

# Falling Standard of Engineering Education in Nigeria\_ Causes and Suggestions

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## ABSTRACT

A nation's growth can be hinged on the functionality of the infrastructure, which is a direct index of efficiency of the human and material resources and invested capital. The bulk of the maintenance and development are direct duties of engineering graduate who are always criticized when failure occurred. Increased rate of failure in engineering infrastructure in Nigeria within the walls of economic reforms called for examining the status of engineering education in the country. The approaches used in carrying out the study include review of engineering education in Nigeria, appraisal of government policies, and use of structured questionnaires to determine the causes and remedy for falling standard of engineering education in Nigeria. This paper concluded that the training of engineering graduates are deficient and suggested the establishment of post graduate college of Engineering as a strategy to fulfill the required training. The advantages of this approach include improved training, reliability and reduction in failure of infrastructure and international acceptability.

**Keywords:** strategies, engineering, education, improvement

## INTRODUCTION

IN Nigeria, there exist various professions as a dominant feature of modern society. They are specialized area requiring expertise, and the regulation of practice in such area is better left to experts who operate with considerable autonomy with the laws of the land and the framework of society established by politicians. The professions establish the criteria for training, required qualification for admission to practice, lay down the code of ethic and sanctions to penalize infringement on the codes. Most national development discussions center on engineering works in terms of electricity, water supply, roads, telecommunications, transportation, buildings, factories, machines etc. One can then say that engineering is that important profession that most impinges on our daily life than all others. A nation's educational program should, among other things, be aimed at solving the problems facing the nation and improving the economy through wealth creation. It is well known that engineers shape our future. Many developing nations, are looking inward, studying the trends of change, suggesting and making modifications to their engineering education content in order to produce engineering graduates capable of carrying their nations through the change and challenges of time (Onwuka, 2009). Engineering is therefore the creative application of scientific principles and skills to design or develop structures, machines, apparatus or manufacturing processes, etc. Depending on the area of requirement, engineering practice is structured into various branches like electrical, mechanical, civil, agricultural, chemical, structural, etc

and because of the target of direct impact on our daily lives, it require a defined period of formal education.

Engineering education therefore relates to formal engineering training in established and recognized institutions in which engineering instructions and principles are disseminated in a classroom while practice occurs in a supervised specially controlled environment ( laboratory or workshop) in the process of impacting skill (O'Benson, 1989). Further skills which are acquired informally directly bear on the basics learnt from the formal phase, that is the formal engineering education becomes the bedrock upon which a person's further development and his contribution to life is premised. Suffice to say that inadequate engineering training will hinder efficiency and effectiveness. It may even cause system failure or reduced reliability. According to Oroge (1991), failure is the termination of the ability to perform its required function. A system is considered to have failed if it becomes completely inoperative or operative but unable to perform the required function or when it becomes unsafe for its continued use. A complete system will evolve from human resource's effort on the material resources that is how well the human resources can effectively utilize the materials available. It can be argued that the strength of the man resources-an engineer depends on its engineering education, acquired experience on the job, self-drive and other informal trainings. His ability to acquire training even on the job, will, to large extent depend again on how well the basics, the principles are understood- these are learned in

the classroom. The importance of engineering education cannot be underestimated. This paper examines the strategies for improving engineering education in Nigeria as panacea for system reliability.

#### Methodology

The approaches used in carrying out the study include review of engineering education in Nigeria, appraisal of government policies, structured questionnaires were distributed to lecturers, technologists, industrial sector and engineering students in universities and polytechnics to determine the causes and reasons for falling standard of engineering education in Nigeria. The approach assisted in determining the immediate and remote causes of falling standard of education in Nigeria.

#### Engineering Education in Nigeria

Engineering is defined as the profession in which a knowledge of the mathematical and natural science gained by study, experience and practice is applied with judgement to develop ways to utilize economically, the materials and forces of nature for the benefit of mankind. The profession is geared to different roles that must be played to ensure the success of any engineering endeavour. Engineering involve a wide spectrum of activities extending from conception, design, development and formulation of new systems and product through the implementation, production and operation of engineering system. Engineering technologists are graduate of bachelor level programs in engineering technology. They applied engineering and scientific knowledge combined with technical skills to support engineering activities. Their education are typically application oriented, while they concentrate on applied design, using current engineering practices and are involved in product development, manufacturing, product sales and management.

