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Optimizing a Cloud Model for Effective and Efficient Collaboration in a Virtual World

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Abstract: The challenge of how organisations can establish global connection or alliance under the backbone of an ICT intensive infrastructure to leverage on the core competences of other organisations for effective and efficient operation in a virtual world in order to create virtual values to serve its corporate objectives has created the opportunity for the rise of the global Cloud champions with different cloud services to meet organisations technological and business needs. Harnessing this concept, organisations are able to exist without the bricks and mortar by taking advantage of technology by using the Internet as well as its offspring- cloud, for collaboration, communication, gathering information, e-Commerce, and marketing. Thus, this research paper responds to the concern on how an organization can be enabled to collaborate in a virtual organization (VO) so as to operate effectively and efficiently under an ICT intensive cloud platform to create value or enhance corporate visibility and competitiveness in the globally digitised business environment. This research develops a novel hybrid cloud-based framework (tagged: Cloud VO) that integrates existing cloud computing models with the VVC Framework of Virtual Organisation (VO) for effective and efficient collaboration to ensure corporate visibility and competitiveness in the virtual environment. Further, a hypothetic deductive methodology (quantitative approach) involving survey approach was advanced to meet the establish objectives, as well as derive a mathematical model for effective and efficient VO operations within the proposed cloud-based framework. The model, if deployed would create corporate value or enhance corporate visibility and competitiveness in the globally digitised business environment. It would further ensure customer satisfaction, shareholder wealth creation and overall stakeholder value creation through optimised collaborative virtual world.

Keywords: Virtual Organisations, Virtual World, Corporate Value, Virtual Value Creation, Cloud Computing

1. Introduction

Over the years, all consumers and enterprises have been delimited by renowned social and geographical constraints that defined their individual industry environments and marketplaces until 1993, when the Internet and the World Wide Web (WWW) emerged. The evolution of the Internet eliminated or greatly alleviated many of these constraints, hence, facilitated the global business environment. Most existing collaborating enterprises are now beginning to appreciate the need to operate with the support of ICT network so as to break their geographical barriers and create effective information systems to gain and sustain their competitiveness in the modern business environment. Similarly, sequel to the rapid development of Internet technology, new network-based computing modes represented by cloud computing have emerged [1]. UIC [1] enumerates the result of this development to includes that the networked computer systems in space has been expanded; the service adaptability of clients has registered hyper improvement; and the ultimate goal of on-demand services and resource sharing has taken a big step forward.

However, furthermore, publication by UIC [1] argues that through the study of the collaboration of cloud and clients as

new service modes of network computing in the virtual world, the looming security problems plaguing most network computing environment such as vulnerability to the performance bottleneck at the server side, due to the intensive demand for computing, storage and network bandwidth resources are optimally combatted to give full play to the advantages of various computing models, and provision efficient and secure services for cloud consumers.

The problem of many organisations, which define the purpose of their existence, has queried on how to reduce cost and time with improved quality so as to boost the economic value of the corporation, in order to maximally increase the organisational value and shareholders' wealth while improving customers' value.

In a recent survey, Mordor Intelligence [2] reveals that the cloud collaboration market was valued at USD 26.39 million in 2017, and is predictable to attain a value of USD 55.54 million by 2023 at a CAGR of 13.2%, over the forecast period (2018-2023). The scope of the report is limited to the types of solutions offered by major cloud players, which include unified communication and collaboration, enterprise social collaboration, project and team management, document management system, and support services. The end users considered under this survey include telecommunication and ITES, education, media and entertainment, healthcare and life sciences, banking and financial systems, and government and public sectors [2].

The resulting challenges and concerns, therefore, have remained core in the minds of most corporate leadership. These seek to interrogate on how any organisation can operate and collaborate under an intensive ICT platform such as cloud; to ensure its global visibility and competitiveness in order to survive and boom in this emerging virtual world.

1.1. Problem Statement

In view of the considerations explained under the previous heading, this research is concerned on how an organization could be enabled to collaborate in a virtual organization (VO) so as to operate effectively and efficiently under an ICT intensive platform- cloud, to create value or enhance corporate visibility and competitiveness in the globally digitised business environment. In proffering suitable solution to this, the research is not limited to the direct modelling and deployment of the proposed Cloud VO alone, but instead, further emphases a difference with deeper consideration and need for performance evaluation and optimization modelling of a mathematical model for effective and efficient VO operations within the prescribed cloud-based framework.

1.2. Research Aim and Objectives

The major thrust of this research is to Model a cloud-based framework for effective and efficient collaboration in a virtual world. It also aims to unveil the suitability of the said framework to ensure corporate visibility and competitiveness in the virtual world.

The study is specifically carried out to:

a. evaluate and justify how widely deployed cloud-based VO collaboration of medium sized organisations is as against those of small sized organization
b. evaluate and justify how the degree of virtualization can widely impact cloud-based virtual organisation as against the successful collaboration of organisations for projects in a virtual world.
c. evaluate how the degrees of virtualization and the successful collaboration impact the adoption of cloud computing future model of VO.
d. model a hybrid concept for Cloud-VO framework having regard to Hales' and IBM models.
e. develop a mathematical model based on the VO activities in the Cloud
f. create an optimized corporate value creation model for collaboration based on a hybrid Cloud-VO model through a controlled mathematical model for VO activities in virtual world

1.3. Research Question

The following research questions shall be answered by this research work:

i. How widely deployed is cloud-based virtual organization collaboration by medium sized organisations as against those of small sized organization?
ii. How widely impacting are the degrees of virtualization on cloud-based virtual organization as against the successful collaboration of organisations for projects in a virtual world?
iii. How do the degrees of virtualization and the successful collaboration impact the adoption of cloud computing as the future model of VO?

1.4. Research Hypotheses

Sequel from the above research questions, the following research hypotheses will suffice:

H_{O1}: Medium sized organisations do not significantly deploy cloud-based virtual organization collaboration more than small sized organization. *(This had been tested using ANOVA Analytical Techniques).*

H_{O2}: The degrees of virtualization do not significantly impact cloud-based virtual organisation more than the successful collaboration of organisations for projects in a virtual world. *(This had been tested using ANOVA Analytical Techniques).*

H_{O3}: The degrees of virtualization and the successful collaboration do not significantly impact the adoption of the Cloud model of VO. *(This had been tested using Multiple Regression Analytical Techniques).*

2. A Framework of VO in a Cloud Environment

2.1. Related Works on Cloud-Based VO

According to The Economist [3], the term virtual

organization ensued from the phrase "virtual reality", which is itself the process of experiencing reality through the use of multimedia especially audio-visual simulations. Following the "root", it may be safely submitted that virtual organization is meant to simulate a traditional organization (whether or not business-oriented) using information technology platforms especially the Internet. Nevertheless, various attempts have been made to express what the term reflects. Agreeably it is a different business model.

Hales [4] identified the foundational and functional drivers of value creation. The foundational drivers include: digitization, infrastructure and environment; and represent all advanced ICT elements existing in and out of the enterprise, which Chinedu et. al [5] asserted, could be duly provisioned by cloud services such as Infrastructure as a service (IaaS), and Platform as a service (PaaS). On the other hand, the functional drivers include: customized value proposition, strategic sourcing, core competence, and an integrated value net that summarizes the value creation theories and describes how value is created to meet corporate objectives. These drivers constitute the bedrock for sustained competitive strategy in the global marketplace albeit conducted through the SaaS cloud computing delivery. Value creation is promoted by value-based management.

