AN APPROACH OF ADOPTING CLOUD COMPUTING BY SME'S IN BANGLADESH

BY

MAMUNUR RASHID SAJAL
ID: 213-17-488

This Report Presented in Partial Fulfillment of the Requirements for the Degree of Masters of Management Information System.

Supervised By

Dr. Md. Ismail Jabiullah
Professor
Department of CSE
Daffodil International University

DAFFODIL INTERNATIONAL UNIVERSITY
DHAKA, BANGLADESH
January 2023

APPROVAL

This Thesis/Project titled "**An Approach Of Adopting Cloud Computing By SME's In Bangladesh**", submitted by Mamunur Rashid Sajal to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of MS in Management Information System and approved as to its style and contents. The presentation has been held on 24 January 2023.

<u>BOARD OF EXAMINERS</u>

Professor Dr. Touhid Bhuiyan **Chairman**
Professor and Head
Department of CSE
Faculty of Science & Information Technology
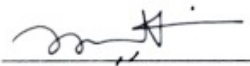Daffodil International University

Fahad Faisal **Internal Examiner**
Assistant Professor
Department of CSE
Faculty of Science & Information Technology
Daffodil International University

Md. Sazzadur Ahamed **Internal Examiner**
Assistant Professor
Department of CSE
Faculty of Science & Information Technology
Daffodil International University

Dr. Mohammad Shorif Uddin **External Examiner**
Professor
Department of CSE
Jahangirnagar University

DECLARATION

I hereby declare that, this thesis has been done by me under the supervision of **Dr. Md. Ismail Jabiullah, Department of CSE** Daffodil International University. I also declare that neither this thesis nor any part of this thesis has been submitted elsewhere for award of any degree or diploma.

Supervised by:

Dr. Md Ismail Jabiullah
Professor
Department of CSE
Daffodil International University

Submitted by:

Mamunur Rashid Sajal
ID: -213-17-488
Department of MIS
Daffodil International University

ACKNOWLEDGEMENT

First I express my heartiest thanks and gratefulness to almighty Allah for His divine blessing makes me possible to complete the final year thesis successfully.

I really grateful and wish my profound my indebtedness to **Dr. Md. Ismail Jabiullah**, **Professor**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "*Cloud Computing*" to carry out this thesis. His endless patience ,scholarly guidance ,continual encouragement , constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior draft and correcting them at all stage have made it possible to complete this thesis.

I would like to express my heartiest gratitude to **Dr. Md. Ismail Jabiullah**, **Professor**, and Department of CSE for his kind help to finish my thesis and also to other faculty member and the staff of CSE department of Daffodil International University.

I would like to thank my entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, I must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Cloud computing is rapidly emerging as one of the most talked-about and potentially transformative areas in IT. It provides a number of options that might enhance a company's operations and make better use of technology. There has been a recent uptick in the use of cloud computing by many companies. Companies are struggling to stay afloat because the old methods of doing business are no longer effective enough to keep them in the game. In today's cutthroat business climate, the need to act swiftly on customer requests has never been greater. Strategic concepts can't be implemented to generate competitive advantages without the organizations. As a result of its improvements, cloud computing has emerged as an indispensable tool for modern enterprises. Because it's a novel approach to boosting corporate value, it's a great technology tool that keeps businesses competitive. Users and customers are given the option of combining and integrating several services, so boosting their own inventiveness and efficiency. The cloud's low entry barrier means that even the smallest businesses may benefit from its processing power. Exploring how small and medium-sized enterprises (SMEs) see cloud computing. The advantages and disadvantages of using cloud computing are examined. We'll select the most suitable cloud computing service by thinking about the organization's size and mission. The study will focus on the benefits of cloud computing for Bangladesh's SMEs

Table of Contents

©Daffodil International University

CHAPTER 8: CONCLUSION

ABBREVIATIONS

SaaS	Software as a Service
Paas	Platform as a Service
IaaS	Infrastructure as a Service
DoS	Denial of Services
MFA	Multi-Factor Authentication

<center>**CHAPTER-01**</center>

<center>**INTRODUCTION**</center>

1.1 Overview:

One of the most exciting and rapidly expanding fields of technology is cloud computing. In a number of ways, it allows businesses to enhance their operations and make better use of technology. The use of cloud computing has been rapidly embraced by numerous companies. Organizations struggle to thrive in the face of stiff competition and outdated methods of operation. It is crucial for businesses to be able to quickly react to customer needs, especially in the current market. To put strategic concepts into action and gain a competitive edge, the organizations are essential. In recent years, cloud computing has emerged as a crucial tool for modern enterprise. It's a cutting-edge approach to boosting company value that helps businesses maintain competitiveness. Users and consumers are given the option of combining and integrating a wide variety of services, which boosts both innovation and efficiency. The curiosity of businesses has been piqued by the many benefits that cloud computing may bring, including more adaptability, scalability, agility, cost savings, and productivity gains. This has led to an increase in the number of businesses moving their infrastructure to the cloud. Businesses have found that adopting and implementing cloud computing practices yields annual revenue increases. The global market for cloud services is projected to be worth \$66 billion by 2016, with annual growth of 30 percent. It's impossible to ignore cloud computing's exponential growth rate. There are growing security, cloud attack, and privacy concerns associated with the growing use of cloud computing. Companies need robust security measures in place for cloud services to prevent data theft. The goals of this article are to examine the advantages of cloud computing, to these services require no specific equipment or prerequisites. 24/7 cloud services. Sometimes it's used to track Computing resources and apps. Cloud computing can provide shared business resources, apps, and services. Cloud Computing allows developers to create and deploy directly to the cloud. Providers handle resource needs, system Maintenance and, upgrades.

1.2 Why choose this topic

With its many advantages, cloud computing is gaining popularity among businesses of all sizes, but especially among larger corporations with international reach. Because of cloud computing, even the

most complex businesses can get to their files and programs from anywhere, at any time. The scalability of these solutions makes them ideal for businesses of all sizes. For instance, businesses can opt for a public Cloud service that is hosted off-site and comes with all required hardware and software, or they can set up a private Cloud that uses their own servers and meets stricter security standards. Eighty-one percent of large businesses have committed resources to a multi-Cloud strategy, and 96 percent use Cloud computing in some capacity. Since more and more businesses are beginning to see the possibilities of Cloud computing for growth and expansion, these numbers may increase in the coming years. The need for skilled Cloud computing professionals to create and maintain these infrastructures has skyrocketed in tandem with the widespread adoption of Cloud computing in business. Employers all over the world are looking for candidates with marketable skills, and you can give them exactly what they need by completing Cloud-related training.

