CHAPTER 21

TECHNOLOGY ADVANCEMENT AND SUSTAINABLE DEVELOPMENT IN NIGERIA'S EDUCATION SECTOR

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Introduction

One of the indices by which a nation's growth and advancement can be measured is by her technological breakthrough and not by the level of her endowment in natural and human resources. A nation's economic efficiency is determined, measured, compared, classified and ranked by its technological advancement. Various authorities have defined the term technology. Technology is derived from the root word "*techne*" which means activities by which man seeks to adapt to his environment. It is said that technology development pertains to development witnessed through industrial activities (Kayode, 2010). Technology embraces the means by which a man controls or modifies his natural environment. It is also seen as a special kind of knowledge which is directed towards practical applications in the physical and social world.

Technology is also defined as the application of practical, mechanical and scientific knowledge to industry and commerce. More so, technology is understood as the body of organized knowledge, tools and machines used by man to manipulate his environment to satisfy his basic needs (Oluka, et al, 2013). Further definition of technology puts it as a systematic application of manufacturing methods and industrial arts to enhance efficiency in human activities. Simply put, technology is defined as the result of man's efforts to do things more efficiently and effectively. Technology is also defined as way or means of accomplishing a task (Oluka, et al 2013; Dekoya, 2012)**.** Summarily, technology can be deduced as the harmonious application of organized scientific,

socio-cultural know-how to manipulate the environment with the intention of solving problems and satisfying human need. Therefore, the traditional skills and techniques used in the production of arts and crafts, blacksmithing, and iron smelting, carding and weaving, brewery among others can be summed up as indigenous technology in Nigeria.

Technology and National Development

Technological advancement entails a process of synchronizing socio-cultural resources, modern and traditional technologies organized together into feasible projects designed to meet specific man's needs and purpose. Hence, the process of textile weaving, spinning, and dyeing, ginning carding had been a well-established occupation in pre-colonial Nigeria. Several studies have been done on the traditional skills of the pre-colonial Nigerian, with evidence regarding the positive contribution of indigenous skills and techniques, particularly to the development and growth of various Nigerian communities before colonialism. This is a pre-requisite to sound technological growth, rather than depending on foreign inputs. For example, the Iron technology of the Nok culture around Jos, Bauchi, Daima, Kano and Zaria is dated to about 500 B. C. Archeologists have excavated iron spears and axes at Nok, and iron smelting furnaces had been discovered in Taruga, and it is believed to have contributed to the development of agriculture in the region, while there had been ample evidence regarding the use of iron around the Kanji Dam in the present Niger State of Nigeria, around 2nd century B. C. which had contributed to the building of canoe and other agricultural implements around that region among others (Dekoya, 2012; Afolabi, 2008; Uwaifo and Uddin, 2009).

Nigeria as a country has been faced with the problem of technology due to relegation of useful indigenous technology as a result of distractions, inability to comprehend what actually is the meaning of technology, inability to identify her appropriate technology and the guiding principle for technology transfer. The country is also faced with the dilemma of scarce foreign exchange to purchase knocked down components and consumer goods. In fact, Science and Technology had been lip-serviced in Nigeria for a long time and these have made it vivid that after sixty years of independence, Nigeria has been depending, in several areas, on foreign nations for her various technological and industrial needs (Isioto*et al*, 2017). Study from Kayode Joseph Onipede(2010)shows that colonialism truncated and hindered improvement in the indigenous skills and techniques of the pre-colonial economy.

Development, on the other hand, is the gradual growth of a skill to become more advanced or the process of producing a more advanced product. Consequently, Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."However, the development of indigenous skills and techniques of pre-colonial Nigeria is a pre-requisite to sound technological growth, rather than depending on foreign inputs, which must be properly monitored and developed to set the pace for Nigeria's industrialization.

As the world has become a global village, there has been an increasing need to strengthen and reinvigorate science, technology, and innovation as vital instruments for sustainable development in Nigeria. In any nation, universities and research institutes are key components of the National Innovation System (NIS) responsible for creating economic opportunities and wealth. The capabilities of each component and the strength of their interactions determine the extent of wealth creation, economic and technological development and global competitiveness of individual nations. One of the demands of the nation is that schools should graduate students with employable skills and from a technological perspective, the main aim of any university is to improve the capability of the students to identify real life technological problems and offer the required solutions.

