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A Survey of Computing Technologies in 21st Century

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ABSTRACT
Technology in the 21st century has given this generation an edge over many of the generations before now. The emergence of social media, smartphones and autonomous flying vehicles has created a huge role in all facets of life. There are so many 21st century technologies today which include Big Data Analytics, Telemedicine, 3-D printing, Socio Network, Cloud Computing, Blockchain Technology, Artificial Intelligence, Internet of Things (IoT), Driverless cars etc. This paper did a survey of computing technologies in the 21st century its impact on the Nigeria society.

Keywords:-*Computing technologies, emerging technologies, big data, social networks*

INTRODUCTION

The world of computing technologies has evolved over the years. The growth has been quite encouraging considering the various technologies. Google, Amazon, Microsoft, and Facebook have 1.2 million terabytes of data on the Internet, which was founded in the 1990s. The surface web is believed to have approximately four and a half billion webpages; however, the deep web is at least 400 times larger than the surface web.

Soon after, in 1990, an email platform along with several applications appeared. From 1995 to the early twenty-first century, a series of web 2.0 technologies emerged, including E-commerce, social media platforms, E-Business, E-Learning, E-Government, Cloud Computing, and others.

There are now a plethora of internet-based technologies with limitless applications in a variety of fields, including business, research and engineering, and healthcare.

The impact of these technologies is important to embrace [22]. In this paper the nature, usage and capabilities of the emerging and future technologies shall be discussed.

SOME TECHNOLOGIES OF THE 21ST CENTURIES BIG DATA

It is a combination of structured, semi structured and unstructured data collected by organizations that can be mined for information and used in machine learning projects, predictive modeling and other advanced analytics applications.

Systems that process and store big data have become a common component of data management architectures in organizations, combined with tools that support big data analytics uses. Figure 1 shows Big data architecture. Big data is often characterized by the three V's the large *volume* of data in many environments; the wide *variety* of data types frequently stored in big data systems; and the *velocity* at which much of the data is generated, collected and processed [5].

This technology consists of software tools that are used to analyze, process, and extract data from a very big and complicated data set. Text, audio, video,

and photographs make up this huge data. Organizations and enterprises analyze it for a variety of purposes, including identifying patterns and trends in human behavior and our interactions with technology that can be utilized to make life-changing decisions. Traffic control, route planning, intelligent transportation systems, and congestion management are some of the government, corporate sector, and individual applications of Big Data.

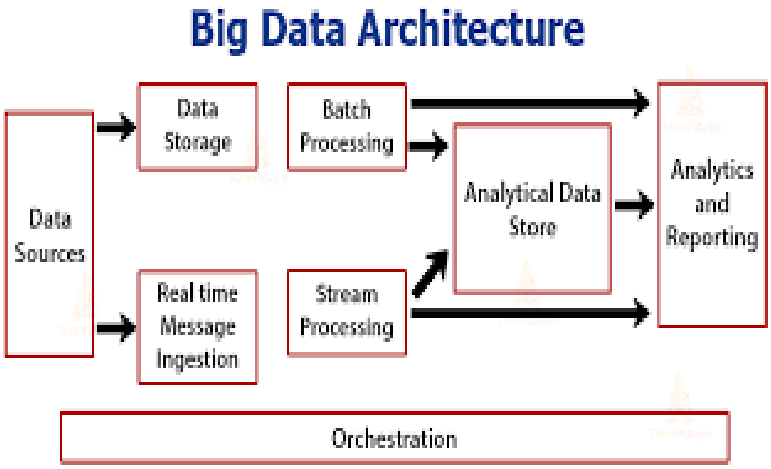


Fig.1:-*Big Data Architecture*

Telemedicine

Telemedicine involves a wide range of medical activities, including disease diagnosis, treatment, and prevention, as well as health-care professional and consumer continuing education, research, and assessment [2]. It is technology that can be used in form of computers, video, phone, messaging by a medical professional to diagnose and treats patients remotely. Figure 2 shows the essential components of telemedicine.

