



Impact of Cloud Adoption on the Performance of Organizations: A Facebook and Linked in Survey-Based Analysis

LAWAL IDRIS BAGIWA

Department of Computer Studies, College of Science and Technology, Hassan Usman Katsina, Polytechnic
Katsina, P.M.B. 2052 Katsina State, Nigeria

E-mail: lbagiwa@yahoo.com

ABSTRACT

This paper presents survey-based analysis and interpretation of results obtained from the data collected using online questionnaire. Questionnaire was distributed to the cloud practitioners via Facebook and LinkedIn through cloud computing professional groups like Cloud Storage, Cloud Computing Microsoft - UK and Cloud Architect-Developer-Expert-Consultants and the like. The survey was conducted to determine the performance of organizations using cloud computing services before, during and after adoption. In particular, we focused to study what impact these four factors (trustworthiness, efficiency, scalability and flexibility) have on the performance of cloud adoption? For the purpose of data collection in this research, 3,500 respondents were invited to participate in this survey. However, 310 respondents from 44 different countries responded in the period of 4 months (June - September, 2015). Hypothesis testing and data analysis was carried out using Statistical Package for Social Sciences (SPSS) and the results have been summarized. In line with two recently conducted similar researches, the findings of this research also show that the selected 4 four factors have significant positive impact on the performance of organizations using cloud computing.

Keywords: Cloud Computing, Cloud Adoption, Cloud, Cloud Impact, Organizational performance, Cloud survey analysis.

1 INTRODUCTION

Cloud computing is an internet based environment that provides software services and other computing resources for its users. The users subscribe to and only pay for the services and computing resources they use. In this case, organizations do not need to procure its own IT gadgets to support its activities. The organizations only make subscription to the services and computing resources from the cloud service providers and start using the services [1].

However, in order to adopt cloud services, organizations need to know whether this adoption would be useful or not. In order to answer this question, one needs to study the factors that affect (positively or negatively) relationship between cloud adoption and performance of an IT organization.

Various survey studies have been carried out by different researchers on general cloud computing in which TWENTY (20) potential factors have been identified that may impact the performance of organizations using cloud computing services. The previous researches indicated no conclusive evidence that these factors determine the performance of organizations using cloud computing. These factors are privacy, trustworthiness, reliability, effectiveness, efficiency, quality of service, information access, quality of decision making, competitiveness, service delivery, team collaboration, service availability, better customer satisfaction, scalability, staff productivity, operational cost reduction, new business or market strategy, flexibility, return on investment (ROI) and job creation. However, TWELVE (12) factors were considered by different previous researches done in different countries and regions across the world. Those TWELVE

(12) factors are quality of service, privacy, service availability, job creation, staff productivity, competitiveness, reliability, effectiveness, better customer satisfaction, service delivery, return on investment and operational cost reduction. Thus, we excluded these 12 factors from this research. So, there were EIGHT (8) factors not considered by most of the researches. These factors are trustworthiness, new business or market strategy, quality of decision making, information access, efficiency, scalability, team collaboration and flexibility. In order to explore about these factors and based on the limitations of existing studies we considered FOUR (4) factors in this research work. These FOUR (4) factors are efficiency, flexibility, scalability and trustworthiness. These FOUR (4) factors were selected based on the limitations of existing studies, efficiency was selected based on the limitation of the research conducted by [2] and by [3]. However, flexibility was also selected based on [4] and [5] limitations. Similarly, scalability was selected based on the limitation in the study conducted by [6]. Trustworthiness also was selected based on the limitation in similar study conducted by [7]. However, the FOUR (4) factors; New business or market strategy, Quality of decision making, Information access, and Team collaboration were not included in this study due to the lack of available literatures to support their inclusion in the study.

For the purpose of this research work, online method of questionnaire distribution was employed. The response destination was Excel file with the following links:

Facebook responses:

https://drive.google.com/open?id=18_8cGQbfpC_K0LIPSc0N3Jo_qlFohWq693-waG1s_D0,

LinkedIn responses:

<https://drive.google.com/open?id=1fDUHeE8RGJEFXX4VeiHF1ckGwqYlX2FrRpOGaNNuREI>

These files were later downloaded and exported to SPSS for data analysis. Hypotheses were used in order to test our Null hypothesis and alternative hypothesis.

Motivation:

This research was motivated by interesting challenges arising from the growing trend and complexity of cloud computing adoption by organizations. Research on impact of cloud adoption is very important now a days because it could greatly help business organizations understand the state of the art of cloud computing adoption [8, 9]. Next section presents the research background and some related work.

