

Benefits of Cloud Computing: An Assessment of Its Implications in Nigerian Industries

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Abstract

Cloud Computing provides the means through which everything from computing power to computing infrastructure, applications to personal collaboration can be delivered to you as a service whenever you need. This study was motivated by the fact that most Nigerian industries have experienced unexpected loss of files from their system units hence virus infection and/or some other sudden crash of the Hard disks. The study therefore seeks access cloud computing, its benefit to business organizations and implementation to Nigerian industries. The opinions of 500 respondents working in some industries in the South Eastern Nigeria were sampled through questionnaires statistically analyzed using the weighted mean average method. The result shows that the benefits of Cloud Computing package, provision of up-scaling opportunities and shared service, as well as easier allocation of resources to a diversity of users. However, these benefits were found to come with some socioeconomic and business implication.

Keywords: Cloud, Computing, Industries, Business, Benefits, Network, Internet, Organization.

Introduction

Cloud Computing refers to manipulating, configuring, and accessing the hardware and software resources remotely. It offers online data storage, infrastructure, and application.

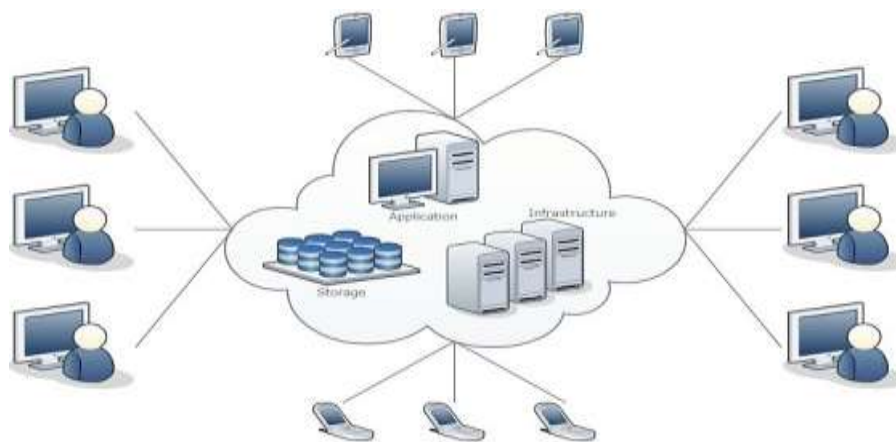


Figure [1]: Cloud Computing

Source: [1]

Cloud Computing offers platform independency, as the software is not required to be installed locally on the PC. Hence, the Cloud Computing is making our business applications mobile and collaborative.

The IT giants such as Google, Amazon and Microsoft offer cloud services via internet [1]

In his own contribution, Rouse [2] points out that Cloud Computing is a general term for the delivery of hosted services over the internet. It enables organizations to consume computer resources as a utility (just electricity) rather than having to build and maintain computing infrastructure in-house. He explains Cloud Computing as a general term for delivery of hosted services over the internet.

It is a converged infrastructure that enables organization to consume computer services as a utility, Just like electricity, rather than having to build or maintain computing infrastructure in-house.

Cloud Computing involves deploying groups of remote servers and software networks that allow centralized data storage and online access to computer services or resources.

At the foundation of Cloud Computing is the broader concept of converged infrastructure and shared services. Converged infrastructure operated by grouping multiple information technology components into a single optimized computing package. Components of a converged infrastructure may include servers, data storage devices, networking equipment and software for IT infrastructure management, automation and orchestration Rouse [2]. With cloud computing, multiple users can access a single server to retrieve and update their data without purchasing licenses for different applications.

The present availability of high capacity networks, low cost computers and storage devices as well as the widespread adoption of hardware virtualization, service-oriented architecture and utility have led to a growth in cloud computing. Organizations can scale up as computing needs increase and scale down as demands decrease.

From the foregoing, the benefits of Cloud Computing to business organizations are memories. However, there are some business implications. This study examines cloud computing, its benefits and implications to Nigerian industries.

