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Panacea for Improved Engineering Education and Industrial Training in Nigeria Educational System

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Abstract: **The complexity and the scope of engineering profession run parallel to those of various processes in the production of goods and services for human wants. Therefore the quality of engineering graduates from Nigerian Universities and polytechnics has been major subject of concern from most industries in Nigeria. Lack of appropriate practical skill acquisition in engineering training has been a subject of concern in developing countries. Thus, the paper examines the impact of teaching methods of the quality of graduates engineers produced for the industrial utilization and x-rays the relevance of the present engineering structure and curricula in some core engineering fields by carrying out a survey of some engineering faculties in some of the universities and polytechnics in south west Nigeria. The study shows lack of coordination in curricula development and dissemination between the institutions, industries and students. The study posited that in reforming education to benefit the industries (local and international) teaching method should connect both resource manpower and facilities from both the industries and institutions**

Keywords: **Engineering graduates, industry, education curricula development.**

1. INTRODUCTION

Engineering is the profession of a highly talented few in any community. The word engineer is said to originate from "ingenious person" and the cleverness, the resourcefulness and the inventiveness implied in the word still remain the principal attributes of the profession. The complexity and the scope of the profession run parallel to those of various processes in the production of goods and services for human wants which all the fields of the profession -aeronautical, agricultural, chemical, civil, electrical, electronics, industrial, mechanical, metallurgical, nuclear, mining and petroleum, etc - progress steadily with a common objective to satisfy. Indeed, in the modern sense of the word civilization and engineering may be said to be synonymous.

The quality of engineering graduates from Nigerian Universities and Polytechnics has been a major subject of concern for most industries in Nigeria. Most industries complaint stem from inadequate skill requirement for most cutting edge technology, low practical knowledge and confidence. Most Nigerian engineering graduates are subjected to several re -training programme since most of the graduates are considered non -employable going by the quality of training acquired from their various institutions. The level of economic development of any nation depends on its level of human resources development, particularly in science and engineering as well as technological advancement and industrialization. Nigeria is far from experiencing any landmark in technological growth towards industrialization due to poor infrastructural status despite the huge number of graduates from various engineering faculties of universities/polytechnics that have failed to impact positively on the growth of industries for economic emancipation and industrialization. The National Universities Commission (NUC) report showed that there are 65 universities in Nigeria including 26 federal universities. 24 states universities and 23 privately owned institutions. There are also 43 polytechnics made up of 17 federal and 26 state owned polytechnics. However, only about 10% of graduates from these various institutions are annually employed. Various studies have queried the relevance of graduates and research results to the industry considering the low academic status and skill acquired by product from various institutions. The training programme is not addressing the growing need of the

industry and society. A change of direction is required to close up the widening gap over a period of time between the engineer -in-industry and the engineer-in-academics. Change of focus will require the re -orientation and possibly the adaptation of the present engineering curricula and training to meet the indigenous demand. The UNESCO report observed that most engineering facilities in Africa are established by colonial governments and the curricula and engineering education system were modeled. This has possible affected the appropriate structuring of the curriculum to meet the immediate growing need of the people.

As events in developing countries move towards engineering manpower development for rapid acquisition of modern technology, it becomes certain that the prerequisite for acquiring the necessary professional skills rests squarely on its sound education and training. The effectiveness of the existing Nigerian engineering educational system in imparting the appropriate skills required to develop the right calibre of technical manpower for the development needs of the nation, is doubtful. In this age which is so much dependent on technology, Nigeria should prepare to take the lead for the very highest engineering education and training standards that would enable her engineers not only perform creditably in the profession, but also keep abreast with the advancing technology. This paper discusses the whole spectrum of our engineering education and training, pointing out their weaknesses and suggesting ways for improvements.

