

# REPOSITIONING ENGINEERING EDUCATION IN NIGERIA

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## **Abstract**

As more Nigerians are becoming apprehensive about the poor quality of our product from schools without the requisite skills, competence and performance, it has become imperative to deliberate on this all-important aspect of our education. This paper critically x rayed intervention policies of the government since independence, identified the problems encountered by the various government in the process of implementing educational programme with respect to engineering education, and went further to proffer solution in light of technological information advancement of our Nation. It also proposes systemic re engineering of engineering education in our tertiary institutions to ensure achievement of policy goals.

## **Introduction**

A Nations growth and development is determined by her human resources. There is no gainsaying the fact that individual skills and techniques are significant determinants of such persons, work performance. These could be acquired through training. Furthermore, educational institutions are established to train, that is to educate human resources for overall individual and National development {NPE, 2004}. This is further buttressed by Maduewesi, (2005), that, National development is defined in terms of human development which is measured by the extent of poverty and deprivation in a given country.

The belief in the efficacy of education as a powerful instrument for development has led many Nations to commit much of their wealth to the establishment of educational institutions at various levels. Education is believed to be the most powerful and dynamic instrument for social economic, political, scientific and technological development of a Nations Fadipe, (2000),:Aghenta, {2001}.

Government started making foray into education in terms of policies as far back as 1959, when it constituted a commission to conduct investigation into Nigeria's needs in the field of higher education over the next twenty years. The commission submitted its presentation otherwise known as Ash by report to the government in "1960 and made far-reaching recommendations, Part of it as touching on engineering education. The reports proposed a degree of bachelor of engineering with emphasis on practical work. It went further to give a standard which should be at par with what was required for a beneficiary to gain membership of professional engineering institutions in the UK and allowance was made for postgraduate program leading to award of masters degree.

The Ashby report, paved way for the first educational development plan of 1962 -1968. Government intention was to develop as rapidly as possible opportunities in engineering education. This plan period witnessed the creation of relevant departments in the fields of engineering. Beyond this, it was expected to run evening classes for university students and place special emphasis in the faculty of engineering, in engineering design essential for the adaptation of modern technology to Nigeria condition.

The first educational development plan ended after the bloody civil war. The second educational development plan 1970-1974, took off in 1970. A great deal of attention was paid to rehabilitation and reconstruction and this affected the educational sector of the economy. Government policy on assistance to students included, Scholarship, bursaries and loan programmes. The policy aimed at making university education available to qualified but financially handicapped Nigerians. It favored those professions and skills declared as necessary for the rapid development of the country.

The third educational plan, 1975-1980, kicked off in 1975. It was at this plan period government determined to shift educational emphasis away from arts to science and place more student in the faculties of engineering, physical sciences and medicine. In this direction, the plan carried a 60: 40 science- humanities projected ratio. Within this plan period, to be precise in September 1977, the first National Policy on Education, was enunciated. Far reaching recommendation as touching on engineering education was suggested. Part of the suggestions included exposure of the students of engineering profession during their long vacation, to relevant work experience. Also Industrial Training Fund will be used in supporting practical training for Nigeria engineers. Care also would be taken to see that professional teachers have themselves been exposed to relevant industrial experience. That professional organization like National Society of Engineer {NSE}, Council for the

Regulation of Engineering Practice in Nigeria {COREN} have codes of ethics and in position to enforce professional discipline and the relevant tertiary institutions make provisions for the acquisition of the latest in the professional field.

The fourth educational developmental plan of 1981-1985, started in earnest in 1981. Most of the intentions was repetitions of earlier anticipation of government on education. Emphasis would be on consolidation and expansion. Because of the austerity measure of the government, it affected all facet of the economy including education.

From 1985, education gradually slid. In 1985, the Federal government promulgated a decree No 16 Section 10, incorporated in Section 4 {m}, of National University Commission {NUC} amendment decree No 49 of 1988, empowered the NUC to lay down minimum standards for universities in the Federation and to accredit their degrees including engineering and other academic awards after obtaining prior approval. In 1989, NUC set a Minimum Academic Standards {MAS} for all universities. The MAS document provides specification on the floor space and holding capacity, staff students ratio for effective teaching in any given discipline. The curriculum and entry and graduation requirements for each discipline are also provided {NUC, 1999}.

