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# Accreditation of Engineering and Architectural Education in Nigeria: the way forward

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## Abstract

In this study, Engineering and Architectural education and how they were accredited was assessed as carried out by the National Universities Commission (NUC), the only body that approves courses and programmes, determines and maintains minimum academic standards, monitors universities and accredits academic programmes in Nigeria. The current trends in education enrolment and engineering and architectural programs in Nigeria were also analyzed. This paper also provides recommendations for policy makers in government and the educational sector on how to redesign, upgrade and modify the existing initiatives to be able to produce graduates that will be able to compete favourably in the global engineering world.

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# 1. Introduction

The 2002 joint proposal by Sweden and Japan during the 57<sup>th</sup> Session of the United Nations General Assembly (Resolution 57/254) to adopt "Decade of Education for Sustainable Development (DESD 2005- 2014)" following the Johannesburg Plan of Implementation which emphasized that education is an indispensable element for achieving sustainable development has influenced global quality assurance in tertiary education (UN,2002). Engineering Education is an instrument capable of bringing about the desired sustainable development that births the development and implementation of sustainable technologies and sustainable system innovations around the world. In fact, to realize a decade of Education for sustainable development, the educational institutions around the world will need constant and consistent forms of quality assurance through evaluation and accreditation of offered programs by suitable bodies. These forms of education quality or evaluation should not only focus on methods of teaching in classrooms and /or novel educational programs differ from one country to the other, although, experts in Engineering Education are advocating for a global assessment and accreditation of Architectural and Engineering program to be able to fine tune-engineering practice without borders (A Patil et al, 2007, Javed A. Memon et al

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2009). Accreditation of undergraduate and graduate programs ensure quality, ethics and code of practice of programs as taught in an institution are in line with national and international set benchmarks. According to Javed et al (2009), accreditation involves an evaluation and assessment of undergraduate and postgraduate programs offered by universities and other educational providers, through a well-defined, peer review process in which endorsements based on broadly designated parameters and criteria are rendered. Program accreditation assures the public, potential employers and professional's bodies that an academic institution is satisfactory preparing candidates for the needed development and skills required for such profession. As at first quarter of 2012 there are 123 universities in Nigeria, aside Monotechnics, Polytechnics, and Colleges of education. There are 36 Federal universities, 37 state universities and 50 private universities (according to Act 9 of 1993 constitution) offering over a thousand different programs. The Universities activities are regulated and controlled by the National University commission (NUC), an agency under the umbrella of the Ministry of Education. NUC is responsible for the program accreditation and setting enrolment benchmarks' for the Universities according to their capacity. NUC works in collaboration with the Joint Admissions and Matriculations Board (JAMB) a body established by law to conduct matriculation examinations into tertiary institutions in Nigeria.

#### 2. Student Enrollment in Nigeria's Universities

Enrolment into Nigeria Universities has witnessed sporadic changes from 1948 when the total student enrolment at University College Ibadan was 104 (Njoku, P. C, 2002). The number grew to 1,395 in 1960, 40,000 in 1976 and 172,000 in 1988 when the first group of graduates from the 6:3:3:4 system of education enrolled in the universities. In year 2000, the student enrolment jumped to 448,230 and 780001 in 2005. Current enrolment in Nigerian Universities is estimated at over 1million degree students. The current massification of university education elicited a growing concern about the quality of education programs offered by the various Universities. The National University Commission (NUC) continues to pursue certain measures to ensure that student enrolment was within limits of the carrying capacity of the institution as dictated by its resources such as staff, teaching support services, laboratories, libraries, equipment and lecture spaces. The continuous pursuit of NUC to regulate and control enrolment in universities has not translated to a useful measure as most Universities with yearly admission into the University. Yearly around 1 million applicants want to gain entrance to Nigerian Universities with only about 10% being successful. This 10% percent of the applicants will have to sit for various University tests before they can be admitted into their various courses.

	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008
Application into Nigeria's Universities	1046940	838051	917960	912350	1034083
Admission into Nigeria's Universities	106007	105955	85649	70997	-
% of applicants admitted	10.13	12.64	9.33	7.78	-

Table 1. Yearly applications to Nigeria University with yearly admission into the University

Table 2. Total Enrolment in federal University by major Discipline (2001-2006)

DISCIPLINES	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
ADMINISTRATION	29,407	29,741	45,247	47,886	29,757
AGRICULTURE	18,557	27,201	30,457	26,455	22,022
ARTS	31,182	31,456	35,585	38,589	33,998
EDUCATION	33,782	33,798	48,230	48,889	49,247
ENGR/TECHNOLOGY	47,278	50,983	51,816	59,702	57,824
ENVIR.SCIENCE	10,864	14,676	18,036	18,853	17,968
LAW	14,395	13,896	15,430	18,506	16,299
MEDICINE	26,360	25,426	28,001	31,540	25,884
PHARMACY	5,727	5,873	5,967	5,538	4,740
SCIENCE	59,361	74,933	78,761	97,724	75,187
SOCIAL SCIENCE	45,320	38,154	54,450	52,924	56,725
VETERINARY MEDICINE	3,474	3,365	7,273	3,771	3,735
TOTAL	325,707	349,502	419,253	450,377	393,386

Source: National Universities Commission, Abuja.