Engineering education in this context, meant formal engineering training receive in an established and recognized institution in which instructions and principles are disseminated in the classroom while practical are supervised and specially controlled to impact skills. The basis pre requisite for engineering education in Nigeria involve studying and passing relevant science subjects in the General Certificate Examination (GCE O/L), Senior Secondary School Certificate Examination (SSCE O/L) or National Examination Council Examination (NECO O/L) or National Board for Technical Education (NABTEB) Examinations. According to Council for Regulation of Engineering in Nigeria (COREN), engineering training can be structured to produce Engineers, technologists, technician and craftsmen depending on the level of educational and professional attainment. It takes five years to study engineering in the University to produce graduate engineers with the award of B.Sc, B.Eng. or B.Tech. Degrees. A period of six months in the second semester of the fourth year is used to acquire industrial skill under supervised industrial work scheme (SIWES). In the Polytechnics, engineering takes two years for

National Diploma (ND) including four month of SIWES and another two years for Higher National Diploma (HND). A minimum of one year industrial work experience in addition to the ND is however the requirement for HND studies to produce graduate technologists. Training of craftsmen is achieved from relevant discipline in the Technical Colleges. Technologists can transfer to become engineers after possession of post graduate diploma in relevant engineering discipline or passing the NSE graduateship examinations.

#### Causes of Falling Standard of Engineering Education in Nigeria

Poor curriculum development is one of the causes of decline in the standard of engineering education; the syllabuses are bloated with many new courses to reflect entrepreneurial development and information technology training to meet international standards. The addition is good in itself but the way they are introduced has eaten into the time scheduled for learning and reduces the periods for the acquiring practical skills in the workshops and laboratories.

Engineering training in the University and the Polytechnic, though based on theoretical and practical works, differs widely both in curriculum and practical content/skill acquisition. The difference indeed is the one of the defect in engineering training in Nigeria. In the Polytechnic, for example engineering students are introduced into their fields at inception, they do more practical laboratory/workshop and experiments where as in the University, engineering students will start engineering training in their third year having spent the first two years on general science subjects and ancillary courses. Onwuka, (2009) suggested that engineering curriculum should accommodate necessary application of engineering that are prevalent in today's environment.

The quantity of the human resources delivering on engineering education is inadequate while the quality of some of them are not sufficient to meet world class service provision because they lack basic facilities and required exposure. In the University, 2<sup>nd</sup> Degree of Masters of Science (M.Sc), Master of Engineering (M.Eng) or Master of Technology (M.Tech) is the minimum teaching requirement, it is not so in the Polytechnics where HND, B.Sc or FTC holders form the bulk of the teaching crew with very few members having second Degrees. So there are defects in the quality of lecturers teaching in the institutions. Lecturers have poor attendance of seminars, conferences and workshops that can assist them to update knowledge, interact with contemporaries and be abreast of developments in their area of specialization because of poor sponsorship plans, staff attitude and paucity of funds. According to Elegba (1990), the quality of students produced largely depends on the quality of training impacted in the schools. Olubadewo (2007) concluded that there was a drastic decline in the quality of engineering education in the country due to several years of neglect.

Proliferation of engineering education with enrolment and establishment of satellite campuses, part time programmes and overcrowding of institutions with mediocre students as a means of generating more funds to meet shortfalls in fund provision are other reasons for the decline in the standard of education. Situations where 20 students are using facilities meant for 5 students cannot produce best output, worst still, the satellite campuses lacked basic workshops and laboratories requirement and so practical classes are hardly attended to. Critical of all factors responsible for the problems of engineering education are lack of fund to purchase consumables for practical work and purchase of new equipment for laboratories and workshops.

Incessant industrial disputes occasion by poor remunerations of lecturers, unkempt government promises and agreements resulting into closure of schools because of strike action is equally a bane to engineering education. Situations where institutions are closed down for four months are not uncommon in Nigeria. The implication is better imagined, whereupon resumption, lecturers will just rush through a 14-week course work in two weeks while workshops and laboratories are overlooked. Students attitudes to learning are quite uncomplimentary as they lack the drive and zeal for independent study and scholarship hence they at best graduated as half baked engineers.

The quality of on the job training is equally poor largely due to poor planning and lack of funds. Surek (2001) established that there is a relationship between funding, management and quality assurance of engineering education in developing countries in the production of quality engineers. Brusselmans et al (1998) defined accreditation as the procedure by which creditability is given by an external body to a programme/institution while quality assurance are planned activities and actions necessary to provide adequate confidence that a programme meets required quality. Accreditation is a tool to facilitate progressive interaction between educational system and social agents for the benefit of adequate institutional response to societal needs.

There is lack of interaction between the higher institutions and the industries, the industries in Nigeria are not involved in research and development while the trainers did not even understand the specific needs of the industries. The institutions are not even properly funded and there is lack of commitment to quality training, the workshop equipment are not adequate or at best they are outdated. Almost all laboratories and workshops in Nigeria tertiary institutions are littered with obsolete equipment, tools and instruments (Nwohu, 2011)

The effect of poor or unorganized industrial sector is equally contributing to problems of engineering education in Nigeria. There is little or no feedback between the industries and the institutions. There is no distinct work target for both the HND holders and the B.Sc holders in Nigeria setting and this is causing disharmony and discrimination in the labour market

as employers. The attendant problem is that Polytechnic students who supposed to be throb of the industries are undermined.