It has to be stressed that since 90s, engineering education has been faced with the crises of inadequate resource inputs except students. It has become obvious that the broad aim of producing high-level manpower for national development is not really being achieved. It becomes necessary therefore, to evolve strategies for making the system more effective and efficient in relation to contemporary Nigerian society.

#### **Analysis of the Policies**

#### **Achievements, Problems and Failures**

The analysis of government educational activities during the first development plan period, one observes that some achievements was made, some problems were encountered and many failures were recorded. There was under spending in terms of estimated capital expenditure during this plan period. A total capital expenditure of ninety million naira was recorded in respect of Federal and Regional Government Educational Programme implementation. This was over 60% of the total projected estimated sum of one hundred and forty million naira. Another major problems during the plan period was traced to a number of factors, such as inadequate facilities and poor teaching quality, poor and marginal exposure of pupils to science, which were prerequisite for admission for higher scientific and technological studies. This had serious effect on government objectives of correcting the existing imbalance in respect of arts and science graduates which was one of the problems left behind by colonial administration. As a handful of post primary students with good grade in science subject left schools, tertiary institution found it difficult to recruit enough students for scientific and technological studies. This was not encouraging especially as government's general aspiration was that of producing high-level manpower in this crucial area for the rapid social economic development of the country.

For the second developmental plan, it has to be stressed that education commanded greater attention during the second national plan period than the first. Considering the weighing of financial allocation, it took the fifth position in the first National development plan and shoot up to the second position in the second. It recorded a tremendous achievement within the first two years of development plan and experience a poor progress subsequently Etuk, (1984). This period also witnessed improvement in the quality of education at higher education level because such improvement warranted increase in the fee and, at times, merger or complete closure of substandard institutions, there was general improvement in quality of education. Thus, in spite of government's effort at the close of the second national development plan period, the gap between aspirations and fulfillment was still very wide. Many of the educational problems left behind by the British at the termination of colonial rule were far from being solved fourteen years after independence. Problem of admission between arts and sciences graduates persisted. Infact, Government aided this problem as evidenced in the allocation of funds and capital expenditure during the plan period. Secondly, grammar schools, for instance, continued to enjoy more patronage than the technical education that ought to form the bedrock of engineering education.

During this plan period {third development plan} two main problems affected, educational planning and programme implementation. These were the problem of finance and relevant statistical data. One very important policy achievement was paying of allowance of =N=150 and -N=75 per year to all students of technology colleges/polytechnics and technical institutions.

As we passed through an era of educational explosion, as Nigerians searches in vain for places for their children in educational institutions, as some children study without classrooms, lab and basic facilities, as the system witnesses acute shortage of qualified and experienced teachers in professional fields like engineering, as the quality of education declines and as the products of our educational institutions become more and more indisplined and less committed financially, the aforementioned gap tend to be wider and wider, it has become imperative that we deliberate on the way forward.

## **Way Forward**

### **Proper Funding**

This is the single non material resource, which has been identified by all operators. There is unbridle increase in the number of tertiary institution and increase in student enrolment without corresponding increase in revenue allocation and provision of infrastructural facilities and instructional materials. The training of all cadres of engineering personnel is quite enormous, requiring a combination of huge expenditure. They include procurement of training materials, development of infrastructural materials and payment of salaries.

According to Okebtikola, (2002}, the available statistical records on the cost of training of a science based graduate obtained from a recent study conducted by the educational Sector Analysis Programme of the Federal Ministry of Education for the Nigerian University Commission and extrapolated for other engineering personnel is as follows.

Technician	=N= 95,763:20
Technologist	=N= 191,526:40
Science based Graduate	=N= 239,408:00

The foregoing shows clearly that it is extremely difficult for the government alone to effectively finance the training of engineers given the large number enrolled in the tertiary institutions annually. For quite some years now, the Federal Scholarship Programme has virtually been non- existent because the Federal Government could neither process new local awards nor utilize Bilateral and multilateral awards made by foreign donor nations.

