Problems and Prospects of Internet of Things to the Automobile Industry in Nigeria

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***Abstract*—This study was carried out to identify the problems and prospects of the Internet of Things to the automobile industry in Nigeria. Two research questions were answered. The descriptive survey design was employed and the target population was made up of experts in Automobile Technology and Information and Communication Technology (ICT). The instrument used for data collection was a structured questionnaire. The questionnaire 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 0.87. The data collected from the respondents were analyzed using m e a n . The findings on the problems of IoT to the automobile industry in Nigeria include among others security, availability and stability of internet network service. The Findings related to the prospects of IoT in the automobile industry in Nigeria include among others, IoT 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 the government should provide financial support to strengthen data confidentiality, availability and stability of Internet network service.**

Keywords— ***Automobile Industry, Internet of Things, Innovation and Technology, Problems and Prospects***

I. INTRODUCTION

The automobile industry is a corporation that involves in the manufacture and overhaul of motorized vehicles together with nearly all components in the motor vehicle, such as the engines and bodies but debar of among others, batteries and fuel. The industry's prime wares are lightweight trucks, pickups, traveller vehicles, vans as well as Sports Utility Vehicles (SUV). Since the days of cart and horse, people have happily possessed and passionately cared for their automobiles. 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 [1].

The automotive industry has been around for quite some time and it has developed ever since, but the major shift that is on nowadays from vehicles driven by humans (dependent) to autonomous vehicles (driven by themselves) will keep on taking part in a significant function as transportation changes on a global scale. Today's automobiles have exploded thanks to IoT in two ways, these include, embedded and tethered. The former utilizes a built-in antenna and chipset while the latter use hardware to enable drivers to interface with their automobiles using smart/ cell phones [2]. Moreover, application integration is becoming commonplace in today's automobiles, Google Maps and other route devices have started to supplement works in the Global Position System (GPS) frameworks. For example, GasBuddy demonstrates where the driver can locate fuel in their local area. The industry is on the threshold of change to change to the self-driving automobile industry and the impulsive force behind this is the Internet of Things (IoT). As technology is becoming apparent as a result of swift development in the contemporary wireless telecommunication, IoT has been given a lot of attention and is presumed to promote good to the automobile industry. Though the prevalent use of IoT 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 [3].

IoT is one of the leading trends that influence the evolution of Information and Communication Technologies (ICT) by connecting "everything" such as data, people, things and process to the Internet. [4] stated IoT is a turbulent technology where the cyber world run into the physical world. Therefore, IoT is an independent communication between non-living objects to profit human beings. As an emerging paradigm, IoT comes together with three principal innovations namely, things (the objects to trace, things-oriented vision), networking (the linking of the objects to the Internet and connection between the objects, Internet-oriented vision) and representation (the portrayal of the objects on the Internet,

semantic-oriented vision). IoT also links automobile parts and services, machines, people and vehicles to smooth-running the flow of data, permit real-time judgment and ameliorate automotive experiences [3].

In the automobile industry, the "things" in IoT may well be any objects that require to be tracked in practice, for example, products in inventory and cars on road. The "things" also focus on the three basic attributes to be recognizable, able to interact and smart [3]. To encapsulate these attributes, several technologies such as Radio Frequency Identification (RFID) tags and two-dimensional (2D) bar code has been put to use to distinctively identify the statuses such as movement, temperature and location of an object [3]. Sensors fused with communication technologies such as Wireless Sensor Networks (WSN) and RFID Sensor Networks (RSN) can also be employed to trace the state of an object and transfer the data to the Internet.

Manufacturers in the automobile industry such as Honda pioneer the RFID to control the demand chain. CarMax, the monumental automotive retail merchant within the U.S. attaches RFID tags to every vehicle therefore on track the life cycle of a vehicle from buy-in to overhaul and finally to the retail/auction [5]. Similarly, BMW has embraced the Intelligent-Drive (iDrive) as an intelligent informatics system that uses assorted tags and sensors. The iDrive supports the environment information and driving data to aid drivers to make an instantaneous judgement while driving on the road. With an integrated GPS, the iDrive tracks the road condition and vehicle location to give driving routes. For instance, if there is a theft of a BMW car, the owner could locate through the BMW tracking system the stolen car. Furthermore, other leading automobile manufacturers such as General Motors, Ford and Toyota also make use of the GM OnStar, Ford SYNC and Toyota G-Book respectively in their recently released models in the market.

The services in the automobile industry ordinarily include sales, marketing, overhauling and recycling of used automobile parts. Through the IoT, 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 [6]. The preceding 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 respective class above, novelty can stretch out to duo distinct degree, 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. IoT, which are 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, this study intended to address the following:

1. What are the problems of IoT to the Automobile industry in Nigeria?
2. What are the prospects of IoT to the Automobile industry in Nigeria?

II. METHODOLOGY

A descriptive survey was selected to identify the problems and prospects IoT to the automobile industry in the Federal Capital Territory (FCT) Abuja, Nigeria. FCT Abuja was purposely chosen due to the presence of high traffic flux and its strong internet network. The aimed population was 218 respondents, consisting of 145 experts in Automobile Technology in Apo and 73 experts in ICT in Zone 3 Plaza, Neighbourhood centre respectively. Since the population is of manageable size, the entire population was studied; hence no sampling technique was utilized for the study. The instrument used for the data collection was a structured questionnaire which comprises twenty-one (21) items. These include fourteen (14) items dealing with the problems of IoT to the Automobile industry in Nigeria and seven (7) items dealing with the prospects of IoT 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 ICT and two from the field of automobile. 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 0.86 and the data collected from the respondents were analyzed using mean.