Cloud computing is used to describe both a platform and type of application. A cloud computing platform dynamically provisions, configures, reconfigures, and deprovisions servers as needed. Servers in the cloud can be physical machines or virtual machines. Advanced clouds typically include other computing resources such as storage area networks (SANs), network equipment, firewall and other security devices [6]. The various services models in cloud as described by Reilly et. al. [7], has their place in a description by Hasan [8], which posited that cloud computing is akin to selling X as a service. Thus, the following deductions are drawn:

a. IaaS: Infrastructure as a Service i.e. Selling virtualized hardware
b. PaaS: Platform as a Service i.e. selling access to a configurable platform/API
c. SaaS: Software as a Service i.e. selling or use of a software that runs on top of a cloud

Added to software engineering landscape is cloud computing which encompasses Software as a Service (SaaS) among others. Cretu [9] maintained that SaaS represents a soft-ware delivery model, which provides access to business functionality remotely (usually over the Internet) as a service. It integrates both a new business model and a new software architecture model. According to Cretu [9], the ability to embed tools and techniques to capture *common and variable* features of various business models within the software at run-time instead of de-sign-time are contained in the very essence of this architectural paradigm shift.

Three main characteristics are identified to be essential to any enterprise cloud:

i. Configurations are dynamic and automated (or semi-automated) in varying and unpredictable ways, and possibly even include event-driven conditions.
ii. Systems management technologies are scalable so that they are manageable in aggregate conditions (e.g., integration of business constraints with infrastructure constraints).
iii. A Cloud is secure and has the necessary information assurance capabilities [9].

In a proposed framework, Cretu [9] takes into consideration the whole complexity of a VO system based on Cloud services.

2.2. A Hybrid Model of VVC Framework of VO in a Cloud Environment

Recent innovations in ICT developments such as VO and Cloud Computing, have radically transformed the nature of the marketplace and how organisations operate and strategize so as to thrive and sustain their competitive edge over their rivals in the global digital marketplace. Changes in the value and utility of information and IS resulting from this kind of electronic society, have brought about the immerse benefits on commercial relationship, products and services, organisational structures and organisational performances.

VO system facilitated by effective information system management under the supporting platforms of high performance ICT infrastructure and environment does not only ensure the integration of core competence for collaborative ventures among participating enterprises with complementary expertise, but also promote knowledge management, and accessibility with effective and efficient use of available resources to satisfy customers discriminatory and ever changing value, thus creating and maximising shareholders' wealth and overall corporate value. Consequently, enterprises are under pressure to modify their operational and strategic perspective since the gap between e-business and none e-business is rapidly disappearing as the forces of the new economy become typical of modern business life.

2.2.1. Method

This paper follows a sociotechnical approach. The sociotechnical approach considers technology and its effects on the environment. The environment in this context includes persons such as business owners, their partners and customers, as well as the relationships that exist between these entities especially with the involvement of high-end technology in driving the operations of the business. The foundation of this sociotechnical study is the Hales VVC model, often regarded as a socio-economic value creation proposition, and how it could be enmeshed with the cloud technology to provide a realistic source of corporate value chain [5].

This research reviewed the strategic role of IS in realising organisational competitive strategy and its influence on the corporate strategy. Appreciation of the impact of the inevitable and ever occurring changes in information on the management of organisational projects such as through Business Process Outsourcing (BPO) further helped to justify

how VO system contribute to value creation for enterprises collaborating or outsourcing projects in the global digital marketplace.

Furthermore, the adoption of the VVC framework of VO, developed by Hales [4], identifies the foundational and functional drivers of value creation. The former which include digitisation, infrastructure and environment, represent all advanced ICT activities existing in and out of the enterprise. The functional driver includes a customised value proposition, strategic sourcing, core competence and an integrated value net which summarises the value creation theories, describes how value are created to meet corporate objectives, and hence sustained competitive strategy for organisations in the global marketplace.

The evolution of Cloud Computing presents a more robust, intensive and dynamic ICT environment where ICT resources could be availed customers, strategic partners, and suppliers (i.e. the functional drivers of the VVC framework of the VO) without huge capital investment for project setup, operationalization and subsequent maintenance. These ICT resources are made available on pay as you go bases. Thus, we have Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) delivery models provided by various cloud providers. The outcome of this kind of ICT backbone on the VVC model of the VO prescription of Hale [4] is as represented by Figure 1:

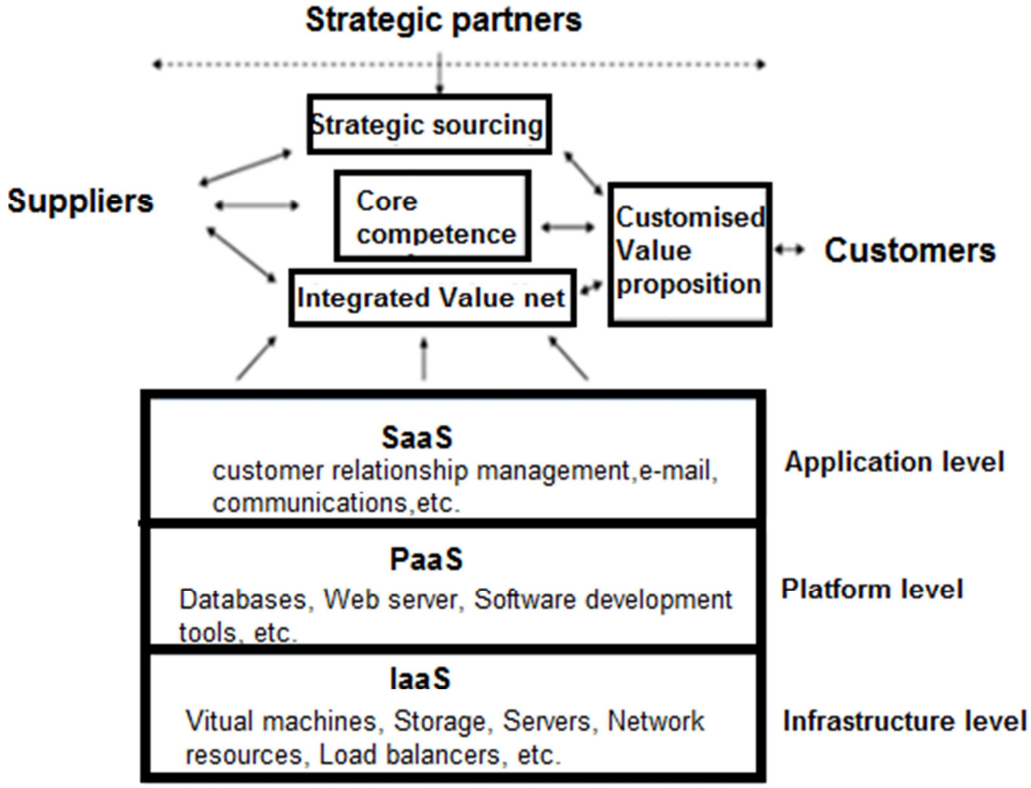

Figure 1. *Hybrid model of VVC framework of VO in a cloud environment [5].*

2.2.2. Exploration of the Model of Cloud-Based Virtual Organisation

As clearly represented in a cloud computing service model, the framework comprises Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Among these, SaaS is a software delivery model, which provides access to business functionalities (such as collaboration, business process, CRM, industry applications, etc.) remotely (usually over the Internet) as a service [9, 10]. Thus, with this cloud service model providing needed interface, both a new business model and a new software architecture model are introduced. The ability of this architectural paradigm shift to avail embed tools and techniques which help to capture common and variable features of various business models within the software at run-time instead of design-time is the essence of this cloud model [9].

The modeling of Cloud-based framework of VO has being supported in Cretu [9] where the relationship between the organizational concept (VO) and the ICT intensive technology (Cloud Computing) are identified by considering that "virtual organizations should be seen as service-based socio-technical systems and that they should be engineered (top-down approach as opposed to ad-hoc formation) following the cybernetics principles and the economic laws (business objectives, cost, profit) [9].