1.1 ANALYSIS OF WEAKNESSES IN THE EXISTING ENGINEERING INSTITUTION EDUCATIONS SYSTEM:

The weaknesses include: Low entry standard; non-uniform entry process and or standard for all engineering faculties in the country's universities, moderate academic quality of entrants for the profession, low level knowledge of mathematics and physical sciences for the profession, short and inadequate period of academic training, little postgraduate and research activities, poor awareness and limited provision for continuing engineering education facilities and inefficient management of organised on-the-course industrial training, but a few will be treated in this paper

1.1.1 LOW ENTRY STANDARD:

The problem of engineering education in Nigeria include factors such as poor secondary school foundation, faulty admission policies, large students enrolment as compared to available facilities and equipment and the non -flexibility of the engineering curricula [4]. Poor secondary school foundation is due to lack of basic practical teaching tools in most elementary schools in Nigeria. In some cases, there are no laboratories. An alternate practical training and examination are used in evaluating students' performance which is based on principle of imagination rather than visual. There is no firm grasp of the natural sciences from the foundation a situation which makes the appreciation of science and engineering principles difficult in the higher schools. A massive faulty admission policy which centralizes the administration of examination by a single body known as Joint Admission and Matriculation Board (JAMB) has contributed immensely to poor classification of candidates into schools. The University Matriculation Examination (UME) is characterized with several examination frauds and the problem of enhancing Federal character through quota system. The quota system is based on the following criteria: 40 – 45% are admitted on merit, 30 – 35% are from states around the university location, 20% from educationally disadvantage states while 0 – 10% is at the discretion of the University [4]. In most cases, merit is compromised such that candidates with good score may not get admitted while average scored candidate were admitted based on this flaw criteria. Inadequate facilities and equipment for adequate engineering training have been a perennial problem. The student enrolment grows astronomically to the extent that the number of institutions and facilities can no longer cope. The Nigerian Universities Commission (NUC) is a body in Nigeria responsible for the accreditation of programmes and facilities. The body recommended maximum of 40 candidates per class per stream. A visit to man y of the engineering facilities recorded 100 – 200 candidates in some of the institutions per class, per stream. This has hampered greatly the process of training towards practical skill acquisition. Some engineering facilities are also confronted with inadequate qualified teaching staff. The staff student ratio have been found grossly inadequate such that some programmes were cancelled in the last accreditation exercise for various Universities in Nigeria by NUC in 2006. Some of the professions in some of these institutions have also left for greater pastures in Europe and America. Various programmes have suffered from this massive brain train.

1.1.2 POOR BACKGROUND KNOWLEDGE OF MATHEMATICS AND SCIENCES:

Engineering may be seen as the profession in which a knowledge of mathematical and natural sciences is judiciously and economically applied to materials and forces of nature for the benefit-of mankind. It is therefore obvious that the acquisition of the skills of the profession is a function of the degree of mastery of the physical sciences.

The levels of knowledge of these subjects in the study of engineering are about those of Advanced Level of the GCE and the knowledge may be acquired before entry into the University in the case of direct entry candidates or in the preliminary

and second years of study for those who gain admission by JME. In any case, as rightly observed by Henry (16), "Standards are regrettably even low at A level for entry qualifications for university". Hence A Level of the GCE in Mathematics, Physics and Chemistry is not sufficiently high a standard for the modern demands of graduate engineering education. Research shows that less than 40% of the whole candidates passed mathematics yearly showing the poor background of the students.

The observed rates of student's performance in May/June WASSCE general mathematics, physics and chemistry in Osun State from 2004-2013 were as indicated in Table 1. The results of the performance with the Jarque-Bera normality test were shown in the Table 2. It could be observed that the highest mean performance rate was at ordinary level pass with mean = 39.09, followed by credit pass (A1-C6) = 31.94 and fail = 21.48 during the years under review, 2004-2013. The standard deviations were as indicated in Table 2. The results of the performance with the Jargue-Bera also showed that the performance of the students was normally distributed since the p-values were greater than 0.05 significant levels. The visual view of the performance rate from 2004-2013 was provided by multiple bar chart of Fig. 1.

Table 1: Performance Rates by Credit (A1- C6), Pass (D7 – E8), Fail (F9), and Unreleased Results (2004-2013).

