the utmost vital factors which affect decision makers.

For individual question in the interview, the responses are weighted the factors by 5point Likert scale from (1 = Not at all Important, 2 = Low Importance, 3 = Moderately Important, 4 = Very Important, 5 =Extremely Important). Open-ended questions were also included in the interview survey to develop the list of validation criteria, to get more factors apart from the identified factors and to get the implicit facts from the experts. Nevertheless, there are no new factors found through the interview survey.

The following are the ten factors which are the most substantial factors that affect the continuous use of cloud computing services:

1. Reduces the maintenance cost.
2. Access to the application anytime.
3. Scalable
4. Flexibility
5. Disaster Recovery

6. Pay per use
7. User Friendly Environment
8. Quick Deployment
9. Less Energy Consumption
10. privacy and security

The results from this research will provide a better understanding of the factors affecting the continuance intention to use cloud computing services. In addition, the findings of this study will contribute to Information Systems continuance research by adding to the continuous use of cloud computing services the important factors which affect decision makers

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ANALYSIS

The foundation upon which priority is established for each factor was median rank.

The median was preferred to the mean for its heftiness to the skewed distribution of the priority ratings.

From the expert's viewpoints, the values allotted to each factor are from a ratio scale of 1 to 7 where 1 represents the lowest importance and 7 represent the highest.

FACTORS	MEAN	MEDIAN	RANK	%
Relative advantage	5.870	6	3	83.851
complexity	5.609	5	6	80.124
Percieved security and privacy	5.522	6	8	78.882
Compatibility	5.870	6	4	83.851
Top managers support	6.000	7	2	85.714
Cost reduction	6.565	7	1	93.789
Competitive pressure	5.565	6	7	79.503
IT readiness	5.478	6	9	78.261
Firm size	4.609	5	16	65.839
Vendor support	4.913	5	15	70.186
Government support	5.478	6	10	78.261
Triability	5.174	5	13	73.913
Perceived reliability	5.087	5	14	72.671
Perceived availability	5.391	6	11	77.019
Uncertainty	5.261	5	12	75.155
Perceived trust	5.652	6	5	80.745

The greater score in the precedence is the most important factor with respect to the considered criterion.

experts perceived that the greatest vital factors that affect the decision makers to continue using cloud computing services in SMEs are:

- cost reduction
- top manager's support and relative advantage.
  Conceivably, cost reduction is the greatest vital factor where mean reach to 6.565 and median was 7 because the limited financial and nonfinancial resources of SMEs and cloud services offer significant efficiencies in cost to SMEs.
  Additionally, decision makers cannot disregard the significance of top managers' supports to continue the use of cloud services.
  Relative advantage is ranked third, while Vendor support, perceived reliability and Trialability did not play the key role for the continuous use of cloud computing services.

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CONCLUSION

Identifying the factors that affect the constant use of cloud computing services is crucial for it will help the decision makers in SMEs to upturn proficiency, observe their performance, competitive advantages and sustainability.

The following are the first ten factors which are hierarchically arranged by the experts as the most substantial factors that affect the continuous use of cloud computing services: cost reduction, top manager's support, relative advantage, compatibility perceived trust, complexity, competitive pressure, perceived security and privacy, IT readiness and government support. Those factors will be categorized based on Technology–Organization–Environment (TOE) framework

FACTORS CATEGORIZED BASED ON TOE FRAMEWORK

Technological Factors

- Relative advantage
- Compatibility
- Complexity
- Perceived security and privacy

Organizational Factors

- Perceived Trust
- Cost reduction
- IT readiness
- Top manager's support

Environmental Factors

- Competitive pressure
- Government support

The results from this research will provide a better understanding of the factors affecting the continuance intention to use cloud computing services. In addition, the findings of this study will contribute to Information Systems continuance research by adding to the continuous use of cloud computing services the important factors which affect decision makers in SMEs.

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RECOMMENDATIONS

For small and medium-sized enterprises (SMEs), cloud computing has many advantages - mainly economic ones. As the data and applications are hosted remotely, it does away with the cost and burden of hardware and software acquisition, and maintenance. Essentially, cloud computing offers four key advantages for SMEs: flexibility, scalability, easy accessibility and pay-per-use models.

1. ECONOMIES OF SCALE

Cloud technology offers SMEs access to technologies that used to be available only to large enterprises with deep pockets. For instance, most sophisticated software like sales force automation (SFA) and customer relationship management (CRM) would have a large price tag in terms of the development or purchase cost, along with the powerful hardware to run the software, and the trained IT staff to manage the software. In contrast, many cloud-computing services have the option of a monthly payment, without the cost of upfront fees, or lock-in periods. You can be up and running in the time it takes to enter your business and payment information - all at a fraction of the cost of buying or developing this software in-house.

2. FLEXIBLE

Running software off the cloud is also extremely flexible, as it enables a lot of software to be completely web-based. For instance, running an office productivity software for word processing or spreadsheets like Microsoft Office on your local desktops or server would mean having to choose an operating system and the relevant software that runs on your platform of choice. For cloud computing, the alternative is ONEOffice, where the only requirement is to have Internet access, without the need to install application programs on corporate systems or computer desktops. This spells huge cost savings as there is no need for storage and processing capabilities, and there are gains from energy savings.

3. SCALABILITY

It is another key advantage. Given the global and competitive business environment of today, it is critical for SMEs to possess the qualities of adaptability and flexibility to react fast to market changes. Cloud based services are scalable on demand and are priced on a pay-per-use basis, where companies only pay for the IT services they consume. The pay-per-use model means companies only pay for the services that they need, and can scale up easily by paying for more users or modules when the business need arises, without heavy investments in equipment, applications or IT personnel.

4. ACCESSIBILITY

Another advantage is the easy accessibility of cloud services. As only Internet access is required to access cloud services, it is platform independent, and cloud services can be accessed anywhere, and on any device - smart phones, desktops, laptops or other mobility devices.

5. SERVICES AVAILABLE

Essentially, there are three categories of cloud services available today. They include: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS).

Ultimately, cloud computing is the technology answer to most SMEs, enabling them to utilise cloud platforms to focus on their core competencies and deliver their services reliably and without the hassle of worrying about the supporting technology foundation.