On these bases, the research proposed framework, represented in Figure 1, and elucidated pictorially in Figure 2, would be adaptive.

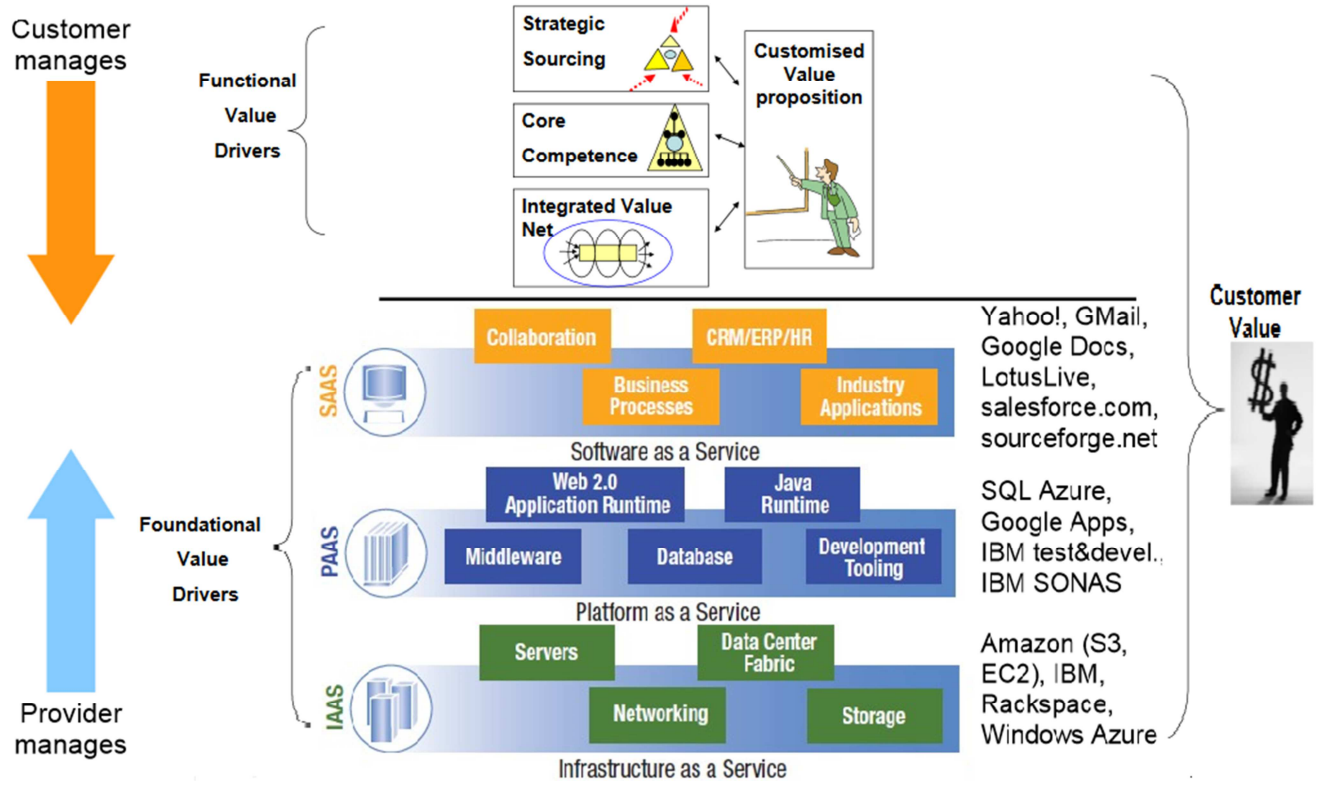

Figure 2. *A model of cloud-based virtual organization [5].*

Cloud computing as the foundational value driver of VVC Model of VO promises a more cost effective enabling technology to outsource storage and computations. The robust high-tech and cost-effective framework is revealed in the model shown in the pictorial diagram above.

Since many enterprises and other organizations need to store and operate on a huge amount of data in a virtual world, Cloud computing aims at renting such resources and their associated resources on demand bases. Today's cloud providers according to Bugiel et al [11] offer both, highly available storage (e.g., Amazon's Elastic Block Store (EBS) [AmEa]) and massively parallel computing resources (e.g. Amazon's Elastic Compute Cloud (EC2) with High Performance Computing (HPC) Clusters [AmEb]) at relatively low costs.

In their paper, Neumeier, Wolf and Oesterle [12] identified 38 kinds of benefits of digitalization and clarified the underlying value drivers. Thus, these benefits were categorized into five areas of the model for organizational information and communication systems to include: Customer, Business Model, Business Processes, Application Systems & Services, and Infrastructure. In order to clearly relate the manifold vague digital benefits within each layer and to conclude on measureable value drivers of digitalization by using logic trees. Further consideration of the value drivers made a rational consideration of the internal and the external perspective. That is, they identified value drivers that enable the measurement at the interfaces between the intra- and extra-organizational perspectives. It was concluded that each digitalization project should thus aim at contributing to the organisation's profitability in terms of efficiency or customer experience or even both values. In the light of this, for an organisation which decides to invest in digital initiatives, the assessment should be based on those drivers [12].

Virtualization being the case with most Cloud computing environment implies much flexibilities in the foundational drivers of the proposed Cloud VO. This has enabled servers to migrate from one host to another dynamically for load balancing as well as made easier dynamic recovery from hardware failures [13]. Thus, VO stakeholders could be assured of safety of all business information and supporting infrastructures throughout the span of the organization in the virtual world.

The idea to shift the focus of participating organisations in a virtual cooperation from the maintenance of their infrastructure back to managing their core business as well as releasing smaller organizations from the constraint of investing in a sound infrastructure before their business can kick start under an intensive ICT platform of cloud network help to promote such virtual organizing among various interest groups or stakeholders. With the Cloud, companies have expanded their reach into unknown territories. The ability to reach and support a remote customer in real-time which was never a reality before is now achievable. As a way of attaining and sustaining corporate visibility and competitiveness through the Cloud, organizations are now able to link and integrate, unifying their core competencies to function as a single organization in a virtual world. This implies a change of the rules of the game.

2.3. Justification of the Cloud Virtual Organisation

UIC [1] unveils that Cloud-client collaborative computing is one of the most popular research fields in network computing. Like cloud computing, this new computing modes are widely applied and rapidly developed in recent years. The publication argued that there is still large room for improvement in the understanding of the architecture of these computing models to ensure effective combination with applications. In order to provide more competitive and distinctive products and technology solutions, the report maintained the need to solve core technical difficulties, develop key products, master core technologies of software and hardware in cloud-client collaborative computing platform, implement its industrialization, and fundamentally improve the level of development and information security in Internet, especially in mobile Internet [1].

In a publication, Puranik [14] submits a list of five trends in cloud computing that strategic businesses will prepare for in the years to come. Exponential growth in cloud services solutions was named as first in the highlights to justify why business and IT executives are turning more of their attention to how they can use technology to accomplish their 2018 business objectives. It was predicted that in 2018, we expect to see many more organizations take advantage of the simplicity and high-performance the cloud guarantees. Thus, Businesses that want to simplify operations and make it easier for their customers to access services will move more aggressively toward integrating Software as a Service (SaaS), Infrastructure as a Service (IaaS), and/or Platform as a Service (PaaS) into their business processes.