2 RESEARCH BACKGROUND AND RELATED WORK

Various studies have been carried out by different researchers in which TWENTY (20) factors determining the performance of organizations using cloud computing services. These factors are privacy, trustworthiness, reliability, effectiveness, efficiency, quality of service, information access, quality of decision making, competitiveness, service delivery, team collaboration, service availability, better customer satisfaction, scalability, staff productivity, operational cost reduction, new business or market strategy, flexibility, return on investment (ROI) and job creation. However, out of these TWENTY (20) factors TWELVE (12) were considered by previous researches done in different countries and regions across the world. These TWELVE (12) factors are quality of service, privacy, service availability, job creation, staff productivity, competitiveness, reliability, effectiveness, better customer satisfaction, service delivery, return on investment and operational cost reduction. Yet, there are EIGHT (8) factors have not been considered by previous researches, these EIGHT (8) factors are trustworthiness, new business or market strategy, quality of decision making, information access, efficiency, scalability, team collaboration and flexibility. Therefore, based on the limitations of existing studies by different literatures reviewed, FOUR (4) factors were considered in this research work which are efficiency, flexibility, scalability and trustworthiness. These FOUR (4) factors were selected based on the limitations of existing studies, efficiency was selected based on the limitation of the research conducted by [10] and by [3]. However, flexibility was also selected based on [4] and [5] limitations. Similarly, scalability was selected based on the limitation in the study conducted by [6]. Trustworthiness also was selected based on the limitation in similar study conducted by [7]. However, the FOUR (4) factors; New business or market strategy, Quality of decision making, Information access, and Team collaboration were not included in this study due to the lack of available literatures to support their inclusion in the study. The next sub section presents analysis of the existing studies.

2.1 Analysis of Existing Studies

Figure 1 shows that a total of SEVEN (7) related works were found in the literatures that have done similar studies to our study. THREE (3) of the researches were conducted in the year 2012. One of the researches was conducted in the year 2013 and

another THREE (3) researches were conducted in the year 2014.

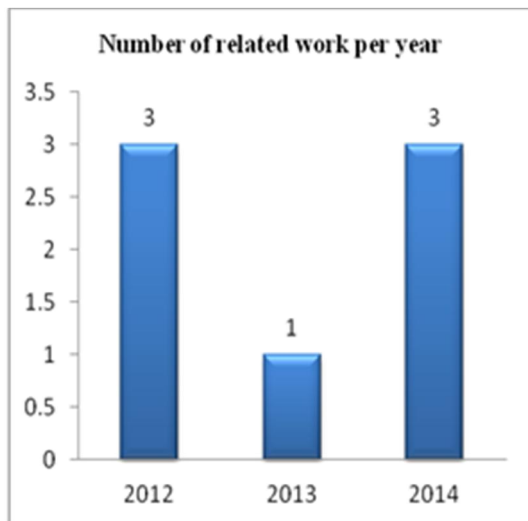


Fig. 1. Number of related work per year

Table 1 shows the scope, factors and limitations of some previous related studies on cloud computing adoption and impact on organizations.

Table 1: Scope, factors and findings on cloud computing adoption and impact on organizations.

Author/Year	Scope	Factor (s)	Limitations
[11]	Cloud adoption, satisfaction and current state of cloud computing use and motivations among IT-organizations: focused on better customer satisfaction in Maryland on two organizations.	Better customer satisfaction	The research limited scope covered only one state in USA (Maryland), considered only one factor which is "Better customer satisfaction". Also, there was lack of in-depth analysis on the cloud
[12]	Analysis of security, cost-effectiveness, and its compliance factors influencing cloud adoption by IT managers.	Privacy and Effectiveness	The research limited scope covered only USA and the study received responses from IT-managers only.
[13]	Critical Success Factors for cloud initiatives: business value, technical performance, and project delivery with 14 sample size.	Service delivery	The research limited scope covered organizations with public and community cloud system using SaaS only and the sample size used for study was 14.
[14]	Factors that relate to and may influence IT managers' interest in adopting cloud computing.	Competitiveness	The research limited scope includes: the study covers only IT-managers willing to implement cloud computing and the survey covered only USA.
[15]	The study was carried out in USA on IT	Return On Investment and Operational cost	The research limited scope covered

	professionals and it concentrated on technology factors while neglecting human factors with regards to return on Investment and operational cost reduction.	reduction	only USA and concentrated on IT professionals only.
[16]	The study was carried out on developing countries with cloud users as participant and concentrated on cloud reliability.	Reliability	The research limited scope includes: the study concentrated on service users while neglecting service providers and was carried out on 19 countries in Europe.
[17]	The study was carried out on the factors that influence cloud adoption by IT-organizations in developing countries.	Quality of Service, Privacy and Service availability, Job creation, Staff productivity.	The research lacks in concentration on service providers. It was carried out in developing countries and participants are IT leaders only.

According to Table 1, related survey studies have been carried out in the area of cloud adoption using some of the factors determining the performance of cloud in relation to organizations. However, some studies were conducted covering part of the country, one country or some few countries. Yet none of the studies cover the whole world. In addition, some of the previous related studies used very small sample size, 14 which could not be used to generalize the results. It has also been identified that so far, none of the previous studies covered the entire cloud related staff of the organizations. The previous studies concentrated largely on IT-Managers [12, 14, 17]. Some of the previous studies also concentrated on cloud service users while neglecting the cloud service providers [16, 17]. However, the related works presented in Table 1 considered not more than TWELVE (12) factors used to determine the performance of cloud in organizations. Therefore, there are still some factors to be explored. Thus this study was initiated to explore answers about the remaining factors. However, as mentioned above, this study only covered FOUR (4) factors; efficiency, flexibility, scalability and trustworthiness. The justification of exploring FOUR (4) has been discussed in section 1 above. Next section presents the analysis of the data collected using facebook and LinkedIn as well as the discussion of the findings.

3 DATA ANALYSIS

This section presents analysis and discussion on responses from Facebook and LinkedIn based on the FOUR (4) cloud performance indicating factors. The responses were analyzed and presented using charts showing responses from the two (2) sources, Facebook and LinkedIn as shown in Figure 2. These charts were briefly explained.