Year	Credit (%)	Fail (%)	Pass (%)	Unreleased (%)
2004	15.55	39.91	31.18	13.36
2005	18.50	37.99	41.29	2.23
2006	24.42	14.74	53.47	7.36
2007	41.62	7.87	36.88	13.63
2008	40.30	15.53	32.37	11.53
2009	41.86	23.62	30.50	4.02
2010	30.27	24.23	41.79	3.71
2011	26.96	22.79	44.02	6.23
2012	38.54	14.97	40.69	5.80
2013	41.39	13.14	38.68	6.79

Table 2: Estimates of Jarque-Bera Test of Normality of Students' Performance Rate (2004-2013)

	Credit (%)	Fail (%)	Pass (%)	Unreleased (%)
Mean	31.94	21.48	39.09	7.47
Median	34.41	19.16	39.69	6.51
Maximum	41.86	39.91	53.47	13.63
Minimum	15.55	7.87	30.50	2.23
Std. Dev.	10.15	10.56	6.93	4.05
Jarque-Bera	1.062	0.98	0.59	0.91
Probability	0.59	0.61	0.74	0.64
Sum	319.41	214.80	390.86	74.66
Years	10	10	10	10

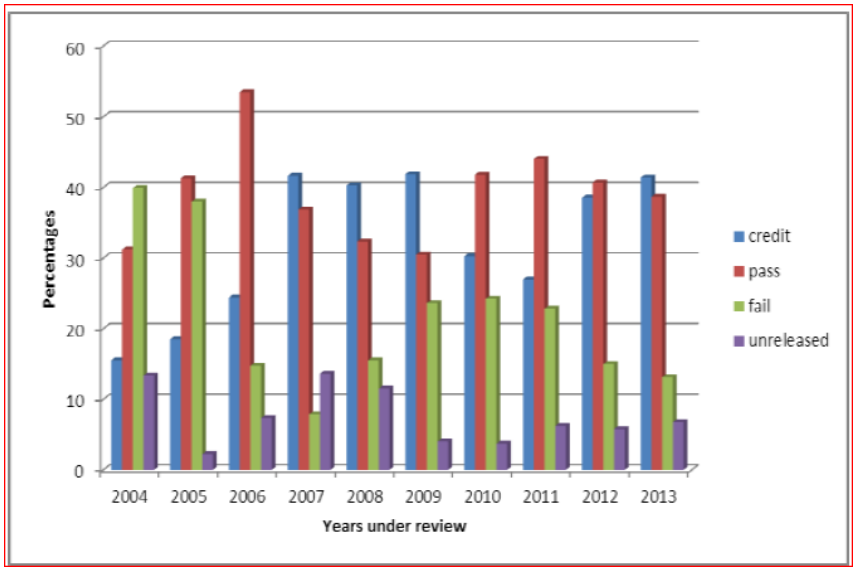

Figure 1: Distribution of Performance Rates by Credit (A1-C6), Pass (D7-E8), Fail (F9), and Unreleased Results (2004-2013)

1.1.3 RESEARCH QUESTION:

What is the pattern of students' performance in WASSCE mathematics and other science related subjects in Osun state from 2004 -2013?

The time series plot represented by Figure 2 showed non-stationary trends in performance patterns with varying means and variances which implied that the trend was stochastic with random walk. The trends showed upward and downward pattern over time. The percentage of candidates who had credit in general mathematics from 2004-2013 in Osun State ranged from 15.55 to 41.86; ordinary pass ranged from 30.50 to 53.47; Fail ranged from 7.87 to 39.91 and unreleased results ranged from 2.23 to 13.63 respectively. The ranges showed that the least percentage of candidates who had credit pass was in 2004 with 15.55% and the highest percentage of candidates with credit pass was in 2009 with 41.86%. The least percentage of candidates with fail was in 2007 with 7.87% and highest percentage of 39.91 failures in 2004. The least percentage of pass was in 2009 with 30.50% and the highest in 2006 with 53.47%. The highest percentage of unreleased cases was in 2007 with 13.63% and the least in 2005 with 2.23% respectively. See Table 1 for the years and respective values.