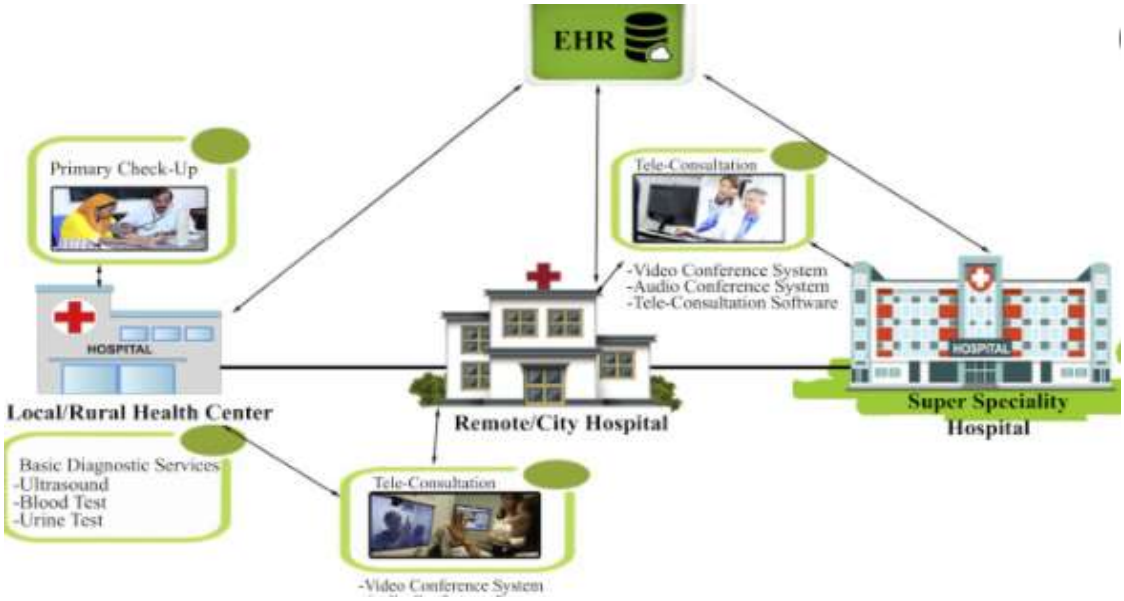


Fig.2:-*Telemedicine System(ScienceDirect.com)*

5G Network

The 5G progression is shown in Figure 3. For optimal communication between devices, a 5G network consists of computational nodes and small cells such as pico cells. This network will be capable of load balancing, interference reduction, and power adaption, among other things [18].

Commercial 5G services were provided in twenty-four European countries by the end of March 2021 [7]. Unfortunately, it was launched in Nigeria in January 2021, and by the end of march 2021 there was a senate rule on the need to stop the operation.[15]

The primary downside of 5G is that it has low worldwide coverage and is only available in select areas. Only cities will see significant benefits from the 5G network, while outlying locations may not have service for several years.

Furthermore, when compared to other networks, the costs of establishing tower stations are significant. People will feel the impact of the 5G revolution as it continues to develop. 5G is projected to be critical for innovation in the future, with faster speeds, larger capacity, and lower latency.

