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University Engineering Education as a Panacea to National Development: Challenges and Way forward

P. O. Omolaye

Department of Electrical and Electronics Engineering,
Joseph Sarwuan Tarka University, Makurdi, Benue State.

Corresponding author: philomolaye@gmail.com

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Abstract
This paper carefully reviews the associated challenges that usually deter the development of University engineering education and painstakingly comparing the template of medicine and surgery profession with the current one run by engineering to unravel the deficiencies. The role of engineering profession as the major player or driver of socio-economic growth and national development cannot be overemphasized. Nigerian Universities can produce qualified engineers to be effective solution providers in this 21st century challenges, if only the government and leaders at the helm of affairs are ready to invest heavily in engineering. The author reported that the backwardness stems from poor funding, obsolete curriculum, dearth of facilities, poor remuneration among others. Furthermore, the author asserts that the real setback to industrialization, technological growth and academic excellence is as a result of the wide gap between University and our industries. The author finally proffers solution to improve the standard of engineering to innovate aggressively, create new ideas and opportunities and also place the profession in an enviable position.

Keywords: NUC Guidelines, National Development, Engineering Education, University Education, Engineer.

Acronyms

BMAS	Benchmark for Minimum Academic Standard
FGN	Federal Government of Nigeria
MIT	Massachusetts Institute of Technology, USA
NUS	National University of Singapore
CBN	Central Bank of Nigeria
DSS	Department of State Services
PAS	Public Address Systems
KPI	Key Performance Index
NSE	Nigeria Society of Engineers
UTME	Unified Tertiary Matriculation Examination
SSCE	Secondary School Certificate Examination
MBBS	Bachelor of Medicine, Bachelor of Surgery.
NNPC	Nigerian National Petroleum Cooperation
MDCN	Medical and Dental Council of Nigeria.
COREN	- Council for the Regulation of Engineering in Nigeria
IPPIS	Integrated Personnel and Payroll Information System
UNESCO	- United Nations Educational, Scientific and Cultural Organization
GIFMIS	- Government Integrated Financial Management Information System

1.0 Introduction

The word engineer is said to originate from "ingenious person" and the cleverness, the resourcefulness, natural talent and the inventiveness implied in the word still remain the principal attributes of the profession (Omolaye et al., 2014). Engineering impinges on our daily life in one way or the other more than some other disciplines. Manufacturing factories, building and constructions, information and communication technology, electricity, roads, telecommunications, machines, transportation, water supply and irrigation system, rail systems to mention but a few, are all engineering works, which are the panacea to national development. Therefore, it is right to say, engineers by profession are trained to be courageous, imaginative, creative, entrepreneurial and innovative in nature. According to Late George King, that gave the description of engineering as a three-legged stool that solely depends on science, mathematics and *techne*. The *techne* is referred to as the creative abilities that differentiate an engineer from scientist; to design, make, conceive and bring about fruition. The future and greatness of a nation does not depend on the number of natural resources available but that of the engineering skills and competence put in place to drive the economy. This is the reason why the Americans do not joke with engineering education. In America, engineering education is seen and categorized as part of the strong pillars to national resources. This is because of its peculiar nature as the bedrock to socio-economic, knowledge-based and as a technological-driven development or economy that has direct bearing on all human endeavors (Thamhain, 1992). So, the differences between developed and underdeveloped nation is just a thin-line which is quite simple grammatically. In this regard, the developed nations often invested heavily to transform scientific and innovative-oriented ideas to usable technology for the benefit of mankind whereas the underdeveloped nations are still finding it difficult to effectively invest and utilize their potentials as a result of lopsided attitude exhibited by the government to properly catapult their nation, Nigeria from technologically backwardness to real giant of Africa in terms of economy and infrastructure development through modern-driven University engineering education and Technology-promoting culture that would further sprout entrepreneurialism

Presently less than 2 percent of Nigeria Universities attracts expatriate lecturers, compared to 80% that the Ghana Universities attract. Imagine in 1970s, Ghanaian, Indians and other countries formed part of lecturers in Nigerian Universities because of favorable economic conditions. No expatriates want to grace our land due to the downturn of the economy and insecurity created as a result of bad leadership and governance. As rightly researched and according to Bassi (2004), over 10,000 graduates left the shores of Nigeria between 1997 and 2007. Also, over 500 Lecturers from Nigerian Universities continue to migrate oversea every year for greener pastures. Currently, Nigerians in diaspora contribute 35 times more wealth to European, American and other African economies (Uwaifo, 2010). So, Nigerian professionals' especially engineers and medical doctors have continued to leave the shores of Nigeria resulting in brain drain to the advantage of other nations around the globe. The recruitments of Nigerian Medical Doctors by Saudi Arabian and UK government agencies and the unruly behavior of DSS in that exercise is a recent occurrence that should send signals to the government.