Kudale, Trikande, Desai, and Kore [15] leverage the recent rise of wearable technology and the Internet-of-Things, which has brought great opportunities and challenges to the healthcare domain to develop a wearable device platform with data sharing and collaboration in mobile Healthcare applications enabled by cloud computing and big data analytics. The data collected from individual devices contributes to big health data and valuable insights can be derived. Hospitals and medical institutions can use these data to link with other Electronic Health Record (EHR) data, such as clinical notes, to facilitate health monitoring, disease diagnoses and treatment. Health insurance companies can make detailed and strategic policies according to individual characteristics, benefiting customers to choose flexible insurance plans according to their needs.

However, arising from this technological and innovative idea were some security concerns on handling health data sharing between institutions. The need for a secure data sharing infrastructure has been identified as critical success factor due to the fact that there are several challenges related to privacy, security, and interoperability. First, health data are highly privacy-sensitive, especially as more data are storing in a public cloud, raising the risks of data exposure. Second, current systems use centralized architecture, which requires centralized trust [15].

Cloud computing has undoubtedly evolved as a popular computing paradigm where virtualization and scalability of few available resources are consolidated to provide unlimited (computational, storage, etc.) services over the conventional Internet. However, as rightly argued in a paper, "the resource capability of a single cloud is generally limited, and some applications often require various cloud centers over Internet to deliver services together" [16]. This implies that coming together in a Virtual Organization (VO) will definitely provide great opportunity and strategy to integrate various providers' services with users across multiple autonomous clouds.

In this research, a framework for Cloud-based VO (Cloud VO) presented will enable some flexible and dynamic VO management protocols for clouds. Therefore, this prescription unveils the Cloud VO achievable among various cloud providers (IaaS, PaaS, and SaaS providers) in satisfying the values of corporate organizations and general cloud users through a form of inter-cloud collaboration.

One major advantage of driving the VO under the cloud computing (especially the public cloud deployment model), is due to the dynamic and temporary life span nature of most virtual organization needing these ICT resources and their availability, scalability and dynamic provisioning by cloud providers to support all collaborative, projects, business processes, etc. functions of most organization that meet their corporate objective and shareholder values.

Therefore, leveraging on these provisions by cloud service providers as the needed VO foundational driver, enable paying for the services in a pay for consumption model. Participating organisations in a Cloud VO model can purchase this service and pay for only what they actually consumed- whether it is hour running a virtual server or actual amount of disk space consumed. With this "pay as you go" concept (usually with prices measured in cent), no long-term commitment to infrastructure (hardware, networks, middleware or software) resources are required.

There are several further compelling justifications for the possible deployment of Cloud VO as an IS strategy for IS/IT based collaboration as discussed in Winkler [17]:

i. Testing and Quality Assurance
ii. Outsourcing Needs
iii. High- Performance Computing
iv. Web-based Application Hosting
v. Small Organizations
vi. High Availability/ Business Continuity
vii. Scale Required

2.4. Scenarios of Cloud Virtual Organizations Formation

Viewing the various cloud providers (players) and their various offerings like Lotus Live, IBM Lotus Sametime, Un-yte, Salesforce.com, Sugar CRM, and We-bEx all delivered via the SaaS model as participating organisations with benefiting consumers whose need to install and maintain their software are relieved by the use of licensing models that support pay-per-use concepts a form of Cloud-VO is realized. Thus, based on this scenario, a definition of the Cloud-based VO (Cloud-VO) by Cretu [9] suggests "as a

business process made of activities that may allocate resources from different Clouds in order to respond to business events".

Social networks have been defined by Winans and Brown [18] citing National Science Foundation [19] definition which has it as "a group of individuals whose members and resources may be dispersed geographically and institutionally, but who function as a coherent unit through the use of cyber infrastructure." These networks (such as Facebook, twitter, etc.) are typical illustrations of platforms that use a somewhat elusive definition of organization similar to a virtual organization.

There are wide variety of other ways virtual organisations deploy the services of cloud. These among many other scenarios previously identified in this paper include the following as discussed in Winans and Brown [18]:

a. A typical VO formation is a startup company using infrastructure cloud to deploy its services, taking advantage of the economic model a pay-for-use model being most affordable as it kicks start, and may also serve it need throughout its entire corporate existence. This form of virtual organising may be taking advantage of the elastic resources the cloud delivers.
b. Thousands of supply chain partners Internetworking their business processes and operations together is a form of VO. Here, partners could utilize the business interaction server hosted in a cloud to manage interactions, ensure conformity to legal and contract policies, and a record of their participation to all participants in an interaction when completed. This type of VO requires the management of the complexity of interoperating with various partner systems and to contain policy differences by harnessing the full range of autonomic computing capabilities of the cloud.
c. Hundreds of thousands travel and entertainment agencies in a network providing services that usually comply with corporate standards via cloud hosted applications and platforms provides an easily familiar scenario of VO. This kind of organizational network invariably regards the life of a traveler by structurally eliminating the need to maintain direct face to face relationship with the travel service provider or agency.
d. A group of scientists spread across the globe but collaborating right from their labs in compute- and data- intensive interactions that are cloud hosted represent another form of cloud virtual organization. Though not large in size (representing a virtual team collaborative network), yet usually demand access to an elastic set of compute resources for hours per time, with the robustness for large database manipulation [18].

Therefore, in a report, Chinedu [20] maintained that the Cloud-VO strategy provides several reasons in justifications of its formation for successful collaboration or alliance in the virtual world. It could be seen as the best way to ensure success in response to today's ever-changing business world. The strategies used shares infrastructure and risk, links core competencies, reduces costs through time-sharing, increases facilities and market coverage, gains access to new markets, and migrates to selling solutions. The participating organisations are able to exist without the bricks and mortar by taking advantage of technology by using the Internet as well as its offspring- cloud for collaboration, communication, gathering information, e-Commerce, and marketing.

3. General Methodology

In respond to the research questions, a four-step research methodology was adopted and thus had been implemented. Firstly, the research objectives were established which guided the setting of the research questions. Secondly, an appropriate architectural framework for the research was developed and adopted following the approach previously elucidated in sub-section 2.2.1, under the sub-heading: Method. The said framework (Cloud VO) is a hybrid model based on the existing works of past researchers. Thirdly, it includes a brief review of relevant and past literatures. Finally, the fourth step of the general methodology is the deployment of a specified hypothetic deductive methodology (quantitative approach) involving survey design, distribution, collation and computational analysis using, frequency distribution and percentage method, Analysis of Variance (ANOVA), and Multiple Regression through a Discriminant Analyses using statistical packages such as Excel, and SPSS. This provided the basis for the development of a mathematical model for the VO activities in the Cloud. The results of such analysis would be discussed and interpreted in relation to the key issue of the research.

3.1. Sources of Data

The gathering of data or information in the course of this research could be classified into Primary Data Sources and Secondary Data Sources. The primary sources consist of survey of expert's opinions and contributions at various levels using questionnaire and structured interview. The data gathering method is known as focus group. Basically, the data gathering from the online questionnaire was done accessing opinions from practicing IT Professionals registered with IT regulatory body, and IT society within Nigeria who hold the membership status as fellows of the institutions. Administering questionnaires and accessing such focus group helps to create and facilitate easy access to experts irrespective of their present national or global location/ dispersion and help mentor young researchers in this dynamic ICT area.

The secondary sources consist of online library resource from various reputable databases including those of some popular universities accessible at the time of the collection. Other e-publications in the Internet such as journals and newspapers, e-books, blog posts, web publications and text books from university libraries were also inclusive.

3.2. Data Analysis Techniques

The total population in this research was 180 respondents. Also, some selected organisations where used to administer the structured interview questions among organisations which maintain corporate membership status and registered with IT regulatory body, and IT society within Nigeria, or whose interviewed staff are registered and practicing professionals.

From the named population, 120 responses (97%) were obtained from the selected 124 persons (sample size) to constitute the required respondents. These constitute a fair representation of the Stakeholders.