3.1 Respondents' Views on Cloud Adoption Improves Organizational Efficiency

Figure 2 shows response from Facebook and LinkedIn. LinkedIn has the highest proportion 79.35% of the respondents who 'strongly agree' about the view that "cloud adoption improves organizational efficiency" followed Facebook with 68.25%. However, 1.21% from LinkedIn and None from Facebook 'strongly disagree' with the view.

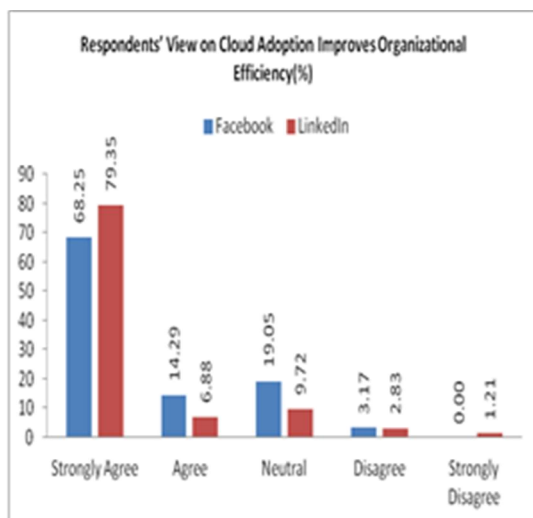


Fig. 2. Cloud adoption improves organizational efficiency. (N=310)

71 EXPLANATION OF FIGURE 2

This section provides a summarized comparison of the findings as presented in Figure 2 above. This summary gives us a clear picture of the results obtained from Facebook and LinkedIn.

Facebook: A sizable number of all respondents 82.54% and majority from India 14.8 ‘strongly agree’ or ‘agree’ with the view that “cloud adoption improves organizational efficiency” when compared to a very few 3.17% who ‘disagree’ with the view. Most the respondents who ‘disagree’ with the view were from USA. It could be suggested that because the respondents from USA have adopted the cloud technology for many years, they have all the experiences to ‘disagree’ with the view. Some of these respondents from USA shared the following comments:

“Cloud adoption does not improve organizational efficiency because cost-saving benefits disappear as demand grows”

“Business data is always at risk in the cloud”

LinkedIn: Majority of the respondents 86.23% from LinkedIn ‘strongly agree’ or ‘agree’ that cloud adoption improves organizational efficiency. Even though 4.04% of the respondents ‘strongly disagree’ or ‘disagree’ with the view but because of 86.23% of respondents who strongly agree or agree, there was a substantial evidence to believe that respondents from LinkedIn are with the view that cloud adoption improves organizational efficiency. In addition, some comments shared by the respondents strengthen this view. They clearly mentioned that cloud adoption improves organizational efficiency because

“It reduce spending on technology infrastructure”

“Maintain easy access to your information with minimal upfront spending”

“Pay as you go (weekly, quarterly or yearly), based on demand”

“Minimize licensing new software. Stretch and grow without the need to buy expensive software licenses or programs”

3.2 Cloud Adoption Improves Organizational Flexibility

Figure 3 shows the views by respondents from Facebook and LinkedIn. the highest 82.19% of the respondents who ‘strongly agree’ with the view compared to 46.00% from Facebook. 8.91% of the total respondents from LinkedIn recorded they ‘agree’ with the view that “adopting cloud computing improves organizational flexibility”. 12.00% and 7.69% from Facebook and LinkedIn went for ‘neutral’ respectively. On the other hand, 1.00% and 1.21% ‘disagree’ with the view respectively.

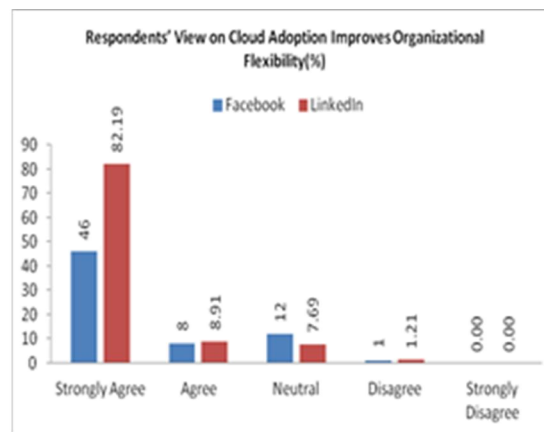


Fig. 3. Cloud adoption improves organizational flexibility. (N=310)

72 EXPLANATION OF FIGURE 3

This section provides a summarized comparison of the findings as presented in Figure 3 above. This summary gives clear picture of the results obtained from Facebook and LinkedIn.

Facebook: Majority of the respondents from Facebook 54% either ‘strongly agree’ or ‘agree’ with the view “cloud adoption improves organizational flexibility” when compared to 1% who ‘disagree’ with the view. Some of the Facebook respondents shared the following comments:

“With cloud computing you can change direction without serious ‘people’ or ‘financial’ issues at stake.”

“Organizations using cloud computing enjoy On-demand computing and Work from anywhere”.

