QUALITY ENGINEERING EDUCATION AND ATTAINMENT OF THE MILLENNIUM DEVELOPMENT GOALS (MDGS) IN SUB-SAHARA AFRICA. IMPLICATIONS FOR PRODUCTION OF QUALITY ENGINEERING TEACHERS IN NIGERIA.

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ABSTRACT
The paper examines the quality of Engineering Education and the attainment of millennium development goals (MDGs) in sub-Saharan Africa. Implications for production of quality engineering Teachers in Nigeria. Perceived strengths of the MDGs agenda and limitations to the realization of MDGs in Nigeria were viewed. The concept of quality of engineering education in sub-Saharan Africa were also examined. Possible ways of improving quality engineering education in Nigerian in order to attain the MDGs were considered. It was concluded that in order to attain the millennium development goals in the country, the quality of teachers and engineers must be improved to meet the world standards.

Keywords: Quality, Engineering Education, Millennium development goals, sub Sahara Africa engineering teacher.

INTRODUCTION
The Millennium Development Goals (MDGs) are eight international goals that all the 192 united Nations member states and at least 23 International organizations have agreed to achieve by the year 2015. Implementing the MDGs is proving to be a staggering challenge. While the development of sustainable engineering education is the totality of all the things needed for man to perform. The challenges as regards the Millennium Development Goals is simply human. In 2000, the UN general Assembly adopted the Millennium Declaration (United Nations, 2000). It was a visionary document which reiterated the global commitment to solidarity, equality, charity and respect for nature as the care values and driver motives underlining global commitments. Moreover, it was especially powerfully as it outlined concrete and specific development goals to be achieved by 2015. These objectives were elaborated in the Millennium Development Goals (MDGs), introduced as the secretary Generals “road map” for the implementation of the declaration. Eight goals and initially 18 targets and 48 inhalators were laid out to harmonize reporting on the millennium declaration. (United Nations, 2011).

Education in science, Engineering and Technology (SET) provides the great needs of the nation through the development of the social economic infrastructure necessary for the growth of enterprise (Gemade, 2009), an antidote to poverty and leveler in the knowledge emerging society (Ajimotokan et al. 2009). Totally, education has evolved as the primary agent of transformation towards sustainable development; increasing human capacities to transform their
visions for society into reality (Oloyede, 2008, UNESCO, 2005). Engineering education entails education in science, engineering and Technology (SET) for capacity building in engineering towards sustainable development. Thus the aim of Engineering Education should be the integration of knowledge, skills understanding and experience.

The Nigerian government has made frantic efforts to encourage engineering education from the mid 1980’s, the first remedy introduced was diversification and specialization of the universities with a view to increasing their scientific, technological and agricultural contributions to the transformation of he country (Ajimotokan et al, 2009), the development of the viable Engineering Education is an indispensible tool in the various sectors of the economy if the nation hopes to develop and sustain the development to attain its national vision and goals’ be it (MDGs) National economic Empowerment and Development strategy (NEEDS) vision: 20,20,20 e.t.c (Ekeh, 2009). The paper examines the quality of engineering education and the attainment of the millennium develop goals (MDGs) in sub-Sahara Africa, with a view to the implications for production quality engineering teachers in Nigeria.

PERCEIVED STRENGTHS OF THE MDG AGENDA

The format of the MDGs agenda (that is the sequence of goals, targets and indicators) is generally considered effective. It has provided a much more operational framework to the international development agenda, thereby helping mobilize support for development, fostering co-operation and influencing global policy debates. It has also helped create stronger accountability mechanisms for the international community. The MDG monitoring requirements and their political importance has also brought the recognition that better monitoring and data are vital for effective design and implementation of development programmes and policies. (Hulme, 2009).

The MDGs have been an influential frame work for global development cooperation, not only in shaping the international discourse, but in driving the allocation of resources towards key global development priorities and improving policy monitoring. They have received unprecedented political commitment which reflects a strong consensus for tackling poverty eradication and other key priorities. The MDGs have proved to be a useful tool because their established time bound and concrete targets which galvanized political leaders, CSOs, the media and international organization around a clearly defined agenda intended to improve human development (Gore, 2010). The MDGs have been instrumental in building a common agenda of broad priorities, and have included government to take concrete actions and improve coordination in support of poverty reduction efforts. As a result, many developing countries have designed national development strategies explicitly oriented at achieving the MDGs and have aligned these objectives with other national priorities. For example, it has been argued that the MDGs strengthens the commitment of African government to implement poverty reduction strategies and improve policy monitoring as well as improved support from donor countries (Jolly, 2010).

