International Journal of Information Processing and Communication (IJIPC) Vol. 9 No. 1&2 [May, 2020], pp. 87-93
Special Issue on Computing and Communication Technologies
Online: ISSN 2645-2960; Print ISSN: 2141-3959

Problems and Prospects of Cloud Computing to the Automobile Industry in Nigeria

[1]MUSTAPHA, Aliyu, [2]AHMED, Haruna Dokoro, [3]ABUBAKAR, Abdullahi Kutiriko, [4]ABDULKADIR, Mohammed, [5] IDRIS, Abubakar Mohammed, [6] RAJI, Abdullahi Egigogo

[1,4,5]Department of Industrial and Technology Education, Federal University of Technology, Minna, Nigeria
[2]Department of Computer Science, Gombe State Polytechnic Bajoga, Nigeria
[3]Department of Informatics, Kings College London
[6]Department of Cyber Security Science, Federal University of Technology Minna, Nigeria

Email: al.mustapha@futminna.edu.ng; harunadokoro@gmail.com; abdullahi.abubakar@kcl.ac.uk; abd.mohd@futminna.edu.ng; idrismohammed@futminna.edu.ng; abdullahirajiegigogo@gmail.com

Abstract

This study was carried out to identify the problems and prospects of cloud computing to the automobile industry in Nigeria. Two research questions were answered and two null hypotheses were tested at 0.05 level of significance. A population of 130 respondents was selected. Simple random sampling was used in the selection of the sample size of the respondents giving the total of 117 respondents using the Taro Yamane formula. This consists of 80 experts in Automobile Technology and 37 ICT (Computer/ Cyber Security Science) respectively. The descriptive survey design was employed and the target population was made up of experts in Automobile Technology and ICT (Computer/ Cyber Security Science). The instrument used for data collection was a structured questionnaire titled: "Questionnaire for Identifying the Problems and Prospects of Cloud Computing to the Automobile Industry in Nigeria (QPPCCAIN)". QPPCCAIN was subjected to face and content validation by five experts; 2 in Automobile Technology and 3 in Computer/ Cyber Security. Cronbach Alpha was used to determine the reliability coefficient of the questionnaire and it was found to be 0.84. The data collected from the respondents were analyzed using mean, Standard Deviation (SD) and t-test statistics. The findings on the problems of cloud computing to the automobile industry in Nigeria include among others security, availability and stability of internet network service. The Findings related to the prospects of cloud computing to the automobile industry in Nigeria include among others, cloud computing connects and adds security to the vehicles; it also turns a vehicle into a hub of infotainment. Based on the findings, it was recommended among others that there should be a political will to the genuine growth of ICT in the automobile industry. Efforts should be made by government and private individuals and organization by introducing energy-efficient and intelligent vehicle to enhance of real-time traffic alert.

Keywords: *Automobile Industry, Cloud computing, Innovation, Technology, Problems and Prospects*

1.0 Introduction

The automobile industry is a conglomerate that involves in the fabricating and revamping power-driven vehicles together with nearly all components in the motor vehicle, such as the engines and bodies but debars of among others, batteries and fuel. The industry's prime products are lightweight trucks, pickups, traveller vehicles, vans as well as Sports Utility Vehicles (SUV). Despite that, technologies such as smartphone, Internet, wireless and cellular communication is softening the impact of the bonds as it widens the frontiers of chances to an unending supply of conveniences and services. Individuals and enterprises alike are adopting the digital innovation, deploying mobile interactive devices to liaise, make choices and smooth the way for purchases (Ackerman, 2018).

Since the days of cart and horse, people have happily possessed and passionately cared for their automobiles. The automobile industry is on the threshold of change to change to the self-driving automobile industry and the impulsive force behind this is cloud computing. cloud computing is transforming the traditional operations of the automobile industry from vehicles driven by humans (dependent) to autonomous vehicles (driven by themselves). Cloud computing presents a shift of control from the traditional way of companies owing to their respective data centre/infrastructure to resolve on resource sharing thereby cutting down the cost of running businesses. The service could be provided by a cloud provider. The major Cloud providers in Nigeria are Microsoft, Google and International Business Machines (IBM). These companies render cloud computing services either directly to customers/organizations or in partnership with other Information Technology (IT) such as Cisco, NetApp, Sunnet, Descasio, Wyse technology, Infoware technologies, Accenture, Business Connexion.