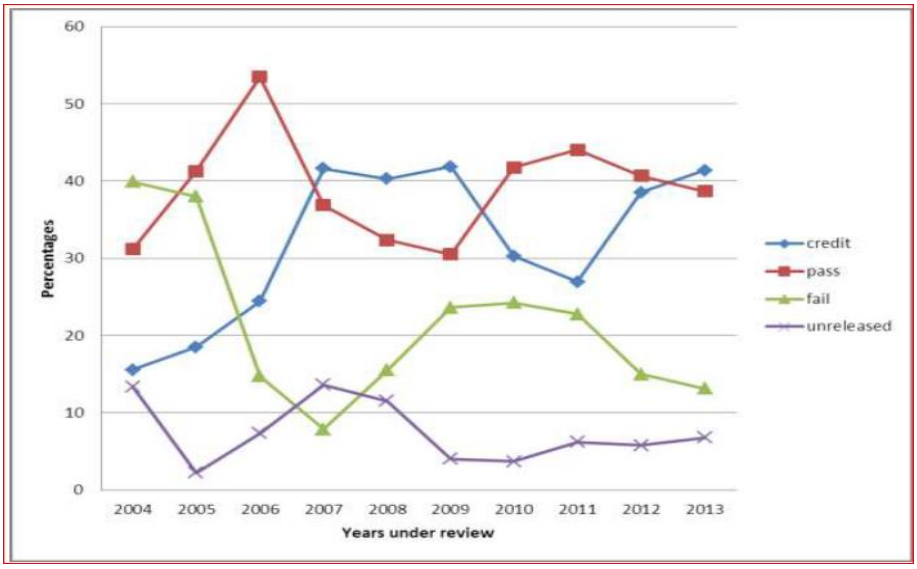

Figure 2: Trends of performance Rates by Credit (A1-C6), Pass (D7-E8), Fail (F9), and Unreleased Results (2004-2013).

2. FUNDING

Government funding of tertiary education has been very dismal. The government only pays little attention by providing paltry budgetary allocation for educational programmes and research less than the United Nations recommendation. These have hindered projects and infrastructure in developments of most institutions. UNESCO recommendation that 26% of national budget be allocated to education have continuously unrealized in Nigeria. Presently only 6% of national budget is allocated to education [5]. Nigerian financial capability is very limited to equip adequately and to maintain a high standard of the many universities and technical institutions hastenly established unplanned. The limited funding implies that Universities and Technical Institutions can only provide:

(a) Limited Library facilities - fewer textbooks, reference books, scientific and engineering journal, library and inter-library services etc.

(b) Limited postgraduate and post-doctoral research grants or facilities.

(c) Ill-equipped laboratories and/or attached industrial units.

(d) Under-staffed courses.

But the universities are fairly distributed throughout the states in the country necessary to foster the much needed unity of Nigeria, and to correct imbalances in inter-state and intra-state developments. According to the National policy on Education (13), not only is education the greatest force that can be used to bring about redress in the imbalances, it is also the greatest investment that the nation can make for the quick development of its economic, political, sociological and

human resources. The limiting effect of the fact of this policy here is that if universities are established in places and at any time for mere political expediency, then it is natural that the excellence of the prime function of the university would have to be compromised somehow, sometimes, somewhere; and this danger would reflect more on engineering and science education than on any other discipline. We could see that on education sector, low funding is applied to it and the table below explains the percentage applied. Below is the Federal Government budget allocations to some federal institutions from the federal ministry of education for the year 2012 and 2014 respectively.