Statement of Problem

Ever since Cloud Computing came into the world's limelight some fifteen years ago, it has continued to elicit obscure responses due mainly to unavailability of detailed data on the subject. There is the need to appraise the practice in the Nigerian perspective as well as globally. No amount of literature on the subject will be excessive. This work was carried out to examine cloud computing, its benefits and implications in Nigeria industries.

Objectives of Study

The purpose of the study is to examine Cloud Computing with regards to its benefits and implications. Based on this purpose, the objectives of the study are as follows: (1) To identify the benefits of Cloud Computing to businesses. (2) To examine the implications of adopting Cloud Computing to industries.

Theoretical Background

There are certain services and models working behind the scene making the Cloud Computing feasible and accessible to end users. Following are the working models for cloud computing:

- Deployment Models
- Service Models

Deployment Models

Cloud can have any of the four types of access: Public, Private, Hybrid, and Community.

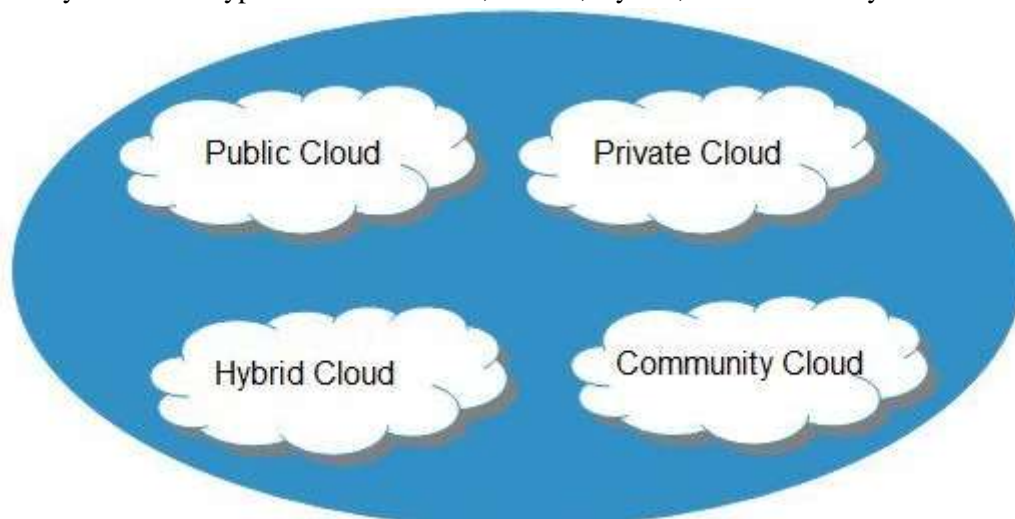


Figure 3: Deployment Models

Source: [1]

Rouse [2], writes that Cloud Computing services can be private, public or Hybrid.

- **Private Cloud:** Services are delivered from an organization’s data center to internal users. This model, as Rouse explains, offers versatility and convenience, while preserving management, control and security internal customers may or may not be billed for services through IT charge-back.
- **Public Cloud:** Involves, a third partly providers that deliver the cloud service over the internet. Public cloud services are sold on-demand, typically by the minute or the hour. Customers only pay for the CPU cycles, storage or bandwidth they consume. Leading public cloud providers include Amazon web services (AWS), Microsoft Azure, IBM/Soft layer and Google compute engine.
- **Hybrid Cloud:** Is a combination of public cloud services and on-premises private cloud-with orchestration and automation between the two. Companies can run mission critical workloads or sensitive applications on the private cloud while using the public cloud for bristly workloads that must scale on-demand. The goal of hybrid cloud is to create a unified, automated, scalable environment which takes advantage of all that a public cloud infrastructure can provide while still maintaining control over mission- critical data.
- **Service Models**
 Cloud Computing is based on service models. These are categorized into three basic service models which are -
 - Infrastructure-as-a-Service (IaaS)
 - Platform-as-a-Service (PaaS)
 - Software-as-a-Service (SaaS)