The introduction of IPPIS over GIFMIS by the FGN further dented the University Autonomy and localized the University system. Though,

GIFMIS platform previously used to pay salaries are used to siphon public funds using ghost workers as observed by FGN (Uzoh, 2020). Also, as rightly claimed by the FGN that IPPIS, an IT-enabled and centralized software would facilitate manpower planning, eliminate record and payroll fraud thereby reduce wastages and leakages to minimum level (Enakirerhi and Temile, 2017) but out rightly violate the Universities Autonomy Act No. 1, 2007. At the heart and soul of a great University lies autonomy, so Nigerian Universities should be bastions of freedom and be free from government interference and laborious tyranny of politicians. A University should control its own academic governance. The recent interference of IPPIS has led to friction with the Academic Staff Union of Universities (Uzoh, 2020).

This paper examines the engineering education in Nigeria, engineering regulatory bodies and the overview of medical profession compared to University engineering education. It further reviews the immediate challenges that cause the falling standard and proffers solution to mitigate the effect.

2.0 Engineering Education in Nigeria

Nigeria University engineering education and training, which was inherited from British engineering training system commenced 70 years ago. However, this similar standard of education and training worked for British engineers and technicians. This is because they are developed nation. Looking beyond mere importation of education systems, neither the British nor USA or any other advance engineering training system would produce Nigerians with our desired technological competence that is capable of transforming Nigerian state (Ojiako, 1986). Nigeria has its peculiar problem which needs her own engineering education training system that is designed to accommodate her background, limitations in consonant with her national objective. Africa including the giant of Africa, Nigeria has been the destination of imported goods and services. From all indication, it is assumed that engineering courses are more of theoretical than the practical experiences (Mahmud et al., 2012).

Engineering is a profession which involves the use of mathematical tools and natural science knowledge to develop systems that are beneficial to mankind. These systems involve a wide range of activities such as conception from scratch or analysis, system design, system development through system deployment or implementation, operation, maintenance and support. The practice in engineering is categorized into various branches and scope or major specialties such as civil (environmental, geotechnical, structural, transport, utility, water resources), chemical (materials, bio-molecular, process, corrosion), electrical and electronic (electronic, electrical, telecommunication, computer, power, optical), Agricultural (farm power and machinery, farm structures, environmental and agricultural natural resources), mechanical (thermal, opto-mechanical, manufacturing, vehicle, power plant and energy) among others.

The student's choice of engineering as a course is often influenced by some factors such as the profession's prestige, parental or peer influence and other reasons. As usual, successful completion of secondary education by passing SSCE examinations in flying colours in relevant subjects such as English, Mathematics, Physics, Chemistry, Biology and other related subjects. The UTME cut-off mark for Engineering and Medicine and Surgery ranges between 180 – 250 marks and 280 – 350 marks respectively. Aside UTME, admission can be gained through direct entry to 200 level or remedial programme to 100 level. Nigeria University

engineering education is a straight five-year course which is distributed through 10 semesters in which the first year comprises the introductory courses on basic principles of all related disciplines in the faculty of science in most cases. The 8th semester is where the students go for industrial training attachment. The products of Nigerian Engineering programmes over the years from our underfunded and poor training Universities are alarming and seriously calls for national attention and prompt action. This setback has hindered engineering education not to live up to expectation, apart from underfunding, maladministration, pillaging of Universities resources, ethnic, sectional manipulation and religious parochialism in staff appointments and student's admission (Oloyede et al., 2017).