1.3 Motivation:

Businesses all over the world now need to undergo digital transformation or perish. Adverse effects of "Digital Darwinism" (the necessity for businesses to adapt or perish in the digital marketplace) are becoming all too real. Businesses today need to be at the cutting edge of innovation if they want to survive. The cloud also becomes the driving force behind the digital revolution. CIOs, CEOs, and CTOs are currently at the forefront of digital transformation, positioning their organizations to take advantage of cloud computing. The cloud computing services market is now worth over $200 billion, a staggering amount that has been growing rapidly in recent years and is predicted to keep expanding. As cloud services become increasingly vital to business operations worldwide, Gartner predicts that cloud growth could hit 17% this year. As far as public cloud markets go, the United States is by far the largest. Many companies anticipate raising their cloud spending by as much as 50 percent as a result of technological advancements and the growth of the cloud industry. But they still have trouble implementing the technology because they don't fully understand it. Cloud computing's primary goal is to provide remote access to data centers and task management for businesses. Businesses can save money and improve efficiency with cloud computing because of its pay-as-you-go pricing model.

CHAPTER- 02
OVERVIEW OF CLOUDS

2.1 Introduction: The precise meaning of "cloud computing" is up for discussion. Issues of confusion, such as the absence of standardized definitions, persist in the cloud since different specialists use different terms to describe it. Cloud computing will offer a wide range of Internet-delivered services to its paying customers. When it comes to cloud computing, everything is hosted online. From an IT standpoint, the cloud can be thought of as a remote environment. Cloud computing, in this definition, is just a shared, centralized repository for various servers and other computing resources. Typically, it presents a unified front end to its consumers while keeping the underlying structure a secret. Cloud computing's architecture is depicted in Figure 1 below
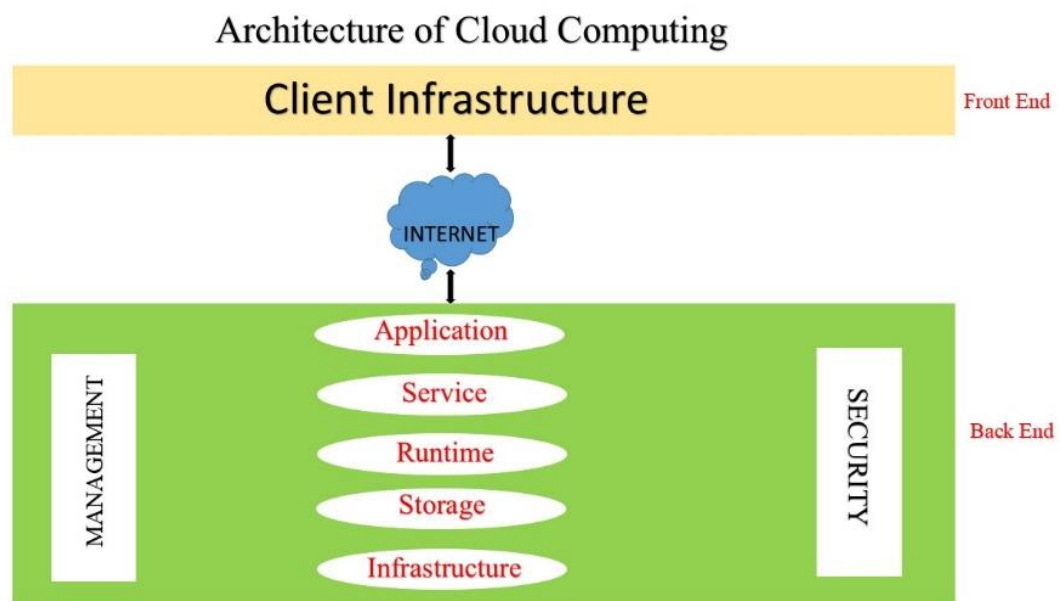
Figure 1. Cloud Computing Architecture

Cloud computing architecture is divided into two parts. First part includes the front end element. Second part includes the back end element. Customers interact with the front end. It includes all the client-facing tools and software needed to connect to cloud-based servers. Web servers (Chrome, Firefox, Internet Explorer, etc.), thin and fat clients, tablets, and mobile devices make up the front end. This is the part of the system that the service provider interacts with. It takes

care of everything that needs to be taken care of in order to deliver cloud computing services. Data storage, security, virtual machines, model deployment, server infrastructure, traffic management, etc.

2.2 Cloud Service Models: Providers in the cloud computing industry employ three major service models to supply customers with a variety of services. Figure 2 depicts the three primary categories of cloud computing service models
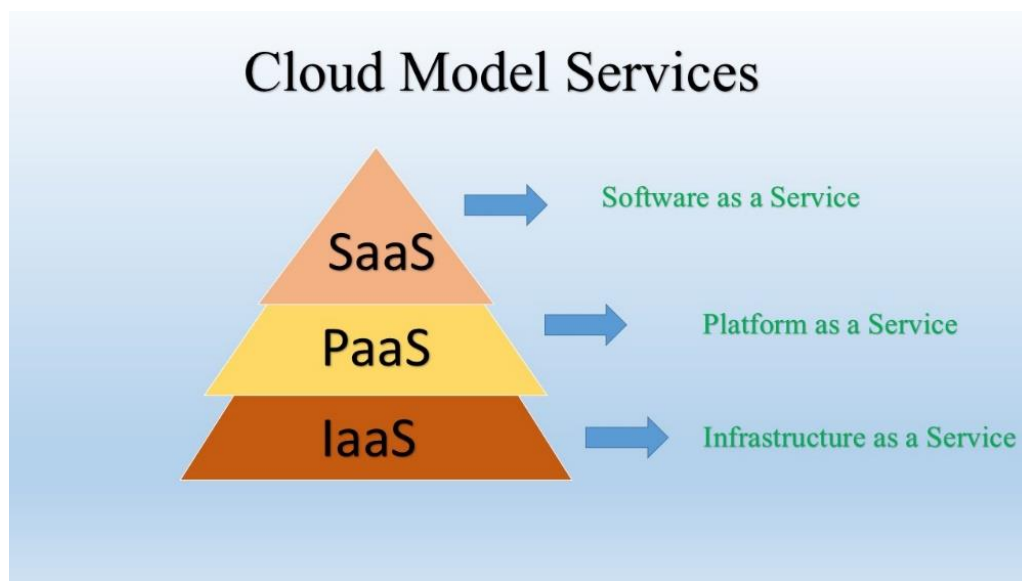
Figure 2: Cloud Computing Service Model

2.2.1 Software as a Service (SaaS)

The providers' software applications, which they manage, will be set up and made available to customers as a service. It can be rented on a subscription basis or on a per-use basis. Users may get to the programs without having to worry about downloading, setting up, or updating anything. Further, it is unnecessary for them to understand the underlying system or platform on which the apps are operating. Software as a service (SaaS) eliminates the need for a company to purchase and maintain its own computer gear and software. The flexibility, interoperability, global availability, and lack of user responsibility for scaling, configuration, and upgrades that SaaS provides have contributed to its widespread adoption. However, the users have zero say over the application's internals, including its components, security settings, and personalization options. Web-based document and spreadsheet sharing platforms like Google Docs and Microsoft's Office 365

2.2.2 Platform as a Service (PaaS)

Cloud computing relies heavily on Platform as a Service (PaaS) since service providers will offer developers a Complete environment in which to create, test, deploy, and manage their applications. Service providers will supply a complete environment for their customers to work in, including the necessary software, hardware, operating system, server, programming tool, and database. Users can run their programs without worrying about the specifics of their computer's hardware configuration (CPU, RAM, and HDD sizes). Platform as a Service (PaaS) enables a whole "Software Lifecycle" by facilitating cloud-based deployment of applications. When comparing PaaS with SaaS, it's important to note that users of the former can build their applications in the cloud while using the latter can only host their finished products. AWS, GCP, and MS Azure are all examples of PaaS.