Among those who were interviewed in the course of the field work include a staff of an IT company- New Horizon, Ikeja, Nigeria, two employees of a telecommunication company- MTN, Lagos, Nigeria, and staff of some randomly selected commercial bank in Lagos, Nigeria: These include Standard Chartered Bank, Agidingbi, Ikeja, EcoBank, Awolowo Way, Ikeja, Skybank, First Bank and Zenith Bank PLC.

4. Analysis and Discussions

The research work presents an in-depth analysis of the results of the survey, together with some comments based on the findings.

4.1. Cloud Computing: From Hype to Future

Cloud computing is the future model of IT

There has being several IT concepts and trends that have come and gone at a very fast pace [20]. Some of our respondents positioned cloud computing as probably next inline. In the survey, participants strongly concur to the fact that cloud computing is not hype that will subside (in responding to Question 12 in the questionnaire set) as revealed in the pie chart below:

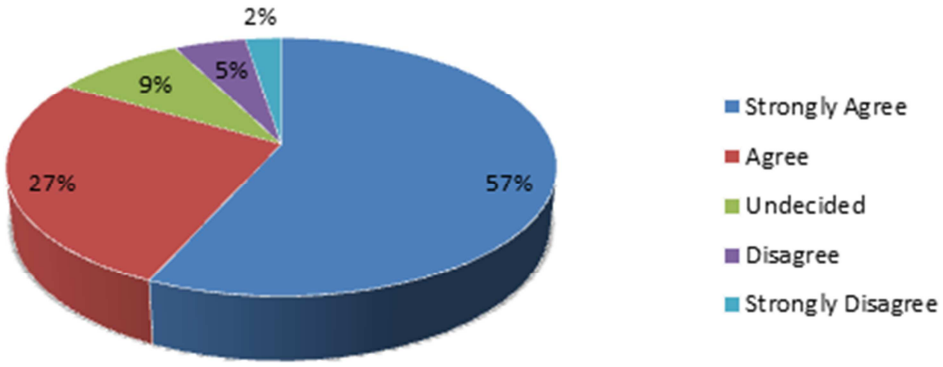

Figure 3. *Cloud Computing: IT Future Model [20].*

While 7 percent of the participants opinions implies, they do not agree (with 5 percent- disagreeing and 2 percent- strongly disagreeing), and just 9 percent of them are undecided with the statement that "cloud computing is the future model of IT", yet an overwhelming 84 percent of these agree (by indicating strongly agree- 57 percent and agree- 27 percent) with the statement that cloud computing is the future model of IT.

Obviously, cloud users maintain remarkably high expectations towards cloud computing. A number of interviewees hold strongly that cloud computing is the next stage of evolution in IT. They feel that the current on-premise IT is highly inefficient and too complex for individual organisations to manage. Cloud computing is the model of choice to shift the complexity to professional vendors and to benefit from their economies-of-scale.

"In the same way we do not generate our own primary energy source via individual power generators anymore but now receive distributed electric energy from a central power source to our buildings, in the near future, IT resources will be commoditized and delivered from huge IT factories. While the Nigerian market gradually gets more mature, cloud computing will obviously replace our local IT. With this in view, the thought that we still deploying on- premise IT resources becomes quite unreasonable." Developer of an international servicing firm to the oil and gas sector

4.2. Further Comments from the Cloud Computing Market

"The impacts of cloud computing are not just measurable in the lives of individuals. Todays' employees are now on the outlook for the same access flexibility and ease of use at work as they have with applications in their personal lives. This suggests the need for sharing information as well as collaborating on projects just as they are engaged chatting on social networks and invite people to participate or comment on their blogs. As information sharing is vital to these individuals, its need cannot be over emphasized within organisations. But availing the needed time, money or infrastructures to provide this experience for most staff are difficult with many organisations. This is where cloud computing becomes your only alternative."

"We are not in doubt that the cloud computing is here to stay and is already impacting heavily on IT world. Where there is increasing flexibility and responsiveness of web applications to meet user needs, thereby reflecting increasingly on the fact most people are collaborative whether at home and in the workplace, innovations in information creation and distribution are definitely a big challenge to traditional notions and boundaries." Israel

Akujobi, Project Director, Jemak Consulting, Nigeria

"It is not a news that most companies in reality are already accustomed with moving data outside of their organization. Consider the present rise of mobility, hosting, outsourcing needs of these organisations." Timothy, IT Infrastructure Architect, New Horizon Nigeria.

"Where Standards are perceived to be an issue, however, also take into cognizance that a cloud is basically built on TCP/IP, HTTP and HTML. So, interoperability is available in its most basic form. We know most people are freely using such cloud services like Google doc, Skype and Facebook without known concerns or fear. Moreover, as appropriate standards gradually converge based on the SOA architecture principles, more and more needs would evolve for cloud users to exploit in the IT marketplace." Victor Ezeliorah, Developer, Intels Nigeria.

"Just like what we now find with most software and web development where already made templates simplifies the job for developers, cloud computing is not intend to replace the need for a customer's or organization's IT department but instead transforms its role. Rather than focusing on technical issues and architecture, IT departments can now associate better and nearer to the business and help in translating all business requirements into cloud computing solutions, their configuration, change management, integration, implementation and governance within the provisioned IT landscape. This would imply providing IT departments an unusual level of responsiveness to any IT matter." John Akpukpu, Infrastructure Support Engineer, MTN Nigeria.

"Here at Expertech we are not unaware of the challenges or possible findings of the survey with our own valued customers. Cloud computing is not a hype. Moving up the service layers from IaaS to real SaaS we are faced with the way forward for computing in the coming years; especially SaaS, with software upgrades and licenses on a 'pay-what-you-use' basis." Emma Nwachukwu, Systems Engineer, Expert Technologies (Nig.) Ltd.

"We can see, from what is real or perceived, as well as from the questions, that the survey truly reveals the present atmosphere in today's marketplace. Cloud computing is swiftly invading than is generally anticipated. To be candid, most of us are already using cloud in our virtual marketplace without being conscious of it." "Based on our experience, we could overcome most of the fears knowing that the issues of security and privacy are justified for any evolving IT innovation. However, the cloud providers, users and legislative bodies should objectively examine the available options." Fredrick, IT Sales Engineer, Jumia, Nigeria.

4.3. Presentation and Analysis of Data According to Tests of Hypotheses

4.3.1. Hypothesis 1: Small and Medium Sized Organisations [ANOVA]

H_{O1}: Medium-sized organisations do not significantly deploy cloud-based VO collaboration more than small- sized organization.

To test this hypothesis, tables 1 and 2 were used. The responses in table 1 represented X_1 column while the responses in table 2 represented the X_2 column.