Nigeria is referred to as an underdeveloped and unindustrialized nation with only few small-scale industries which should be termed as "non-growth" and negligible large ones. Our negligible industries are not in the categories of production of an automobile, heavy-duty machines, electronics and computer gadgets, chemicals and pharmaceutics that often exploit new developments and advances of knowledge. Thus, engineering students are not privileged to experience the real technological development in this category. The sinking spell of quality of engineering graduates are as a result of non-availability or world-class facilities such as video conferencing systems, interactive boards, PAS, obsolete workshops and laboratories, overcrowded classes / lecture theatres, epileptic and affordable internet services and epileptic power supply, outdated library resources.

In 2007, in other to improve on the quality of graduates in the University system that are of a comparable international standard, NUC in collaboration with other Universities stakeholders developed minimum academic standards for all the programmes, which is referred to as BMAS. The percentage of the recommended staff mix by rank for engineering is contained in Table 1. In trying to meet up with the staff mix rank guideline, lecturers embark on study leave for masters or PhD which relieve them from administrative duties and teaching. The exercise creates momentary reduction in staff strength thereby allowing other lecturers in the department take more credit loads than the approved recommended per lecturer by NUC.

Table 1. NUC Academic staff mix by rank for Engineering

Ranks of Academic staff	Recommended Percentage
Lecturer I and Below	45
Senior Lecturers	35
Professors/ Readers	20

Source: Stephen et al., (2018)

However, a cognitive style has to do with individual mode and consistent approach to perceive, acquire, process and organize information or descriptive technique of sorting, apprehending, transforming or utilizing information (Höffler *et al.,* 2017). This shortage of facilities really affects the cognitive styles or level of students. The variation in cognitive or assimilation level is categorized into three, namely: Verbalizers, Visualizers and Doers.

i. **Verbalizers**: These are the kind of students that learn easily based on information given in form of written or spoken. They usually benefit from lectures, hand-outs, referenced books and tutorials.
ii. **Visualizers**: These categories tend to learn more and understand easily when information is represented or presented in diagrammatic or pictorial formats.

iii. **Doers**: These set can learn more and understand easily when information is passed through practical demonstration by the lecturers or technologists.

Invariably, due to dearth of facilities, visualizers and the doers are at a great disadvantage and verbalizers may have problem in overcrowded classes or lecture theatres. By all standard, only a small fraction of students' population benefits from the current pedagogical system (Uwaifo, 2010).

3. 0 Engineering Regulatory Bodies

Nigeria's technological problems can be solved by Engineers through a fundamental change in how engineers are trained in the Universities (Ogunaike, 2017). The development and regulation of engineering profession in Nigeria have been carried out by the regulatory body and learned societies through their professionals. The learned society, the NSE was established in 1958 to promote and enforce a high performance, engineering ethics, practice and welfare among engineers while in 1970, the COREN was setup by law of decree 55, amended in 1992 by decree 27 and 'CAP E11 of 2004, Engineers (Registration, among others.) Act' and charged among others things with the responsibilities to monitor, control and regulate engineering practice in Nigeria.

4. 0 Medical Profession

The medical profession is a very noble one that is saddled with the responsibility to save lives and ensure the healthy well-being of all the citizenry. Apart from strictness of professional bodies, competitive and lucrative nature of the profession, it is arguably one of the highest remunerated professionals in the world. It is perceived that the 6-years intensive duration of study and the bulky workload of real-time practical makes the professions to be highly valued and respected in the society. A 6-year intensive degree programme that is required taking relevant courses and passing all courses before a degree is awarded and operational license issued. The journey is broken down into three (3) phases first year, pre-clinical and clinical period:

- **First year:** Candidate will take and pass exams in the approved courses with hand-on practical courses in biology, chemistry and physics. In case of failure in any of the subjects, the candidate is allowed to repeat the entire first year while other successful mates are promoted to 200 Level. Therefore, as a medical student, fail a course and repeat the entire whole year (Adeniyi et al., 1998)
- **Pre-clinical period (200L-300L) –** This stage is referred to as the pre-clinical period (200L – 300L) where pure medical courses are taught, practical classes and administration of series of tests in second year and examination after the pre-clinical period in the third year. These courses are anatomy, biochemistry, community medicine, embryology, histology, physiology among others. This serves as the first professional examination (Second MBBS professional examination).
- **Clinical period (400L-600L) –** Clinical activities and lectures at the teaching hospital of a University to expose the students in pathology, microbiology, pharmacology, and medicine and surgery, a professional examination (MBBS) is administered. In 500L, you are required to take courses in pediatrics, obstetrics and gynecology, and community medicine, write a medical project on any topic of your choice and also conduct field operation to sit for the fourth MBBS professional examination. The sixth years deals with pure medicine and surgery where candidate will be required to clerk patient, perform examinations and recommend laboratory investigations as well as prescribe treatment(s) (Nwobodo et al., 2019).

