Cloud and Big Data: A Mutual Benefit for Organization Development

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Abstract. The emergence of big data as a novel model gives unparalleled composition and value for an organization. The growth of big data is posing challenges in areas such as processing, analytics, sharing, and visualization. Interestingly, the cloud computing technology also emanated to specify important required infrastructure to tackle these disputes. Cloud computing is an effective interface that’s used to manipulate enormous-scale and complicated calculations. It eliminated the requirement to sustain lavish computing hardware, dedicated infrastructure, and software. Big data and cloud computing (BDCC) are considered to become the source of productivity that drives today's electronic business transformations. Nonetheless, the ratio of the companies that adopt and use BDCC isn't significant. There are also obstacles to facilitating BDCC's market proliferation. Hence, this paper aims to recognize and emphasize the factors that affect the adoption and use of BDCC in technology-organization-environment (TOE) viewpoints in enterprises. Data were obtained from a sample of 100 companies to scientifically check our system. The understanding of BDCC's potential advantages and technical capabilities are defined as the BDCC's important elements. Consistency with current infrastructure, data reliability and functionality, and protection and privacy are highly rated within the sense of technologies. Managerial expertise and financial expenditure capacity for the application and use of BDCC and governmental assistance and regulation are defined as organizational and environmental considerations for acceptance and use, simultaneously.

1. Introduction

The ever-increasing capacity and scope of records gathered by establishments, like the growth of social networks, multimedia, and the internet of things (IoT), has created an unprecedented flood of data in either organized or disorganized fashion. The formation of data occurs at a record rate called big data and has evolved as a broadly accepted trend [1]. Big data attracts the academic world, administration, and businesses among other sectors. Big data are defined as various data, which cannot be characterized into standard personal records, and data, which is quickly made, ap-prehended, and managed. Besides, big data affects government, education, research, engineering, banking, industry,
and eventually humanity. The advances in data storage and processing technologies require the retention of growing quantities of data represented by a shift in the quality of data kept by organizations [2]. The speed of creating new awareness is incredible, [3] a big problem for scholars and personnel is that this development rate surpasses their capacity to build suitable cloud computing platforms for data collection and intense upgrades of workload. Cloud computing refers to the most important changes in contemporary ICT and business software infrastructure; it has become a dominant far-reaching and complex computing system [20-27]. The impressive early growth of the cloud has been largely powered by technology entrepreneurs, for whom the value proposition is obvious. Start-ups by definition have little or no customers at the start and no one knows how good the product or service of the company would be, so it is hard to justify buying upfront information technology (IT) infrastructure. Instead, renting the server and storage as needed makes more sense and expands quickly if the company is successful. Because of that clear economic advantage, the entire IT infrastructure of many start-ups is running on the cloud. However, the adoption of the cloud in large corporations has been opportunistic. There is a good business case for using the cloud when a project is a one-off, needs no interaction with current enterprise processes, and raises no security issues [2].

The rewards of cloud computing comprise virtualized infrastructure, equivalent processing, integration with flexible data storage, protection, and data service. Cloud computing cannot only mitigate individuals' and companies' costs and weaknesses for automation and computerization but can as well deliver abridged network conservation costs, resourceful administration, and operator entrée [4]. Because of these benefits, a range of applications has been created that exploit different cloud technologies which have culminated in a considerable upsurge in the data produced which are used by these applications. Many cloud computing's first big data adopters are customers who have implemented Hadoop gatherings in extremely scalable and open vendor-provided application systems such as International Business Machine, Microsoft Azure, and Amazon Web Services (AWS) [5].

Virtualization is one of the traditional cloud computing incorporating technologies. Virtualization provides the framework for many application features required in a broad data system to view, store, analyze, and handle distributed components. Virtualization is a way of ex-changing resources and isolating the fundamental hardware to escalate the utilization of computing resources, security, and scalability.

The objective of this research is to categorize and evaluate the factors that affect the acceptance and use of big data and cloud computing in companies using the model for Technology-Organization-Environment (TOE). To examine the conditions relevant to the adoption and use of the TOE structure by BDCC.