2.2.3 Infrastructure as a Service (IaaS)

The Infrastructure as a Service (IaaS) layer is the foundation of the service model. For Infrastructure as a Service, virtualization is key. To put it simply, IaaS is what makes it possible for applications to be used. In between PaaS and SaaS, IaaS functions as a real or virtual machine to support users' applications by providing the necessary computational resources and infrastructure such as storage, processing unit, networks, etc. It paves the way for the installation and operation of software and operating systems. The biggest perk is that the customers don't have to worry about deployment, management, or upkeep. Microsoft Azure Virtual Machines is an IaaS example

©Daffodil International University

CHAPTER-03

DEPLOYMENT MODELS OF CLOUD COMPUTING

3.1 INTRODUCTION: Public cloud computing, private cloud computing, community cloud computing, and hybrid cloud computing are the four deployment methods identified for cloud computing. The range of services provided by each model varies. Different criteria, such as the ability to personalize the cloud, the availability of other cloud services, the necessity for a secure cloud, and the location where the services are located, will determine the methods of Cloud Computing deployment. Cloud deployment models are depicted in Figure 3 below
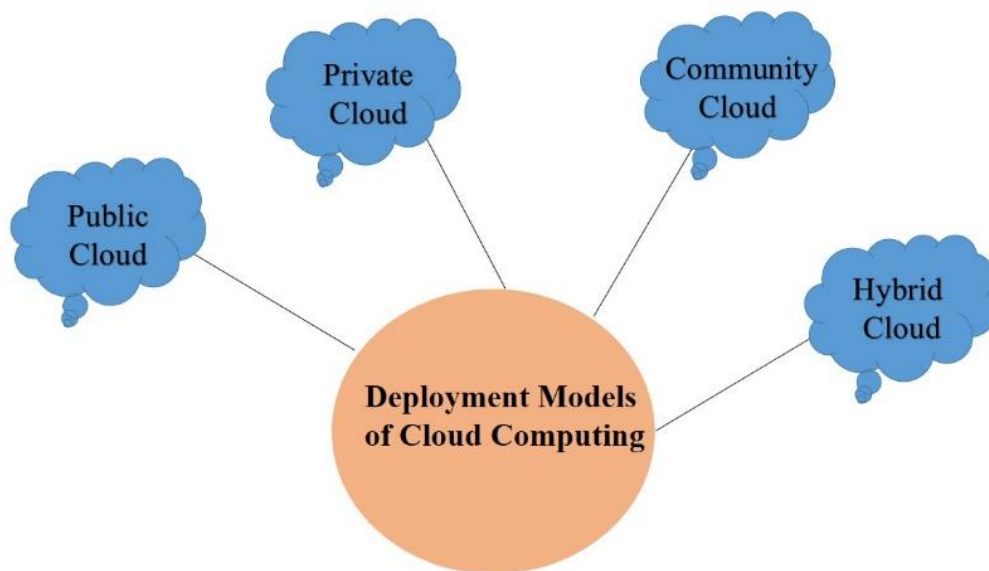

Figure 3. Cloud Deployment Models

3.1.1 Public Cloud

The services in a public cloud are accessible to anybody with an Internet connection. Third-party service providers offer and distribute these features to several companies. Typically, service providers establish their own policies, values, cost, and billing structures. It was determined in that the provided services are both

convenient and dependable. The users, however, are viewed as suspect. According to the studies, researchers have determined that privacy and security are the most frequently raised concerns regarding public cloud. Email and photo storage are two examples of public cloud services.

3.1.2 Private Cloud

Enterprises can only make use of private cloud services. When compared to the general public cloud, private clouds are safer because they restrict access to only authorized employees and partners. Using a private cloud, a company can easily share client information between locations. In comparison to other cloud services, these ones are simpler, safer, more cost-effective, and more energy-efficient. This has been demonstrated by studies that intentionally place businesses in dangerous situations. In order to set up their own private cloud, businesses must invest extra money in obtaining the necessary software and hardware.

3.1.3 Community Cloud

There is a community cloud in between the public and private clouds. The differences between these and private clouds are minimal. It's a win-win situation, with money going to groups with comparable aims and needs. Either the company or an external provider could be in charge of the services. Since the infrastructure costs are spread across multiple businesses, public clouds can be set up for less money than private ones. It's also more private and secure. The necessity of communal data storage is one issue. The educational cloud is an example of a community cloud service that may be used by universities all over the world to exchange resources for scientific research.

3.1.4 Hybrid Cloud

Two or more clouds, whether public, private, or communal, come together to form a hybrid cloud. Clouds will provide a service by combining the physical hardware with server instances. All the benefits associated with public and private clouds are present in this third option. With hybrid cloud, businesses may store their most critical information in isolated environments, reducing the burden of managing data security. These cloud services are typically employed for data backup. An organization's most important applications can be hosted in both private and public clouds without compromising data security

CHAPTER 4
BENEFITS OF CLOUD COMPUTING IN BUSINESS

4.1 Flexibility

Cloud computing is becoming increasingly popular because it allows for greater organizational flexibility. This provides all workers with greater freedom both in and out of the office. If an employee is on a business trip, they can access the information from any Internet-connected device. Businesses are able to better meet customer demand with the support of cloud computing's myriad offerings. Using cloud computing, workers can upload and download files and documents from each other's computers in real time. This ensures that all staff members have access to the most recent version. In particular, this is helpful since it allows remote workers to have easy access to company data. Consequently, the proprietors can focus on other matters without being tied down to a single office. Since everything is saved digitally on the cloud, multiple workers can get to the same information at once

4.2 Cost Reduction

Both claim that the ability to cut expenses by using cloud services is the primary motivation for businesses to embrace this model. Businesses are excited by the prospect of savings offered by cloud service providers' ability to enable "in-house" provision of these services. Moreover, the businesses pay only for the resources they actually employ. By utilizing cloud services, businesses will only be required to pay for the resources they really employ. Figure 4 displays the company's motivations for embracing cloud computing.
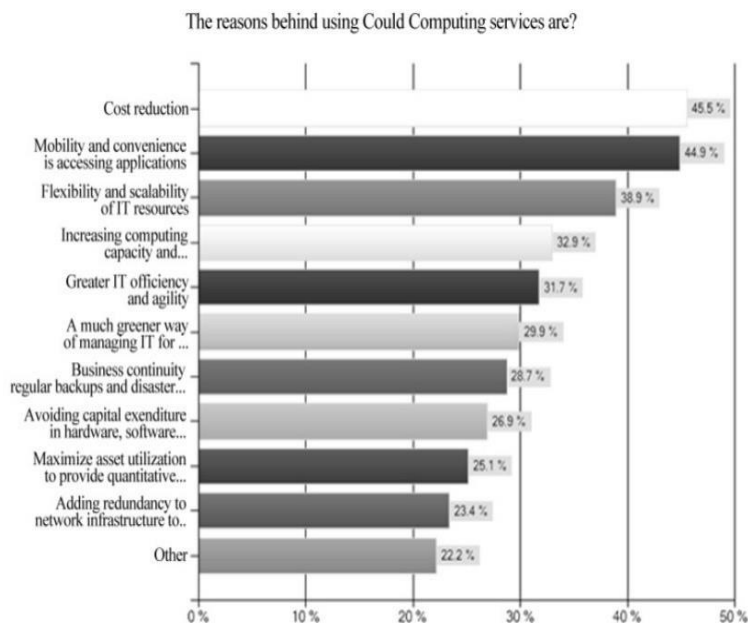