4.1 Comparison Between Engineering and Medicine and Surgery

i. In Engineering, once all your examination is passed, you are awarded an Engineering degree (Bachelor of Engineering) while Medicine and Surgery, you are awarded an MBBS degree
ii. In Engineering, there are Grade points such as First Class, Second Class or Third-Class degrees awarded while in Medicine and Surgery does not use Grade points, all successful students are awarded the same degree in Nigeria.
iii. In Engineering, you are to stay for minimum of 5 years before writing any professional exam to qualify as an Engineer whereas in Medicine and Surgery, you are inducted into the medical profession and a practicing license is issued to operate as a medical doctor the moment you obtain a MBBS degree.
iv. In Engineering, once 5-year degree program is completed successfully, the graduating student proceed to NYSC while in Medicine and Surgery, you proceed for internship at any MDCN hospitals.

5.0 Challenges in University Engineering Education

The challenges faced by University engineering education over the years are enormous. The inability to address these challenges has put the profession in a tight corner, thereby increasing ill-prepared and half-baked engineers, increase in unemployment, poverty and overnight misery as underdeveloped nation. These factors are painstakingly highlighted as follows:

5.1 Lack of Funds

Nigeria government has failed severally to comply with UNESCO recommendations of at least 26% of the National budget for educational purposes (Akintoye, 2008). The inadequate government subventions have negatively impacted engineering education and the output. The critical of all root cause of the challenges of University engineering education is zero down to lack of proper funding to equip the laboratories and workshops for practical activities. Table 2 shows the National budget and allocation to educational sector between the 2010 and 2020. All that could be seen are outdated equipment and tools that are irrelevant to what is obtainable in developed nations. Due to paucity of funds, the following are some of the end results:

i. Students lack in-depth exposure to engineering practice due to obsolete equipment or tools
ii. Lecturers cannot attend seminars, conferences and workshops to boost, update their knowledge, interact freely with contemporaries and be abreast of new happenings in their areas of specializations.

5.2 Irrelevant & Over-Bloated Curriculum

The present engineering curriculum is obsolete and filled with over-bloated course that do not have direction. In order to allow Nigerian engineering graduates to compete globally with their peers and also be relevant, the curriculum should undergo complete overhauling based on international best practices, flexible to the needs of the country and accommodate the challenges of recent time and societal needs.

Table 2: National Budgetary and allocation to Educational Sector between 2010-2020

Year	National Budget (₦)	Education Allocation (₦)	% of Education Allocation	Remark
2010	4,079,654,724,257	293,427,655,563	7.19	poor
2011	4,226,191,599,259	393,810,171,775	9.32	poor
2012	4,749,101,000,000	468,385,037,983	9.86	poor
2013	4,924,604,000,000	499,761,707,888	10.15	poor
2014	4,695,190,000,000	494,783,130,268	10.54	poor
2015	4,493,363,957,158	484,263,784,654	10.78	poor
2016	6,060,677,358,227	480,278,214,689	7.92	poor
2017	7,441,175,486,758	550,597,184,148	7.40	poor
2018	8,600,000,000,000	605,800,000,000	7.04	poor
2019	8,830,000,000,000	620,500,000,000	7.02	poor
2020	10,330,000,000,000	671,070,000,000	6.70	poor

Source: Nig. Budget. 2010-2020

5.3 Deficient Background Knowledge of Mathematics and Physical Sciences

It is a shame and disgusting that most of the admitted candidates are not fully grounded in mathematical and physical science subjects. However, it is obvious that the engineering as a profession acquire the knowledge of applied mathematical and physical science to economically and judiciously apply to force of nature or material in order to solve problem that are beneficial to mankind.