The recognized success of the MDGs has been associated with several of their key characteristics. Their embedded priority for human development objectives and the associated
frame work provided: (i) a clear focus to national policy effort; (ii) a set of clear, simple quantitative and easily communicable targets, while providing an integral approach to key human development dimensions; (iii) a starting point for improved accountability through the use of simple but robust indicators; and (iv) a tool for advocacy to strengthen international development cooperation, including through the explicit recognition of the special needs of Africa. (Jones et al 2010).

LIMITATIONS TO THE REALIZATION OF MDGS IN NIGERIA.
According to Banabo and Ndjomu (2014), the present day statistics on the achievement of MDGs in Nigeria is worrisome; all theses are traceable to the following:

1. Political Instability: Nigeria politics/democracy is still not very certain following the trend of events. The current devastating effects of Boko Haram in the North and the Infighting of political parties, Nigeria is just attaining sixteen (16) of democracy since independence.

2. Economic Depression: What we hear on the print and electronic media, is how the economy is experiencing a great depression, the prices of things rising by the day and making the common man helpless. This in turn make many engage in nefarious and degrading acts of indiscipline, stealing and prostitution. Hence there is an increase in poverty and sexually transmitted diseases.

3. Ethnicity/Religion: Ethnic dichotomy is another problem we need to put behind us. People are still glued to tribal interest above national interest: This has also led to poor information dissemination concerning the use of contraceptives because of religious believes.

4. Poor policy implementation: Nigeria is excellent at policy formulation and absolutely poor in implementation. How many reforms policies have we seen, but fizzes into tin air due to complacency of our leader. Policies do not stand the test of time.

5. Loss of moral values: people no longer uphold the tenets of moral values. We live in a country where evil is not punished and good never rewarded. This is evident because the elites who should actually lead by example become the very culprits of lying and the perpetration of immoral values.

6. Poverty/unemployment: Poverty and the rising level of un-employment are two major challenges plaguing the country in achieving the Millennium Development Goals (MDGs) says government report, 2008. Imajire the countless thousand of young graduates from higher institutions without a corresponding provision of job opportunities, graduates roam the streets in search of jobs so as to make a living.

THE CONCEPT QUALITY
The word “quality” is derived from the Latin word quails, meaning, “what kind of”. With a wide variety of meanings and connotations attached to it, quality is a difficult and elusive term define, having thus been referred to as a “slippery concepts” (Pfeiffer and Coote, 1991). The world implies different things to different people. It has, thus, been defined with different perspectives and orientations, according to the person, the measures applied and the context within which it is considered. Quality in education can be viewed as ‘exceptional’ with three notions in terms of
being distinctive, as exceeding very high standards and as passing a set of required standards]], with each of these being subject to debate. Quality of education can be viewed in terms of ‘consistency’, especially of the process involved through specifications, to be achieved through a “zero defects approach and a quality culture”. But the very basis poses limitations and may be questioned with regards to whether there is a consistent conformity or standards in education especially given the fact that such standards of conformance are achieved by the students. Quality viewed in relation to the “purpose of the product / services” (Crawford, 1991) raises three issues – “fitting the customer specifications, mission – based fitness for purpose and customer satisfaction” each being subject to debate. Schrock and Lefeure, 1988 viewed quality as “value for money through efficiency and effectiveness” where they clearly linked to accountability and with emphasis on performance indicators, but, here again this very emphasis on performance indicators is debatable. Green (1994), refers to quality as “an elusive” concept difficult to articulate. While it is subjectively associated with something that is good and worthwhile, it involves differing concepts and approaches however, as Green (1994) points out, this is not of much values when it comes to quality in higher education as a whole, quality is conformance to specification or standards”. Mortimore and stone (1990) drew attention to the “ normative and comparative” element inherent in quality, emphasizing quality in education as “an attribute or defining essence; a degree of relative worth; a description of something good or excellent; and a non-qualified trait”. Legerweij and Voogr (1990), lay emphasis on the dynamism of quality and concluded that while the concept of quality in education cannot be easily defined in a clear and exact manner, any definition of quality should be expected to change over time, because “it necessarily reflects a society’s interpretation of educational needs and the intensity of its moral and financial commitment to fulfilling them”.

ENGINEERING EDUCATION AND ATTAINMENT OF MILLENNIUM DEVELOPMENT GOALS (MDGs) IN SSA (NIGERIA).

Any Nation that does not place premium in its educational system, does so at its own detriment (Banabo & Ndiomu 2014). It is quite unfortunate to note that many of our leaders both past and present do not regard engineering education as a vital sector that needs revampment. Education generally in Nigeria is not properly regarded by of our leaders in the past and present. This ought not to be. This is obvious looking at the educational budgets from when Nigeria got her independence. Statistics clearly depict a down ward movement in the budgets. Education constitutes the bedrock to any meaningful developmental stride in a polity. Modern nations show great concern for education especially education in science; engineering and technology (SET) for obvious reasons. Some of which include provision of great needs of the nation element infrastructure necessary for the antidote to poverty and leveler in the knowledge emerging society. e.t.c. the literature is replete with numerous definitions of education based on philosophy of life, disciplines, past experiences, circumstances environment among others. Education therefore is the aggregate of all process by which an individual
develops values, attitudes, abilities and other forms of behaviour that is of positive value to the society (Fatunwa, 1974).