The universities and research institutes are responsible for generating and imparting new knowledge, and within the domains of science and technology (S&T), developing new ideas that can be transformed to the market by Industry. In Nigeria, budgetary allocation to science and technology rose from N 1.5 billion (US0.01$billion$)in 1998 to N16billion (*US* 0.11 billion) in 2006, in 8 years. As impressive as the figures look, they represented only 0.11% of GDP. Furthermore, Nigeria only accounts for 0.01% of global expenditure on research and development, her Global Competitiveness Index (GCI) ranking is 94 (out of 134 nations), and she has no university in the world's top 500. Nigeria has aspirations to be one of the top 20 world economies by this year 2020 creating two key issues - a need for massive investment in science and technology research and development (R&D) over the next decade and strategic opportunities for researchers in R&D and new product development.

A critical concern is knowing the capability of the Nigeria university researcher to effectively harness these opportunities and marshal Nigeria's economic revolution (Isola et al, 2010).Currently, according to the Nigerian Universities Commission (NUC), Nigeria has 43 federal universities, 48 State universities, 79 private universities, 11 distant learning centres, approved affiliation of some Nigerian universities with colleges of education, seminaries/theological and other educational institutions are 15 in number By taking a cursory look at the 2020 education budget, a sum of N691.07 billion constituting 6.7% was allocated to Nigeria's Federal Ministry of Education in the 2020 national budget, (Figure 1), this was based on details contained in the Appropriation Bill obtained from the Budget Office of the Federation. The budget proposal presented by President Muhammadu Buhari before a joint session of the National Assembly was N10.33 trillion naira.

The budget estimate was of the highest ever since Nigeria's independence. A sum of N4.88 trillion was earmarked for recurrent expenditure and N2.14 trillion for capital expenditure. Of the N691.07 billion, the sum includes the statutory transfer allocated to the Universal Basic Education (UBE), which is N111.79bn. Comparing with earlier years, N620.5billion, which is 7.05% of the total estimate was allocated to the education ministry in the 2019 budget. The ministry got allocated only 7.04% or N605.8 billion in the 2018 proposal, 7.4% or N550 billion of that of 2017 and 4% or N369.6 billion in 2016. Compared with all these, the 2020 education budget is higher than others in sum but lower in percentage to the entire estimate. (https://educeleb.com/nigerian-2020-budget-education-ministry/).

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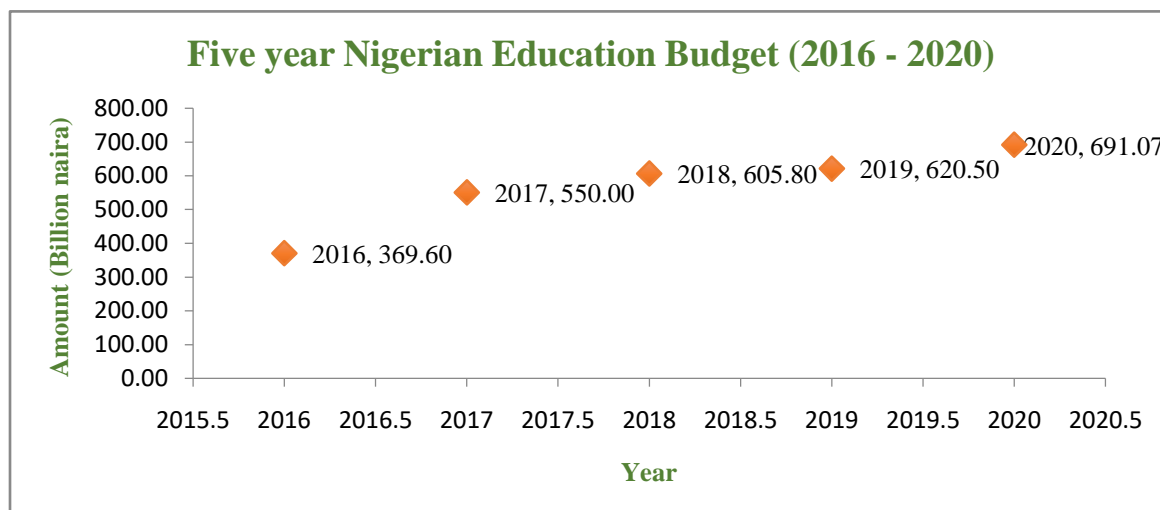
Education and Sustainable Development