5.4 Lack of Laboratory Facilities for Intensive Practical Classes

In Nigerian Universities, most students pass exams through cramming because they are loaded with just theory-based lectures and outdated syllabus. Ideally, theoretical and practical courses ratio should be approximately 60 to 40 percent. The ratio of theory courses and practical offered by students as shown in Table 3 is terribly alarming, unprofessional and unethical to the profession.

Table 3. The ratio of theory courses and practical offered by students

Department	AGE	CVE	EEE	MEE
Ratio	73:10	74:11	68:18	76:15

Source: Author's input

Table 4. The ratio of academic staff to students

Name of Univ	Nigeria Open Univ	Uni of Abj	LASU	MIT	Harvard	Yale	NUS
Ratio	1:363	1:122	1:111	1:9	1:4	1:4	1:12

Source: Wikipedia

The following are highlighted by the author:

i. Laboratory facilities are inadequate qualitatively, quantitatively, and absolutely obsolete for current cutting-edge technologies.
ii. Dearth of laboratories and workshops with insufficient consumables and recent educational materials.
iii. Laboratories are littered with obsolete tools and the space meant for 10 students is used for over 100 students,

which makes running of effective experiment extremely difficult.

iv. Acute shortage of tools and equipment due to large number of students to be involved.

v. Component shelves have practically turned to den of rats and cockroaches

Due to shortage of all that is required, engineering graduates are faced with challenges of exposure to current edge technology during their programs which definitely will result to problem of poor communication, emotional instability, lack of self-confidence and responsibility. On a general note, the ratio of academic staff to students in Nigeria Universities and that of the foreign counterparts as shown in Table 4 is alarming, embarrassing and disgusting which needs urgent and prompt action as against the NUC guideline on Lecturers'/Students' ratio as contained in Table 5. Most Nigerian Engineering Faculties are overpopulated by students with few academic staff which result to overburden on the part of the lecturers and lecturers cannot identify their students.

Table 5. NUC ideal guidelines on Lecturers'/Students' ratio

Faculty	NUC Guidelines
Agricultural Science	1:15
Arts	1:30
Engineering	1:15
Law	1:30
Management Science	1:30
Science	1:20
Social Sciences	1:30
Education	1:30

Source: Olayemi, 2012

Establishment of Satellite Campuses and Part/Time Programmes

One of the cardinal issues militating against acceptable standard is the unwholesome proliferation of engineering education with establishment of satellite campuses and part-time programmes. All in the name of generating funds without taking into cognizance the declining standard.

5.5 Incompetent Manpower and Low Remuneration

Engineering lecturers play a pivot role in facilitating any country's development through lecture deliveries. So, the lecturer's zeal to tutor with appropriate mindset also speak volume of quality of training to deliver to students. It is unhealthy and unheard of to leave junior cadre (Graduate Assistant to Lecturer II), who are supposed to be learning the curve, therefore, rolling out engineering graduates every year that can only recite theories but not practically oriented. The systems showcased few numbers of senior lecturers with Ph.D. qualification and few numbers of professors that are close to retirement age. Some other associated problem are as follows:

i. The defects in the caliber and quality of lecturers are appalling and perpetually absentee from lectures.

ii. Dearth of offices, sizeable laboratory for personal research work and non-reliable internet connectivity.

iii. Academic prostitution from one University to the others, all because of better or improved condition of service, resulting to nil commitment to lecture delivery

iv. Movement of seasoned lecturers from academics to join politics and industries for enhanced economic incentives.

v. Movement of best brain to study abroad in order to acquire more skill and knowledge but fail to return as a result of non-payment of school fee by the University or government or better still low remuneration.

vi. Movement of our best brains from Nigerian Universities to other countries due to poor working environment and poor remuneration.