LinkedIn: Figure 3 shows majority of the respondents from LinkedIn 91.10% either ‘strongly agree’ or ‘agree’ that cloud adoption improves organizational flexibility when compared to 1.21% of the respondents who ‘disagree’ with the view. Therefore, from the respondents’ view, one could conclude that using cloud computing improves organizational flexibility because majority of the respondents either ‘strongly agree’ or ‘agreed’ with the view.

3.3 Cloud Adoption Improves Organizational Scalability Performance

Figure 4 shows that LinkedIn has the highest number of respondents 77.33% who ‘agree’ cloud adoption improves organizational scalability performance, followed by Facebook 74.60%. However, 0.40% respondents from LinkedIn indicated ‘strongly disagree’ with the view.

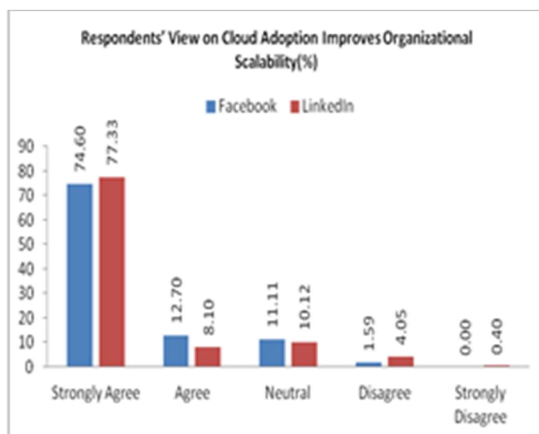


Fig. 4. Cloud adoption improves organizational scalability performances. (N=310)

73 Explanation of Figure 4

This section provides a summarized comparison of the findings as presented in Figure 4 above. This summary gives clear picture of the results obtained from Facebook and LinkedIn.

Facebook: A preponderance of all respondents 87.30% either ‘strongly agree’ or ‘agree’ with the view “cloud adoption improves organizational scalability performance” when compared to 1.59%

who ‘disagree’ with the view. Here are some of the comments shared by the respondents:

“Using cloud by organization improves resources utilization”

“Increased delivery speed of IT resources to end users”

“Ability to seamlessly move existing application to cloud and back onsite if needed”.

LinkedIn: Majority of the respondents from LinkedIn 85.43% either ‘strongly agree’ or ‘agree’ that cloud adoption improves organizational scalability performance. Even though 4.09% of the respondents either ‘strongly disagree’ or ‘disagree’ with the view. 85.43% of respondents who ‘strongly agree’ or ‘agree’, this could serve as significant evidence to believe that respondents from LinkedIn are with the view that cloud adoption improves organizational scalability performance.

3.4 Cloud Adoption Improves Organizational Trustworthiness

Figure 5 shows the views by respondents, 83.81% of the total respondents from LinkedIn ‘strongly agree’ with the view that adopting cloud computing improves trust to organization. Followed by 65.08% from Facebook. while 23.81% from Facebook ‘agree’. However, 4.05% and 0.40% from LinkedIn went for ‘disagree’ and ‘strongly disagree’ respectively.

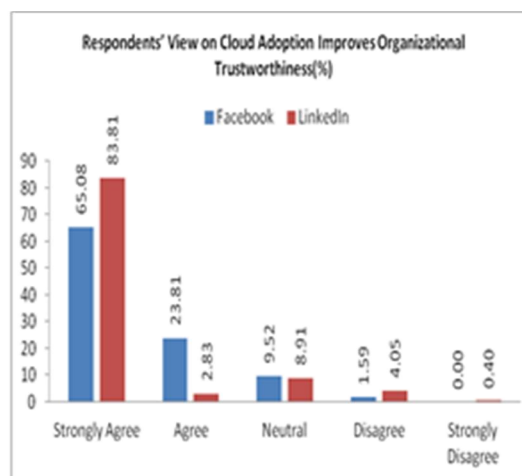


Fig. 5. Cloud Adoption Improves organizational Trustworthiness. (N=310)

74 Explanation of Figure 5

This section provides a summarized comparison of the findings as presented in Figure 5 above. This summary gives clear picture of the results obtained from Facebook and LinkedIn.

Facebook: Majority of the respondents from Facebook 74.60% either ‘strongly agree’ or ‘agree’ with the view “cloud adoption improves organizational trust” when compared to 1% who ‘disagree’ with the view. This shows that the respondents believe that cloud adoption improves organizational trust.

LinkedIn: Figure 50 shows majority of the respondents from LinkedIn 86.64% either ‘strongly agree’ or ‘agree’ that cloud adoption improves organizational trust when compared to 4.09% of the respondents who either strongly disagree or disagree with the view. Therefore, from the respondents view, one could conclude that using cloud computing improves organizational trust because majority of the respondents either ‘strongly agree’ or ‘agreed’ with the view and shared the following comments:

“Work done in less time with less people and better customer satisfaction.”

could be the major factor that improves trust between community and organizations using cloud computing services. Next section presents the primary reasons motivated respondents' to start using cloud services.

3.5 Primary Reason Motivated Respondents' Organization to Start Using Cloud Services

Figure 6 shows view by respondents on the primary reason motivated their organizations to start using cloud service. The figure depicts that majority of the respondents 21% adopted cloud services to improve scalability performance. However, 16% of the respondents adopted cloud services in order to improve ‘quality of service’. Also 16% of the respondents were moved to cloud in order to improve return on investment (ROI). However, 10% of the respondents adopted cloud services in order to improve organizational reliability.