Figure 4: Reasons for Adopting Cloud Computing

8

45.5% cost savings is the primary driver for our company's interest in cloud computing. According to and, cloud computing has enabled significant cost savings for businesses, primarily through subscription models. Since the providers handle everything, cloud computing resources, especially SaaS, may be set up and put into use quickly. The providers often handle management, patches, and upgrades for these services. When companies outsource IT maintenance to service providers, they no longer have to deal with IT issues themselves. On top of that, providers provide technical assistance, which is a huge load off the IT departments. This can save time and money for businesses by avoiding the need to train new employees.

4.3 Energy Consumption

Figure 5 depicts the results of a survey conducted by Amazon, which reveals that the cost consumption of Amazon data centers is shocking. The survey found that servers account for 53% of the total cost over a three-year amortization period, while energy and cooling requirements account for 42% of the total budget. This includes both the direct power consumption (19%) and the cooling requirements (23%). More than 1.5% of the total energy produced in the United States in 2006 was used by data centers, and it is anticipated that this percentage will expand by 18% annually over the next few years
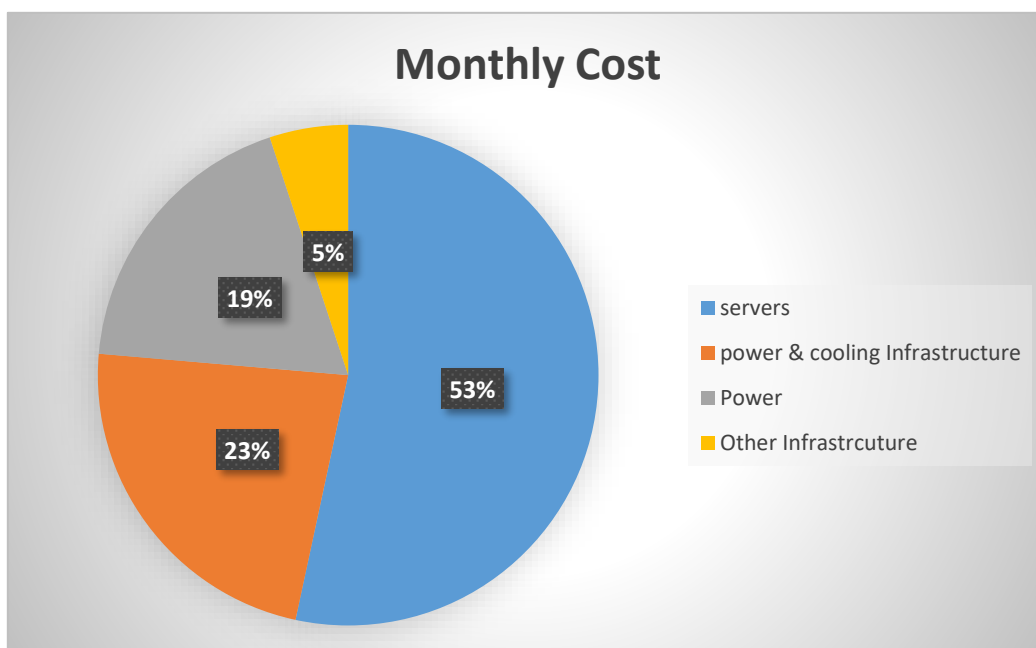
The cooling equipment needed to remove the heat created by the thousands of servers that make up a cloud data center is built up in the cloud data center. These server farms and the accompanying cooling infrastructure consume a significant amount of energy and generate greenhouse gases (GHGs). In addition, the cloud data

©Daffodil International University

centers, which are an essential component of the cloud infrastructure, have a very high operating cost and a very high level of energy consumption. These factors contribute to the overall high cost of using the cloud. For instance, the amount of electricity used by the Google data center is comparable to that of a major city like San Francisco. Because information and communications technology helps in the development of applications and facilities for human flourishing, we need to design hardware, software, scheduling policies, networks, and other protocols that consume energy in a way that is both friendly to the environment and as efficient as possible. Not only is the goal to cut down on the amount of energy that is used, and consequently the cost that is incurred by data centers, but it is also to maintain environmental standards that are required not only to live but also to flourish.

4.4 Scalability

A further perk of cloud computing is that it gives customers the flexibility to modify resources according to fluctuating organizational requirements. Due to the intuitive nature of the cloud, this is easily accomplished simply adding to the existing computer infrastructure. Claimed that the inability of traditional IT solutions to support scalability caused significant disruption for businesses. Because they aren't being used during off-peak hours, companies are balking at the cost of maintaining them during rush hour. Customers' displeasure could result in a drop in sales. As a result of the cloud's scalability, it's easier to address issues and boost consumer happiness. Since cloud computing can make the resources available instantly, it eliminates the need for capacity planning. When it comes to expanding their resources, when necessary, cloud computing is especially beneficial for smaller enterprises. Further, the processing capacity of the cloud enables users to analyze massive amounts of data in a matter of minutes. Because of this, business analysts have flocked to the industry to make educated predictions about consumer preferences.

4.5 Easy administration and Flexibility of work practices

Office suites are accessible via web browser and can be used regardless of the operating system there is no need to install the packages on the local devices and software versions are updated regularly by the service Provider. With cloud computing, workers can alter their routines as needed. You can, for instance, access information when at the office, on vacation, or traveling to and from work (providing you have an internet connection). Get access to your files from anywhere with a simple connection to your virtual office and no need to wait till you return to the office.

4.6 Automatic Software Update

According to, the high cost of obtaining and maintaining software is a problem for firms once an IT

solution has been adopted. It's clear that this will have a detrimental impact. The use of cloud computing is the answer to these issues. Companies might reallocate previously spent money on capital expenditures to the operational budget. It's not just about saving money; it also benefits relationship building, staying abreast of technology developments, making more money, and giving better service to clients at lower prices. Because of the low subscription costs, more businesses will be interested in investing in programs for Supply Chain Management and Customer Relationship Management. The workforce has instantaneous access to these programs. Time to market is reduced because no upfront money is required. Furthermore, if these costs can be reduced, it will open up the market to more participants. More businesses, especially in countries lagging in the IT revolution, will be inspired to launch as a result.