Table 6. Nigerian Public University

Rank	Grad. Assist	Lecturer II	Lecturer 1	Sen. Lecturer	Associate Prof	Professor
Amount (₦)	99,768.11	130,002.17	163,709.24	231,393.17	281,867.72	342,442.35

Table 7. Uganda Public University

Rank	Assistant Lecturer	Senior Lecturer	Associate Professor	Professor
Amount (₦)	627,935	936,320	1,498,035	1,560,790

Table 8. South Africa Public University

Rank	Junior Lecturer	Lecturer	Senior Lecturer	Associate Professor	Professor
Amount (₦)	871,110.50	1,045,645.33	1,356,081.92	1,685,352.67	1,860,487

The template of Nigerian Public University remuneration as shown in Table 6 compared to that of Table 7and 8 of the same African continent is uncalled for. Due to low exchange rate that brought about fatal accident to salary and service benefit, Engineering lecturers have device means of migrating to African countries such as South Africa, Botswana and overseas for better pay, well-equipped laboratories and workshops. This has singularly brought about under-staffed problem in Engineering with bottom-heavy pattern of junior lecturers forming the largest chunk of the workforce.

5.6 Lack of Proper Regulations and Interference

Quarks at the helm of affairs, allowing non-professionals like auditors and lawyers to man engineering-based industries. The regulatory body that is shouldered with the responsibility in Nigeria have non-challan attitude. They collect annual practicing fees from their engineers and engineering firms but fail to address the lopsided attitude of politicians, and poor leadership among members of professional bodies for lacking professional commitment to see to their yearnings, welfare of members and better condition of services. This singular act has created a setback to engineering education till date during accreditation. (Owolabi and Rafiu, 2010).

5.7 No Synergy between Engineering Industries and Engineering Institutions

Most of the industries we have are not well structured, that alone is a problem to University engineering education. This gap will definitely create little or no feedback between the engineering industries need and engineering institutions offer. However, a well-structured and organized engineering industry will create a kind of handshake with engineering institutions to give grants, sponsor researches and development, offer contracts, exchange of research staff, hiring or training of students/fresh graduate for industrial attachment experience. The following are some of the issues associated with the disconnect between engineering industries and engineering institutions:

i. Corruption and insincerity among lecturers that often divert research grants to personal use.
ii. Lack of confidence in Universities due to dearth of research infrastructure.
iii. Weak institutional capacity and poor governance policies
iv. Failed leadership and bad policy framework

Ye and Lu (2011) reported that great significance attached to practical education in engineering in conjunction with industries is of great importance for the training of engineering students. These arrangements highlighted by the author is laudable but does not exist between Nigeria Universities and industries.

5.8 Poor Teaching Technique and Environment

The number of students per class or lecture theatre capacity has already been violated during admission processes, thereby resulting into overcrowding intelligent students with mediocre in the same facilities. The teaching method is poor due to the difficulties in performing experiments or test run what you have tutored. The following are some of the challenges under this sub-heading:

i. Shortage or no ICT-driven classes or lecture theatres to facilitate smoother lecture delivery.
ii. Dilapidated buildings that existed from the inception of the University.
iii. Inadequate or no provision of interactive boards and public-address system for large classes.
iv. Poor lighting and ventilation system with epileptic power supply.
v. Overcrowding which makes students to sit on the floor or beside the podium.
vi. Our physical libraries are manually operated with obsolete textbooks, fewer reference books, scientific and engineering journal and the book shelves have practically turned to homes of mosquitoes, rats and cockroaches.

Apart from the uncomplimentary learning nature, these students are made to learn compulsorily under harsh conditions that tend to dampen their zeal for optimum understanding and concentration.

5.9 Compromised Engineering Accreditation Teams

Engineering accreditation is the procedure where creditability is issued by an external body (such as NUC, COREN) to a programme/institution where adequate requirement and guideline of establishing such institution or floating such courses are met. Ideally, accreditation is supposed to serve as a tool to facilitate progressive interaction and institutional response to societal needs but the reverse is the case. Some institutions and courses are accredited without meeting the requirements.

5.10 Lack of Internship and Proper Placement

Internship plays an essential role for the transition trajectory by creating an enabling environment, opportunity for new engineers to explore and implement their knowledge and skills. Paucity of proper exposure to practical while in the University is one of the ugly scenarios encountered in Engineering. The maximum period for SIWES and Industrial Training Attachment varies between 6 to 9 months which is not even enough for 5 years course. Exacerbating a bad situation, 90 percent of the students ended up not getting placements in Engineering firms till the duration expires.