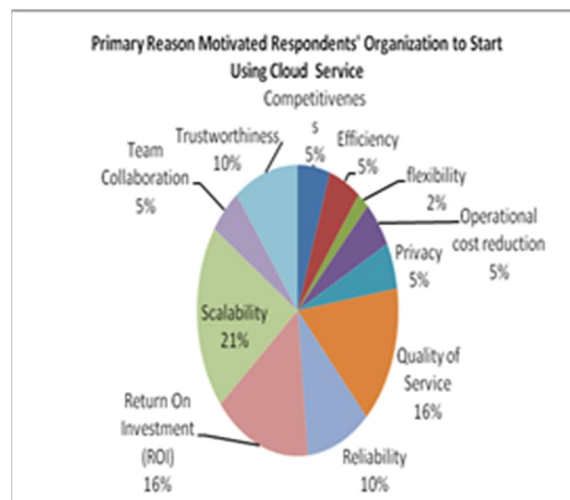


Fig. 6. Primary reason motivated respondents' organization to start using cloud. (N=310)

75 Explanation of Figure 6

This section presents discussion of Figure 6 above. This gives clear picture of the results obtained from Facebook and LinkedIn on primary reason motivated respondents' organization to start using cloud. According to the figure, to improve security or privacy of information ranked the highest among the reasons motivated the respondents to adopt cloud computing as stated by the respondents.

However, respondents in their comments stated that

“The cloud computing industry is becoming huge nowadays and alongside many measures and precautions against threat and attacks is being employed by the service providers in a way that data and information in cloud are becoming more secured than in organizations' data centers.”

Ho: There is no relationship between efficiency and performance of organizations using cloud computing.

Ho: $Y = 0$

H1: $Y \neq 0$

"It is difficult and costly for individuals or organizations to provide as much data security as that of cloud environment".

"the opportunity to increase return on investment and identify new business strategy is much greater in cloud environment".

"The team collaboration in cloud computing is very efficient because team members could be disperse no matter the distance apart and work effectively and efficiently".

4 DISCUSSION

Based on the research objectives and the questionnaire, the research was designed to find out the impact of cloud adoption on performance of organizations using FOUR (4) selected cloud performance indicating factors; efficiency, flexibility, scalability and trustworthiness. The collected data from 44 different countries across the globe was processed and analyzed. The data collection was based on the three sections of the survey questionnaire; Section A: respondents' basic data, Section B: adoption of cloud services and Section C: organizational performance in relation to cloud services adoption. The sources for data collection were; Facebook and LinkedIn. However, this section provides detail discussion on the processed data and finally presents the conclusion remark based on the results obtained from the data processing.

4.1 Cloud adoption driving factors

On primary driving factors to cloud adoption, the findings of the survey shows that majority of the respondents 26% were with the view that the primary reason to adopt cloud computing services was to scalability performance of their organization.

4.2 Challenges faced by respondents' during cloud adoption

On challenges faced by respondents' organizations during cloud adoption, the findings of this research show that roughly 43% of the total respondents believe that they were struggling to unite all of the individual cloud services they're using. For many, these included service elements

such as IaaS and PaaS but it also included public and private cloud options. It's critical for companies to ensure all of these tools play nicely with each other, but there's another element beyond that. According to the majority of the respondents, another challenge which organizations moving to the cloud are facing is juggling multiple solutions purchased from multiple vendors. One vendor doesn't always provide all of the technical solutions a company needs. However, the finding of this research also shows that one area in particular users seem to struggle with the most is cloud computings' self-service component. Many users want to take the lead on customizing their cloud environment and if they're having trouble with self-service, and channeling that frustration to IT, it could limit the likelihood of a company exploring future cloud prospects.

4.3 Challenges faced by respondents' after cloud adoption

On cloud challenges after adoption, the findings of this research show that challenges change with cloud maturity. According to the research, respondents list these challenges in the following order, **Cloud beginning:** Security, Compliance, Managing multiple cloud services, Integration to internal system and governance/Control. **Maturity level:** Compliance, Cost, Performance, Managing multiple cloud services and Security. Next section presents hypothesis testing and result discussion

5 HYPOTHESIS TESTING AND RESULTS

This section presents hypothesis testing and results using the data obtained from the survey research conducted online via Facebook and LinkedIn platforms as received from 310 respondents worldwide. The hypotheses were designed using the four (4) cloud performance indicating factors selected for this research work and tested using (2-tailed) Pearson correlation test. The section also discusses the impact of cloud adoption on performance of organizations before, during and after cloud adoption.

5.1 Hypothesis Testing

This is a formal procedures used by researchers to accept or reject null hypothesis in the formulated hypotheses[18]. A proper way to identify if the hypothesis is true is to test the entire population of the study. In some cases, researchers test a random sample from the population [19] which in some cases provides wrong result and lead to wrong conclusion for the entire research work.

5.1.1 Steps of Hypothesis Testing

When conducting a hypothesis test, we are asking ourselves whether the information in the sample is consistent, or inconsistent with the null hypothesis about the population of the study. The process is usually achieved using four (4) basic steps:

Step 1 - Hypothesis: Two types of statistical hypotheses are usually used in statistical tests, Null hypothesis and Alternative hypothesis. Null hypothesis is symbolized by H_0 , sample observations result are purely from chance. The alternative hypothesis is symbolized by H_1 or H_a , observations are influenced by some non-random cause [20]. These hypothesis need to be clearly designed for any successful hypothesis testing. The hypothesis design needs to be part of the design/planning process of the survey.