Engineering education is so momentous and should be spiritedly pursued to fully exploit the available possibilities for promoting sound engineering education and sustain development. The challenges guarantee quality engineering education seems overwhelming, however, they are attainable (Ajimotokan et al 2010).

In 2010 UNESCO published a landmark report entitled “Engineering issues challenges & opportunities for development”, well contribution from 120 experts from around the world. Since 1998 UNESCO has published its well known science reports and although science in its broad sense includes technology and therefore engineering, UNESCO responded to the call from the engineering community for a specific study on engineering, especially on the role of engineering in international development. The report emphases the importance of engineering in achieving the millennium Development Goals (MDGs), mentioning that in sub-Sahara Africa alone it has been estimated that a staggering 2.5 million new engineers and technicians would be needed to achieve the MDG of improved access to clean water and sanitation. (UNESCO REPORT 2010).

THE CONCEPT OF TEACHER QUALITY

According to Amoor, (2008), teachers play a significant role in the economic development of a society by providing necessary skills and competencies to learners through enabling them to partake in national development. Dasko (2002) defined a teacher as a person that imparts knowledge to people, teaching them how to read and write and explain how problems are solved. The teacher guides the children and advices them about different matters in relation to their studies and life. He noted that, a teacher is sometimes a parent to students who provides for them what they need in class and shows care when the need arises and he possesses traits like; kindness, patience, calm, honesty, caring, loving, smart etc. He opined that a teacher is more than someone who passes on knowledge but also provides the interaction, relationship, understanding and encouragement to enable a person or child to reach the full potential. He explained further that a teacher provides opportunities that allow the learners to learn by themselves because learners do not learn by being told but by finding out for themselves. He explains that a teacher is a key to the learning process of students in the classroom. He thus concluded that the success of any educational reform depends largely upon having good quality as standards of something as compared to other things. That is the degree of goodness or excellence. The teacher quality means the ability of teacher to raise students performance on test as well as skills, and also work well with other teachers and school administrators for the purpose of raising the performance of the students.

Considering the above definition on teacher quality it can be summarized that, the implication for quality engineering teacher in Nigeria entails effective and excellent teaching that improves students learning and satisfaction. It also ensures that learners possess adequate knowledge, skill
and competences that are appropriate for their areas of responsibility that would meet the needs of labour workforce.

**QUALITY OF ENGINEERING EDUCATION IN SUB-SAHARA AFRICAN**

The contradictory situation in Africa is that although there is a shortage of engineers, engineering graduates remain unemployed or are under-employed. There are several reasons for this and one of them is the poor quality of engineering education. There is first of all an urgent need to upgrade the infrastructure and laboratories of the existing institutions. Publicly funded African tertiary education institutions have for several decades suffered from lack of investment and this has led to a deterioration of their infrastructure (Du Toit and Roodt 2009). Laboratory equipment are out of date or are non-functional and have not been repaired; libraries do not have the appropriate books and journals; and availability of ICT and computer is still limited (Du Toit and Roodt 2009).

The curricular of Engineering courses also need to be revised, most of them have been copied from universities in Europe or the USA (Erasmus and Breier 2009), have not been updated and are not necessarily relevant to African situations, very few African universities, involve industry and other stakeholders to assist in revising their engineering curricula. This is where the Turning methodology which is currently being introduced in several African higher education institutions, can be of enormous help.

The teaching methodology also needs to be improved, because of large student numbers, the subjects are mostly taught by the magisterial mode with hardly any opportunity for the students to discuss and interact with the lecturer or among themselves. It would be advisable to adopt the Problem-Based Learning (PBL) approach in engineering education (Goolam, 2014) such an approach could result in noticeable improvement in the students’ ability to solving problems and in addition, help them to acquire certain “soft” skills such as good communication, team spirit, creativity and adaptability. Indeed, many employers give greater importance to soft skills than qualifications. And PBL need not be laboratory – based or require expensive equipment and materials. Students could even be assigned problems to be solved while they are on training, matching the problems with the environment of their training.