The remainder of this paper is structured according to the following. Section 2 provides the description, attributes, and big data grouping with an outline of cloud infra-structure. Section 3 describes the methodology used for this research. Section 4 presents the relationship between cloud computing and big data. It also presents an analysis of the questionnaire. Section 5 describes the advantages derivable from the two innovations and conclusion.

2. Literature Review

2.1. Big Data and Cloud Computing Emergency in Business Organization

Big data denotes the huge quantities of digital information produced within our im-mEDIATE environment by corporations and governments. 2.5 quintillion bytes of data are being created regularly in so much so that, 90 percent of today's data in the bio-sphere has been formed on an individual basis in the last two years [19]. The problems of storage, security, safety, processing, and methods are all compounded by the size, quantity, and availability of big data, for example, huge amounts of cloud infrastructure, variety of databases and formats spilling data procurement environment and huge capacity inter-cloud movement. Figure 1, shows the six-dimensional classification [6]. These six dimensions occur for the key features needed to find a big data infrastructure.
Most organizations are leveraging data at the moment to make enhanced judgments on their financial and working routes. Using data to make decisions is not new; corporate companies have been processing and analyzing vast amounts of data since the introduction of data storage systems in the early 1990s. Nevertheless, the scope of the data available to most organizations is evolving, and the developments carry with them difficulty in handling the quantities and interpreting those data. It has been observed that most organizations are operating on primary numbers and categories data, refers to as structured data [23]. Nevertheless, it does not reveal the complexity of the organizational data available and their untapped confidential business value. According to IBM, eighty percent of the data companies produced are unstructured and come in a range of formats such as text, film, audio, diagrams, photographs, and some two or more type variations. Any of these unstructured data makes room for commercial data centers. The term "data center" refers to a consolidated database or data server. This reflects a perfect dream of having a single data archive and a live data history that can be used to make smart choices.

Over the years Cloud computing has grown very fast within the IT industry and enterprise, providing secured internet, remote data center, hardware, and IaaS applications [7]. Cloud services seem to be a strong platform for conducting difficult significant computing activities that covers variety of information processing operations from storing and processing to database and device services. The need to archive, analyze, and interpret vast volumes of datasets has encouraged numerous companies and persons to embrace cloud computing [8]. A growing number of research claims for comprehensive investigates are presently being implemented in the cloud and will continue to grow due to the absence of facilities accessible on local servers, lower inventory costs, and an increased amount of data generated and processed by the experiments [9]. Similarly, cloud providers have started to integrate parallel data processing structures into their programs to assist people to use cloud facilities and install their programs [10]. Cloud computing has many positive benefits to combat the exponential development of economies and technical obstacles. Cloud computing eliminates complete ownership costs and permits companies to concentrate on the main professional without having to worry about problems such as infrastructure, efficiency, and resource availability [11]. Also, the combination of cloud computing utility model and a vast range of computers, infrastructures, and cloud storage facilities provides a highly desirable environment in which researchers can conduct certain analyses [12]. Cloud service models classically comprise of: Platform as a Service, Software as a Service, and Infrastructure as a Service.

Because of the mobile device's narrow processing ability, memory bandwidth and power consumption, the growing prevalence of wireless systems and mobile devices has brought cloud computing to greater levels [16]. This situation has contributed to an introduction of a new model for mobile computing. Mobile cloud service allows remote network operators to outsource tasks. For instance, outside a smartphone, data can be accessed and stored [13]. Mobile cloud apps like Gmail, iCloud, and Dropbox have become popular in recent years. These devices boost quality and performance in the mobile cloud. However, the restrictions related to wireless networks and the intrinsic nature of smartphones placed restrictions on computational and data storage [14,17].
2.2 Relationship between Cloud Computing and Big Data

Big data and cloud services are intertwined, big data allows consumers to use re-source computation promptly to process dispersed queries through various databases, and to return and set results. Cloud computing offers the fundamental engine through Hadoop, a class of distributed data-processing systems. The use of cloud computing in big data is shown in Fig. 3. Big cloud and network data sources are kept in a different fault-tolerant repository and analyzed in a cluster using a broad dataset programming model with a shared sequential algorithm. Data visualization's primary purpose, as shown in Fig. 3, is to view visually presented analytical results through various decision-making graphs. Big data use distributed storage technologies based on the cloud, rather than local storage connected to a computer or mobile device. Big data analysis is powered by fast-growing cloud-based applications that are built using virtualized technologies. Consequently, cloud computing not only provides storage and storage facilities for big data but also serves as a business strategy. Map Reduce [15] is an excellent cloud-based example of Big Data analytics; it enables the handing of huge numbers of sequential cluster datasets. In integrated computer contexts like power consumption, storage, and network access, cluster computing works well.