Step 2 - Select significance Level: Statistical significance (or a statistically significant result) is achieved when a p -value is smaller than the significance level [21, 22]. As a matter of good scientific practice, a significance level is chosen before data collection and is usually set to 0.05 (5%) [23] or 0.01(1%) depending on the study [24].

Step 3 - Analyze the data and compute the test statistic: A statistical test provides a mechanism for making quantitative decisions about a process or processes [24]. The aim of this step is to have basis or evidence to “accept” or “reject” the Null hypothesis, based on the output or the test results, we would be prompted with strong and convincing evidence to accept or reject the null hypothesis [22].

Step 4 - Decide/Interpret the result: In this step, we decide to accept or reject the null hypothesis using FOUR (4) possible scenarios: a) A true hypothesis is rejected. b) A true hypothesis is not rejected. c) A false hypothesis is not rejected. d) A false hypothesis is rejected [25, 26]. Here we interpret the four scenarios, when making correct decision, we accept true hypothesis or we reject false hypothesis. But an error is when we accept false hypothesis or reject true hypothesis.

5.1.1.1 Hypothesis Testing 1

A (2-tailed) Pearson correlation test was performed and significant correlation value was determined as shown in Table 2. $N=310$, Sig. (2-tailed) or P-Value = 0.000, significance level = 0.05. Therefore, Null hypothesis (H_0) is rejected since P-Value is smaller than significance value or significance level and accept alternative hypothesis (H_a) under the 95% confidence level. In other words, There is significance relationship between

efficiency and performance of organizations using cloud computing.

Table 2: T-Test - One-Sample Test (Efficiency

There is no relationship between efficiency and performance of IT-organizations using cloud.	Test Value = 0									
	N	Mean	Std. Deviation	Std. Error Mean	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
									Lower	Upper
	310	4.58	0.866	0.049	93.083	309	0.000	4.577	4.48	4.67

Table 2 describe the result obtained from the 2-tailed Pearson correlation T-test. This result was used in our decision to accept alternative hypothesis (H_a) and reject Null hypothesis (H_0). The result shows that we have 310 valid and non missing number of respondents used in calculating the t-test. The respondents’ mean is 4.58 and standard deviation is 0.866. The standard error of the mean is 0.866 (0.866 / square root of 310 = 0.049). The t-test value: $(4.58 - 1) / (0.866 / \text{square root of } 310) = 93.083$. The df (degree of freedom) column shows that the t test has 309 degrees of freedom obtained from $(310 - 1 = 309)$. Sig. (2-tailed) column shows that the *two-tailed* significance (the 2-tailed p value = 0.000). The mean difference in the population means is 4.577 and the 95% confidence intervals are 4.48 to 4.67 ("**Lower**" to "**Upper**" columns).

5.1.1.2 Hypothesis Testing 2

<p>H_0: There is no relationship between flexibility and performance of organizations using cloud computing.</p> <p>H_0: $Y = 0$</p> <p>H_1: $Y \neq 0$</p>
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In Table 3, A (2-tailed) Pearson correlation test was performed and significant correlation value was determined. $N=310$, Sig. (2-tailed) or P-Value = 0.000, significance level = 0.05. Therefore, we reject Null hypothesis (H_0) since P-Value is smaller

than significance value (0.05) or significance level and accept alternative hypothesis (Ha) under the 95% confidence level. In other words, There is significance relationship between flexibility and performance of organizations using cloud computing.

Table 3: T-Test - One-Sample Test (Flexibility)

There is no relationship between Flexibility and performance of IT-organizations using cloud.	Test Value = 0									
	N	Mean	Std. Deviation	Std. Error Mean	T	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
								Lower	Upper	
	310	4.69	0.683	0.039	120.857	0.000	4.690	4.61	4.77	

Table 3 describe the result obtained from the 2-tailed Pearson correlation T-test. This result was used in our decision to accept alternative hypothesis (Ha) and reject Null hypothesis (Ho). The result shows that we have 310 valid and non missing number of respondents used in calculating the t-test. The respondents' mean is 4.69 and standard deviation is 0.683. The standard error of the mean is 0.683 (0.683 / square root of 310 = 0.039). The t-test value: $(4.69 - 1) / (0.683 / \text{square root of } 310) = 120.857$. The df (degree of freedom) column shows that the t test has 309 degrees of freedom obtained from $(310 - 1 = 309)$. (2-tailed) column shows that the *two-tailed* significance (the 2-tailed p value =0.000). The mean difference in the population means is 4.69 and the 95% confidence intervals are 4.61 to 4.77 ("**Lower**" to "**Upper**" columns).

5.1.1.3 Hypothesis Testing 3

Ho: There is no relationship between scalability and performance of organizations using cloud computing.
Ho: Y = 0
H1: Y ≠ 0

In Table 4, A (2-tailed) Pearson correlation test was performed and significant correlation value was determined. N=310, Sig. (2-tailed) or P-Value = 0.000, significance level = 0.05. Therefore, we reject Null hypothesis (Ho) since P-Value (0.000) is smaller than significance value (0.05) or significance level and accept alternative hypothesis (Ha) under the 95% confidence level. In other words, There is significance relationship between scalability and performance of organizations using cloud computing.