Today among some of the transformation in the automobile industry are in terms of sales, services, marketing, overhauling, advertisement and recycling of used automobile parts. For instance, in the aspect of sales, the traditional operation to sign contract have been transformed into social networking with people who share similar interest related to designing, driving and maintenance of automobiles. The cloud computing also provides a practical innovation that entails the renting of common business applications or services online by cloud computing service providers to clients on either as a pay-as-you-go basis or by subscription. Through cloud computing, the merchandiser-ship is susceptible to track car usage and examine end-user choice in addition to the life cycle to heighten the efficiency and enhance end-user satisfaction (Erwa et al., 2013). According to Erwa et al., (2013), the past modality breaks the "normal" pattern to change the automobile services to:

1. Product innovation: this involves the improvement or development of an existing or new product
2. Process innovation: this involves the enhancement of practices used in creating the product.
3. Position innovation: this involves a product that is re-positioned in a transformed condition.
4. Paradigm innovation: this involves the substantial revamping the operation that demands an adjustment in company worth and dominance constitution.

For a particular class above, innovation can extend to two distinct levels, these include the 'Do better' and 'Do different'; the former deals with continuous ground-breaking activities on the same path while that latter deals with the change that transform the actual function activities. In the automobile services, the transformation includes the following types of innovation: product/service, process and paradigm innovation. The innovation may stretch out to independent levels at a separate time frame.

Several definitions have been given on cloud computing by different authors. However, the word 'cloud computing' has become a popular marketing term that needs clarification through suitable definitions. The obscure definition of cloud computing is "computing on the Internet, as opposed to computing on a desktop" (Landis, *et.al.*, 2011). This definition thrives only on identifying the reliance on cloud computing on the Internet. Addendum, Accenture (2011) defines cloud computing as "the dynamic provisioning of IT capabilities (hardware, software, or services) from third parties over a network". This definition concedes the on-demand, at scale and multitenant characteristics of cloud computing. According to Mell and Grance (2011), the National Institute for Standard and Technology (NIST) proffers five fundamental characteristics of cloud computing as follows:

i. On-demand self-service: That is the ability of a client to sign up and receive services at will from any cloud provider.
ii. Broad network access: This refers to the ability of a client to access the cloud provider's services using any standard computing device with internet connectivity like desktop, laptop, mobile phone, etc. The figure below shows cloud computing capability of being accessed across several classes of users.

iii. Resource pooling: Regardless of the client's location, the cloud provider's computing resources are readily available and can be accessed as desired by each client to meet up its needs.
iv. Rapid elasticity: Due to varying demands in workloads by different clients, cloud computing can scale up and down to meet up each client's demand.
v. Measured service: Computing resource usages by clients are transparently recorded to reflect the actual rate of usage by each client.

Furthermore, the application and integration of cloud computing are becoming routine in today's automobiles, some of the heavily used cloud computing applications are the Web mails (Gmail, Yahoomail, Sifymail), online storage systems (Skydrive, Idrive, Box.net), Web-based office tools (Google Docs & Zoho), Web-based RSS readers (Bloglines, Google Reader), entertainment (YouTube, Flickr, Hulu), Social networking (Orkut, Facebook, hi5) and Web-based useful applications: P&o (sharing large files), Adobe Photoshop Express (online photo editors), Jumpcut (edit videos online). All these activities are being performed in a cloud accessible environment via any device having a Web browser with internet connectivity. As technology is becoming evident due to swift development in the contemporary wireless telecommunication, cloud computing has been given a lot of attention and is presumed to promote good to the automobile industry. Though the prevalent use of cloud computing in the automobile industry is so far in its early stage with the origination of 4G and 5G networks, the demographic, market and digital trends are coming together to transform the automotive industry to expedite swift transmission and processing of assorted data (Ruhi et al., 2018).

Cloud computing which is demanding new technology, is weird to the African continent and Nigeria in particular; this is borne out of the fact that Nigeria is deficient of the basic Information Technology (IT) infrastructure demands such as stable electrical energy and meagre internet connectivity service for the successful taking up of the technology, therefore, it is against this background that this study intended to address the:

1. Problems of cloud computing to the Automobile industry in Nigeria?
2. Prospects of cloud computing to the Automobile industry in Nigeria?

1.1 Hypotheses

The following null hypotheses were tested at 0.05 level of significant

HO_1 There is no significant difference between the mean responses of the respondent's Problems of cloud computing to the Automobile industry in Nigeria

HO_2 There is no significant difference between the mean responses of the respondents on the Prospects of cloud computing to the Automobile industry in Nigeria.