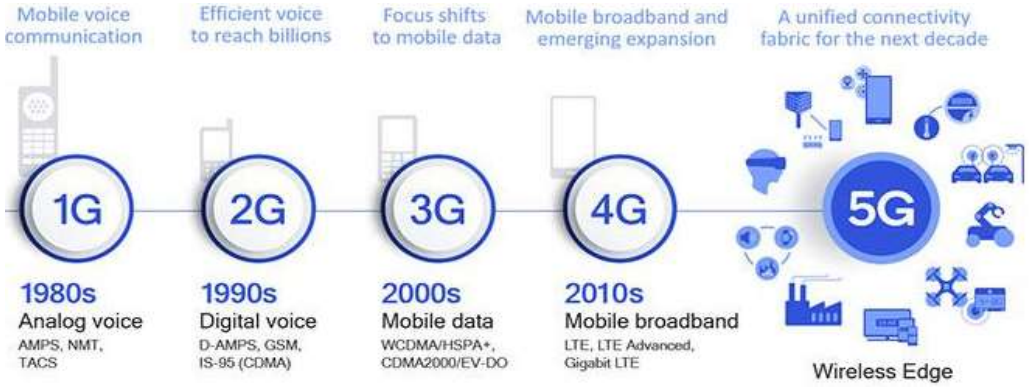


Fig.3:-*5G Wireless technology(mmwrcn.ece.wisc.edu,2019).*

3D Printer

The notion of 3D printing was first sketched forth by David E. H. Jones in 1974. Chuck Hall of the 3D System Corporation submitted his own patent in 1984.

The method of creating 3D items from a digital file is known as 3D printing. Objects are created by printing layers of a certain material on top of one another until the entire object is completed.

Figures 4a and 4b show the schematic diagram and a simple and functional 3D printer.
This is one of the most effective methods for producing complex objects in a short amount of time without the need of complicated processes or massive machines. The use of a 3D printer can be found in a variety of fields: - Aerospace: Many things are manufactured directly with a 3D printer in this industry.

The aerospace and defense industries were responsible for 16% of all 3D printing. Material jetting is a technique for creating high-resolution, smooth scale models. It has been seen in areas like Food, Automobile industry, Medical application etc [1]. On the other hand, only few companies in Nigeria have been able to implement this technology.

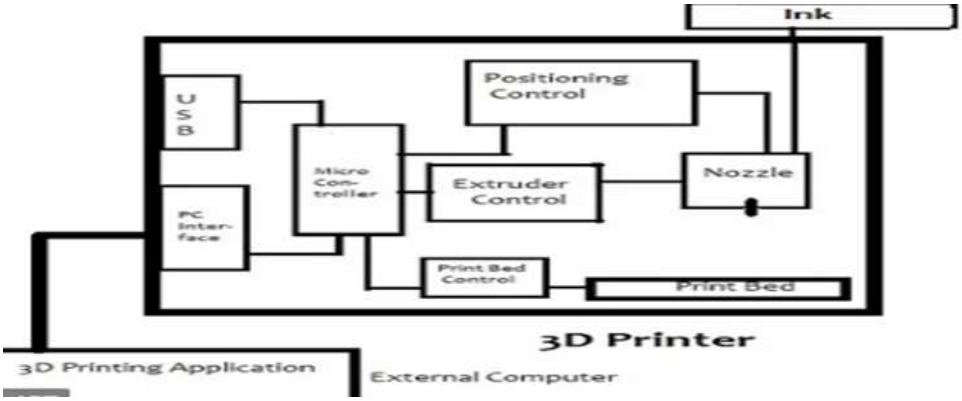


Fig.4(a):-*Schematic diagram for a 3D printer (allaboutcircuts.com)*

Fig.4(b):-*Flashforge 3D Printer(www.flashforge.com)*

Social Network

In recent years, Web 2.0 technologies have evolved into powerful tools that are utilized by people all over the world for a variety of purposes. Online social networks are one of the most extensively used Web 2.0 technologies. People utilize social networking sites such as Facebook and Twitter to communicate and build social capital [4]. Figure 5 shows the concept of social media.

Around January 2021, Nigeria will have 33 million social media users. Between 2020 and 2021, the number of Nigerians using social media increased by 6.0 million (+22%). In January 2021, Nigeria's social media users accounted for 15.8% of the country's total population [12]

Fig.5:-*Social Network (Copyright: PHOTOMORPHIC PTE. LTD)*

Cloud Computing

Cloud computing is characterized as a "distributed computing concept wherein computer boundaries are controlled by justification rather than technical limitations." Cloud computing allows for more efficient data center administration, time sharing, and resource virtualization, with a focus on the business model [11]. Figure 6 is a cloud computing concept for industrial applications.