FEDERAL GOVERNMENT OF NIGERIA						
2012 BUDGET						
SUMMARY						
FEDERAL MINISTRY OF EDUCATION						
CODE	MDA	TOTAL PERSONNEL COST =N=	TOTAL OVERHEAD COST =N=	TOTAL RECURRENT =N=	TOTAL CAPITAL =N=	TOTAL ALLOCATION =N=
0517021001	UNIVERSITY OF IBADAN	12,724,561,393	260,640,575	**12,985,201,967**	450,609,633	**13,435,811,600**
0517021002	UNIVERSITY OF LAGOS	9,807,818,541	161,091,810	**9,968,910,351**	450,609,633	**10,419,519,984**
0517021003	UNIVERSITY OF NIGERIA NNSUKA	11,224,719,961	228,730,780	**11,453,450,742**	500,609,633	**11,954,060,375**
0517021004	AHMADU BELLO UNIVERSITY, ZARIA	12,823,548,538	223,531,131	**13,047,079,669**	400,609,633	**13,447,689,302**
0517021005	OBAFEMI AWOLOWO UNIVERSITY	9,729,793,257	164,471,506	**9,894,264,763**	400,609,633	**10,294,874,396**
0517021006	UNIVERSITY OF BENIN	12,305,463,285	165,632,460	**12,471,095,745**	400,609,633	**12,871,705,378**
0517021007	UNIVERSITY OF JOS	6,893,519,935	156,484,687	**7,050,004,623**	450,342,466	**7,500,347,089**
0517021008	UNIVERSITY OF CALABAR	9,218,203,425	186,473,918	**9,404,677,343**	456,026,918	**9,860,704,261**
0517021009	UNIVERSITY OF ILORIN	5,855,835,247	111,999,639	**5,967,834,886**	400,342,466	**6,368,177,352**
0517021010	UNIVERSITY OF ABUJA	3,920,761,955	111,778,263	**4,032,540,217**	500,000,000	**4,532,540,217**
0517021011	UNIVERSITY OF AGRICULTURE, ABEOKUTA	5,002,120,859	142,011,068	**5,144,131,927**	334,502,998	**5,478,634,925**
0517021012	UNIVERSITY OF AGRICULTURE MAKURDI	4,605,656,325	77,383,997	**4,683,040,322**	334,502,998	**5,017,543,320**
0517021013	MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE	3,248,919,758	77,780,673	**3,326,700,432**	334,502,998	**3,661,203,430**
0517021014	UNIVERSITY OF PORT - HARCOURT	8,591,829,187	128,791,423	**8,720,620,610**	400,342,466	**9,120,963,076**
0517021015	ABUBAKAR TAFAWA BALEWA UNIVERSITY, BAUCHI	3,082,444,270	82,625,051	**3,165,069,322**	450,891,816	**3,615,961,138**
0517021016	UNIVERSITY OF TECHNOLOGY, OWERRI	6,381,126,019	181,086,790	**6,562,212,809**	400,891,816	**6,963,104,625**
0517021017	UNIVERSITY OF TECHNOLOGY AKURE	3,964,792,868	158,152,846	**4,122,945,714**	400,891,816	**4,523,837,530**
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FEDERAL GOVERNMENT NIGERIA BUDGET 2014

No	Code	Mda	Total Personnel	Total Overhead	Total Recurrent	Total Capital	Total Allocation
1	0517018003	FEDERAL POLYTECHNIC BIDA	3,046,752,675	151,630,339	3,198,383,014	199,037,791	3,397,420,805
2	0517018004	FEDERAL POLYTECHNIC IDAH	2,228,284,621	128,043,413	2,356,328,035	182,160,154	2,538,488,189
3	0517018005	FEDERAL POLYTECHNIC KAURA-NAMODA	3,772,878,921	100,878,954	3,873,757,875	197,950,182	4,071,708,057
4	0517018006	FEDERAL POLYTECHNIC MUBI	3,772,878,921	100,878,954	3,873,757,875	197,950,182	4,071,708,057
5	0517021001	UNIVERSITY OF IBADAN	11,732,960,827	225,063,084	11,958,023,911	343,454,041	12,301,477,952
6	0517021002	UNIVERSUTY OF LAGOS	9,183,965,971	135,857,842	9,319,823,812	346,821,381	9,666,645,194
7	0517021003	UNIVERSITY OF NIGERIA, NNSUKA	11,359,894.951	187,403,342	11,547,298,294	344,646,643	11,891,944,936
8	0517021004	AHMADU BELLO UNIVERSITY, ZARIA	13,010,729,633	186,936,236	18,197,665,869	343,454,041	13,541,119,910
9	0517021005	OBAFEMI AWOLOWO UNIVERSITY	10,335,712,714	140,414,316	10,476,127,013	347,034,334	10,823,161,364
10	0517021006	UNIVERSITY OF BENIN	12,760,110,918	136,990,922	12,897,101,840	343,454,041	13,240,555,881

Research from CBN Statistical bulletin between 2000-2011 shows that, the percentage allocated for education is very low, no wonder there is a little or no advancement in our technological inclination.