2.0 Methodology

A descriptive survey was selected to identify the problems and prospects Cloud computing to the automobile industry in the Federal Capital Territory (FCT) Abuja, Nigeria. FCT Abuja was chosen due to the presence of high traffic flux and its strong internet network. A population of 130 respondents was selected. Simple random sampling was used in the selection of the sample size of the respondents giving the total of 117 respondents using the Taro Yamane formula. This consists of 80 experts in Automobile Technology and 37 ICT (Computer/ Cyber Security Science) respectively. This method was selected to give every respondent in the population the equal chance of being selected into the sample without bias. The instrument used for the data collection was a structured questionnaire titled: "Questionnaire for Identifying the Problems and Prospects of Cloud Computing to the Automobile Industry in Nigeria (QPPCCAIN)". QPPCCAIN comprises of thirty-two (32) items. These include fourteen (14) items dealing with the problems of cloud computing to the Automobile industry in Nigeria and eighteen (18) items dealing with the prospects of cloud computing to the Automobile industry in Nigeria. The study adopted a four-point rating scale Using real limit of numbers. These include Strongly Agree (SA) = 3.50-

4.00, Agree (A) =2.50-3.49, Disagree (D) =1.50-2.49, Strongly Disagree (SD) = 1.00-1.49. To ensure the validity of the instrument five validates validated the instrument; these comprise of three from the field of Information and Communication Technology (ICT) (Computer Science/ Cyber Security) and two from the field of Automobile Technology. This is to make certain that the instrument was able to bring forth the fundamental information needed for the study. To determine the internal consistency of the instrument, Cronbach Alpha (α) was used to establish its reliability. The reliability coefficient was found to be 0.84 and the data collected from the respondents were analyzed using mean, Standard Deviation (SD) and t-test statistics. Mean and SD are used in determining the acceptance or rejection of the research question while t-test is used to test the hypothesis at the 0.05 level of significance. Therefore, if P-value is less than α (P<α), the null hypothesis is rejected, this implies that there is a significant difference. However, if the P-value is greater than the α value (P> α), the null hypothesis is accepted, this implies that there is no significant difference.

3.0 Results

3.1 Research Question 1

What are the problems of cloud computing to the Automobile industry in Nigeria?

Table 1: Mean and Standard Deviation response of the respondents on the problems of cloud computing to the Automobile industry in Nigeria

N= 117

S/N	ITEMS	SA (4)	A (3)	D (2)	SD (1)	$\bar{X}$	SD	Decision
1	Availability of internet service	96	19	1	1	3.79	0.45	SA
2.	Corruption	82	30	5	0	4.12	0.37	SA
3.	Data privacy	93	24	0	0	3.79	0.43	SA
4.	Erratic power supply	38	74	3	2	3.26	0.34	A
5	Information secrecy	17	63	24	13	2.72	0.22	A
6	Lack of good maps	48	56	7	6	3.25	0.26	A
7	Lack of good sensors	16	101	0	0	3.14	0.48	A
8	Lack of good software	63	41	10	3	3.40	0.27	A
9.	Lack of political will to the genuine growth of ICT	28	62	20	7	2.95	0.23	A
10	Security	98	11	8	0	3.77	0.46	SA
11	Scalability of the storage	41	70	5	1	3.29	0.32	A
12	Liability issue	38	79	0	0	3.32	0.37	A
13	Stability of internet service	36	55	15	11	2.99	0.20	A
14	The reputation of service providers	33	43	31	10	2.85	0.13	A
	Xg					**3.33**	**0.32**	**A**

Keys: SA= Strongly Agree. A= Agree, D= Disagree, SD= Strongly Disagree, N= Number of respondents, $\bar{X}$= Mean Value, SD= Standard Deviation, Xg= Grand Average mean/ SD

The analysis of mean responses of the two groups of respondents from Table 2 reveals that items 1, 2, 3 and 9 under this sub-heading are rated as strongly agreed (SA); items 4, 5, 6, 7, 8, 10, 11, 12, 13 and 14 under this sub-heading are rated as agreed (A). Since the grand average SD (0.32) is not too far to the grand average of the mean (3.33), this implies that there is indication of homogeneity in agreement; therefore, this gives the impetus to conclude that the respondents agreed on the problems of cloud computing to the Automobile industry in Nigeria

3.2 Research Question 2

What are the prospects of cloud computing to the Automobile industry in Nigeria?