CHAPTER 5

EFFECTIVE CLOUD COMPUTING SERVICES FOR SME'S

5.1 Microsoft 365

Microsoft Office 365 delivers practically all of the capabilities of a typical office, as it contains components from traditional office suites. Documents are saved in the cloud, and all users have access to the most up-to-date versions of those documents, making Office 365 an ideal platform for real-time collaboration and data sharing. You may monitor updates and revert to previous versions if necessary. There will be online meetings, a gateway for uploading and sharing company movies, and more as part of the collaborative effort. The Yammer workplace social network is a part of Microsoft Office 365 that encourages teamwork and communication inside an organization. Microsoft Office 365 is available in a wide variety of subscription tiers, with three Business plans and three Enterprise tiers each featuring unique sets of features and pricing structures.
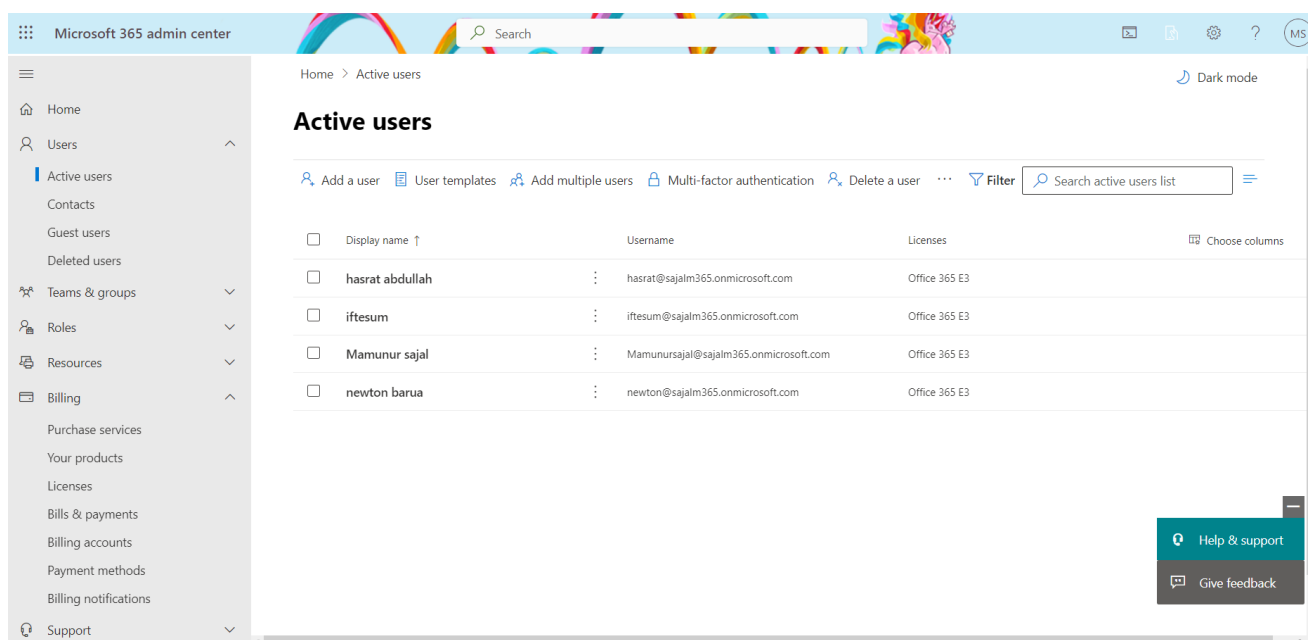

Fig 6 – M365 Admin Center Interface

5.2 One Drive

A cloud storage and remote access service, OneDrive is a Microsoft product. Data may be uploaded and accessed in a variety of ways, including through the web, within Microsoft Office itself, and via mobile apps; the service is also compatible with Windows Phone. The cloud storage service OneDrive provides users with 1 TB of free space for their own files. Using OneDrive for Business, businesses have a central location for storing files that can be accessed by multiple users and kept in sync with one another. SharePoint Server 2013, which includes the storage service, is part of Office 365, which also enables real-time document collaboration. In order to keep track of document revisions and sign off on any alterations, businesses may use the features included in OneDrive for Business.

5.3 Microsoft Azure virtual Machine

Within the Microsoft Azure portal is where you'll find the scalable computing capability provided by Microsoft Azure Virtual Machine. We can now create and deploy apps more quickly thanks to the use of Azure Virtual Machine (VM), which eliminates the requirement to make an initial investment in hardware. We may deploy as many or as few virtual servers as we want using Azure VM, as well as handle security and networking, and manage storage. We are able to reduce the need to anticipate traffic by using Microsoft Azure VM since it provides us with the opportunity to scale up or down in response to changes in demand or surges in popularity
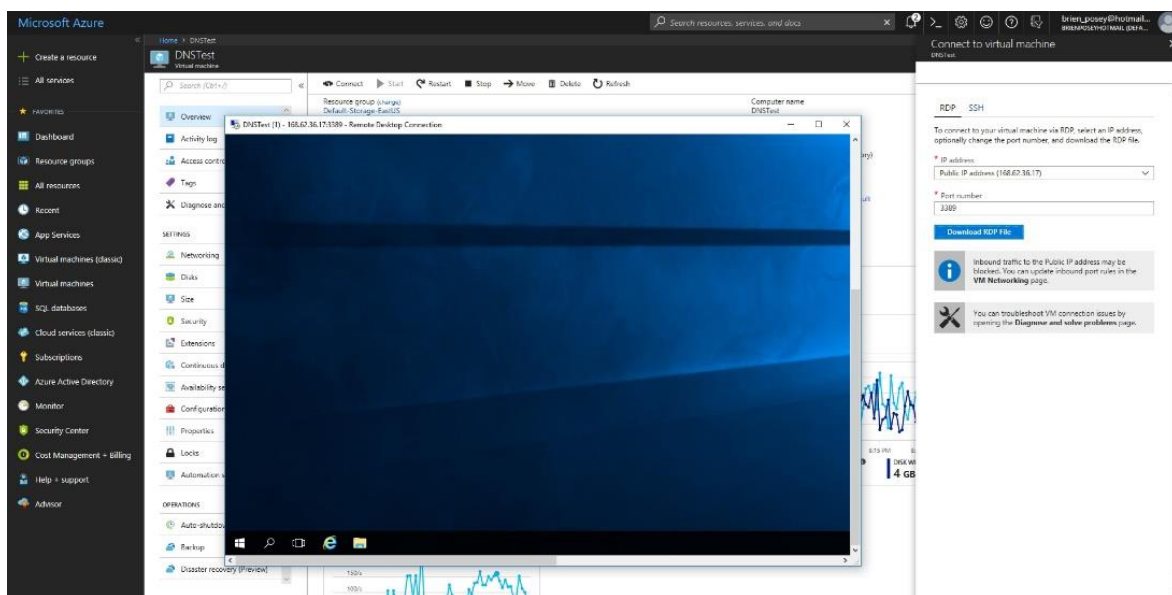

Fig 7 – Deployment of Azure Virtual Widows Server 2016 Machine

CHAPTER 6
ISSUES OF CLOUD COMPUTING IN BUSINESS

6.1 Introduction: Despite claims to the contrary, cloud computing has proven to be an invaluable tool for many businesses. Though cloud computing has many advantages for businesses, it also has drawbacks that decision-makers must weigh. The performance of the cloud will be negatively impacted by the increased network traffic. If the cloud is at or above 80% utilization, computers will behave irresponsibly. Any time data is sent between computers and servers, crashes might occur. Because of this, important information including client records, sales reports, and company files would be lost. Another critical problem with cloud computing is the threat of cloud attacks. Web services, such as web hosting and cloud storage, can be hosted by users on the cloud. It is because of this that hackers have become so interested in stealing companies' sensitive information, such as daily sales, profit reports, financial reports, etc. identified several distinct attacks that can occur in the cloud, including malware injection, wrapping, SQL injection, authentication, and Denial of Service.