The push for businesses to rapidly adopt and integrate cloud-based services to tackle the problem of acquisition of data that is big and handling burdens poses unforeseen risks and consequences. Many similar studies show how big data functions using cloud computing technologies. It's no surprise that the growth of Big Data associated with the widespread adoption of IaaS and Platform-as-a-Service (PaaS) technologies. PaaS helps companies to expand their resources on-demand and cut costs while IaaS helps significant computational resources to be deployed rapidly. New processing and storage resources can be added to this combination almost immediately. Cloud computing's versatility enables the deployment of resources as required. As a result, businesses avoid the enormous cost of purchasing hardware power they would only use periodically. Figure 2 shows the big data cloud computing usage [18].

![Diagram](image)

**Figure 2:** Cloud computing usage in big data.

3. Methodology

The study uses a research questionnaire to collect data from business organizations to find out how they are using big data and cloud computing in their day-to-day activities. This study was based on the following research questions:

1. Is big data and cloud computing adoption relevant for business organization advancement?
2. Are there challenges militating against the adoption of big data and cloud computing in business organizations?
3. Do the adoption of big data and cloud computing have a significant influence on satisfying customer requirements?

The research hypothesis is:

Hypothesis Ho1: There is no significant difference between business organization using big data and cloud computing and those who are not using them.

Ho2: There are no challenges militating against the adoption of big data and cloud computing in business organization.

Ho3: There is significance influence of big data and cloud computing on customer satisfaction.

3.1. Research Approach

This research aims to analyze the factors affecting the acceptance and use of big data in businesses. The analysis starts with the definition of big data variables and the acceptance of cloud services in companies, as shown in Fig. 3. From the results of this study, we offer recommendations for promotion BDCC implementation in companies.

3.2. Research model and the adoption factors

The study designed the research framework using the theoretical TOE model, as shown in Fig. 4. Tomatzky et al. (1990) [28] created the structure for the Technology-Organization-Environment (TOE) to research the implementation and application of technical services and goods. The TOE system discusses the acceptance factors from three perspectives as follows: technical background including innovation-related technology problems, and organizational structure including internal resources and skills, and climate context including competitiveness and economic strategy.

![Figure 3: Research Procedure](image)

![Figure 4: The framework for the Research model](image)
3.3. Sample, Measures, and Testing the Research Model

Responses were extracted using questionnaire distributed randomly from business organizations in four major business area of Nigerian. A total of 332 surveys were received, and 32 were eventually disposed of for incomplete answers. For all measuring objects a (4) point Likert measure vacillating from "Strongly Disagree" to "Strongly Agree" was used. Using a systematic random sampling technique, a sample size of 300 was established. Mean, Pearson Correlation and t-test were used to analyze the data at a significant level of 0.05. The instrument was therefore adjudged reliable at a 0.89 coefficient as its internal consistency at a significance level of 0.05.

3.4. Respondents Profile

The respondents' socio-economic status is summarized in Table 1. Lagos has the majority part of respondents 31.4%, Ogun state has 29.3%, Port-Harcourt with 21.0% while Abuja was 18.3%. 19.0% of the respondents were less or equal to 30 years, 68.0% of respondents were between the age of 31–45, and 13.0% were aged forty-five and above. A substantial percentage of respondents 77.3% have B.Sc. and above while the remaining respondents have below B.Sc. degree (27.7%). Also, a significant number of respondents (79.7%) have worked for more than 5 years in their respective companies. 65.7% of companies have adopted big data, cloud computing or both in doing their works and the remaining 34.3% have not used the technologies in their various companies but have the idea of using or adopting both big data and computing.