Google Cloud is an example of a system that uses the internet to store and manage data on a remote server and then access data via the internet. Google hardware is used for every application development. Despite much effort, most Nigerian corporate circles have shown a sluggish but steady willingness to accept this new technological trend. This is also linked to their apprehension and opposition to having their digital assets housed and managed.

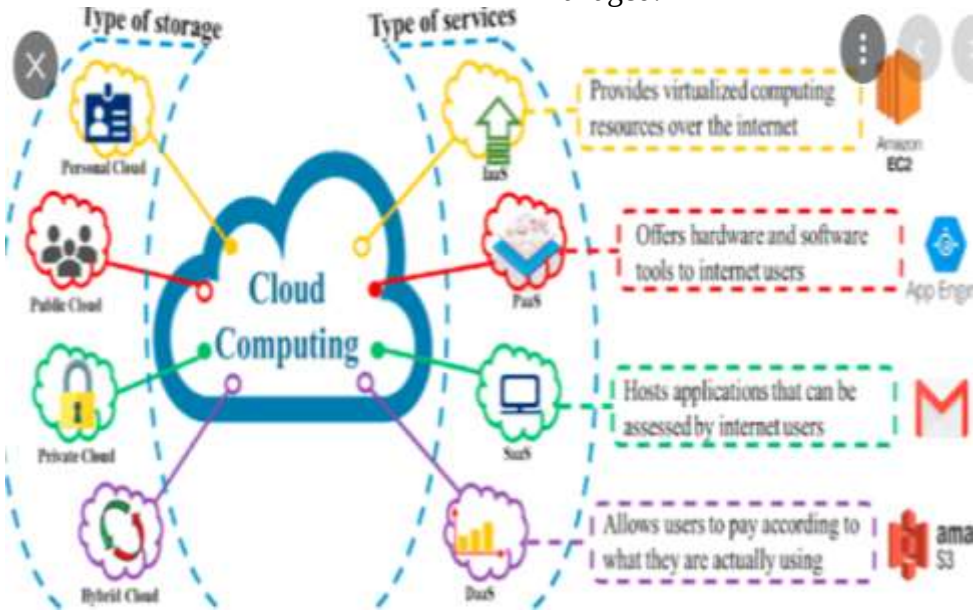


Fig.6:*-A holistic view of cloud computing options for industrial applications,2021(Researchgate.com)*

Blockchain Technology

Bitcoin and blockchain were first proposed in 2008 by a person going by the pseudonym Satoshi Nakamoto, who detailed how cryptography and an open distributed ledger could be coupled to create a digital currency application (Nakamoto 2008). [14]. The concept of blockchain technology is shown in Figure 7.

It is a widely accepted technology around the globe, despite its origins with cryptocurrency. It's a method of storing data in such a way that changing, hacking, or cheating the system is difficult or impossible. It's basically a digital ledger of transactions that's duplicated and dispersed across the block chain's whole network of computers. It is a series of blocks that carry data; the data contained within each block is determined by the type of block.

Regretfully, this is not the situation in Nigeria, where the Central Bank of Nigeria (CBN) has warned Nigerians to be weary of cryptocurrency investments, claiming that virtual currencies are not acknowledged as legal tender (Invoice, 2021).

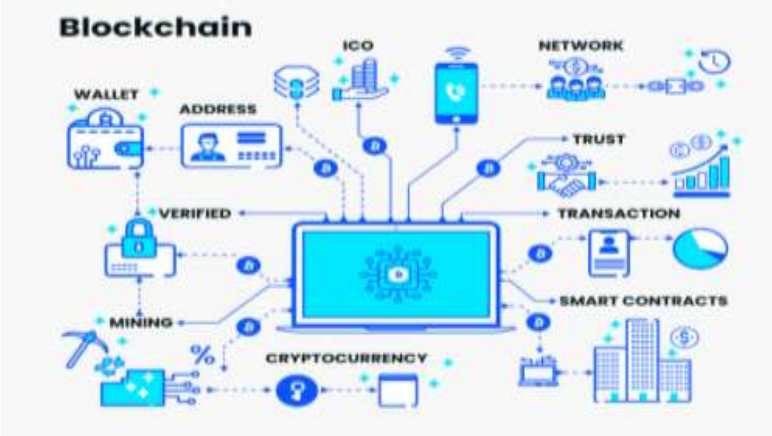


Fig.7:-*Blockchain technology (blockgeeks.com,2021)*

Artificial Intelligence (AI)