6.2 Data Theft

more and more people and businesses are joining the online community every day. This also makes it more likely that hackers may try to probe your system or launch an attack using malware like a virus or worm. One of the service providers, Google Inc., has had their systems compromised. Figure 8 shows a breakdown of cloud computing's most pressing problems by proportion of concern.
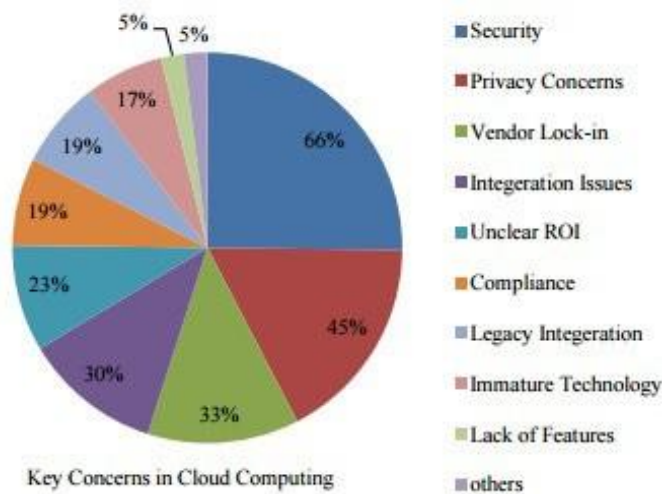

Fig 8: Cloud Computing Adoption Issues

©Daffodil International University

Security is the biggest concern for businesses embracing cloud computing (66%). IDC's survey showed that security is the biggest issue. Third-party providers are involved. also noted that security is the biggest problem, putting pressure on cloud service providers to preserve their clients' data. Networks, OS, databases, transaction management, etc. are all vulnerable. Cloud computing is plagued with data theft. Some service providers don't have their own server since it's more cost-effective and adaptable. This enhances external server data theft. As cloud computing provides strong processing and enormous storage for individuals or businesses, it encourages them to shift to cloud so they don't need to buy servers. 37% of worldwide enterprises attacked, per. Zappos was hacked. Personal information, credit card numbers, and encrypted passwords for 24 million customers were taken.

6.3 Malicious Code Insertion

Threats to cloud-based software and websites might be expected from cybercriminals. Normal operation of a website or online application can be altered by hackers who have discovered its flaws and corrected them. It is possible that cybercriminals have already planned to utilize virtual machines to compromise cloud services by introducing malware into legitimate applications. Hackers can use this to steal information or listen in on conversations. SQL injection is the most widespread sort of malware insertion. Modifying the SQL query format is the core idea of SQL injection. Cybercriminals will exploit weak data validation in order to steal sensitive information. The majority of the time, SQL servers and other databases are the intended victims. In addition, hackers will try to insert malicious code, most often to a web server, in order to avoid having to log in.databases. They will attempt to change information in databases, steal information from companies, and even take over a whole web server. Hackers will utilize JavaScript, HTML, VBScript, ActiveX, and Flash, all of which are ripe with potential for malicious scripting.

6.4 Vendor lock-in

Another purported downside of cloud computing is vendor lock-in. Organizations may have trouble migrating their services from one vendor to another because of the immaturity of easy switching between cloud providers. Migration from one cloud platform to another may be complicated by differences in vendor platforms, which may lead to increased expenses and setup challenges. Security and privacy holes introduced by the migration process cannot be ruled out.

6.5 **Denial of Service (DoS) Attack**

One of the most pressing problems in cloud computing is the proliferation of Denial of Service (DoS) attacks, also known as Distributed Denial of Service (DDoS) or flooding attacks. Experts in network security have been working on a solution to the growing threat of denial-of-service (DoS) attacks for decades, but the problem shows no signs of going away. Smurf attacks, SYN flood attacks, PING of Death attacks, Tear Drop attacks, and IP spoofing attacks are only few of the forms of DoS attacks described in and. In addition to application-focused DoS attacks, resource-focused DoS attacks (targeting the network, memory, CPU, etc.) are possible. They lower the quality of services and the network connection, making cloud-based services inaccessible, unbearably sluggish, or unavailable. Attackers frequently employ floods of data packets as one of their methods. The goal is to cause the servers to crash or become overloaded, making the services inaccessible to users. DoS attacks, as stated by, can happen on any network layer. DoS attacks at the network layer aim to render the server unavailable; SYN Flood attacks at the transport layer overload servers with bogus requests; and attacks at the application layer steal server memory.

6.7 Data Privacy

Different entities can access unencrypted cloud data. Data privacy hazards include poor user control and regulatory compliance, per. Some companies share files through cloud. This raises confidentiality and data privacy challenges, such as protecting personal or commercial information. Sometimes where data is kept affects privacy. Data leaking results from insufficient security across many domains. Insider user risks will increase along with exposures and vulnerabilities. Cloud companies don't control data and information. In a SaaS setting, service providers store data with limited control and visibility. Theft is up. Users don't know where their data is stored or what's been done to it because all cloud procedures are done by machines. The storage servers are worldwide. Sometimes it's hard to guarantee data compliance with the law because cloud computing is global and has different laws everywhere. Cloud storage affects privacy and duty.

CHAPTER 7
HOW TO OVERCOME THE ISSUES

7.1 Data Theft Solution

Theft of data is often an extremely common occurrence. The perpetrators of this assault will make an attempt to steal the users' account credentials. To avoid this from happening, a unique and one-of-a-kind number should be produced at the beginning of each login session. The users are obligated to submit an email including information regarding the session's usage and duration, in addition to the one-of-a-kind number needed for the subsequent login at the conclusion of each and every session. The users will have a greater awareness of the usage and the unique number that must be used for each login as a result of this. For instance, in order to authenticate customers of the Amazon EC2 cloud service, a one-of-a-kind number is needed. Before being able to purchase something, users of retail organizations are required to first register as users of the organization. Details pertaining to credit cards are included in the material. According to , it is vital to improve the registration mechanism in order to lessen the likelihood of data being stolen from clients. The use of a fraud monitoring system for credit cards is one way to achieve this goal. Inappropriate use of cloud computing resources can be mitigated by the implementation of security policies, guidelines, and laws.