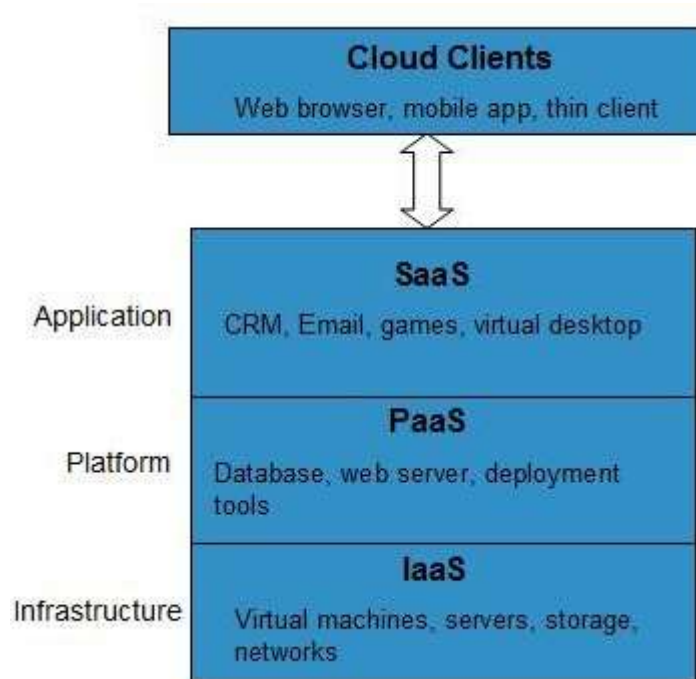


Figure 2: Service Models Source: [1]

1. Infrastructure as a service (IaaS)
2. Platform as a service (Paas), and
3. Software as a service (Saas)

Rouse [2], explains the characteristics of these service models as follows:

IaaS providers offer small, medium, large, and extra large and memory optimized instances, in addition to customized instances, for various workloads needs. Users access those tools over the internet, APIs (Application Program Interfaces), web portals, or gateways software. IaaS has providers supply a virtual server instance and storage as well as application program interface that allow users migrate workloads to a virtual machine.

- PaaS is used for general software development and many PaaS providers will host the software after it has been developed. Common PaaS providers include salesforce.com, force.com, Amazon Elastic Beanstalk and Google App Engine.

- SaaS is a distribution model that delivers software application over the internet; these are often called web services. Microsoft office 365 is a SaaS offering for productivity software and emails services. Users can access SaaS applications and services from any location using a computer or mobile device that has internet access.

Benefits of Cloud Computing

Cloud Computing promises several attractive benefits for business organization and end users. Stud and Forlan [3] identify the following benefits.

1. Self Service Provisioning: End users can spin up computing resources for almost any type of workload.
2. Shared Service: Organizations have the advantage of gaining from services they would find uneasy to pay for, especially for one-time or infrequent use.
3. Up-Scaling Opportunities: Cloud computing provides opportunities for businesses to up-scale their operations.
4. Optimized Computing Package: Cloud Computing is argued to be all optimizing package for business applications.
5. Easier Allocation of Resources: With cloud computing, allocation of resources to many users is made possible.

Advantages of Cloud Computing

Cloud Computing has numerous advantages. Some of them are listed below [4]

- One can access applications as utilities, over the Internet.
- One can manipulate and configure the applications online at any time.
- It does not require to install a software to access or manipulate cloud application.
- Cloud Computing offers online development and deployment tools, programming runtime environment through PaaS model.
- Cloud resources are available over the network in a manner that provide platform independent access to any type of clients.
- Cloud Computing offers on-demand self-service. The resources can be used without interaction with cloud service provider.
- Cloud Computing is highly cost effective because it operates at high efficiency with optimum utilization. It just requires an Internet connection
- Cloud Computing offers load balancing that makes it more reliable.