Despite the efforts of the National Universities Commission with the vision to be a dynamic regulatory agency acting as a catalyst for positive change and innovation for the delivery of quality university education in Nigeria, her mission of ensuring the orderly development of a well-coordinated and productive university system that will guarantee quality and relevant education for national development and global competitiveness, and her goals of attainment of stable and crisis-free university system, work with Nigerian universities to achieve full accreditation status for at least 80% of the academic programmes, initiate and promote proficiency in the use of ICT for service delivery within the Commission and the Nigerian university system, upgrade and maintain physical facilities in the Nigerian university system for delivery of quality university education, matching university graduate output with national manpower need and to foster partnership between the Nigerian university system and the private sector, Nigerian universities in reality still wallow in static condition of technological unsustainability.

These Universities are established to conduct technical research and to impart practical skills (among other things) to its new graduates. Ekeh (2003) saw the role of universities as a basic necessity which helps countries to rip off poverty, ignorance and disease. Universities achieve this through the inculcation in young people of requisite knowledge and skills in science, technology, arts and humanities. By so doing, university education ensures that qualified manpower is produced for proper management and development of different sectors of nation's economy, including education, health, transportation and industries. They are expected to bring about some form of technological and industrial revolution in Nigerian society by producing graduates whose engineering education is geared to industrial applications. These graduates are expected to fit into industry much more quickly than those who have received a more general engineering training, becoming productive even while receiving the necessary orientation for specific skills peculiar to the industry just like in other countries.

These were the reasons for the establishment of universities and other tertiary education institutions in Nigeria. It is quite unfortunate that the education system in Nigeria cannot boast of catering to these needs today. Huge population of graduates emerges each year from these universities, from various fields of technology; yet, Nigeria still has her technology under - developed. It saddens the heart to be aware that an average Nigerian wishes to study in the developed nations, the question now is when will our nation get to that level where every Nigerian student will develop interest in home-based institutions rather than abroad? This drives home the point that something is wrong with our technological system and this calls for a complete overhauling in order to achieve a sustainable development.

Looking at the triangle of innovation around the world held together by the cooperative endeavour of the Government, the Academic Community, and the Industry. A deficiency in any of these key drivers of innovation will definitely bring an imbalance in the innovation ecosystem. This makes the role of the academic community in driving innovation very critical; many nations are maximizing their ivory towers by creating superb technology institutes and centres focused at grooming a generation of innovators for the future. In Africa, the African Union and other relevant stakeholders are beginning to take several African innovation initiatives seriously. Innovation is now like a major Sport with each country running their innovation Olympiad (Omeruo, 2013).

While many universities around the world are at the centre of innovations, Nigerian universities are yet to realize how important their role is in driving this innovation. This gives a great concern seeing how innovation around the world are been driven by the intellectual prowess of the academics and the academia while in Nigeria, universities have been reduced to a derelict and a contraption for just issuing certificates and grooming half-baked graduates who are considered misfit by most organizations when it comes to employment and creating value in the society. The problem is not from these young people who study in Nigeria, the government and the academic community is to blame. This is something to worry about especially if Nigeria wants to be relevant in the future. There was a report that says Nigerians are one of the most educated people in the United States, I don't know how true that is but am aware that many young Nigerians are excelling and becoming recognized abroad as University dons. And these Nigerians in the US also contribute their quota in driving innovations over there.(Omeruo, 2013).

Talking about Universities of Technology in Nigeria, according to Hilaryet.al(2018), Technological education is often seen as a steppingstone to technological advancement of every nation. Regrettably, Nigeria remains undeveloped and imports most of her technological needs despite the establishment of Universities of Technology. This has caused the economy of Nigeria to suffer as a result such that, organizations have to depend on outsourcing or employment of expatriates to manage their technological needs. The technological backwardness has led to huge capital flight, high cost of doing business and total dependence on foreign nations for technical assistance. The genesis of the problem can be traced to low allocation of funds to the educational sector, corruption, lack of research activities, red-tapism, tribalism, lack of political will to develop the Universities of Technology and political interference on educational activities.