7.2 Malicious Code Insertion

In cloud computing, the permission and authentication of users' requests are handled between web servers and web browsers. This ensures that only authorized users may make changes to their accounts. In order to do damage, hackers will attempt to insert malicious code into the cloud environment. When a user registers for the first time with a cloud service provider, the provider has to record information about the operating system (OS) the customer uses so that this problem may be avoided. Before running an instance on a cloud, there will be cross-checking performed due to the entirely independent nature of cloud computing as an operating system platform. The purpose of this is to determine whether the operating system information that has been saved in the cloud is compatible with the instance that has been requested from.

7.3 Denial of Service (DoS) Attack

The countermeasure to this assault is currently undergoing further development. Increasing the safety of networks is a typical approach that is taken. Eliminating the assaults may be accomplished using a variety of methods, including those that are based on filters, firewalls, and signatures respectively. An technique that is

based on filters may be utilized to identify a low rate of assaults such as an increase and attack in the traffic rate and network. The usage of a firewall in order to improve the strategy is what is meant by the "firewall-based approach." It is possible to utilize it to either allow or refuse access to the protocol. For instance, if an attack is originating from an odd IP address, the firewall-based solution will make an attempt to block any unlawful traffic that is heading its way. When comparing the signature database, we employ a technique that is based on signatures. The signature pattern is used to monitor the traffic that is going across the network. In the event that the signatures do not correspond to one another, the assaults will be stopped. The total number of packets that attackers send to the server is multiplied by a factor that is comparable to the number of hosts behind the router," as it was said. They hypothesized that the likelihood of denial of service assaults may be reduced by turning off IP broadcast. Installing the available security fixes is yet another method. Operating System (OS) and apps both have the potential to become victims of a Denial of Service (DoS) attack. The operating system should have the most recent security updates installed in order to protect itself from the threats. For instance, in the event of a SYN Flood assault, the servers have to have software fixes that can identify the threat and help prevent it.

7.4 Multi-Factor Authentication (MFA)

By requiring more than just a password to access an account, multi-factor authentication (MFA) ensures that no unauthorized parties may gain access to sensitive data. In addition to a password, users may be required to provide additional authentication information, such as an answer to a secret question, a fingerprint scan, or a code sent by email. If a system password has been hacked, additional authentication measures can assist prevent unwanted account access. The use of several authentication methods reduces the likelihood of security breaches caused by factors such as forgotten passwords and misplaced or stolen devices. Businesses now have the assurance to launch their digital efforts. Using multi-factor authentication, businesses can ensure the safety of their customers' and employees' personal and financial information while conducting business online.

©Daffodil International University

CHAPTER 8
CONCLUSION

8.1 Conclusion and Future Work

Cloud computing is a key technology for improving business operations. It helps firms compete. Many industry specialists have presented different definitions of cloud computing, making it hard to define. This report outlines how SME's may benefit from cloud computing, including better flexibility, less overhead, automatic hardware and software upgrades, and increased scalability. It reduces excessive spending on new technology and software. Like any technology, cloud computing has drawbacks. Information theft is a security issue. If difficulties are solved, more SME's will use cloud computing. Several solutions have been suggested. Prioritize cloud security. Cloud providers should address user concerns about regulatory compliance. Compliant users can be securely certified. Access control, risk management, and system backup and recovery should also be covered. Future case studies on how SME's benefited from cloud computing will be limited due to time restrictions. We'll also examine the framework's corporate applications. The cloud is vulnerable to many attacks, thus we'll propose a secure theoretical concept and architecture. As a cyber-attack reaction, the cloud provider must do this.

REFERENCES:

[1] Abdulaziz, A., 2012. Cloud Computing for Increased Business Value. International Journal of Business and Social Science, 3(1), pp. 234-239.

[2] Abhinay, B. A., Akshata, B. A. & Karuna, C. G., 2013. Security Issues with Possible Solutions in Cloud Computing - A Survey. International Journal of Advanced Research in Computer Engineering & Technology, 2(2), pp. 652-661.

[3] Adam, M. M. et al., 2014. Impact of Cloud Computing Adoption on Stock Price. Savannah, AISeL.

[4] Ahmed, Y., 2012. Exploring Cloud Computing Services and Applications. Journal of Emerging Trends in Computing and Information Sciences, 3(6), pp. 838-847.

[5] Akhila, R. & Rakesh, R., 2015. Study and Analysis of Big Data in Cloud Computing.

International

Journal of Advance Research in Computer Science and Management Studies, 3(6), pp. 416-422.

[6] Ali, K. H., David, G. & Ian, S., 2010. Cloud Migration: A Case Study of Migrating an Enterprise IT

System to IaaS. Washington, IEEE.

[7] Amol, C. A., Vikram, D. S., Seema, H. P. & Gopakumaran, T. T., 2015. Cloud Computing - A Market Perspective and Research Directions. International Journal of Information Technology and Computer Science, 10(1), pp. 42-53.

[8] Andrew, C., Mohammad, H. & Omar, A., 2015. Defence for Distributed Denial of Service Attacks in

Cloud Computing. Tunisia, Elsevier.

[9] Angadi, A. B., Angadi, A. B. & Gull, K. C., 2013. Security Issues with Possible Solutions in Cloud

Computing - A Survey. International Journal of Advanced Research in Computer Engineering & Technology, 2(2), pp. 652-661.

[10] Angela, L. & Chen, N. C., 2012. Cloud Computing as An Innovation: Perception, Attitude and Adoption. International Journal of Information Management, 32(6), pp. 533-540.

[11] Aniruddha, S. R. & Chaudhari, D. N., 2013. Cloud Computing: Instructure as a Service.

International

Journal of Inventive Engineering and Sciences, 1(3), pp. 1-7.

[12] Ankeny, J., 2011. Heads in the Cloud. Entrepreneur, 39(10), pp. 50-51.

[13] Anthony, B. & Syed, M. R., 2011. An Overview of the Security Concerns in Enterprise Cloud

Computing. International Journal of Network Security & Its Applications, 3(1), pp. 30-45.

[14] Apostu, A. et al., 2013. Study on Advantages and Disadvantges of Cloud Computing - The Advantages of Telemtry Applications in the Cloud. Morioka City, Iwate, Japan, World Scientific and Engineering Academy and Society.

[15] Apurva, S., Sanjay, S. & Rahul, C., 2013. Security Aspects in Cloud Computing. International Journal of Engineering Trends and Technology, 6(3), pp. 118-120.

[16] Arnon, R. et al., 2010. Cloud Computing: A New Business Paradigm for Biomedical Information

Sharing. Journal of Biomedical Informatics, 43(2), pp. 342-353.

[17] Assante, D., Castro, M., Hamburg, I. & Martin, S., 2016. The Use of Cloud Computing in SMEs.

Procedia Computer Science, 83(1), pp. 1207-1212.