5.11 Lack of Suitable Job Placement

Despite ill-prepared and half-baked graduates of Engineering, there is lack of proper prior career guidance, the opportunity to get jobs, to learn on the job is very slim and highly ridiculous based on the ratio of slots required, thereby making the creative and talented engineers to seek for jobs in other sectors such as banking, finance or even marketing that does not have direct nexus with the prestigious world of engineering. No satisfaction, no commitment, all in the name to survive and make ends meet.

5.12 Lack of Motivations

Ideally, engineers are known to be problem solvers but the reverse is the case in our society. Attention are supposed to be given to Engineers in terms of deserved recognition and motivations through research grants and an enabling environment to proffer solutions to problems. Instead of investing in engineering talents to fund developed prototypes, the zeal, morale, ideas, innovative and creativity of young engineers are diminished gradually and killed day by day by our government and their ill-conceived policies that often employ the services of foreigners to take over jobs. The zeal and willingness to develop sustainable innovative projects or some ideas maybe there but no funds or financial backing for sustenance. In that regard, the project or the idea can either be left unimplemented for life, stolen or even applied by someone else without any financial benefits to the innovator.

5.13 Incessant Industrial Disputes

The government to implement agreements entered into often precipitate incessant industrial action that result in closure of the entire Universities especially if the strike action declared by the union is comprehensive and total. To this effect, no academic activities of any form are allowed to operate. After weeks of negotiation and intervention by government or other stakeholders, the strike is suspended or called-off. Upon resumption, 14 weeks per semester will be collapsed to 4 to 6 weeks to meet up with the academic calendar for the year. In most time, workshop practices and other laboratory experiments are truncated for that semester.

5.14 Low Researches in Postgraduate Activities

Limited opportunities endangering research and development should be of national concern. Conducting notable researches to solve practical problems should be the parameters to use in measuring the progress of University engineering education. This is because, engineering research work constitutes source of advanced learning in engineering principles. But, lack of subventions and dearth facilities often limit the opportunities and type of research work to conduct. This is one of the problems faced by engineering lecturers and students.

5.15 Industrial Experience and Scarcity of Graduate Training Programme

The establishment of Students Industrial and Work Experience Scheme (SIWES) and Industrial Training Fund (ITF) was a laudable one but suffers national pattern of monitoring, inefficient management and proper supervision. Hitherto, it was established to provide a unique opportunity to our undergraduates of engineering but the purpose is defeated because of outdated workshops within Universities and insufficient industrial placements. Furthermore, most of the companies do not offer the graduate training programme to

transform young engineers into useful problem-solvers. Rather, they are quick to engage the services of experienced technicians instead of graduate engineers.

5.16 Establishment of Engineering Course for Political Reasons.

If Engineering course is floated based on political expediency, then there will be compromise somehow, sometimes, somewhere. The purpose of which it was established would be defeated, thereby gracing low entry standards and non-uniformity in entry process which will reflect on the quality of the end products. I bey to say, garbage in garbage out.

6.0 Way forward

Education, especially engineering education should be viewed as the greatest force and investment of a nation to redress the imbalances and quick development of its political, socio-economic and human resources. It is in this view the author has painstakingly highlighted some grey areas that if well implemented, will definitely facilitate our desired dream of technological development through University engineering education:

i. Funding of engineering education should be a national concern. The financial capability is extremely limited but striking a balance to fund University engineering education adequately and to maintain a high standard by improving on the existing provision is vital. The effect is simple and direct. Proper funding will activate manpower development to acquire modern technology which is directly proportional to sound education and training.
ii. Government should look into the policies of establishment of TETFUND and PTDF scholarship schemes. Although they are career boaster and capacity-building exercise that supposed to have timelines. They have produced enough scholars for the past 10 years now. Those funds should be redirected to our laboratories.
iii. Government should as matter of urgency review engineering policies to establish University Engineering Graduate Research and Training Centers (like the usual University Teaching Hospitals for Medical Doctors) to further instill, rekindle and strengthen the engineering profession and that of the fresh graduate, who will be tutored practically for additional 12 months and to be supervised by the regulatory bodies.
iv. Our purposeless and directionless postgraduate programmes should be restructured to innovative-oriented programmes to produce new concepts, creative ideas that will sprout knowledge-based economy to assist in development of state-of-the-art facilities.
v. Investment in Lecturers to unlock their potentials in order to conduct researches; Jerk up (pay rise) their salary to compete foreign Universities or with salary scale of NNPC or CBN to encourage the best brains to re-trace their steps back to the country; there should also be an improved condition of service and better welfare packages.
vi. It is high time knowledge-based economy is adopted instead of political-based economy in our various Universities. The quest for positions and powers is now based on religion and tribes and not based on performance. Virtually, everything is politicalized.
vii. Rather than boosting on the number of professors, the appointment or promotion to the rank of senior lecturer or professor should be purposeful and patent-driven

exercise with KPI to measure their contribution and performance.