Year	Total Recurrent Expenditure	Education Recurrent Expenditure	% of Education to Total Recurrent Expenditure
2000	461,600.00	57,956.64	12.56
2001	579,300.00	39,882.60	6.88
2002	696,800.00	80,530.88	11.56
2003	984,300.00	64,782.15	6.58
2004	1,110,643.60	76,527.65	6.89
2005	1,321,229.99	82,797.11	6.27
2006	1,390,101.90	119,017.97	8.56
2007	1,589,269.80	150,779.27	9.49
2008	2,117,362.00	163,977.47	7.74
2009	2,127,971.50	137,156.62	6.45
2010	3,109,378.51	170,770.56	5.49
2011	3,314,513.33	335,837.89	10.13

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3. POSTGRADUATE AND RESEARCH ACTIVITIES

All progress in engineering, ultimately, depends on scientific research which may be based in industries, research and institutes and universities. Research work in engineering constitutes source of advanced learning in which the students' knowledge of science and engineering principles is applied to practical problems and utilization.

Two aspects of scientific research concern the engineer. Firstly, there are fundamental and applied research which provide the engineer with new materials and techniques and with new applications of known principles. Secondly, there are huge research instruments which have to be designed and built by engineers to facilitate continued scientific investigations. In Nigeria, both the engineering teaching staff of universities and their postgraduate students have for some reasons, very limited opportunities for the types of research work they have desire to undertake. The foremost of these reasons are scarce facilities and funding. The 1imited opportunities for research should be of national concern because one or two nationally and internationally recognised personalities in engineering research can do a very great deal by their achievements to enhance the reputation of engineering and its national education system in the eyes of their fellow countrymen and those abroad.

3.1 INDUSTRY-INSTITUTION PARTNERSHIP INITIATIVE:

The industry-institutions partnership is increasingly inactive in the engineering education in several areas compared to what is obtainable in the developed world. Several blue chip industries have had great influenced in transforming engineering education. Several reports showed IBM 1940 – 1960 mobilization of University professions to collaborate in e -commerce curricula development in year 2000 [6]. It is also reported that IBM invested over $1 million in faculty and

University around to service innovation pioneers. IBM also hosted a conference on Service Sciences, Management and Engineering (SSME), a cross-disciplinary approach towards developing new services -oriented courses and curricula [6]. Cisco system, established in 1984 has provided internet protocol (IP) based network technologies with new approaches for both Instructions and learning. This includes a partnership deal with 10,000 educational institutions in over 160 countries. Nokia Corporation is also working in con cert with educational institutions to create an environment for open innovation in mobile entertainment and communication area to advance mobile multimedia application development [6]. Nigeria's educational institutions are yet to reach this level of partnership. The contributory roles of most multinational s are only in assisting local farmers and provision of infrastructures. The wide gap between the two establishments is due to ineffective concert curriculum structure and colonial syndrome wherein the nation is import driven in most facets of endeavours. Government interest did not help either.

Most researches fund support is not properly channeled to solving industrial problems but rather abstract. Most industries problem are solved internally and widening the interactive zone between the industry and institution which should have benefited b oth sides. The University became ignorant of activities in the industry and vice versa thus resulting in the weak link as presented in fig 1. [7].The effect is the turn out of fairly baked graduates from various engineering faculties.

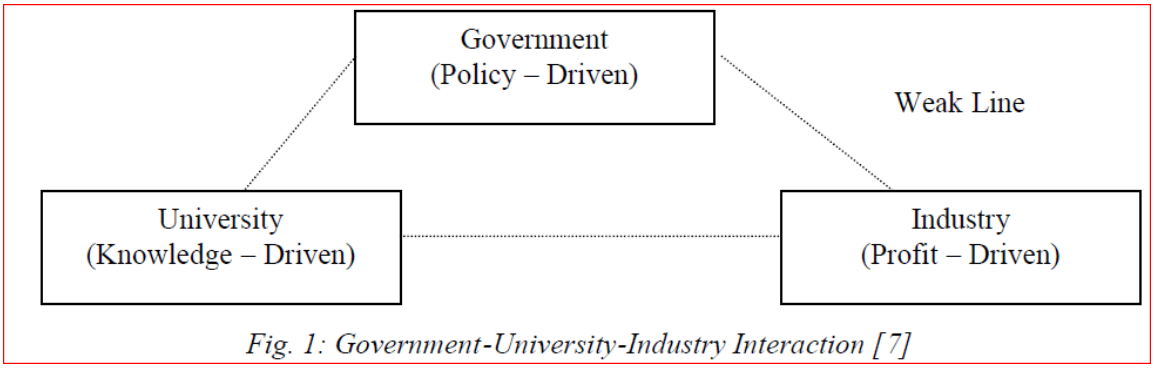

Fig. 1: Government-University-Industry Interaction [7]

Non effective linkage between the two sectors as observed in fig 1 are worsened by government inability to provide the necessary support.