It is concerned with the theory and practice of creating systems that exhibit the characteristics of intelligence in human behavior, such as perception, natural language, problem solving and planning, learning and adaptation, and acting on the environment, animals, and artificial agents. It is the ability of a computer or a computer-controlled robot to perform jobs normally performed by people. AI concept is illustrated in Figure 8.

Its fundamental scientific goal is to figure out what principles enable intelligent conduct in humans. It studies and develops computer systems that can do activities that require human intellect. It may possess aspects of human intellect such as speech recognition, decision making, and visual perception. It is used to provide people with customised recommendations. It is critical in commerce, product optimization, inventory planning, and logistics.

This scientific goal directly supports several engineering goals, including developing intelligent agents, formalizing knowledge and mechanizing reasoning in all areas of human endeavor, making working with computers as simple as working with people, and developing human-machine systems that take advantage of the complementarity of human and automated reasoning [20]. Despite the obvious advantages of artificial intelligence, many Nigerians remain skeptical of the concept, believing that full acceptance will lead to a reduction in many industries and businesses.

Fig.8:-*Artificial Intelligence(Bernard Marr bernardmarr.com,)*

Internet of Things(IoT)

Instead of typical networks of homogenous devices, the Internet of Things refers to networks of heterogeneous devices. The Internet of Things (IoT) is a network of interconnected computing devices, mechanical and digital machinery.

It is a network of interconnected devices and also the technology that enables connectivity between devices and the cloud as well as between devices. It refers to physical items that are equipped with sensors, processing power, software, and other technologies and may communicate with other devices and systems over the internet or other communication networks. IoT for resource management is shown in Figure 9.

Things, in the context of the Internet of Things, refer to a variety of embedded devices and smart items whose interconnection is intended to enable enhanced and intelligent applications, as well as making communications and automation, in general, easier and more attainable [3].

According to research conducted by[8], IoT is still non-existent in research, planning, and early phases of implementation. As a result, enterprises still have the potential to not only use IoT more effectively, but also to refine how IoT is employed.