III. RESULTS

A. Research Question 1

What are the problems of IoT to the Automobile industry in Nigeria?

Table 1: Mean response of the respondents on the problems of IoT to the Automobile industry in Nigeria

N_1=145,N_2=73

S/N	Item	X_1	X_2	X_T	Remark
1	Erratic power supply	3.42	3.34	3.38	A
2	Lack of political will to the genuine growth of ICT	3.37	3.19	3.28	A
3	Corruption	3.73	3.67	3.70	SA
4	Availability of internet service	3.90	3.97	3.94	SA
5	Stability of internet service	3.37	3.40	3.39	A
6	Data privacy	2.90	3.01	2.95	A
7	Security	3.86	3.92	3.89	SA
8	Information secrecy	2.47	2.67	2.57	A
9	Scalability of the storage	2.53	2.52	2.53	A
10	The reputation of service providers	2.49	2.56	2.52	A
11	Liability issue	3.67	3.52	3.60	SA
12	Lack of good software	2.73	2.81	2.77	A
13	Lack of good sensors	3.85	3.75	3.80	SA
14	Lackofgoodmaps	9.69	2.74	2.72	A
	X_g			**3.22**	**A**

Keys: X_1 = Mean of experts in the automobile; X_2 = Mean of experts in ICT; X_T = Average of Mean response of the respondents; X_g = Grand Average of Mean response of the respondents; N_1 = Number of experts in the automobile; N_2 = Number of experts in ICT.

The result in Table 1 revealed that the respondents strongly agreed on item number 3, 4, 7, 11 and 13 and agreed on the item number 1, 2, 5, 6, 8, 9,10 and 12. Having a grand average of mean of 3.22, This gives the impetus to conclude that the respondents agreed on the problems of IoT to the automobile industry in Nigeria.

B. Research Question 2

What are the prospects of IoT to the Automobile industry in Nigeria?

Table 2: Mean response of the respondents on the prospects of IoT to the Automobile industry in Nigeria

S/N	Item	X_1	X_2	X_T	Remark
1	Pay-as-you-go services	3.97	3.84	3.91	SA
2	Intelligent parking cloud services	3.63	3.59	3.61	SA
3	Revolutionary changes in financing	2.83	3.92	3.38	A
4	Revolutionary changes in insurance	3.59	3.71	3.65	SA
5	Real-time traffic alert	3.83	3.79	3.81	SA
6	Evolution of driverless cars	3.84	3.77	3.81	SA
7	Evolution of connectedcars	3.60	3.55	3.58	SA
	X_g			**3.68**	**SA**

The result in Table 2 revealed that the respondents strongly agreed on item number 1, 2, 4, 5, 6 and 7 and agreed on item number 3. Having a grand average of mean of 3.68, This gives the impetus to conclude that the respondents strongly agreed on the prospects of IoT to the Automobile industry in Nigeria

IV. DISCUSSION OF FINDINGS

The inference on the problems of IoT revealed that security, availability and stability of internet network service, are the major problems of IoT to the Automobile industry in Nigeria. This result concurs with [7] that the top critical problem to adopt IoT widespread is security. [8]also corroborated that the main concerns of IoT include among others, accessibility and steadiness of the internet network and invulnerability. [6] 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 IoT 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. [9] noted that the IoT can be linked-to reinforce security to the vehicles. The findings also revealed that connected vehicles will be transformed into a centre of infotainment. This is in line with [2] 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.

V. CONCLUSION

Internet of Things is undoubtedly a technology that has come to stay and play a critical part in the automobile industries from vehicles driven by humans to vehicles driven by themselves and also gets connected to smartphones, register real-time traffic alerts and offer emergency roadside assistance. Thus, identifying the problems and prospects of IoT to the automobile industry in Nigeria, IoT will become a player in the automobile industry because of its ability to benefit customers, manufacturers, whole economic system and automobile dealers.

VI. RECOMMENDATIONS

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

1. The government should provide financial support to strengthen data confidentiality, availability and stability of Internet network service.
2. Efforts should be made by introducing the energy-efficient and intelligent vehicle to tackle the bone of contention of safety, environment and energy.

REFERENCES

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

[2] B. S. Davika and A. Kumari. Review paper on IoT based technology in automobiles. International Research Journal of Engineering and Technology (IRJET) vol. 5 No. 3 pp. 3140-3142. 2018.

[3] K. B. Ruhi., R. Madhuri and A. Himanshu. Internet of Things (IoT) In The Smart Automotive Sector: A Review. IOSR Journal of Computer Engineering (IOSR-JCE) vol. 1 pp. 36-44. 2018.

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

[5] E. Turban., C. Pollard and G. Wood. Information Technology for Management: On-Demand Strategies for Performance, Growth and Sustainability. London: Wiley. 2018.

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

[7] G. Alasdair. IoT Security Issues. Germany: CPI book GmbH, Leck 2017.

[8] F-L. Paula., M. F-C. Tiago., S-A. Manuel., C. Luis. and G-L. Miguel. A Review on the Internet of Things for Defense and Public Safety. Sensors (Basel) *vol.* 16 No. 10, pp. 1644. 2016

[9] A. Nadeem., A. Muhammad., T. Noshina., B. Thar and A. Sohail. A Mechanism for Securing IoT-enabled Applications at the Fog Layer. Journal of Sensor and