The responses by Small-Sized Organisations on the IS/ IT Strategy for collaboration can be obtained by considering the average responses of respondents under this classification which addresses elements for successful collaboration of organisations for projects in a virtual world shown in Table 1 following:

Table 1. *Responses on IS/ IT strategy for collaboration by Small-Sized Organisation [20].*

Options	Involvement (Ques. 5)	Contribution (Ques. 6)	Benefiting (Ques. 7)	Impacts (Ques. 8)	Collaboration (Average)
1	38	34	37	49	39.5
2	20	28	32	19	24.75
3	14	7	0	4	6.25
4	0	0	0	0	0
5	0	3	3	0	1.5
Total	72	72	72	72	72

Hint: 1 = Strongly Enable, 2 = Enable, 3 = Don't Know, 4 = Disable, 5 = Strongly Disable
For details of the results and source of data, please refer to the field survey statistical data

The responses by Medium-Sized Organisations on the IS/ IT Strategy for collaboration can be obtained by considering the average responses of respondents under this classification, which addresses elements for successful collaboration of organisations for projects in a virtual world shown in Table 2 following:

Table 2. *Responses on IS/ IT strategy for collaboration by Medium-Sized Organisation [20].*

Options	Involvement (Ques. 5)	Contribution (Ques. 6)	Benefiting (Ques. 7)	Impacts (Ques. 8)	Collaboration (Average)
1	13	15	16	21	16.25
2	11	9	11	4	8.75
3	6	3	0	5	3.5
4	0	0	0	0	0
5	0	3	3	0	1.5
Total	30	30	30	30	30

Hint: 1 = Strongly Enable, 2 = Enable, 3 = Don't Know, 4 = Disable, 5 = Strongly Disable
For details of the results and source of data, please refer to the statistical data

The resultant table is represented by the regression table of Table 3:

Table 3. *ANOVA table for test of hypothesis 1 [20].*

Options (n)	Small (X_1)	Medium (X_2)
1	39.5	16.25
2	24.75	8.75
3	6.25	3.5
4	0	0
5	1.5	1.5
Total (∑X)	72	30

Outcomes using Excel software for the analysis:

Table 4. *ANOVA test results: Single Factor [20].*

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
X1	5	72	14.4	294.3313		
X2	5	30	6	43.78125		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	176.4	1	176.4	1.04344	0.336916	5.317655
Within Groups	1352.45	8	169.056			
Total	1528.85	9				

Decision Rule:

F_α with (k-1; N-k) from the table is given as F (critical) or F distribution table equals 5.317655. Compare the F-ratio, F = 1.04344 with F_α, we have that $F < F_\alpha$. Thus the null hypothesis is accepted since F_α (k-1; N-k) > F and the alternative hypothesis is hereby rejected. Hence, Medium- Sized Organisations do not significantly deploy cloud-based virtual organization collaboration more than Small- Sized Organization.

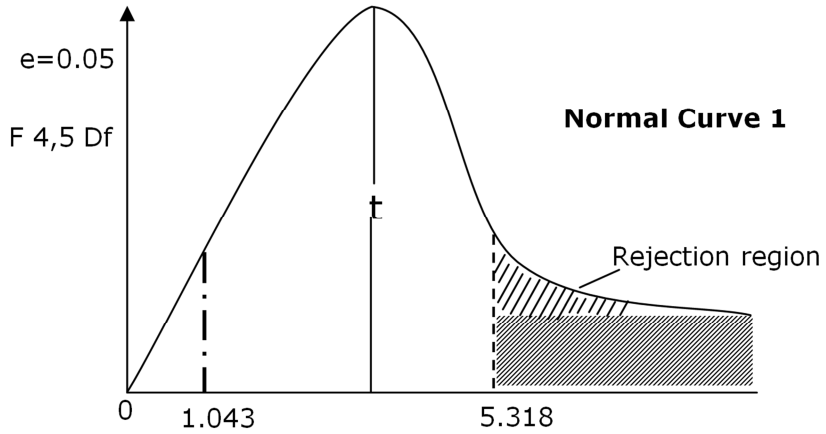

Figure 4. *Graph showing the table and the calculated value of ANOVA computation for hypothesis 1 (H_{O1}) [20].*

Justification of the ANOVA Result for Test of Hypothesis 1

The analysis of variance to the degree to which Small-Sized Organisations deployed cloud-based virtual organization as IS/IT strategy for collaboration as against those of the Medium Sized Organisations can be explained by considering the average responses of respondents under this classification, which provides average of the responses of respondents in these organisations based on their experiences of IS/IT strategy of collaboration both externally and internally as shown in Table 5:

Table 5. *IS/IT strategy for collaboration versus size of organization [20].*

Size of Organisation	Involvement (Ques. 5)	Contribution (Ques. 6)	Benefiting (Ques. 7)	Impacts (Ques. 8)	Collaboration (Average)
Small (10 - 50)	1.666667	1.75	1.611111	1.375	1.600694444
Medium (50 – 100)	1.766667	1.9	1.766667	1.466667	1.725
Large (>= 100)	1.94444	2.055556	1.944444	1.611111	1.888888889

Hint: 1 = Strongly Enable, 2 = Enable, 3 = Don't Know, 4 = Disable, 5 = Strongly Disable
For details of the results and source of data, please refer to the statistical data

Research result in the table suggests that there is a decline in the deployment of cloud-based virtual organization as IS/IT strategy for collaboration as the size of the organisation increases. This is evident by comparing the average of responses by respondents under the various sized organisations.

It is apparent from the result presented that the presence and practice of the IS/IT Strategy among Medium-Sized Organisations is beyond being said to be mere "Enable" in terms of effective and efficient collaborative relationship with other organisations, as they tend to nearly strongly enable its practice in the activities among their internal groups or teams as well as with other external organisations. This is evident due to the fact that the average response to questions 5 – 8 returned a value of 1.725. However, this degree of enablement is closer to being said to be "Enable" (represented by "2") than Strongly Enable (represented by "1") when compared with average response from the Small-Sized Organisations which returned a value of 1.6 (indicating more a nearer strong enablement). Thus, Small Sized organization proved to have more strongly enabled effective and efficient collaborative relationship with other organisations through its practice in the activities among their internal groups or teams. And as indicative from the Table 5 above, the level of cloud-based VO as an IS/IT strategy of collaboration among the different sized organisations increases as the organization decreases in size.

Evidently, Medium- Sized Organisations do not significantly deploy cloud-based virtual organization as IS/IT strategy for collaboration more than Small- Sized Organization from the results available from the field survey. Consequently, most Small- Sized Organisations as against Medium-Sized Organisations operates more in some form of virtual groupings to strategically facilitate access to their remote and mobile workers and, thus, maximize their 'presence' with other team members in the workplace within the corporate office or better still to strategically facilitate access to others organisations in a virtual world, thus, maximize their global visibility within the international information systems. So, smaller organisations leveraged on the core competencies, strategic partners and outsourcing strategies (Functional VVC drivers) of larger organisations through collaborations to attain and sustain global visibility and competitiveness in the evolving information society. The virtualization- digitization, infrastructure and ICT environment (i.e. foundational VVC drivers) required, no doubt is a function of the Cloud Computing model, which provisions IT resources at little or no initial capital outlay, maintenance cost, and technical Personnel cost for these smaller organisations.

4.3.2. Hypothesis 2: The Degrees of Virtualization and Successful Collaboration [ANOVA]

H_{O2}: The degrees of virtualization do not significant impact cloud-based virtual organizations more than the successful collaboration of organisations for projects in a virtual world.

To test this hypothesis, tables 6 and 7 were used. The responses in Table 6 represented x column while the responses in Table 7 represented the y column.