Table 2: Mean and Standard Deviation response of the respondents on the prospects of cloud computing to the Automobile industry in Nigeria

N= 117

Special Issue on Computing and Communication Technologies
Online: ISSN 2645-2960; Print ISSN: 2141-3959

S/N	ITEMS	SA (4)	A (3)	D (2)	SD (1)	$\bar{X}$	SD	Decision
1.	Analytics	83	34	0	0	3.71	0.39	SA
2.	Evolution of connected cars to add security	25	55	12	16	2.61	0.19	A
3.	Evolution of driverless cars	93	18	4	2	3.73	0.43	SA
4.	Intelligent parking cloud services	65	13	29	10	3.14	0.20	A
5.	Kids club	38	41	26	7	2.85	0.15	A
6.	Management capabilities	66	31	12	8	3.32	0.26	SA
7.	Model comparison	80	31	4	2	3.61	0.36	SA
8.	Pay-as-you-go services	96	19	1	1	3.79	0.45	SA
9.	Price enquiry	17	63	24	13	2.72	0.22	A
10.	Real-time traffic alert	17	24	63	13	2.32	0.22	D
11.	Revolutionary changes in financing	60	62	13	2	3.88	0.48	SA
12.	Revolutionary changes in insurance	77	16	12	12	3.50	0.31	SA
13.	Sales operation	93	24	0	0	3.79	0.43	SA
14.	Social interaction with people of similar interest in vehicle design	86	31	0	0	3.74	0.40	SA
15.	Social interaction with people of similar interest in a vehicle driving	38	39	22	18	2.83	0.10	A
16.	Social interaction with people of similar interest in vehicle maintenance	39	59	13	6	3.12	0.24	A
17.	Vehicle-related lesson	43	57	15	2	3.21	0.25	A
18.	Virtual games	49	62	6	0	3.37	0.30	A
	Xg					**3.31**	**0.29**	**A**

Keys: SA= Strongly Agree. A= Agree, D= Disagree, SD= Strongly Disagree, N= Number of respondents, $\bar{X}$= Mean Value, SD= Standard Deviation, Xg= Grand Average mean/ SD

The analysis of mean responses of the two groups of respondents from Table 2 reveals that items 1, 3, 6, 7, 8, 11, 12, 13 and 14under this sub-heading are rated as strongly agreed (SA); items 2, 4, 5, 9, 14, 15, 16, 17 and 18 under this sub-heading are rated as agreed (A) and item 10 under this sub heading was rated disagreed (D). Since the grand average SD (0.29) is not too far to the grand average of the mean (3.31) this implies that there is indication of homogeneity in agreement; therefore, this gives the impetus to conclude that the respondents agreed on the prospects of cloud computing to the Automobile industry in Nigeria

3.3. Hypotheses

3.3.1 Hypothesis 1

HO_1 There is no significant difference between the mean responses of the respondents on the problems of cloud computing to the Automobile industry in Nigeria

Table 3: t-test statistics of Respondents on the problems of cloud computing to the Automobile industry in Nigeria

Respondents	N	Mean	Mean Diff.	Std. Dev.	Std. Dev. Diff	t-calc.	df	p-value	Remarks
ICT Experts	37	29.80	2.20	33.6	8.90	0.398	115	0.691	NS
Automobile Technology Experts	80	27.60		24.7					

Keys: N= Number of respondents, t-calc.= t-calculated value, p-value= Probability value, df= Degree of Freedom, Std. Dev.= Standard Deviation, Std. Dev. Diff.= Standard Deviation Difference, Mean Diff.= Mean Difference, NS= Not Significant

The result in Table 3 reveals that is no significant difference in the mean response of the respondents. But there is a slight difference between the mean and standard deviation with the scores of 2.20 and 8.90. Therefore, since the p-value is greater than α (0.691>0.05), the null hypothesis is accepted, this gives the impetus to conclude that there is no significant difference in the mean responses of the respondents on the problems of cloud computing to the Automobile industry in Nigeria

3.3.2 Hypothesis 2

HO_2 There is no significant difference between the mean responses of the respondents on the prospects of cloud computing to the Automobile industry in Nigeria

Table 4: t-test statistics of Respondents on the prospects of cloud computing to the Automobile industry in Nigeria

Respondents	N	Mean	Mean Diff.	Std. Dev.	Std. Dev. Diff.	t-calc.	Df	p-value	Remarks
ICT Experts	37	55.14	5.43	28.8	11.60	1.269	115	0.207	NS
Automobile Technology Experts	80	49.71		17.2					

Keys: N= Number of respondents, t-calc.= t-calculated value, p-value= Probability value, df= Degree of Freedom, Std. Dev.= Standard Deviation, Std. Dev. Diff.= Standard Deviation Difference, Mean Diff.= Mean Difference, S= Significant

The result in Table 4 reveals that is no difference in the mean response of the respondents. But there is a slight difference between the mean and standard deviation with the scores of 5.43 and 11.60. Therefore, since the p-value is greater than α (0.005>0.05), the null hypothesis is accepted, this gives the impetus to conclude that there is no significant difference in the mean responses of the respondents on the prospects of cloud computing to the Automobile industry in Nigeria