Hilary *et.al* (2018) also noted that research outputs of universities are often used for the determination of their ranking, prestige and impact among competing partners across the globe. From their research "Research Output Analysis for Universities of Technology in Nigeria", it was observed that the research outputs from the universities of technology in Nigeria were poor especially when compared with other African countries like Egypt, Morocco, Ghana, South Africa, Algeria and so on. The universities seem to perform poorly in 3 core science areas which are chemistry, physics, and mathematics. Agricultural and biological sciences, engineering, environmental sciences, and medicine are the major subject areas of strength of Universities of Technology in Nigeria. This is a major concern for policy makers in education sector because apart from engineering and environmental sciences, it seems that Universities of Technology in Nigeria are deviating from their mandate. Surprisingly, the Universities of Technology in Nigeria are not very active in energy research. This is supposed to be one of their major strength since Nigeria is a major oil producer and has petroleum and petrochemical industries. It should be noted that for Nigeria to be able to migrate to green economy, Universities of Technology in Nigeria should be funded in the area of renewable energy research.

Brain drain, infrastructural deficiency, knowledge gap, poor ethical standards and different levels of malpractices are some or the reasons Nigerian universities cannot drive innovation in Nigeria. These factors have continuously brought with it decay of the higher education sector. They have become very incapacitated and redundant as the years grow by. It leaves no option than to think and ask where the future is and hope for Nigeria without a good and healthy educational system.

Can there be sustainable development through innovation without the good knowledge-force(Omeruo, 2013).

At 60 years of the existence of Nigeria as an independent entity, one would actually think that with the exposure our leaders are getting traveling around the world, that there should be a change from what it used to be in terms of making education a top priority and as an ingredient for economic development. It is certain that they hear and see how other nations are driving technology development and innovation with the academic community contributing their own quota through research and commercialization of researched works.

Realities in Nigeria's Educational Sector

For Nigerian universities to be on an industrial action for several months with no way forward in resolving the dispute affirms the fact that Nigeria really has misplaced priority and is not willing to move forward. Such ugly characteristic of the higher education sector in Nigeria has left the system with great mediocrity and lack of focus. Our leaders care less in developing the education sector just like the health sector, because they send their wards abroad to study, everyone knows this. Does that really solve the problem? It is very glaring that the increased reduction in the standard and quality of education in Nigeria makes it impossible for technological development or innovation to come out of the citadel of learning and so Nigerian universities cannot pioneer or drive innovation as other nations.

The major cause of the poor standard of education is that Nigerian government over the years does not give the needed priority and attention to higher education in the country. It is very unfortunate how our leaders continuously disregard the values and need for quality education because they can always afford sending their wards to universities abroad.Nigerian universities are poorly funded by government, government does not give attention and provide the financial support that is needed by the universities and that is a major problem that sets back innovation in Nigeria. Universities need good funding to build and develop several infrastructures, carry out research work and then take care of the welfare of the staffs, and these funds must be strictly monitored so as not to be embezzled. Despite the importance of education to national development, education is one of the least when it comes to allocation of funds in the Nigerian budget (Figure 2).
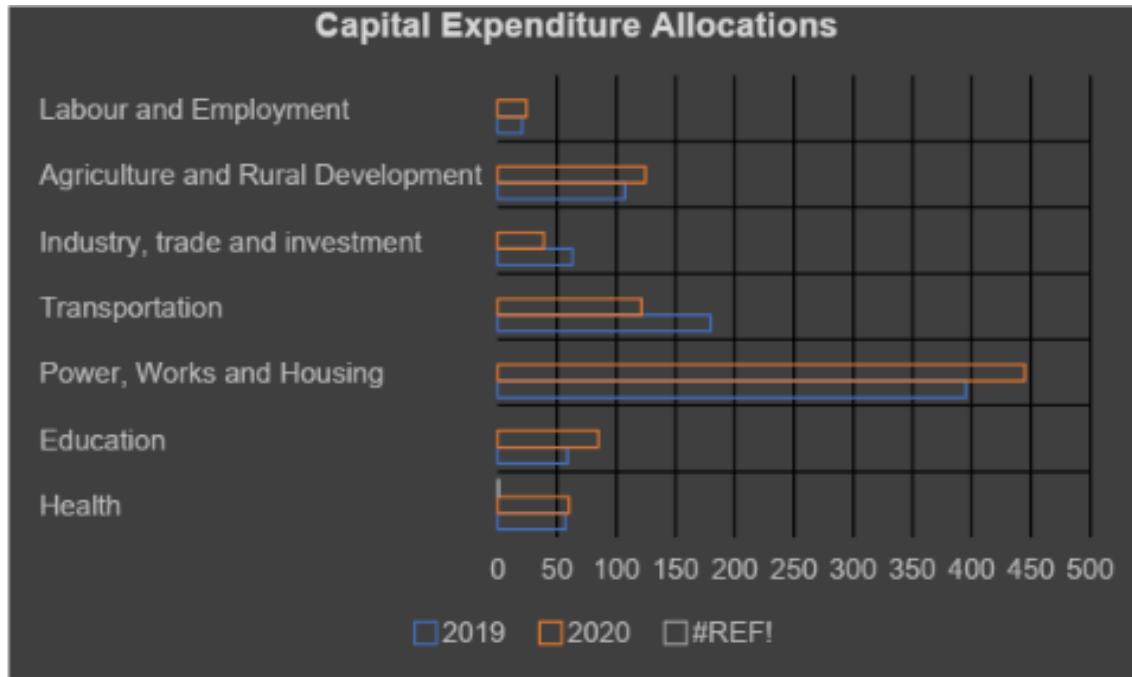
Fig. 2: Nigerian Capital Expenditure Allocations for 2019 - 2020