DISCIPLINES	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
ADMINISTRATION	1,141	890	1,181	982	773
AGRICULTURE	1,757	1,979	2,317	1,533	1,428
ARTS	1,417	1,719	1,434	1,598	1,660
EDUCATION	1,418	1,559	1,370	1,515	1,552
ENGR/TECHNOLOGY	1,966	1,907	2,171	1,992	1,886
ENVIR.SCIENCE	696	820	682	769	889
LAW	424	350	433	523	538
MEDICINE	1,780	2,004	1,996	2,041	2,027
PHARMACY	253	410	290	400	376
SCIENCE	3,153	3,872	3,495	3,099	2,986
SOCIAL SCIENCE	1,130	1,272	775	1,283	1,398
VETERINARY MEDICINE	290	379	515	381	377
TOTAL	15,425	17,161	16,659	16,116	15,890

Table 3.Number of Teachers in Federal University by Major Discipline (2001-2006)

Source: National Universities Commission, Abuja.

Table 2 shows the Total enrolment in Federal Universities by major Disciplines. The Federal Universities are the best when it comes to Education in Nigeria because of direct funds available to them from the Federal government. In addition, data is available on the Federal Universities as compared to the State Universities and the newly established private Universities. Science and Engineering faculty have the highest enrolment of student (except for 2003/2004 when social science had more than Engineering) in Federal Universities, meaning that most students preferred mathematical oriented courses to the other courses. Table 3 shows the Number of Teachers in Federal Universities by Major Disciplines. It will be observed that Science and Engineering have the highest number of Instructors. The Teacher to Student ratio for Engineering (1:30), Sciences (1:32), Veterinary Medicine (1:12) and Medicine (1:16) means that the Science and Engineering faculties are actually taking more students than their capacity.

# 3. Engineering and Achitectural Education Assessment & Accreditation in Nigeria

Accreditation as defined by many authors (Brusselmans et al 1998, Reyes et al 2008, Dodridge 2002, Szanto 2005) involves procedure by which creditability is given by an external body to a programme/department/institution when the program outcome is compared with the attributes and objectives using available evidence. Engineering Education assessments by a reputable external body is to ensure quality and public accountability, encouraging trust on behalf of students, parents, employers, education administration and society in general. Accreditation as a tool of progress should facilitate both internal and external evaluations of program on a continuous basis to improve the quality of offered programs. Engineering programme assessment is carried out by NUC in conjunction with Council for the Regulation of Engineering in Nigeria (COREN) while Architectural program is done in done in conjunction with Nigeria Institute of Architects (NIA). The 2007 NUC accreditation exercise, out of 872 programs 599 (68.7%) got full accreditation 247% (28.3%) interim accreditation and 26(3.0%) were denied accreditation. In all 90 Engineering programs were examined, 50 (55%) were fully accredited while 39 (43%) got interim accreditation and 1 (1%) was denied accreditation. The following four core areas were criteria; Staffing, Academic content, Library and Physical facilities. A program that secure 70% in all these four areas. The procedure for accreditation as carried out by NUC involves the following:

i. Manual for accreditation procedures for academic programmes in Nigerian Universities.

ii. Self-Study Form (NUC/SSF)

- iii. Programme Evaluation Form (NUC/PEF)
- iv. Accreditation Panel Report Form (NUC/APRF)
- v. Accreditation Re-visitation Form (NUC/ARVF)

NUC strives to demonstrate through its assessment/accreditation that all academic programmes have attained an acceptable level of competence in their areas of specialization and to certify to the international community that the programmes offered in Nigerian Universities are of high standard and their graduates are adequate for employment and for further studies.

# 4. Accreditation Board for Engineering & Technology (ABET)

The Accreditation Board for Engineering and Technology (ABET) is no doubt the most reliable accrediting body in the world, evidence of this is seen in the number of applications from different Universities outside the United State requesting for ABET evaluation to boost their credibility. ABET accreditation guidelines are adopted in whole or part by other accrediting bodies of engineering programmes due to it robust and comprehensive nature.