[18] Astri, L. Y., 2015. A Study Literature of Critical Success Factors of Cloud Computing in Organizations. Procedia Computer Science, 59(1), pp. 188-194.

[19] Atul, S. C. & Dhore, M. L., 2012. CIDT: Detection of Malicious Code Injection Attacks on Web

Application. International Journal of Computer Applications, 52(2), pp. 19-26.

[20] Avram, M. G., 2014. Advantages and Challenges of Adopting Cloud Computing from Enterprise

Perspective. Procedia Technology, 12(1), pp. 529-534.

[21] Buse, R. F., 2011. Why Use Cloud Computing?. Annals of University of Craiova - Economic Sciences Series, 3(39), pp. 228-231.

[22] Buyya, R. et al., 2010. Cloud Computing and Emerging IT Platforms: Vision, Hype and Reality for

Delivering Computing as the 5th Utility. Future Generation Computer Systems, 25(1), pp. 599-616.

[23] Calheiros, R. et al., 2011. CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing

Environments and Evaluation of Resource Provisioning Algorithms. Software Practice and Experience, 41(1), pp. 23-50.

[24] Charu, A., 2011. Concepts, Challenges and Opportunities of Cloud Computing for Business Analyst.

AKGEC International Journal of Technology, 2(2), pp. 25-30.

[25] Cheng, F. C. & Lai, W. H., 2012. The Impact of Cloud Computing Technology on Legal Infrastructure within Internet—Focusing on the Protection of Information Privacy. International

Workshop on Information and Electronics Engineering, 29

[26] Nabil, S., 2010. Cloud Computing for Education: A New Dawn?. International Journal of Information

Management, 30(1), pp. 109-116.

[27] Nazir, A. & Jamshed, S., 2013. Cloud Computing: Challenges and Concerns for its Adoption in Indian SMEs. International Journal of Software and Web Sciences, 4(2), pp. 120-125.

[28] Nicholas, H., 2013. Compliance in the Ether: Cloud Computing, Data Security and Business Regulation. Journal of Business & Technology Law, 8(1), pp. 255-273.

[29] Nikita, G. & Toshi, S., 2014. Cloud Computing - SPI Framework, Deployment Models, Challenges.

International Journal of Emerging Technology and Advanced Engineering, 4(1), pp. 19-25.

[30] Pankaj, S. & Tripat, D. S., 2015. Data Security in Cloud. International Journal of Computer Science

Engineering, 4(5), pp. 221-227.

[31] Parekh, D. & Sridaran, R., 2013. An Analysis of Security Challenges in Cloud Computing. International Journal of Advanced Computer Science and Applications, 4(1), pp. 38-46.

[32] Piotr, P. & Zbigniew, P., 2013. Cloud Computing - A Case Study for the New Ideal of the IS/IT Implementation. Zadar, ToKnowPress.

[33] Poonam, Y. & Sujata, 2013. Security Issues in Cloud Computing Solution of DDoS and Introducing

Two-Tier CAPTCHA. International Journal on Cloud Computing: Services and Architecture, 3(3), pp. 25-40.

[34] Pourqasem, J., Karimi, S. & Edalatpanah, S. A., 2014. Comparison of Cloud and Grid Computing.

American Journal of Software Engineering, 2(1), pp. 8-12.

[64

] Rania, E.-G. F., 2014. A Literature Review on Cloud Computing Adoption Issues in Enterprises. IFIP

Advances in Information and Communication Technology, 4(1), pp. 214-242.

[35] Rashmi, D. & Kailas, D., 2015. Understanding DDoS Attack & Its Effect in Cloud Environment.

Procedia Computer Science, 49(1), pp. 202-210.

[36] Reza, S., Adel, A. & Justice, O. M., 2013. Cloud Computing From SMEs Perspective: A Survey Based Investigation. Journal of Information Technology Management, 24(1), pp. 1-12.

[37] Richard, C. et al., 2010. Contolling Data in the Cloud: Outsourcing Computation Without Outsourcing Control. New York, ACM.

[38] Santosh, K. & Goudar, R. H., 2012. Cloud Computing - Research Issues, Challenges, Architecture,

Platforms and Applications: A Survey. International Journal of Future Computer and Communication,

1(4), pp. 356-360.

[39] Sara, Q. & Kausar, F. K., 2012. Cloud Computing: Network/Security Threats and Countermeasures.

Interdisciplinary Journal of Contemporary Research in Business, 3(9), pp. 1323-1329.

[40] Sayyed, M. S. S. & Bahare, T. P., 2013. Study of SQL Injection Attacks and Countermeasures. International Journal of Computer and Communication Engineering, 2(5), pp. 539-542.

[41] Sean, M. et al., 2011. Cloud Computing - The Business Perspective. Decision Support Systems, 51(1), pp. 176-189.

[42] Shashi, C., Iti, R. & Nitasha, H., 2013. Analyzing Security Solutions in Cloud Computing. International Journal of Computer Applications, 68(25), pp. 17-21.

[43] Shikha, S. et al., 2014. Cloud Computing Attacks: A Discussion with Solutions. Open Journal of Mobile Computing and Cloud Computing, 1(1), pp. 1-10.

[44] Shweta, T. et al., 2013. Hadoop Based Defense Solution to Handle Distributed Denial of Service (DDoS) Attacks. Journal of Information Security, 4(1), pp. 150-164.

[45] Singh, S. & Jangwal, T., 2012. Cost Breakdown of Public Cloud Computing and Private Cloud Computing and Security Issues. International Journal of Computer Science & Information Technology, 4(2), pp. 17-31.

[46] Smith, A., Bhogal, J. & Sharma, M., 2014. Cloud Computing: Adoption Considerations for Business

and Education. Barcelona, IEEE.

[47] Srinivas, A., Seetha, R. & Venkatesh, L., 2013. A Study On Cloud Computing Disaster Recovery.

International Journal of Innovative Research in Computer and Communication Engineering, 1(6), pp. 1380-1389.

[48] Subashini, S. & Kavitha, V., 2011. A Survey on Security Issues in Service Delivery Models of Cloud

Computing. Journal of Network and Computer Applications, 34(1), pp. 1-11.

[49] Subramaniam, T. & Deepa, B., 2015. A Review Towards DDoS Prevention and Detection

©Daffodil International University

Methodology. International Journal of Computational Science and Information Technology, 3(1), pp. 1-9.

[50] Subramaniam, T. K. & Deepa, B., 2016. Security Attack Issues and Mitigation Techniques in Cloud

Computing Environments. International Journal of UbiComp, 7(1), pp. 1-11.

AN APPROACH OF ADOPTING CLOUD COMPUTING BY SME'S IN BANGLADESH

PRIMARY SOURCES

1	www.jicrjournal.com Internet Source	2%
2	docplayer.net Internet Source	1%
3	Submitted to Campbellsville University Student Paper	1%
4	Submitted to University of Salford Student Paper	1%
5	Submitted to Nottingham Trent University Student Paper	1%
6	Submitted to Polytechnic Institute Australia Student Paper	1%