The response on the degree of virtualisation can be obtained by considering the average responses of respondents under this classification, which addresses the degree of existence and use of the Foundational Virtual Value Creation (VVC) Drivers (i.e. digitization, infrastructure and environment) shown in Table 6:

Table 6. *Responses on the degree of virtualisation [20].*

Options	Digitisation (Ques. 9)	Infrastructure (Ques. 10)	Environment (Ques. 11)	Virtualisation (Average)
1	96	40	24	53.33
2	24	68	84	58.67
3	0	12	12	8
4	0	0	0	0
5	0	0	0	0
Total	120	120	120	120

Hint: 1 = Very High, 2 = High, 3 = Medium, 4 = Low, 5 = Very Low
For details of the results and source of data, please refer to the field Survey statistical data

The response on successful collaboration of organisations for projects in a virtual world can be fetched by considering the average responses of respondents under this classification, which addresses the issues on IS/IT Strategy and Collaboration shown in Table 7:

Table 7. *Responses on successful collaboration in a virtual world [20].*

Options	Involvement (Ques. 5)	Contribution (Ques. 6)	Benefiting (Ques. 7)	Impacts (Ques. 8)	Collaboration (Average)
1	56	56	60	80	63
2	40	44	52	28	41
3	24	12	0	12	12
4	0	0	0	0	0
5	0	8	8	0	4
Total	120	120	120	120	120

Hint: 1 = Strongly Enable, 2 = Enable, 3 = Don't Know, 4 = Disable, 5 = Strongly Disable
For details of the results and source of data, please refer to the field survey statistical data

The resultant table is represented by the regression table of Table 8:

Table 8. *ANOVA table for the test of hypothesis 2 [20].*

Options	X	Y
1	53.33	63
2	58.67	41
3	8	12
4	0	0
5	0	4
Total (∑)	120	120

Outcomes using SPSS software for the analysis:

Table 9. *ANOVA test results: One way [20].*

ANOVA					
2	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	2922.000	3	974.000	121.750	.067
Within Groups	8.000	1	8.000		
Total	2930.000	4			

Decision Rule:

That is comparing the F-ratio, F = 121.75 with F_{α} with (k-1; N-k) = 10.13, we have that F > F_{α}. Since the computed value of F, 121.75 is greater than the tabulated (critical) value of F, 10.13, the null hypothesis is hereby rejected and the alternative hypothesis accepted. And so, the degrees of virtualization significantly impact cloud-based virtual organizations more than the successful collaboration of organisations for projects in a virtual world.

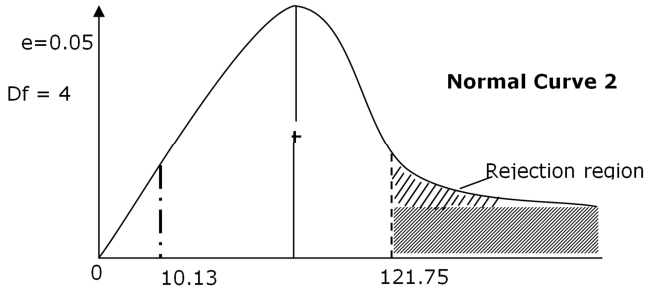

Figure 5. *Graph showing the table and the calculated value of ANOVA-Test computation for hypothesis 2 (H_{O2}) [20].*

Justification of the ANOVA Result for Test of Hypothesis 2

The analysis of variance to the degree to which participating organisations deployed IS/IT strategy for collaboration as against the degree of virtualization experienced among same organisations for projects in a virtual world can be explained by considering the average responses of respondents under both classifications i.e. for IS/IT strategy for collaboration and the degree of virtualization based on their "Small-size Organisations: Between 10- 50 employees", "Medium-Size Organisations: 50- 100 employees" and "Large-Size Organisations: Above 100 employees" respectively.

Therefore, from the field survey data gathered, the following responses are fetched:

Responses to the IS/IT Strategy & Collaboration:

The average responses from the various size organisations on the IS/ IT Strategy and Collaboration give us the resultant response of the entire participants on the successful collaboration of organisations for projects in a virtual world. Thus, the following table below containing responses from the field survey would suffice:

Responses to the Degree of Virtualisation:

The average responses from the various size organisations on the degree of virtualization give us the resultant response of the entire participants on the degree of virtualization of organisations in a virtual world. Thus, the table following avails these details:

Table 10. *Responses on the IS/IT strategy for collaboration and the degree of virtualisation [20].*

Small- Size Organisation	IS/IT Strategy & Collaboration				Degree of Virtualisation		
AVERAGE RESPONSES (1ST LEVEL)	1.666667	1.75	1.611111	1.375	1.208333	1.75	1.916667
AVERAGE RESPONSES (2ND LEVEL)	1.600694444				1.625		
Medium- Size Organisation	IS/IT Strategy & Collaboration				Degree of Virtualisation		
AVERAGE RESPONSES (1ST LEVEL)	1.766667	1.9	1.766667	1.466667	1.133333	1.8	1.866667
AVERAGE RESPONSES (2ND LEVEL)	1.725				1.6		
Large- Size Organisation	IS/IT Strategy & Collaboration				Degree of Virtualisation		
AVERAGE RESPONSES (1ST LEVEL)	1.9444	2.05556	1.94444	1.61111	1.27778	1.77778	1.888889
AVERAGE RESPONSES (2ND LEVEL)	1.888888889				1.648148148		

HINTS:

1. AVERAGE RESPONSES- 1ST LEVEL: This represents the respective average responses for the various indicators of collaboration (i.e. involvement, contribution, benefiting, and impacts) and virtualization (i.e. digitization, infrastructure and environment).
2. AVERAGE RESPONSES- 2ND LEVEL: This represents the average responses for collaboration and virtualization respectively

Thus, resolving the details in the table above, the resultant averages are as shown in Table 11:

Table 11. *IS/IT strategy for collaboration versus degree of virtualisation [20].*

Size of Organisation	Successful Collaboration (Resultant Average)	Degree of Virtualisation (Resultant Average)
Small (10 - 50)	1.600694	1.625
Medium (50 – 100)	1.725	1.6
Large (>= 100)	1.888889	1.648148
Total	1.738194	1.624383

Collaboration Hint: 1 = Strongly Enable, 2 = Enable, 3 = Don't Know, 4 = Disable, 5 = Strongly Disable
Virtualisation Hint: 1 = Very High, 2 = High, 3 = Medium, 4 = Low, 5 = Very Low

For details of the results and source of data, please refer to the field survey statistical data

The resultant research result in the Table suggests that evidently, the presence and practice of the various indicators of collaboration (i.e. involvement, contribution, benefiting, and impacts) did not experience greater deployment for cloud-based VO more than experience of the various virtualization indicators (i.e. digitization, infrastructure and environment). Though the IS/IT Strategy for collaboration was beyond being said to be "Enable" with the response of 1.738, yet the degree of virtualization for the participating organisations tended more to "Very High" with the response of 1.624. Thus, in terms of the overall impact on Cloud-based virtual organizing, the degree of virtualization contributed more than the effective and efficient collaborative relationship with other organisations. Evidently, the result of our ANOVA test of hypothesis 2 above had been elucidated.

From both results of this analysis, it is justifiable to assert that in as much as participant operated in some form of strategic groupings and corporations to promote collaboration both internally and externally with others organisations in a virtual world, robustly supporting and sustaining such alliance or networking for global visibility with effective and efficient international information systems was more of a function of the degree of virtualization in place. So, the digitization, infrastructure and 'ICT' environment (i.e. foundational VVC drivers) required were more 'INTENSIVE'.

4.3.3. Hypothesis 3

The degree of virtualization and successful collaboration on the adoption of the cloud model of VO *[MR]*

H_{O3}: The degrees of virtualization for cloud-based virtual organizations and the successful collaboration of organisations for projects in a virtual world do not significantly impact the adoption of the Cloud model of VO.