Practice of engineering in Nigeria is radically too loose, most engineering works and contracts are executed by quarks as the enabling laws and authorities that should ensure compliance are nonchalant. This has a remote contribution to poor standard of engineering education in that if the authorities are alive to responsibilities there will be value and premium on engineering services which would earn the profession the required commitment from lecturers and students. The Council for Regulation of Engineering in Nigeria (COREN) was established by decree 55 of December 1990(amended in 1992) and was charged among other things with the duty of determining who are engineers, determining what standards of knowledge and skills are to be attained by persons seeking to be become registered as engineers; securing the establishment and maintenance of a register of person entitled to practise as registered engineers and regulating and controlling the practice of the engineering profession in Nigeria in all aspects and ramification.

#### **Suggestion/Strategies**

1. The government should review and harmonize the engineering education curriculum in the higher institutions using behavioral objectives to cater for industrial and societal needs. This will ensure that trainees are employable and acceptable by the demand of the labour market and useful feedback should be obtained from the industries. Regular accreditation of programmes should not be compromised while government should proscribe part time classes/satellite campus for engineering programmes. This will ensure compliance with minimum standard of class size, time table, workshop/laboratories needs, lecturer-student ratio, attendance, conduct of practical, staff development etc.
2. The admission requirements of the University and the Polytechnic should be harmonized and standardized to reflect parity even when their curriculums are biased to specific industrial needs. This will reduce the disharmony between the cadres. The requirement for lecturing whether in the university or polytechnic alongside with their remunerations should be harmonized to reflect competence, efficiency and effectiveness in impacting knowledge. Independent public participation supervision should be encouraged as measures to make lecturers deliver knowledge to the student without affecting their research and development concept. Technologist cadre should be given their pride of place and adequately respected and remunerated as motivation since they are very important to compliment the lecturer's impact.
3. The government should drastically improve funding of engineering education with greater emphasis placed on making consumables available, purchase of adequate

equipment and other installations necessary for effective conduct of practical, experiments and laboratory work; sponsorship for seminar, workshops, conferences and further studies. This will stop/reduce the strike actions of the lecturers thereby creating sufficient duration for training and conducive environment for learning.

4. The government should harmonize engineering Degrees by phasing out HND while polytechnics are posited to award Bachelor of Technology Degrees while the ND is retained as technician certificate and as pre requisite for direct entry into Degree courses. This will eliminate the dichotomy between university and polytechnic education and will encourage more students into training in the technological cadre.
5. Skill development and acquisition centers should be established in different parts of the country to strengthen the engineering profession. Conducive training environment should be created so that trainee's requirements are provided while quality trainers should make trainee's development competitive to rekindle commitment from the trainees.
6. There should be collaboration between the industry and the engineering institutions to achieve industry-based training while industries should suggest and sponsor research and development programmes that will be of benefits to all concerns. There should also be exchange of staffs for on-the-job training while students should be allowed to attend free holiday attachment with industries. The industries should patronize the institutions for testing, consultancy and other peculiar service provisions.
7. Development and maintenance of internet access, e-books, e-library and e-learning and other ICT based learning methods to augment class room/laboratory training. Lecturers should drive student with the use of online assignments for research and development. This will allow trainers/trainees to be in tune the development around the world because the advancement in ICT has made it possible for knowledge to be distributed in the current globalization. Institutions should rise up to the challenges of providing state of art functional internet facilities as this will allow researchers and students to update their knowledge regularly to meet the challenge of improved education.
8. Finally, establishment of one year Post Graduate College of engineering to serve as a centre of engineering excellence is proposed to be made compulsory for all graduates and be thoroughly supervised by COREN so that the product from such college will earn the title Engineer and such should be the prerequisite for employment for engineers and technologist. The graduate of the college should be accorded special salary structure to reflect recognition, importance and motivation as main block building set up. This college should serve as training and interaction cen-

ter for graduate engineers and technologists where emphasis will be placed on marrying classroom training with industrial practical requirements. The colleges could be created in the geographical zones of the country and should employ seasoned technologists and renowned lecturers as trainers while seasoned industry professionals are allowed to participate in development of the future employees.

## CONCLUSION

The development of engineering and technology is one of the major keys to national development and this will hinge on importance attached to engineering and improvement made to standard of engineering education. Therefore, it is recommended that the institutions should be well funded, conducive learning environment should be available to incorporate modern ICT supports, trainers should be of high quality and they be exposed to on-the-job training; curriculum should be reviewed to reflect industrial requirements while a post graduate college of engineering should be established as the final incubator for Nigerian engineering graduate.

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