| Characteristics               | Frequency | Percentage |
|-------------------------------|-----------|------------|
| **Location**                  |           |            |
| Lagos                         | 94        | 31.4%      |
| Port-Harcourt                 | 63        | 21.0%      |
| Abuja                         | 55        | 18.3%      |
| Ogun                          | 88        | 29.3%      |
| ≤30                           | 57        | 19.0%      |
| **Age**                       |           |            |
| 31 - 44                       | 205       | 68.0%      |
| ≥45                           | 38        | 13.0%      |
| **Education Level**           |           |            |
| Below University Degree       | 68        | 22.7%      |
| University Degree and Above   | 232       | 77.3%      |
| ≤5                            | 61        | 20.3%      |
| 6-10                          | 173       | 57.7%      |
| ≥11                           | 66        | 22.0%      |
| **BDCC Adoption and Usage**   |           |            |
| Yes                           | 197       | 65.7%      |
| No                            | 103       | 34.3%      |

4. Analysis and Discussion

4.1. Research Question 1: Is BDCC adoption relevant for business organization advancement?

The research question one was answered using mean;
Table 2: Showing mean of respondents.

| Items | Strongly Agree | Agree | Disagree | Strongly Disagree | FX | X=Mean | Remark |
|-------|----------------|-------|----------|-------------------|----|--------|--------|
| Is Big data and cloud computing important to your organization? | 166 | 58 | 45 | 31 | 959 | 3.20 | Agree |
| Big data will revolutionize the way we do business to a degree similar to the Advent of the Internet in the 1990s | 154 | 88 | 39 | 19 | 977 | 3.26 | Agree |
| Big data and cloud will dramatically change the way we do business in the future | 213 | 53 | 18 | 16 | 1063 | 3.54 | Agree |
| Companies that do not embrace big data and cloud technologies will lose their competitive position and may even face extinction | 177 | 67 | 36 | 20 | 1001 | 3.34 | Agree |
| We feel we are ahead of our peers in using big data and cloud and this creates a Competitive advantage for us. | 187 | 65 | 37 | 11 | 1028 | 3.43 | Agree |
| Group Mean | | | | | | 3.35 | Agree |

The mean rating of respondents on the question; Is BDCC adoption relevant for business advancement was answered using mean as shown in Table 4, and based on its mean score the question was answered remarking that the respondents accepted the issues raised that BDCC adoption is relevant for business organization advancement.

4.2. Research Question 2: Are there challenges militating against the adoption of BDCC in business organization?

The research question two was answered using mean;

Table 3: Showing mean of respondents

| Items | Strongly Agree | Agree | Disagree | Strongly Disagree | FX | X=Mean | Remark |
|-------|----------------|-------|----------|-------------------|----|--------|--------|
| We have challenges in implementing big data or cloud in my organization. | 178 | 42 | 56 | 24 | 974 | 3.25 | Agree |
| We had some external help for our big data or cloud installation | 150 | 48 | 65 | 37 | 911 | 3.04 | Agree |
| We are not sure how to integrate BDCC with our existing infrastructure. | 123 | 65 | 76 | 36 | 875 | 2.92 | Agree |
| We are using big data and cloud computing seamlessly in our organization. | 147 | 50 | 63 | 40 | 904 | 3.01 | Agree |
| Group Mean | | | | | | 3.06 | Agree |
The mean rating of respondents on the question; Are there challenges militating against the adoption of BDCC in business organization was answered using mean as shown in Table 3. Based on its mean score the question was answered remarking that the respondents accepted the issues raised that there are some challenges in the adoption of big data and cloud computing.

4.3. Research Question 3: Does the adoption of BDCC have a significant influence on satisfying customer requirements?

The mean rating of respondents on the question; Does the adoption of big data and cloud computing have a significant influence on satisfying customer requirements was answered using mean as shown in Table 4. Based on its mean score the question was answered remarking that the respondents accepted the issues raised that the adoption of big data and cloud computing has significant influence in customer satisfaction.