The right priority is not given to things about the education sector in Nigeria. Government has the duty to create the enabling environment for the universities to drive innovation in Nigeria. The failure of Nigerian government over the years in this has brought other problems. The curriculum used in the universities is such that does not support innovation and entrepreneurship. This has resulted in a big knowledge gap and has brought with it the issue of graduates studying courses for years and not learning how what they studied can be applied in real world to solve problems. The problem associated with this is so huge and complicated that one cannot exhaust it in this piece.

Agreed that government has key role to play in pioneering tech development in Nigeria, some universities themselves lack focus as to how to pioneer technology innovation in Nigeria. They are really not interested in such. Organizations like the World Bank give some Nigerian universities funding but the universities simply lack the needed idea and projects that can attract such funds meant for them. The universities themselves have all it takes to attract funding from the private sector and relevant organizations and drive relevant agenda for innovation. This is what is

happening all over the world where several research projects are being funded by organizations and individuals. Sticking to the old ways of doing things has limited the development of Nigerian universities in competing globally in innovation. Lack of ideas and initiatives that can drive innovation is the bane of growth of innovation among the academic community. Nigerian universities are not daring or eager to try new ways of doing things. What is wrong in Nigerian universities partnering with top technology institutes around the world like Technion-Israel Institute of Technology, MIT, Harvard and others?

Jaguar Land Rover is involved with over 30 universities and academic institutions in the United Kingdom. Its relationship with Warwick and Coventry Universities especially come to mind. Jaguar Land Rover is principal sponsor of the Warwick Manufacturing Group's (WMG) Academy for Young Engineers. WMG is an affiliate of Warwick University. The academy caters for the technical development of students 14-19 years of age and specializes in practical and academic instructions. Jaguar Land Rover and other major employers shape the curriculum of the academy. They are directly involved in the content of the instructions and practical lessons provided by Warwick to the students. With Coventry University, Jaguar Land Rover annually has some 100 of its employees enrolled as students in the University. Research activities are conducted in partnership with Jaguar Land Rover and other major employers (Japheth, 2015).

But Nigeria appears quite far from this model because, as much as we spouted the word "autonomy," especially during the President Obasanjo years in the 90s, the truth remains that most of our universities remain tied to the state governments and the federal government. You cannot look to be independent from a source that continues to supply the bulk of your funding. We are left with universities that more or less suffer the same fate and destiny. If one closes down due to union issues with the federal government, others are affected. The acronym ASUU (Academic Staff Union of Universities) is more synonymous with school closures than it is with whatever agenda it is pursuing to make University education better in Nigeria. ASUU has done a lot to improve the lot of university lecturers and funding for universities in Nigeria, but "ASUU strike" is such a norm you would think that was the full name of the organization. While some companies have supported and continue to support university and technical education in Nigeria, the majority would rather look to employ graduates of foreign universities in place of locally-educated ones. In fact, we have

seen a lot of unpleasant experiences of how foreign construction companies treat Nigerian graduates they employed.