Table 4: T-Test - One-Sample Test (Scalability)

There is no relationship between Scalability and performance of IT-organizations using cloud.	Test Value = 0									
	N	Mean	Std. Deviation	Std. Error Mean	T	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
								Lower	Upper	
	310	4.58	0.839	0.048	96.237	0.000	4.584	4.49	4.68	

Table 4 describes the result obtained from the 2-tailed Pearson correlation T-test. This result was used in our decision to accept alternative hypothesis (Ha) and reject Null hypothesis (Ho). The result shows that we have 310 valid and non missing number of respondents used in calculating the t-test. The respondents' mean is 4.58 and standard deviation is 0.839. The standard error of the mean (the standard deviation of the sampling distribution of means) is 0.839 (0.839 / square root of 310 = 0.046). The t-test value: $(4.58 - 1) / (0.839 / \text{square root of } 310) = 96.237$. The df (degree of freedom) column shows that the t test has 309 degrees of freedom obtained from $(310 - 1 = 309)$. Sig. (2-tailed) column shows that the *two-tailed* significance (the 2-tailed p value =0.000). The mean difference in the population means is 4.584 and the 95% confidence intervals are 4.49 to 4.68 ("**Lower**" to "**Upper**" columns).

5.1.1.4 Hypothesis Testing 4

Ho: There is no relationship between trustworthiness and performance of

organizations using cloud computing.

Ho: Y = 0

H1: Y ≠ 0

In Table 5, A (2-tailed) Pearson correlation test was performed and significant correlation value was determined. N=310, Sig. (2-tailed) or P-Value = 0.000, significance level = 0.05. Therefore, we reject Null hypothesis (Ho) since P-Value (0.000) is smaller than significance value (0.05) or significance level and accept alternative hypothesis (Ha) under the 95% confidence level. In other words, There is significance relationship between trustworthiness and performance of organizations using cloud computing.

Table .: T-Test - One-Sample Test (Trustworthiness)

There is no relationship between Trustworthiness and performance of IT-organizations using cloud.	Test Value = 0									
	N	Mean	Std. Deviation	Std. Error Mean	T	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
								Lower	Upper	
	310	4.63	0.817	0.0871	99.871	0.000	4.632	4.54	4.72	

Table 5 describe the result obtained from the 2-tailed Pearson correlation T-test. This result was used in our decision to accept alternative hypothesis (Ha) and reject Null hypothesis (Ho). The result shows that we have 310 valid and non missing number of respondents used in calculating the t-test. The respondents' mean is 4.63 and standard deviation is 0.817. The standard error of the mean (the standard deviation of the sampling distribution of means) is 0.817 / square root of 310 = 0.046). The t-test value: (4.63 - 1) / (0.817 / square root of 310) = 99.871. The df column tells us that this t test has 309 degrees of freedom (310 - 1 = 309). Sig. (2-tailed) column shows that the *two-tailed* significance (the 2-tailed p value =0.000). The mean difference in the population means is 4.632 and the 95% confidence intervals are 4.54 to 4.72 ("**Lower**" to "**Upper**" columns).

5.1.1.5 Discussion of Hypothesis Test Results

Table 6 presents the summary of hypothesis correlation test results, it gives clear picture of the results outcome in which statistically significance factors were indicated from the statistical tests carried out using the FOUR(4) factors with regards to the relationship of cloud computing adoption and the performance of organizations. Meaning, all the FOUR (4) selected factors tested are statistically significance in terms cloud computing adoption and performance improvement in organizations using cloud computing services. However, the correlation test results are significant because the P-Value (Sig. (2-tailed)) is smaller than significance value 5% (0.05) (P<0.05) in all the statistical tests carried out as shown in Table 2 to Table 5. Therefore this led to the rejection of null hypothesis (H₀) and acceptance of alternative hypothesis (H_a) under the 95% confidence level.

Table 6: Summary of Hypothesis Test Results

Factors	Correlation Test Result
Efficiency	Significant
Flexibility	Significant
Scalability	Significant
Trustworthiness	Significant

The results presented in Table 6 above correlates with the work of [17], who worked on the following FIVE (5) cloud performance indicating factors: Quality of Service, Privacy, Service availability, Job creation and Staff productivity. The study was carried out on the factors that influence cloud adoption by organizations in developing countries. His results shows that cloud computing services has significance and very critical influence in the performance of organizations using cloud computing services in relation to these five(5) factors, with job creation having the least significant relationship with the performance of organizations using cloud computing services. Another correlation with our findings was in similar research conducted by [15] who considered the following factors in their research: Return On Investment (ROI) and Operational cost reduction. The outcome of His research shows that adopting cloud computing services by organization provides maximum improvement in terms of return on

investment (ROI) and operational cost reduction as majority of his respondents believed.

Another related study results that correlates our work was the study conducted by [16] in his work, he has identified that organizations with low budget and human resources tend to use cloud computing for achieving reliability, one of the factors use to determine the performance of organizations using cloud computing services. According to the findings of his study, the most fundamental factor that play significant role for cloud computing adoption by business organizations was gaining reliability from employees and customers.

In line with the above mentioned previous research findings, the findings of this research also shows that the selected factors are very important to be considered while adopting cloud computing service and they should also be continuously measured after cloud adoption by organizations.