Other problems of funding include shortfalls for estimated budget on education: Asobie, (200), shows that, in Nigeria, there are consistently significant shortfalls between what is approved as recurrent and capita! and what is actually released by government to universities. The following example was cited "for revenue grant in 1994,the shortfall; of =N=900,000,000,in 1995 =N=335,864,042.00.in 1996, =N=27,582,981, while for capital grants in 1993, there was a shortfall of =N=200,700,00.00.in 1994, =N= 198,404,650 and in 1-996, -N-59,995.000.Poor funding is actually one of the main reason Academic Staff Union of Universities (ASUU) has always given forgoing on strike.

In tertiary institutions, academic activities are frequently disrupted by conflicts ASUU, ASUP,COEASU SSANU AND NASU though at different times gone on strike for funding related issue. These conflicts and consequent disruptions of activities in institutions of higher learning have negative effects on the quality of the products from our system. Many employers observe that the quality of university graduates has worsened during the 90s and concluded that the last well trained corps of graduate left the system in the mid 80s.

Recent trends show an encouraging intervention of Government to ensuring that education is remarkably funded. The new democratic Government deliberated on the Revitalization of the federal Scholarship Scheme and raised a high Powered Fact Finding Delegation and two Committees (Ministerial and Presidential). A total of Fifty thousand naira (=N-50, 000) awards is to be made with fifteen thousand naira (=N= 15,000) in phase one for undergraduate and Post graduate studies in Nigerian tertiary Institutions. This is already being implemented. The award also covers postgraduate studies in overseas Universities especially for programs, which are not available in our universities.

Tertiary education should no longer be viewed as a social responsibility of Government. There is a need to improve on the funding strategies. Ofofile, (2000), recommended that all stake holders and beneficiaries of engineering training should jointly provide all the fund and facilities required.

Funding of education is the responsibility of all. The three tiers of government should in addition be compelled through constitutional provisions to set aside a minimum of 26% of their annual budgets

as recommended by UNESCO to fund education. Education tax paid by all registered companies in Nigeria should be reviewed upwards from the current 2% and evaders and defaulters seriously sanctioned.

### **Curriculum Overhaul**

Curriculum is generally defined as the totality of all the experiences that a student is exposed to, in order to achieve a particular educational purpose. Curriculum is a dynamic concept which depicts an intention, a plan, a presumption or ideal about what one would like to see happen in school Nadnasus, (2001). It is naturally open to criticism, evaluation reevaluation, adaptation and sometimes-outright reforms. As exists in so many other professions, the practice of Engineering is changing rapidly hence; there is a need to regularly review the curriculum to ensure that the training is not only relevant but also competitive.

Curriculum relevance must be borne in mind during curriculum structuring. According to Maduwesi, (2005), this term refers to the sensitivity of the curriculum to the values, beliefs, norms, traditions, aesthetic science and technology, art, religion, custom of the people. Simply put the curriculum must be sensitive to the totality of the way of life of the society for which it was designed.

The Longe Commission on review of higher education in Nigeria (1992), made useful recommendation touching curriculum. Part of the recommendation as touching curricula reforms in engineering reads "The educational system should be effectively tilted with a bias towards science and technology with a focus on the creation of science and technology at the primary level, absorption of science and technology knowledge and thinking at the secondary school level, actualization of science and technology through design, construction and production at the tertiary level (FGN, 1992). Another problem that should be avoided in curriculum design is curriculum overload. Adeniyi, (1999), opines that there are emerging needs and mounting desire to acquire new knowledge, skills and competencies in such areas as computer science and application, banking and finance, information and communication technology, engineering, medicine" and these needs, must be reflected in the curriculum. He believes that student curriculum should not be overloaded in terms of content and this overload is not good for the school system.

Although a cursory appreciation of the curriculum on paper can compare favorably with equivalent materials in the developed countries, it has however been recognized that a very wide gap exists in the implementation from the feedback obtained from the employers of the graduates. In fact, a recent study by NUC (2000), shows that most organizations had to retrain their newly appointed staff. This short fall is essentially due to inappropriate implementation of the curriculum.