4.0 Discussion of Findings

The inference on the problems of cloud computing in the Nigerian Automobile industry disclosed that security, availability and stability of internet network service, are the major problems of cloud computing to the Automobile industry in Nigeria. This result concurs with Alasdair (2017) that the top critical problem to adopt cloud computing widespread is security. Paula et al., (2016) also corroborated that the main concerns of cloud computing include among others, accessibility and steadiness of the internet network and invulnerability. Erwa et al (2013) also supported the claim that another prominent problem is the global benchmark in protection, secrecy, structure and subject area to give a wide berth to antagonism between and mystification of locally established benchmarks in industry or an establishment.

The findings on the prospects of cloud computing in the Nigerian Automobile industry revealed that the automobile industry can take the benefit of novel alternatives for competitive demarcation in mobility services that is the Pay-as-you-go services and connected vehicles technology. Nadeem et al (2019) noted that cloud computing can be linked-to to reinforce security to vehicles. Addendum, Evans et al (2011) state that automobiles

cab be connected to add analytics, security and management capabilities. The findings also revealed that connected vehicles will be transformed into a centre of infotainment. This is in line with Davika and Kumari (2018) that in time to come; vehicles will be available embedded with telematics that will bring about pleasure in driving. This means that the driver will have applications on the dashboard that would convey real-time trip and traffic reports to the driver, convert speech-to-text to thwart the woes of typing while driving and hand gesture sensors to help avert road traffic crashes.

5.0 Recommendations

Based on the findings of this study, the following suggestions were made:

i. There should be a political will to the genuine growth of ICT in the automobile industry
ii. Efforts should be made by government and private individuals and organization by introducing energy-efficient and intelligent vehicle to enhance of real-time traffic alert.

6.0 Conclusion

As the market tosses up new challenges, the automobile industry is also going through sweeping changes. On such innovative change is the way ICT is transferring, recording, storing and processing data and cost associated thereto cloud computing. Cloud computing is undoubtedly a technology that has come to stay and play a critical part in the automobile industries. Consequently, identifying the problems and prospects of cloud computing to the automobile industry in Nigeria will be converted into a performer in the automobile industry because of its ability to benefit automobile customers, manufacturers, dealers and the economic system.

7.0 References

Ackerman, G. L. (2018). Efficacious Technology Management: A Guide for School Leaders.Retrieved 20th June, 2019 http://hackscience.net/etm/Efficacious%20Technology%20Management%20ver.%201.2.pdf

Alasdair, G. (2017). *IoT Security Issues*. Germany: CPI book GmbH, Leck

Davika, B. S. & Kumari, A. (2018). Review paper on IoT based technology in automobiles. *International Research Journal of Engineering and Technology (IRJET)* 5(3), 3140- 3142

Erwa, Q., Yoanna, L., Chenghong, Z. & Lihua, H. (2013). *Cloud Computing and the Internet of Things: Technology Innovation in Automobile Service*. Berlin Heidelberg: Springer-Verlag Berlin

Evans, D. (2011). The Internet of Things How the Next Evolution of the Internet Is Changing Everything. Cisco Internet Business Solutions Group, IBSG, Retrieved from http://www.cisco.com/web/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf Accessed 1st April 2020

Mell, P. & Grance, T. (2011). The NIST Definition of Cloud Computing (Draft). Recommendations of the National Institute of Standards and Technology. National Institute of Standards and Technology Special Publication 800-145

Nadeem, A., Muhammad, A., Noshina, T.,Thar, B., & Sohail, A. (2019). A Mechanism for Securing IoT-enabled Applications at the Fog Layer. *Journal of Sensor and Actuator Network 8*(1), 16

Nick, I. (2017). The impact of the Internet of Things. Retrieved 20th June, 2019 from https://www.information-age.com/impact-internet-things-iot-123467503/

Paula, F-L., Tiago, M. F-C., Manuel, S-A., Luis, C., & Miguel, G-L (2016). A Review on Internet of Things for Defense and Public Safety. *Sensors (Basel)*16(10), 1644

Ruhi, K. B., Madhuri, R. & Himanshu, A. (2018). Internet of Things (IoT) in the Smart Automotive Sector: A Review. *IOSR Journal of Computer Engineering (IOSR-JCE)* 1(1), 36-44

Turban, E., Pollard, C. & Wood, G. (2018). *Information Technology for Management: On-Demand Strategies for Performance, Growth and Sustainability*. London: Wiley