3.2 APPROACH:

The basic approach to this study is in examining the role of teaching methods, practical training on the quality of graduates in meeting standard requirement of most established engineering firms. Suggested learning methods – visual,

sensory, inductive, active and global were used as a tool of assessing training methods in some selected institutions along with their various curricula [3]. Also the contributions of these graduates in some industries were evaluated. Most training programmes in Nigerian institutions are based on instinctive with emphasis on memories idea and insight while theoretical approach is a common feature. The listed learning styles were hardly in use. Most curriculums are not adequately structured to address class demonstration of principles and operations of systems. Most developing countries of the world such as Nigeria are

Still grappling with old methods of teaching practice of several years back which is predominantly theoretical

4. OBSERVATIONS AND DISCUSSIONS

The study observed a very weak link between the school training programme, the curricula and the industrial activities. The curricula are not structured to meet the changing trend in engineering education especially in the areas of AUTOCAD, IT Skills and Systematic Model Design (SMD). The applied technologies in major multi -national companies in Nigeria lack strong local content and indigenous participation. The observed teaching methods have not succeeded in impacting positively on practical engineering training in schools. These training methods include traditional lecture delivery based on strong theoretical background, students industrial work experience scheme (SIWES). Necessary modifications of these methods are very imperative to meet the present industrial challenges [7]. Most of these multi-nationals in Nigeria source their fundamental and scientific research expertise and facilities from their home countries with little or no input from the local scientific research. The major institutions training facilities are obsolete and inadequate making practical training difficult to meet the modern trend. The industries in Nigeria do not have much stake in training, funding and curricula development of training institutions, which are the hallmark of industrialization in the developed world. There is no direct relationship and interaction between the industries and institutions in research activities and manufacturing. The identified poor elementary foundation in science subjects affects the students learning approach to engineering principles and applications. Studies have also shown the connection between learning approaches and workload [8]. The incessant violence in various campuses has been connected to so much idle time resulting into low quality of training since the workload do not reflect in -depth practical training. The practical class period on the timetable are spent on unfruitful exercise. Student learning becomes inefficient when the basic principles are not understood thereby leading to poor motivation.

5. THE WAY FORWARD

In building strong partnership between the tertiary/institution and industry towards engineering education transformation, the followings are suggested as way forward to adequately tackle the problem.

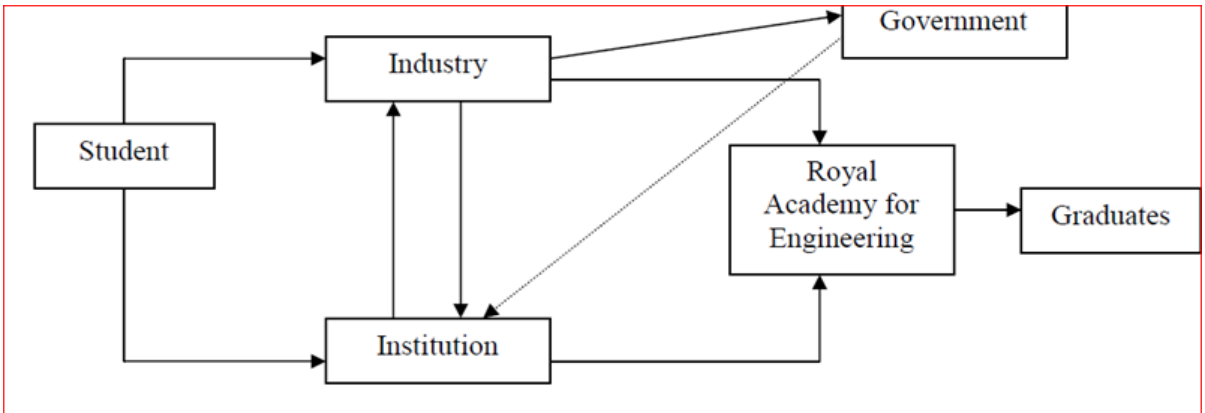

Fig. 2: Suggested Model in Government/In stitution and Industry for Sustainable Engineering Education.

i. The model suggested in (fig 2) provides a platform of relationship where government role is only a facilitator. The model engage the enrolled student in engineering education to go through 5year s programme between the institution and the industry and 1year internship at the Royal Academy for engineering before graduation as presented in table 3.