### **The Role of Federal Government Agencies**

#### **JAMB**

The legal instrument establishing the Board was promulgated by the Act (No. 2 of 1978), of the Federal Military Government on 13th February 1978. By August 1988, the Federal Executive Council amended Decree No. 2 of 1978. The amendments have since been codified into Decree No. 33 of 1989, which took effect from 7th December 1989. Decree No. 2 of 1978, (amended by Decree No. 33 of 1989), empowered the Joint Admissions and Matriculation Board to: Conduct Matriculation Examination for entry into all tertiary institutions, appoint examiners and place suitably qualified candidates in the tertiary institution.

The process of admission does not aim to select the more qualified candidates. The selection of candidates into universities by JAMB is based on the following criteria merit 40%, catchment area 30%, disadvantage state 20% and discretion 10%. In the final analysis only 40% of the candidates are admitted on merit while the other are done on personal ground. On the other hand, admission ratio of science and arts was fixed at 60:40 during the third National development plan. Actual practice shows that there is a gap between policy and its implementation. Out of the 110,000 candidates admitted in Nigeria universities between 1983-1984, 1986-1987, 64,146 {58.32%} and 45,845 {41.7%}, were distributed between science and art respectively. Nwadiana, (1992). He opines that 60:40 science to art placement policy has not been implemented resulting in over production of art graduates while some area of critical importance like engineering and technology has been neglected. Beside, the fact that

various institutions are clamoring for another round of qualifying exams to get into that particular institution is a clear signal that JAMB has failed in its statutory function of conducting exams for tertiary institutions in Nigeria.

From the above analysis, it is clear that the statutory function of JAMB as sound as it appear on paper, the implementation has been faulty. This paper concurs with the various tertiary institutions to have a stake in the type of candidates that they admit. The clamoring is not a slight on Jamb but as precauniary motive to check the excesses of examination racketeers. Jamb needs a radical overhaul in terms of exams transparency.

### **NSE, COREN**

The two are separate and different bodies so that they cannot be referred to interchangeably. The Nigerian Society of Engineers (NSE) is a voluntary association established by the practitioners of the profession while the Council for the Regulation of Engineering in Nigeria (COREN) is a statutory organ of Federal Government, established by Decree 27 of 1992, which empowers it to control and regulate the practice of the engineering profession in all aspects in Nigeria. In this respect, it caters for about 65 engineering disciplines, accredits engineering courses in the universities, polytechnics / college of technology, technical colleges in Nigeria, Organizes and supervises the post-graduate practical training of newly graduated engineering personnel.

These are professional bodies regulating engineering practice in Nigeria. This body should play more proactive role in the disengagement of engineering student in their final year. The registration of engineers should be changed from 4 years compulsory postgraduate experience to one year of intensive training in real world situation immediately after graduation.

Accreditation should not be seen as Childs play. It needs to be periodical and once an institution loses accreditation, it should wait for nothing less than three years before its approval needs to be revisted. The rules should be treated with utmost diligent irrespective of whose ox is gored. The society should act as a link between the school and the working environment outside and by placing engineering student in the field to garner the necessary experience. There should be maximum input by the society to keep the student abreast with latest in the field. Operation wipe away quack should be new slogan in the society. We don't expect to be stagnant or static in a world that is dynamic.

### **NUC, NBTE, NCCE**

These are three different boards and they regulate practices in universities polytechnic and colleges of education respectively. These bodies were empowered to advice the government on the financial needs of universities, polytechnics and colleges of education. It was also to advice the government on the pattern of universities, polytechnics and colleges of education development and the establishment of new ones. Accreditation of institution and courses in conjunction with necessary professional bodies was their sole responsibility. While these institutions are expected to perform supervisory roles in their respective higher institution of learning, they sometimes get involved, negatively, in the direct administration of the institutions through delay in releasing fund with or without cogent excuses and bureaucratic measures.