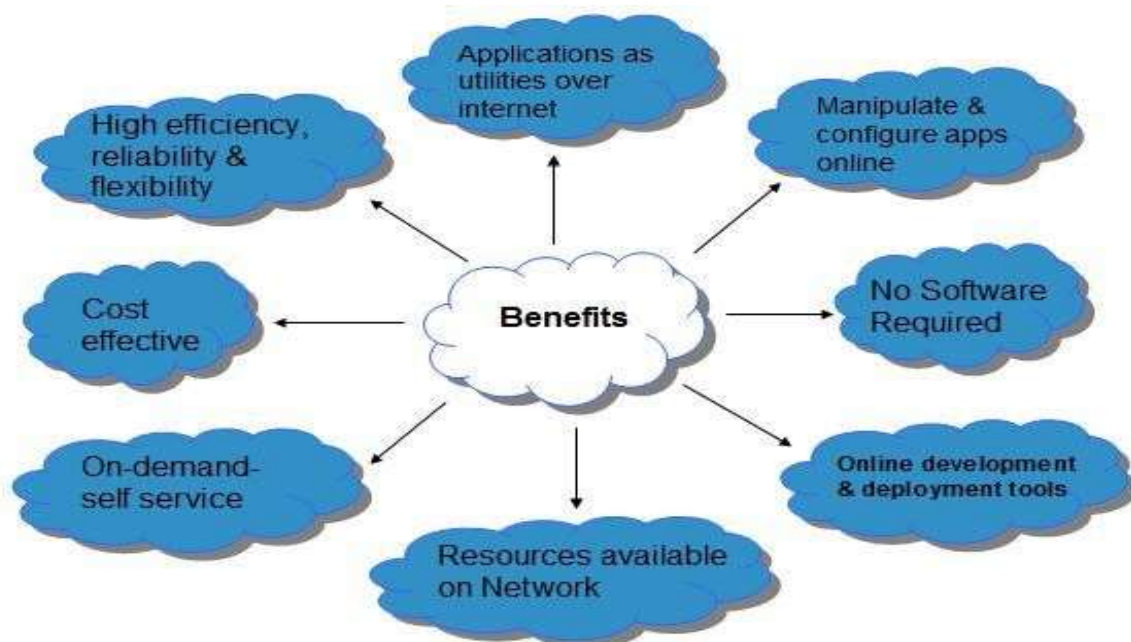


Fig 4: Advantages of Cloud Computing

Source: [4]

Business Implications of Cloud Computing

As Cloud Computing becomes mainstream within the Nigerian business environment, organizations now move from the “when and why” of cloud adoption to instead focus on the “how” [5].

Nigerian organizations are beginning to shift more and more care business functions unto cloud platforms and we now see a growing recognition that cloud adoption is significantly more complex than originally anticipated. This is particularly obvious in data management, system integration and management of multiple cloud providers. Findings by Wright [5] in the research, “The cloud takes Shapes” suggest that business process re-design must occur in tandem with cloud adoption of organizations hope to achieve the full potential of their cloud investments. While cloud brings great opportunity for business both providers and users of cloud services need to be fully aware of the business case for moving to cloud and the risks and challenges associated with it. In a research report entitled “cloud-Enabled business Transformation”, Agura and Mbah [6] State that as Nigerian organizations become more comfortable with the benefits of cloud computing, they are gaining valuable insight into not only the potential opportunities such as cost saving and speedy adoption but also the practical challenges of cloud adoption. In another research titled “Building a successful cloud provider services”, Majid and Olu [7] State that as cloud continues to enable new business models incremental disruptions in enterprise and consumer market, cloud service providers and to consider a variety of business, financial reporting, environmental, tax and social implications in order to enhance the efficiency and value of their cloud offering.

Research Design

Descriptive Survey Design was used. The research was a survey which involved the sampling of a selected group of individuals from different organizations in the South Eastern part of Nigeria that use cloud computing infrastructure, by means of copies of questionnaire structured for this purpose. This group of individuals constituted the respondents to be studied and their responses provided the data analyzed in this report.

Population and Sample Size Determination

The population of the study was made up of 579 staff of some organizations selected from the South Eastern part of Nigeria working in various organizations. A sample size of 500 was selected from the entire population using the statistical relationship by Ekezie [8] as a guide. Thus, we have;

$$n = \frac{N}{1+N_e^2} \dots\dots\dots 1$$

Where N = population size, e = Error term =, n = the required sample size [8]

Data Analysis

The data collection from the respondents was put into tables and the response frequencies were converted to percentage. Therefore, the weighted Mean Average was the statistical tool used to analyze the data.