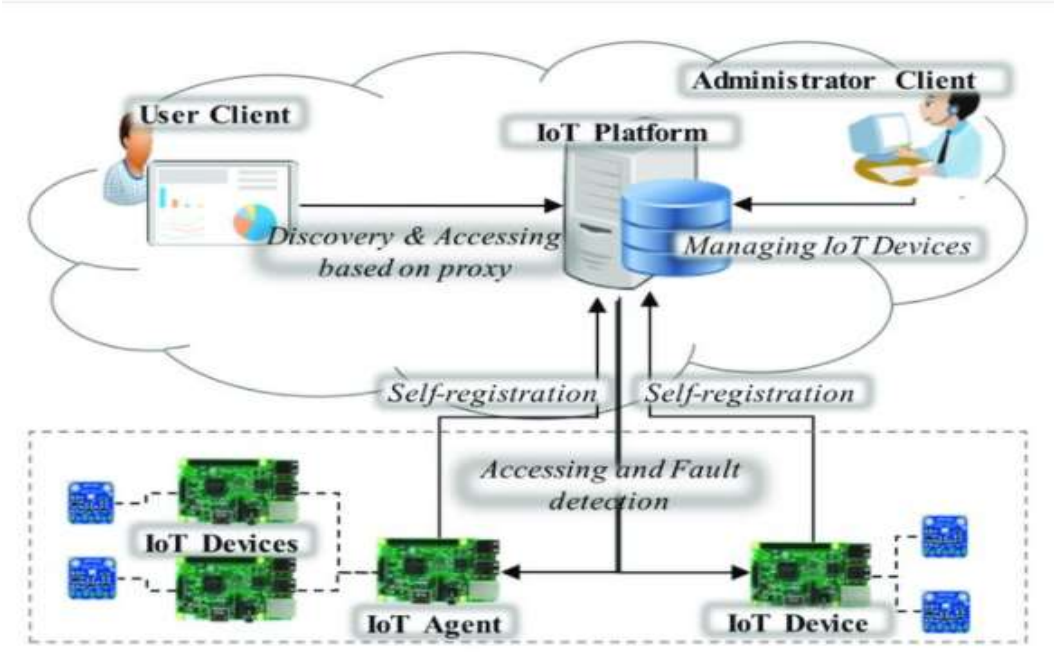


Fig.9:-*Internet of Things (IoT) architecture for proposed resource (Jin and Kim 2019) management (www.researchgate.net)*

Driverless Cars

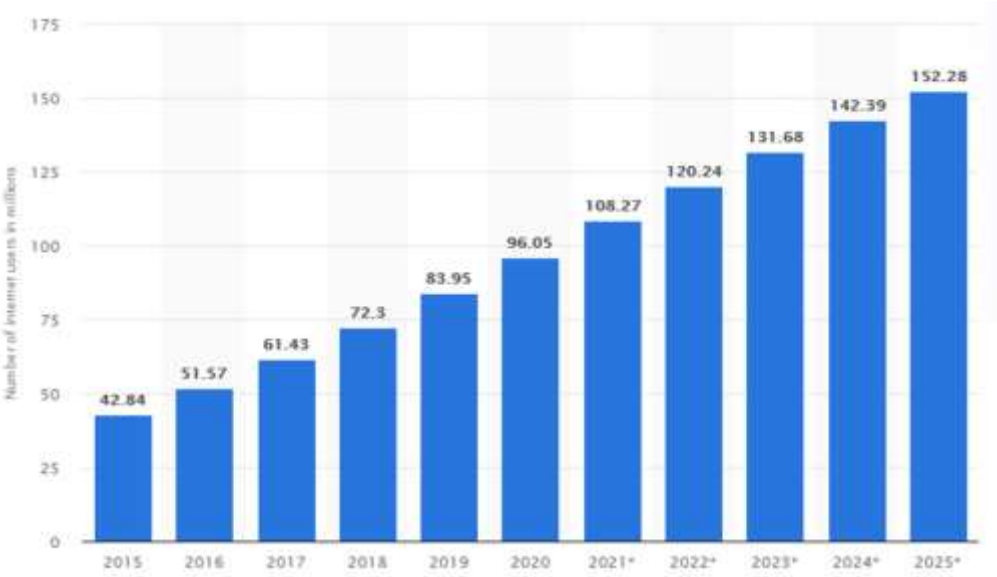
Autonomous cars are vehicles that are controlled entirely by digital technology and are not supposed to require any form of human assistance. They are qualified to drive and navigating on roads by monitoring the effects of the environment. Figure 10 shows autonomous vehicle. The design of such cars is done in such a way that they take up less space on the road, reducing traffic congestion and the risk of accidents. Enormous progress was

achieved in this direction but the autonomous cars on public roads in 2017 are not entirely autonomous: each one requires a human driver who recognizes when it is crucial to regain control of the vehicle. The majority of the major brands – Mercedes-Benz, Audi, BMW, Tesla, Hyundai, and so on – have started building alliances around autonomous technology. Despite the benefits of this technology Nigeria seem not to have fully adopted it due to some challenges [13].