5.2 Discussion on Impact of Cloud Adoption on Performance of Organizations

Generally, the impact of cloud adoption on performance of organizations according to the findings of this study was positive. Despite some few challenges identified by this study associated with cloud adoption, cloud computing was viewed by the study participants as a positive development for organizations in relations to efficiency, flexibility, scalability and trust. Globally, over 84% of the total respondents, more than eight out of ten respondents believe that cloud computing services positively impacted their organizations and there were general performance improvements in terms revenue generations (Return on Investment (ROI)), staff productivity, efficiency and the like. Though there was slight variation among respondents from developed nations and that of developing countries with regards to the view, majority of the respondents from developing countries almost 60% thought believed cloud computing services positively impacted their organizations, they also highlighted some challenges associated with cloud computing usage in their countries that need urgent consideration which if tackled squarely, cloud computing adoption by organization will provide more significant and 100% positive impact to their organizations.

According to the respondents, cloud computing market in developing countries is attractive because of their fast developing economy and business agility, the result also shows that there were changes in organizations using cloud computing services in terms of roles and responsibilities because cloud services deliver managed functionality; therefore less technical roles are

required and new roles emerged, like technical engineers for PaaS services and functional managers for SaaS services. However, the respondents also emphasized that cloud adoption impact the technical skills required as almost every aspect has been automated therefore, organization will gradually require less technical skilled employees, shifting focus from technical knowledge to service orchestration. Similarly, it was also discovered that rather than eliminating corporate IT jobs, cloud computing adoption offers IT professionals opportunities to learn new skills and advance their careers.

The research also found that cloud computing adoption lets innovative organizations create products that either were not possible before cloud adoption or are significantly just more profitable. Some of the respondents also highlighted, cloud is transformative in that it is creating new business opportunities as organizations harness its power to efficiently facilitate new revenue, services and new business models.

5.2.1 Performance of Organizations Before Cloud Adoption

On performance of organizations before cloud computing adoption, majority of the respondents 66% were with the view that the performance of their organizations was very poor before cloud computing adoption. They highlighted some challenges that slowed down the performance of their organizations before cloud adoption; these include: poor security/privacy of data or organizational information, lack of adequate storage capacity, lack of new business transformation methods, poor organizational scalability, poor staff productivity, poor organizational flexibility within the organization, poor team collaboration and high operational cost.

5.2.2 Performance of Organizations During Cloud Adoption

On the performance of organizations during cloud adoption, the findings of this research show that roughly 43% of the total respondents stated that they were struggling to unite all of the individual cloud services they were using. For many, these included service elements such as IaaS and PaaS but it also included public and private cloud options. It was critical for their organizations to ensure all of these tools play nicely with each other. According to the majority of the respondents, another issue which they faced during cloud adoption was juggling multiple solutions purchased from multiple vendors. One vendor

doesn't always provide all of the technical solutions an organization needs and each solution needs to be tested separately. According to them, this slowed down the performance of their organizations for a short period of time.

5.2.3 Performance of Organizations after Cloud Adoption

On performance of organizations after cloud adoption, the findings of this research show that at the initial stage of cloud adoption; the respondents faced some challenges which led to poor organizational performance but according to them the challenges lasts from weeks to few months and the poor performance also lasts within the period only. However the respondents indicated attainment of high organizational performance when the challenges were overcome. The challenges include: Managing multiple cloud services in order to choose the best, Integration to internal system and governance/Control, Cost, Managing multiple cloud Security services to choose the best and staff compliance.

6 CONCLUSION AND FUTURE RESEARCH

The findings of this research correlate with the work of [27], who worked on five (5) cloud performance indicating factors: Quality of Service, Privacy, Service availability, Job creation and Staff productivity. Their study discovered that cloud computing services had significance and very critical influence in the performance of organizations using cloud computing services in relation to these five (5) factors. However, [28] considered the following factors in their research: Return On Investment (ROI) and Operational cost reduction. The outcome of their research also shows that adopting cloud computing services by organization improves ROI and the organization enjoyed operational cost reduction.

In line with the above mentioned research findings, the findings of this research concludes that cloud adoption significantly improves organizational Efficiency, Flexibility, scalability and trustworthiness and majority of the respondents believed that cloud adoption improves organizational performance. Similarly, majority of the respondents were using private cloud and public cloud while very few of them are using community cloud and hybrid cloud. However, the research also discovered that majority of the respondents over 83% are using Infrastructure as a Service (IaaS) followed by very few who are using PaaS and SaaS. However, respondents from India

contributed the largest participants of this study, followed by respondents from United Kingdom. However, respondents commented that majority of the companies that excel in the field of cloud computing services are operating in India, including: IBM, Cisco, HP, VMware, Wipro, TCS, and so on. These firms take care of the IT part for several of their clients and provide cloud services that not only reduce their IT costs but also equip them with latest technologies. This could be the basis of having respondents from India being the majority.

Area of cloud computing is very wide, we hope this opens an opportunity for further research to compare the level of cloud adoption and the impact of cloud adoption on performance of organization developed and developing countries. However, it is recommended to conduct similar survey research with the remaining four (4) factors not yet considered by any research, these factors are Quality of decision making, New Business or Market Strategy, Team Collaboration, and Information access.

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