This section is the analysis and presentation of the data collected from the respondents. The data are presented in tables and the response frequencies are converted to percentages. The analysis was based on the 500 copies of questionnaire administered to and retrieved from the respondents. The section opens with demographic data of the respondents, which highlights the gender, age, and job experience of respondents

The measuring instruments that were utilized in this study would be of two forms; Questionnaire and Oral Interview of staff of the organizations that use Cloud Computing Infrastructure. Response to each item in the scale would be scored as in Fido Gayford five point Likert scale responses of Strongly Agree (SA), Agree (A), Undecided (U), Strongly Disagree (SD) and Disagree (D). The response options are weighted or scored in such a way that a higher value indicates a more positive/intense response or attitude as follows: Strongly Agree (SA) = 5, Agree (A) = 4, Strongly Disagree (SD) = 3, Disagree (D) = 2 and Undecided (U) = 1

In this piece of work, data were collated, classified, categorized and analysed as shown in the tables below. Using the set of graduated options an individual is expected to indicate his degree of agreement or disagreement in response to all statement. These responses are weighted (i.e assigned numerical values) and by summing up an individual response to all statements, a total score is obtained. This total then provides an estimate of that person’s standing on the variable

being measured. According to Nworgu [9], the construction of this scale entails generating a list of statement about what is being measured and providing a set of graduated responses options,

Here also, the total percentage and mean of data were calculated. The Weighted Mean is given by

$$X_w = \frac{\sum_{i=1}^n (F_i W_i)}{\sum_{i=1}^n W_i} \dots\dots\dots II$$

Where F_i = Frequency of the responses
 W_i = The Weighted Mean of the responses

Research Question

1. Does Cloud Computing have some Business implications?
2. Should Cloud Computing be encouraged in organizations?
3. Do you think Cloud Computing is cost effective and reliable?
4. Is the application of cloud computing flexible?

Table 4.1: Demographic Data of Respondents

S/n	Attribute	Option	Frequency	Percentage (%)
1	Gender	Male	294	58.8
		Female	206	41.2
		Total	500	100
2	Age (yrs)	<20	82	16.4
		20-24	86	17.2
		25-29	74	14.8
		30-34	78	15.6
		35-39	104	20.8
		40 and above	76	15.2
		Total	500	100
3	Job experience	<2	93	18.6
		2-4	108	21.6
		5-7	100	20
		8-10	122	24.4
		Above 10	77	15.4
		Total	500	100

Source: field work 2015

Tables 4.1 above shows that 294 respondents (58.8%) were males and 206 (41.2%) were females. In terms of age 16,4% were below the age of 20 years, 17.2% were 20 to 24 years, 14.8% were 25 to 29 years, 15.6% were 30 to 34 years, 20.8% were 35 to 39 years while 15.2% were above 40 years. In terms of job experience, 18.6% had worked for less than two years, 21.6% had worked from 2 to 4 years, 20% had worked from 5 to 7 years, 24.4% had worked from 8 to 10 years while 11% had worked above 10 years.

Table 4.2 whether Cloud Computing has some business implications.

Response	Strongly agree	Agree	Strongly Disagree	Disagree	Undecided	Total
Observed Frequency	268	122	62	30	18	500
Percentage (%)	53.6	24.4	12.4	6	3.6	100

Source: field work 2015

Table 4.2 above shows that 268(53.6%) strongly agreed, 122(24.4) Agreed, 62(12.4%) Strongly disagreed, 30(6%) Disagreed while 18(2.6%) were Undecided. that Cloud Computing has some business implications This is shown by the fact that Nigeria Organization has become comfortable with the benefits of cloud computing, gaining valuable insight into saving, speedy adoption and challenges of cloud adoption.