As the university reflects the typical Nigerian setting where corruption is a major challenge to development, the university community has its own unfair, unethical things happening in the administration of the universities, in teaching and learning. Standards are compromised; education values and morals are eroded leaving the academic community with different levels of malpractices that hinder development of the universities in Nigeria. With these, Nigerian universities cannot really drive innovation.

The advent of private universities in Nigeria, which looks like the hope for education, they are also faced with the same issues. Until these problems are tackled, the dream of the Nigerian universities in driving innovation will always be a mirage!A situation where the economy is asking one question in terms of needs and the universities are providing answers that are irrelevant, in terms of graduates, to the needs of the economy it is not sustainable. Before we speak of specializations, certain statistics indicate that some 70% of graduate employees cannot write in Basic English. This is unacceptable. If we cannot get the basic things right, how then can we specialize? The world and the essence of education and employment are changing at an increasing rate. Some of the top jobs today were not in existence less than half a decade ago, the top jobs of 2025 are not in existence today. How can a university system that cannot meet the needs of today's job environment meet the needs of a tomorrow it is even barely prepared for? (Japheth, 2015).

Conclusion

We have a long way to go but the least we can do today is admit our educational system needs to get fixed. That will happen only if we understand that this would involve a long process of developing a dynamic educational system rather than assume that new pronouncements would deliver the results. The way we thought changing the system from 6-3-3-4 to 9-3-4 would. Some would argue the change from 6-5-4 to 6-3-3-4 in 1982 only made things worse. Former minister of education, Professor Ruqayyatu Ahmed Rufa'i even presented a reversal to 6-3-3-4 to the National Assembly but not without an amendment, adding 1 to make it 1-6-3-3-4. Whatever system gets introduced will be introduced in the same environment of teachers who would rather be anywhere but the classrooms and an education system that cannot meet its needs due to the shortage of

private and public funding. The revision of the basic education curriculum is a step in the right direction, but a lot more needs to be done to revamp the system.

There should be more investment in our universities, and we have already established the fact that the government cannot meet these needs. If it could not meet them during the years of unprecedented high oil prices, it cannot meet them now that oil prices have drastically declined. With a sizeable number of public universities still charging less than $100 per academic year as tuition, one is forced to wonder how such institutions will survive modern demands for university education where internally generated revenue is hardly enough to meet the basic needs of running the system. If we cannot commit to making the sacrifice to make education work in Nigeria, we have already committed ourselves to a future of battling more insecurity, unemployment and high poverty rate. We can choose better (Japheth, 2015).

For Nigerian Universities to achieve technological sustainable development:
1. There must be Vice-chancellors who are selfless, determined, visionary, sincere and focused, Vice-chancellors who have the progress of the University at heart, someone devoid of political sycophancy but with passion for performance.
2. There should be strong collaborations between Nigerian universities and multinational companies to implement some schemes like NOTAP Industry Technology Transfer Fellowship (NITTF) and the Technology Story Board initiative in order to create indigenous critical technological competencies of elite applied knowledge through special PhD programmes tenable in Nigerian universities.
3. Government should increase in the budgetary allocation of the universities to ensure that the visions are actualized. There should be increase in funding for research and development. To reverse the trend of technological backwardness, Nigerian universities should also learn from other foreign universities who allocate high percentage of money for research and development (R&D). Universities need good funding to build and develop several infrastructures, carry out research work and then take care of the welfare of the staffs. Isioto et al (2017) noted that investing into the educational infrastructural facilities is investing for the future growth and development of our children and by extension, investing for the future growth and development of technology. If students cannot do basic practical how can we aspire to a technological breakthrough? It is therefore imperative that to overcome the

problem of technological 'unsustainability', the University must invest monumental resources towards upgrading our educational infrastructures.

4. Thousands of university graduates are unemployed, and this has been steering the country on the face but could be curbed if science, technology and innovation are harnessed to develop a critical mass of skilled manpower that will be the catalyst for job creation.

5. Another sustainable thing to do should be for several companies to form solid partnerships to support universities in the cities or states where they operate. There is nothing wrong in Nigerian universities partnering with top technology institutes around the world like Technion-Israel Institute of Technology, MIT, Harvard and others.

6. The vice-chancellors should receive orientation on strategic thinking and planning in the form of a workshop provided by a team of experts.

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