To test this hypothesis, tables 12, 13 and 14 were used. The responses in tables 12 and 13 represented x_1 and x_2 columns respectively while the responses in Table 14 represented the y column. The response on the degree of virtualisation had been obtained in Table 6 under test of hypothesis 2 above and is as represented below:

Table 12. *Responses on the degree of virtualisation [20].*

Options	Digitisation (Ques. 9)	Infrastructure (Ques. 10)	Environment (Ques. 11)	Virtualisation (Average)
1	96	40	24	53.33
2	24	68	84	58.67
3	0	12	12	8
4	0	0	0	0
5	0	0	0	0
Total	120	120	120	120

Hint: 1 = Very High, 2 = High, 3 = Medium, 4 = Low, 5 = Very Low
For details of the results and source of data, please refer to the field survey statistical data

The response on successful collaboration of organisations for projects in a virtual world as fetched in Table 7 under test of hypothesis 2 above is shown in Table 13:

Table 13. *Responses on successful collaboration in a virtual world [20].*

Options	Involvement (Ques. 5)	Contribution (Ques. 6)	Benefiting (Ques. 7)	Impacts (Ques. 8)	Collaboration (Average)
1	56	56	60	80	63
2	40	44	52	28	41
3	24	12	0	12	12
4	0	0	0	0	0
5	0	8	8	0	4
Total	120	120	120	120	120

Hint: 1 = Strongly Enable, 2 = Enable, 3 = Don't Know, 4 = Disable, 5 = Strongly Disable
For details of the results and source of data, please refer to the statistical

The response on the general adoption of Cloud Computing as the future model of IT by the entire study population has

been represented by Table 14:

Table 14. *Responses on cloud computing model for general adoption [20].*

Options	Cloud: Future IT Model (Ques. 12)
1	68
2	32
3	11
4	6
5	3
Total	120

Hint: 1 = Strongly Agree, 2 =Agree, 3 = Undecided, 4 = Disagree, 5 = Strongly Disagree

For details of the results and source of data, please refer to the statistical data of the field survey.

The resultant table is represented by the regression table of Table 15:

Table 15. *Multiple Regression table for test of hypothesis 3 [20].*

Options	X_1	X_2	Y
1	53.33	63	68
2	58.67	41	32
3	8	12	11
4	0	0	6
5	0	4	3
Total (∑)	120	120	120

Outcomes using Excel software for the analysis:

Table 16. *MR computer output table for test of hypothesis 3 [20].*

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.991022684
R Square	0.982125959
Adjusted R Square	0.964251919
Standard Error	5.120665741
Observations	5

ANOVA					
	df	***SS***	***MS***	***F***	***Significance F***
Regression	2	2881.557565	1440.779	54.94706	0.017874041
Residual	2	52.44243526	26.22122		
Total	4	2934			

	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	0.382918463	3.226387607	0.118683	0.916372	-13.49910698	14.264944	-13.499107	14.2649439
X1 (Virtualization)	-0.453609786	0.244999233	-1.85147	0.205307	-1.507756406	0.6005368	-1.5077564	0.60053683
X2 (Collaboration)	1.437654851	0.266631702	5.391913	0.032718	0.290431231	2.5848785	0.29043123	2.58487847

Decision Rule:

Since the computed f–ratio. F* is greater than the critical value of f from the table, $F^c_{1-}\alpha$ (k, n-k-1) i.e. F*= 54.947 > F^c = 0.0179, we therefore reject the H_0 and we conclude that the degrees of virtualization for cloud-based virtual organizations and the successful collaboration of organisations for projects in a virtual world significantly impact the adoption of cloud computing as the future model of IT.

4.4. The Hypothetical Cloud-Based VO Model

The following Cloud based Virtual Organisation model was the case based on the test of hypotheses three of the research undertaking:

Model based on the VO Activities in the Cloud

This resultant model can be represented by applying the multiple regression equation. Therefore, the resultant model based on the VO activities from the MR analysis of the test of hypothesis 3 is given by:

Cloud VO = 0.383 – 0.454VZ + 1.438CB

Where:

Cloud VO = VVC VO = Index of Virtual Value Creation model of Virtual Organisation

(Represents the Existing model of Virtual Organisation in the cloud)

VZ = Degree of Virtualisation

(Represents Digitisation, Infrastructure, and ICT Environment)

CB = Successful Collaboration

(Represents index of IS/ IT Strategy for Collaboration. This includes Involvement in collaborative venture, Contributing Core Competences, Benefiting from Integrated Value Net, and Impact on Corporate Value/Image).

5. Conclusion

5.1. Preamble

A look at the future of information and communication technologies and their estimated impact on our lives and business environment reveals a disappearing threshold between online and offline; virtual and functional/ traditional groupings. Man, and organizations are metamorphosing into inforgs (that is connected informational organisms).

No individual, organization or nation can afford to be left behind in this ever- evolving information society. Cloud Computing is no longer becoming a hype that will subside but like the Internet and the E-commerce emergence, which originally faced public fear of adoption due to enormous security and privacy concerns, it is now the future model of IT. Cloud Computing among practicing and registered IT professionals/organization in Nigeria is now real as they are gradually deploying this ICT intensive virtualization and

utility computing to attain and sustain global visibility and competitiveness in the virtual world.

5.2. Summary of Findings and Applications

5.2.1. Summary of Findings

There were no indications of any significant difference between the degrees to which Medium-Sized Organisations deployed cloud-based virtual organization collaboration as against those of the Small Sized Organisations. Evidently justified, was that their degrees of enablement of this IS strategy were closer to being said to be "Strongly Enable" for the Small- Size organisations than for the Medium- Size organisations. These, however, demonstrates how smaller organisation could leverage on the enormous benefits of cloud computing via Cloud-based virtual organising by collaborating with larger organisations to ensure corporate visibility through global presence, attain and sustain competiveness and create value in a virtual world using our integration of the respective VVC and Cloud Computing frameworks by Hales [4] and IBM Research [10].

The relevance of Cloud VO in project team collaboration was appreciated among most project organisations with numerous geographically dispersed workers. The result of the study showed that virtualisation leads to successful collaboration, and that there is significantly very strong relationship (of up to 94%) between the degree of virtualization for Cloud-based VO and the successful collaboration of organisations for projects in a virtual world. Therefore, study justified how the restrictions of geographical barriers are broken among networked organisations, and those mobile workers, road warriors, teleworks and those in remote offices by ensuring secure real-time, anytime, anywhere (Convenience) business operations, communications and collaboration with their colleagues in the company premises or team in other organisations using the intense ICT support via virtualization or Cloud Computing model.

Further, ANOVA test results unveiled that the degrees of virtualization significantly impact cloud-based virtual organizations more than the successful collaboration of organisations for projects in a virtual world. This argument was sufficiently justified with the field survey responses to affirm that in as much as participant operated in some form of strategic groupings and corporations to promote collaboration both internally and externally with others organisations in a virtual world, robustly supporting and sustaining such alliances or networking for global visibility with effective and efficient international IS was more of a function of the degree of virtualization in place. So, the degrees of digitization, infrastructure and 'ICT' environment (i.e. the foundational VVC drivers described in Hale [4] required were more *INTENSIVE*.

However, holistically, the virtual organizing processes of various cloud stakeholders and users based on basically their VO activities (virtualization and strategic collaboration) indicated that of operations in a cloud-based virtual world.

5.2.2. Application

The application of this research contains the enterprise, industry and public policy levels. Cloud-based VO, to begin with, as we have established, provides individual users or enterprises with an innovative framework with which to facilitate their current use of existing information in their own competitive and evolving business environment. Enterprises effortlessly predict her business environment in a virtual world by explore opportunities via the Internetwork information systems to boom.

5.3. Concluding Statements

The bottom line of corporate organisations that defines their purpose of existence is value creation by means of effective and efficient collaboration and use of the shareholders' money. Thus, the vision of Cloud VO is to meet this purpose by improving traditional methods to business.

In practice, research data and observations from this study clearly indicates there are not many organisations that are fully virtualized and deploying cloud computing environment for virtual organisation practice. This is as a result of various lacking dependable security or uncertainties and barriers which need to be overcome first in the Nigeria market. However, many organisations practices depict some features evident of a Cloud VO. Hence, operating within a Cloud VO is a relevant strategic asset for ensuring corporate visibility, sustained competitiveness, customer satisfaction, shareholder wealth creation and overall stakeholder value creation in a collaborative Virtual Environment.

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