Table 4.3: whether Cloud Computing has a variety of benefits to business organizations

Response	Strongly agree	Agree	Strongly Disagree	Disagree	Undecided	Total
Observed Frequency	261	136	58	24	21	500
Percentage (%)	52.2	27.2	11.6	4.8	4.2	100

Source: field work 2015

Table: 4.3 above shows that 261(52.2%) of the respondents strongly agree that Cloud Computing has a variety of benefits to business organization. 136(27.2%) disagreed to the assertion and 58(11.6.%) strongly disagreed to the statement, 24(4.8%) disagreed while 21(4.2%) were undecided

This result is confirmed by the fact Cloud Computing offers lead balancing that makes it more reliable. In addition it is highly cost effective because it operates at high efficiency with optimum utilization.

Similarly, Tables 4.4 and 4.5 show the analyses of the responses on the Determination of Cost Effectiveness and Reliability and Flexibility of Cloud respectively.

Table 4.4: Determination of cost effectiveness and Reliability

Response	Strongly agree	Agree	Strongly Disagree	Disagree	Undecided	Total
Observed Frequency	270	120	52	38	20	500
Percentage (%)	54	24	10.4	7.6	4	100

Source: Source: field work 2015

Table 4.5: Flexibility of the cloud

Response	Strongly agree	Agree	Strongly Disagree	Disagree	Undecided	Total
Observed Frequency	265	125	44	24	42	500
Percentage (%)	53	25	8.8	4.8	8.4	100

Source: Source: field work 2015

Answering Research Questions:

Research question 1 was answered through the use of item 1 in the question “Does Cloud Computing have some business implications?”. Table 4.2 shows that out of 500 respondents, 268(53.6%) Strongly Agreed, 122(24.4%) Agreed, 30(6%) Strongly Disagreed, 64(12.4%) Disagreed, and 18(3.6%) were Undecided that Cloud Computing has some business implications in organizations. Similarly, Research Question 2 was answered using item 2 in the questionnaire. Table 4.3 explains this answer. It shows that 261 (52.2%) Strongly Agreed, 136(27.2%) Agreed, 58(11.6%) Strongly Disagreed, 24(4.8%) Disagreed and 21(4.2%) were Undecided whether Cloud Computing should be encouraged in organizations.

Using this same method of analysis, Research Questions 3 and 4 as shown in tables 4.4 and 4.5 respectively.

Table 4.6: Summary of the Results

Research Question	Weighted Mean X_w	Remarks
1	4.2	Agreed
2	4.2	Agreed
3	4.2	Agreed
4	4.1	Agreed

Source: field work 2015

Decision:

For all the research questions posed to the respondents as respective subjects matter, they were in agreement to the research questions raised. That is, they all agreed that:

- i. Cloud Computing has business implications.
- ii. Cloud Computing should be encouraged in business.
- iii. Cloud Computing is cost effective and Reliable.
- iv. The application of Cloud Computing is flexible.

Summary of Findings

The following findings were made in the study. Firstly, the benefits of Cloud Computing to business organizations and individuals are many and adverse. They include provision of shared service, shared infrastructure, optimized computing packages, opportunity for business up-scaling and provision of easy allocation services to multiple users. Secondly, Cloud Computing has some business, environmental, social, economic and financial implications. This is sequel to the fact that industries and organizations have now gained valuable insight into saving, speedy adoption and challenges of Cloud adoption.

Conclusion

As Cloud Computing continues to gain adoption in the Nigerian business environment, organizations now move towards business process redesign. Nigerian organizations are beginning to shift more and more core business functions into cloud platforms. We now see a growing recognition that Cloud Computing is significantly more complex than originally anticipated. This is particularly obvious in data management, systems integration and management of multiple cloud providers. The benefits of Cloud Computing are many and diverse. However, no benefit comes without cost, Cloud Computing is associated with some social, economic, business and environmental implications.

Recommendations

Based on the findings of the study, the following recommendations are made by the researcher.

1. Business organizations in Nigeria and the rest of Africa should intensify effort towards the adoption of cloud computing, to reap the numerous benefits associated with the package.
2. Service providers should develop devices for monitoring the cloud services being provided, in order to ensure high quality service while minimize adverse business implications of the cloud.

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