Fig.10:-*Driverless cars (IEEE Computer Society)*

SURVEY OF 21ST CENTURY TECHNOLOGY IN NIGERIA

Several different technologies that emerge in the twenty-first century have been discussed. Nigeria, despite its well-publicized achievements, as reported in the Research ICT Africa (RIA) Sector Performance Review (SPR), trails many other African countries in a number of market indices. RIA's 2012 ICT Access and Usage Surveys in Twelve African nations used nationally representative household survey samples to look at household, individual, and informal business ICT access and usage. Nigeria is ranked 5th in terms of mobile adoption and 5th in terms of industry perceptions of the efficiency of domestic telecommunications regulation in the RIA ICT Survey.



Statista (2020) Adegbite (2015)

Nigeria ranks 17th out of 46 nations in terms of affordability of the lowest prepaid mobile product from a dominating operator, and 13th out of 46 for affordability of the cheapest mobile prepaid product from any operator, according to the RIA's Pricing Transparency Index: Prepaid Mobile for 2012. According to the 2012 RIA Nigeria ICT Access and Usage Survey, there is a broad contradiction in Nigeria's telecoms industry (one of performance and the other of deficiency), and this paradox exists across all market subsectors. For instance, mobile communication is booming at the same time as the fixed-line sector is in freefall.

According to another RIA study, after Nigeria's progress in the telecommunications sector earned it recognition as a continental ICT leader, the sector has seen minimal network investment in recent years, reflecting the sector's decline, against the backdrop of the 2015/16 economic recession, which resulted in a dramatic drop in crude oil prices, negatively affecting exchange rates and leading to high government-set USD/Naira rates. This resulted in an increase in equipment costs and a decrease in imports, both of which are necessary for the construction of telecommunications infrastructure. Though Nigeria has adequate 2G coverage, its lacking 3G, 4G, and 5G coverage as well as the necessary infrastructure.

Furthermore, Nigeria lacks the requisite infrastructure to support sufficient broadband deployment. Low levels of investment, as well as disabling economic and other environmental challenges, have resulted in unsatisfactory policy decisions and low levels of Internet access and use.
In terms of self-driving cars. It has not been adopted by Nigeria. Many places are still unmapped, which makes this effort tough. There are still some Many people still believe it is tough to control because of our roads and people's unwillingness to follow rules and regulations. At the end of the day, they do more harm than good.

FACTORS AFFECTING 21ST CENTURY TECHNOLOGIES IN NIGERIA

Porous Infrastructural Base: Nigeria's current infrastructure is woefully inadequate in terms of capacity and quality, and it will be unable to support planned industrial growth. Despite government efforts, Nigeria continues to have significant infrastructural gaps, particularly in terms of power generation. The current capacity of electricity generation is less than 2000 megawatts, which is just around 20% of the expected national demand.`

Internal Security: Nigeria's internal security has become a major issue in recent years. Internal conflicts, kidnappings, and insurgency, as well as religious, ethnic, and economic crises, have all had an impact on the economy, most notably frightening investors away from particular areas of the country. Despite the fact that insecurity of lives and property had been apparent following the civil war and successive military regimes, which directly increased urban violence, the recent outbreak of violence and insurgency in the country highlights the need to completely address the persisting sources of social tension as a risk factor for Nigeria as an investment destination.

High Index of Corruption: In the Corruption Perception Index, Nigeria is ranked first. This has ramifications for foreign investment and the flow of funds into the country. Previous anti-corruption initiatives in Nigeria have primarily focused on enforcing existing laws rather

than tackling the core problems. Social insecurity and over centralization of resources at the center have been cited as major causes of corruption in Nigeria.

Lack of Purposeful Leadership: Selfishness on the part of Nigerian Leadership structure is a jinx that must be broken if Nigeria is to achieve any significant technological advancement. However, the government's stance toward breaking Nigeria's technology jinx is ludicrous [16].

CONCLUSION

It is clearly shown that many technologies emerged in the 21st century such as Driverless cars, IoT and Cloud Computing, 3-D printing, 5G Network etc. Also, comparison with other African states and European state were shown. The paper has shown clearly that Nigeria is not doing so badly, but there is need for improvement in order to match many of the countries ahead.

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