Table 3: Training Groups

Class	Level	Curriculum	Location	Duration
1.	100	Basic Engineering Principles	Institution	1year
2.	200	Practical Training	Industry	1year
3.	300	Core Engineering Principles and Applications	Institution	1year
4.	400	a) Core Engineering Principles and Applications Continued. b) Engineering Project Studies. c) Commencement of Students Projects	Institution Industry	6 months 6 months
5.	500	a) Student Project Continued. b) Core Specialized Subjects.	Industry/Institution	1 year
6.	Graduation Class	▪ Internship Programme ▪ Entrepreneurship.	Royal Academy Institute	1 year

ii. Renaissance of talent based education from the elementary school.

iii. E-learning which consists of practical demonstrations, motion pictures, workshops, seminars, conferences and industrial visits.

iv. Curriculum review is an essential ingredient towards attainable sound engineering education. Courses such as technology in sustainable development, academic engineer as social engineer, cultural change in engineering education are suggested which is coordinated by hybrid lectures with the overall objectives provided [9].

v. To develop consciousness among the students for the challenge that sustainable development poses to engineers.

vi. To develop students understanding of the role technology plays within the society at large, and more specifically in the process of sustainable development.

vii. To develop knowledge of the most relevant concepts, models and tools regarding sustainable development and basic skills for application during their professional life.

viii. Integration of sustainable entrepreneurship. The development of personal skills connecting social aspects of technology, management and entrepreneurship are of increasing concern for engineers for in -depth engineering education [10]. Options adopted to evolve entrepreneurial and personal skills among engineering students include.

Training studies in micro-economy, business administration, marketing and financing. Integrating management and environment in the industry. Engaging students in management games. Encouraging students to prepare business plans for starting a company or developing new product design. These factors are major targets to produce entrepreneur engineer that will posses the adequate knowledge of core engineering and demonstrable technical competence with intellectual foundation. This intellectual base will be applied in the context of local environment towards industrialization.

5.1 ROLE OF GOVERNMENT:

The role of government should be to facilitate research activities and funding of the institutions through the industry as presented in the developed model (fig 2). Government involvement in funding of the institution has hampered negatively since most of the fund are misappropriated and most cases grossly inadequate Government intervention in this direction has widened the gap between industry and institutions of learning. There is a need therefore for the government to redirect emphasis on being a facilitator rather than engage in direct investment which has not yield much required engineering educational transformation.

6. CONCLUSIONS AND RECOMMENDATIONS

Industry – institution partnership in training, research, curriculum development, funding and facilities upgrading is a major missing link in the quest for industrialization in developing economy like Nigeria. The present training methods as evaluated provides weak foundation, which cannot sustain industrial development. Most training programmes in major institutions are not in tune with modern facilities, which only the multi -nationals can afford. Most of these institutions are poorly funded. The interaction of institutions and industries in formulating programmes and curricula development will benefit the students, staff and companies. It will avails the companies the opportunity to evaluate the performance of young highly motivated graduates, which eventually serve as pool from w hich the companies can seek future full –time employees [11].

The following are subsequently recommended.

a) Industries should participate actively in the establishment of engineering workshops, laboratories for undergraduates to enhance quality training and research.

b) Industries/Academia cooperation in the areas of research and development with a view of establishing pilots projects, plants to enhance industrial experience of both teachers and students.

c) Regulatory and professional bodies such as Nigerian Society of Engineers (NSE), Council for the Regulation of Engineering in Nigeria (COREN) should be engaged in the moderation, standardization of quality assurance of various industrial institutional collaboration for students, teachers and facilities.

d) Establishment of industrial-institution sabbaticals for both teachers and company's technocrats.

e) Proper placement of engineering graduates at engineering firm during the NYSC period should be considered paramount and compulsory.

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