ABET accreditation is a non-governmental, peer-review process that assures the quality of engineering programs, institutions or programs volunteer to undergo this review periodically to determine if certain criteria are being met and where they need to improve upon. ABET's accreditation is voluntary and nongovernmental unlike the case of NUC in Nigeria and in other developing countries where government is the largest provider of education and thus makes accreditation compulsory. NUC and ABET agree on the fact that accreditation is not a ranking system but simply an assurance that a program meets the minimum established quality of standard. One major line of difference as seen in the way ABET and NUC operate is that ABET accredits programs only, not degrees, departments, colleges, or institutions as against the NUC which accredits department and institution. This issue needs to be addressed for quality engineering education in Nigeria, as the NUC during its visit to Universities for evaluation get involved in so many things that deprives her from conducting a comprehensive examination of programs. ABET collaborates with many different professional and technical societies to ensure a proper assessment of a Universities program. These societies and their members work together through ABET to develop the standards, and they provide the professionals who evaluate the programs to make sure they meet those standards. The NUC works in conjunction with COREN but there exist huge difference between the two. COREN believes that the accreditation of Universities programs should be sole responsibility of its organization while the NUC can busy itself with other roles that concerns the University. The criterion 3 of ABET accreditation is seen as the pivot of the success of the accrediting body, the criterion stresses the knowledge, skills and behaviours that students acquire in their degree programme. The important elements of the criterion are listed below (ABET 2007):

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments as well as to analyse and interpret data

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) an ability to function on multi-disciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

The NUC/COREN or NUC/NIA partnerships needs to update its evaluation criteria to measure the programs outcomes as listed in the criterion 3 of ABET. One of the authors has witnessed institutional accreditation evaluation as an undergraduate student in Nigeria and has also been part of the committee that hosted an ABET accreditation team in Mechanical Engineering Department, Eastern Mediterranean University, TRNC. The need for criterion 3 in NUC's accreditation criteria cannot be substituted if quality accreditation is desired. ABET unlike NUC continuously develops, upgrades and updates accreditation criteria according to the need of the Engineering profession. The task of constant upgrading of accreditation criteria is huge for NUC since the body evaluates all the academic programs, department and institution. The two bodies (ABET & NUC) organize accreditation workshops. Since ABET is an American institution, it will be better for general acceptance, to have a global Engineering accrediting body that brings uniform basic requirements for the engineering program. Patil et al, 2007 and Javed et al 2009 have done an extensive study on the need for a global accrediting body.

# 5. Observation on Nigeria Engineering and Architectural Education

The most important issue in accreditation in Nigeria (be it engineering or architecture) is the inadequate design of accreditation criteria as obtained in the developed world. The accreditation criteria life cycle should include the *Input*, the *Process* and the *Output*, with a feedback closing the loop as seen in most ABET accreditation procedures. The feedback is needed to improve the Output and can be used to improve the quality of the Process. The major concern of engineering education in Nigeria is poor funding, non-availability of basic facilities and poor staffing. The recorded teacher to student ratio in a Federal University in Nigeria is 1:30, a ratio worse in most state Universities. The funds available to most Universities are inadequate and the number of yearly intake tends to increase without control as universities offering Engineering programs admit more students than their capacity (See

Table 2&3) a situation that has led to overcrowding of the classes and available facilities. The accreditation body is yet to perfect its evaluation criteria to reveal the short comings in the engineering education, the latest round of accreditation (2007) only approved 56% of the engineering programs(fully accredited) while the rest are either on interim or denied status. One will expect that these problems should be feedbacks needed to improve the engineering education but that has not been the case over the years. The need to seek help from proven accreditation bodies like ABET should be top priority on the agenda of NUC, also NUC should allow professional institutions like NIA and COREN (a non-governmental organization) to run the accreditation of their respective programs to upgrade its credibility. A global accreditation body will be of great help to developing countries like Nigeria to upgrade its engineering education to world standards. The standard of engineering education is falling in Nigeria; a situation leading to brain drain of good students to developed countries where engineering faculties is because of poor staff remuneration in the country. The country has huge human resources in engineering as well as other faculties but the poor remuneration is repelling them to the industry or outside the country where there is far better pay.

### 6. Conclusion

This work has looked into enrolment in Nigerian Universities with a focus on engineering and architectural education. An overview of NUC accreditation of engineering education is presented in this paper. A comparison of NUC and ABET accreditation was also provided highlighting weakness and strength of accrediting bodies. Areas of improvement were also highlighted for NUC for a quality accreditation of engineering programs. The paper suggests that COREN and NIA instead of NUC should be charged with the responsibility of engineering and architectural education accreditation as a non-governmental organization. This will remove bureaucracy and government influence in program accreditation and expose under funding of University education in Nigeria. This work also advocates the need for a global accreditation model that will enhance uniformity in engineering education.

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