From close analysis, these three bodies has performed reasonably but much still need to be done in the area of establishment of tertiary institutions and, accreditation of courses. Establishment of tertiary institution has been more for political rather than for economic purposes. Accreditation has been recurring decimal in the field of engineering. Licencies are given at will without completely satisfying the minimum requirement for accreditation. These bodies have woefully failed in the area of accreditation. There should be a radical turnaround in the statutory functions. According to Jamb brochure 2004-2005, about 18 Universities runs Agric Engineering in the Universities, 30 in the Polytechnic, Civil Engineering 31 in the University 26 for Polytechnics, Electrical engineering 37 in the Universities, 34 in the Polytechnics while Mechanical engineering 31 in the University and 29 in the Polytechnic. From the above, it is very clear that proliferation in the field is going on unabated. National Board for Technical Education (NBTE) requirement to run Mechanical engineering workshop for 30 students sum up to a whopping sum of half a billion. How many institutions can provide that?

### **Proper Teacher Education**

This issue is perhaps the uppermost concern of educational planner. The importance is clearly stated in the National Policy on Education (NPE) that "no education can rise above the quality of its teachers" NPE, (1981). Teachers are largely responsible for the translation and implementation of educational policies, curriculum or course.

Offering, instructional material packages and assessment of learning outcome at the level of the learner. The quality of teachers produced in Nigeria over the years fall far short of National expectations. Worst hit is in professional courses like engineering where we have dearth of experienced manpower.

### **Recommendation and Conclusion**

Considering the above analysis, there is therefore, a need for a more drastic commitment to science and technology education to enable us overcome the current economic difficulties. Nigeria as a Nation needs to re focus its needs by identifying and concentrating in the fields of research critical to its development This is the most exciting time to reposition our engineering education towards the new and rapidly evolving pervasive technologies.

### **Establishment of Industrial Centers**

In view of the dearth of adequate facilities in most Engineering Studios and laboratories vis-'-n -vis the enormous exchange rate, it is becoming increasingly difficult for Government to provide adequate facilities in all Universities and Polytechnics hence the need to identify existing facilities" and where possible, upgrade some to industrial centers, where engineering Students could be sent for"- a given period for adequate exposure to practical.

### **Institution-Industry Relation**

The industrial sector is the major consumer of the products from the tertiary institutions. There is therefore, a need for adequate collaboration to ensure that the institutions produce graduates and diplomats who will ill into the industrial system.

### **Funding**

This will reduce the huge investment involved in training engineers by involving other Participants to support the public sector through Private sector, non-governmental organization, endowment, privatization and involvement of the industry through adaptive research.

### **Accreditation of Programmes**

The three supervisory Agencies for the three categories of tertiary institutions in Nigeria now have as one of their primary objectives, the need to ensure that the quality of the academic content of the curricula is not diluted below a predetermined standard. To this end, periodic inspection and evaluation of the inputs to the system is conducted to ensure that standard is not compromised. These agencies are statutorily empowered to stop or withdraw the approval or accreditation of programmes, which fall below standard at the time of the visit. It is advised that once an institution loses its license it should wait at least three years before it can be revisited. Beside, the number of institution offering different engineering professions should be reduced to the barest minimum Preferably. the best five institution running the particular discipline should be empowered to qualitatively run that discipline.

### **Discontinuation of Satellite Campuses and Running of Tart Time Programmes**

The restrictions placed on access to tertiary education by space constraints resulted in the establishment of satellite campuses by some of the institutions and private individuals. However, this development presented a challenge to the educational system as quality was usually compromised as most of the campuses were operated without enough academic staff, physical facilities, library facilities and those admitted were deficient in admission requirements. In the light of this, it is the position of this paper to close all satellite campuses running engineering programme and also part time programmes.

### **Role of Professional Bodies**

The professional bodies/Institutes can provide the required link with the industry thereby, making the training relevant. This can be done by; (a) Provision of necessary environment for the linkage through interactions with the programmes in the schools.

- (b) Bringing the industrial needs to the Engineering Departments.
- (c) Assistance with the placement of Engineering trainees for industrial attachment.
- (d) Provision of seasoned professionals to participate in accreditation visitation to Institutions.
- (e) Provision of experts to participate in the development and review of curriculum.

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