viii. The curriculum of Engineering should be revisited, reviewed and harmonized to introduce engineering students to their core courses of study from the inception rather than usual third year curriculum. Also, the key players in the industries and engineers should collaborate to come up with a working curriculum (standard and globally competitive design) to accommodate engineering application, that is relevant and ready to address economic growth, dynamic and free from over-bloated courses.

ix. The engineering industries and engineering institutions should collaborate in the area of knowledge exchange (to rekindle performance, commitment and productivity), consultancy and also to facilitate a smoother transition of career. Joint effort collaboration or partnerships enhances the provision of products and services toward a common goal and also visibility of the engineering education to meet industry's goals. The University through partnerships with industries tend to get additional funds for research grant, training equipment or facilities. This strong connection gives engineering students the opportunities to gain relevant industries experience and better prepared for the challenges ahead.

x. Development of institutional capacity through regular staff development such as sponsorship for conferences, seminar, workshops; and improved remunerations to reflect competence, efficiency, effectiveness in impacting knowledge to their students should be considered.

xi. As a matter of policy and regional development, all federal and state ministries that are engineering-based (work, housing, water and irrigation, power and energy among others.) should be fully equipped with modern technology so as to facilitate industrial exposure to our young engineers and manage by qualified engineers.

xii. Government should invest on the development of Fiber-Optic backbone and other state of art functional internet facilities such as ICT driven classroom and library (e-library, e-books, e-learning) for research and development across campuses with unlimited or burstable bandwidth.

xiii. To avoid diversion of research grant for personal use, an efficient monitoring and balancing unit should be established across all campuses. Furthermore, an enlightened engineer and lecturer should deem it fit to frequently contribute to the progress of the ever-changing technological developments in their fields through interactions, publications and conferences.

xiv. A policy should be enacted for fresh graduates of engineering to work between 3 to 5 years in the industrial related sector for additional expertise before venturing into lecturing.

xv. Provision of dedicated and state of art hostel accommodation for Engineering final year students.

xvi. Compliance with lecturer-student ratio, regular accreditation without compromise, and provision of conducive training environments with minimum standard of class size, workshops, laboratories and physical libraries.

xvii. All satellite campuses and part-time programmes for engineering courses should be identified and proscribed by joint effort of government and engineering regulatory bodies.

xviii. Apart from stable political and economic system aspects, a unified national examination system for all engineering final years' student across the nation should be endorsed, duly supervised in conjunction with our professional bodies. They should be tested from what they were taught from 200 level to final year. This will spur the students to study harder

7. 0 Conclusion

There are several challenges in our University engineering education system that require urgent and radical approach in the development of engineering education system in the country. Not for anything but due to the role of engineering profession as the major player or driver of socio-economic growth and national development, Nigerian Universities can produce qualified engineers to be effective solution providers in this 21st century challenges, if the government and leaders at the helm of affairs are ready to invest substantially in engineering. The engineers should be given deserved recognition in the society, expose young engineers to industries research establishment and replace the old curriculum with an effective curriculum like that of medicine and surgery to enhance students' creativity and entrepreneurial through more practical exposure alongside theoretical aspects. The role of engineering lecturers with best frame of minds should not be underestimated. The concrete fusion or synergy between Industries and University Engineers should be stimulated to create significant yields in the development of engineering and solving problems in the country. We have our own peculiar problems in Nigeria and Africa as a whole. We cannot sit and expect manners from heaven. It is high time we all stop waiting or patronizing western engineering firms to provide solutions for our country. The economic down turn is all our fault. We all share in the fault, because we have refused to do the needful, we refused to collaborate and believe in ourselves. With all these points highlighted, the Nigeria Universities and Engineering Profession will be repositioned to have both national and international outlooks.

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