5. Test of Hypothesis

Ho1: There is no significant difference between business organization using big data and cloud computing and those who are not using them.

There is no significant difference between business organization using big data and cloud computing and those who are not using them. Hypothesis one was tested using Pearson Product Moment Correlation coefficient at a 0.05 level of significance. Table 3 shows the Pearson correlation coefficient.

| Adoption of BDCC affect business organization | Functional business environment |
|-----------------------------------------------|---------------------------------|
| Adoption of BDCC affect business organization | Pearson Correlation | Sig. (2-tailed) | N |
|                                               | 1                              | 0.789           | 0.050 |
|                                               | 0.050                  | 300             |

Correlation is significant at the 0.05 level (2-tailed).

Ho2: There are no challenges militating against the adoption of big data and cloud computing in business organization.

There are no challenges militating against the adoption of big data and cloud computing in business organization. Hypothesis two was tested using the mean value. The mean value gotten support the fact that there are some factors militating against the adoption of BDCC in business organization, thus rejecting the hypotheses 2 and accepting the alternative hypotheses. The respondent list security, budget, lack of talent to implement the technologies and some are not sure how to integrate to their existing system as some of the challenges facing the implementation of BDCC in business organization.
**Ho3: there is significance influence of big data and cloud computing on customer satisfaction.**

The adoption of BDCC have no significance influence in customer satisfying requirement in business organization. Hypothesis three was tested using Pearson Product Moment Correlation coefficient at a 0.05 level of significance.

| Adoption of BDCC affect customer satisfaction | Pearson Correlation | Functional business environment |
|---------------------------------------------|---------------------|---------------------------------|
| Sig. (2-tailed)                             | 1                   | 0.697                           |
| N                                           |                      | 0.050                           |
|                                              |                      | 300                             |
| Functional business environment              | Pearson Correlation  | 0.697                           |
| Sig. (2-tailed)                             | 0.050               | 1                               |
| N                                           | 300                 | 300                             |

Correlation is significant at the 0.05 level (2-tailed).

The table reveals the Person Correlation for the relationship between adoption of BDCC in satisfying customer requirement in business organization and a functional business environment with a 2 – tailed correlation value of 0.697. This implies that as the adoption of BDCC in satisfying customer requirements in business organization increases, the level of functionality of the business environment improves by approximately 69.7%. Confirming this also is its Sig value of 0.050 indicating that there is a statistically significant correlation between adoption of BDCC in improving customer satisfaction in business organization and a functional business environment, being that the p-value 0.050 = 0.05 significant level, thus rejecting the hypotheses 3 and accepting the alternative hypotheses.

6. **Conclusion**

Cloud and Big data provide numerous prospects to boost the performance and profitability of the business organization. One of the primary features of cloud and big data is for a business organization to enhance their mode of rapid decision-making capacity, understanding customer needs, developing techniques for adding new features, expand the customer base, enhancing sales volume, lowering complaints from customers and enhancing quality and performance of employees. This study developed a survey to determine the benefits a business organization stands to gain from Cloud and Big data adoption. Based on the result obtained from the analysis, it can be concluded that big data and cloud computing usage in a business organization have a great impact on business development and enhanced customer satisfaction. The test carried out shows clearly that the integration of the two technologies despite its challenges brings about customer satisfaction and increases the performance of the business. The services of the current cloud provider will also need improvement to meet new technology requirements. This research provides the acceptance of enter-prize big data and cloud computing through studying factors that influence BDCC implementation. The findings revealed that significant predictors of BDCC adoption include: usability, sophistication and implementation costs in the technical context, organizational support and organizational resources in the organizational context, external pressure, protection, and privacy issues and environmental external support.

However, the results indicate that complexity, compatibility, cost of adoption, management support, organization resource, and security and privacy concern are significantly positively related to BDCC adoption, while external pressure and external support are significantly negatively related to BDCC adoption. At the conceptual stage, future studies will aim to follow specific evaluation metrics (e.g. a weighted metric for perceived quality), use other analytical methods to evaluate participant associations, provide contextual reasons for BDCC decisions dependent on participant views, and investigate the generalization of the results of this study by making cross-country decisions.
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