According to Goolam (2014), another important reason for the poor quality of teaching is the fact that engineering teachers have not undergone any pedagogical training. Many of them have hardly had an industrial experience, although they may have a doctorate degree in their field. They are thus ill-equipped to help students to team using appropriate pedagogical techniques. Pedagogical training of academic staff in universities in Africa is not widespread although some institutions have made attempts to introduce it (Goolam, 2014) A recent quick survey was undertaken by UNESCO to prioritize challenges facing higher education in Africa. The need to train lecturers was ranked first. Many universities are insisting that all their lecturers should have a PhD. This may not necessarily be the right approach for all engineering lecturers, and in any case may not be feasible (Goolam, 2014). For many of them, having a good master’s degree in the appropriate field, acquiring same industrial experience and undergoing pedagogical training would better equip them for their teaching.
IMPLICATIONS FOR THE PRODUCTION OF QUALITY ENGINEERING EDUCATION TEACHERS IN NIGERIA

In order to attain the millennium development goals (MDGs) Agenda in sub-Sahara African, specifically Nigeria, quality engineering education must be ensured. For quality engineering education to be achieved, the quality of engineering education teachers must also be improved to the required world standards. Modern nations show great concern for education, especially education in science, engineering and technology. This is because it provides the great needs of the nation through the development of the social and economic infrastructure necessary for the growth of enterprise (Gemade, 2009). A lot of researches have shown that, most of the challenges of engineering education in Nigeria bows down mainly to the quality of engineering teachers among other reasons (Noyede, 2008, Ekeh 2009).

The dearth of teaching, and laboratory and workshop facilities in most Nigeria engineering degree programs will inevitably contribute to the diminution of the quality of the engineering graduates (Balogun & Esezobor 1990). Students have been classified into three distinct categories. These are ‘verbalisers’, ‘visualizers’ and ‘doers’. Verbalizers are those who learn more easily if information is in written or spoken form. These benefit a lot from lectures, tutorials and hand-outs. Visualizers are those who learn more easily when information is presented in pictorial or dramatic form. These benefits more from maps, drawing, film projection, videotape, the idea is presented by practical demonstration by the teacher and the doer gets a quick grasp of the concept. (Reyes-Guerra 1989).

From the above, it is clear that verbalizers among Nigerian students have the best prospect of good performance on the programme. The inadequacies in teaching, laboratory and workshop facilities, put the visualizers and doers at a great disadvantage. Even the verbalisers have problems when students’ population is too large and communications facilities are inadequate. The implication of these shortcomings is poor overall performance of engineering students across the board. The implications for the production of the engineering teacher therefore, is that the Nigerian engineering education teacher must be the ones with quality to meet up with the existing academic challenges of engineering education in Nigeria in order to produce quality engineering education graduates that will enable the attainment of the Millennium Development Goals (MDGs) agenda in sub-Sahara African.

WAYS OF IMPROVING QUALITY ENGINEERING EDUCATION IN NIGERIA

Sub-Sahara Africa urgently needs quality engineering in order to attain the Millennium Development Goals (MDGs). This is also because sub-Sahara Africa needs such development as the construction of roads, airports, harbours, bridges, buildings, etc also for accelerating its industrial development, especially in manufacturing, so that it becomes a net exporter rather than importer of manufactured goods. SSA also needs quality engineering in fighting acute power shortages experience regularly and the issue of empowering it to take control of the mining of its...
rich natural resources, especially minerals, oil and gas and finally achieving the MDGs, especially in rural areas.

Studies reviewed indicated that at present there is a severe lack of engineering capacity in SSA and it has relied heavily on imported expertise in engineering. First, the insufficient output forms the training institutions to meet the countries requirement; and the poor quality and lack of practical experience and skills of the graduates produced which often make them unemployable. These are the two fronts on which SSA countries have to tackle the challenge of improving engineering education and training in SSA (Goolam 2014).

According to Goolam (2014), there are, broadly speaking, three categories of personnel in the engineering industry. There are professional engineers, technicians and craftsmen (or skilled workers). The professional engineer usually holds a degree in engineering, has some years of experience and needs to be registered nationally in order to practice the profession. The technician has an engineering diploma (either higher or ordinary) and the craftsman has an appropriate trade certificate. The technician grade is often sub-divided into two categories; technologist (or technician engineer) and engineering technician, the former requiring a higher qualification and more experience. The nomenclature used for the different categories varies significantly from one region or country to another. And there is some degree of overlap between the various grades. It is usually accepted that for the effective operation of the engineering industry, there needs to be a skill ratio between the categories. In several engineering branches the common skill-mix ratio used is two technologists and four technicians for every professional engineer, that is 1:2:4. The international labour organization recommends the ratio between engineers/technicians/craftmen to be 1:5:25. The engineer: technician ratio should therefore be of the order of 1:5 or 1:6, clearly indicating that there needs to be a far greater number of technicians than engineers.

CONCLUSION
Implementing the millennium development goal seem to be proving a staggering challenge. Quality engineering education stands to be the only solution to the attainment of the MDGs. Africa stands at a cross-road in its development process. It is widely acknowledged that the continent has huge potential for growth and development. Education and training, especially in science, engineering and technology are necessary tools for the continent to access its potentials. Engineering education is probably the area requiring most attention. Engineering education however faces a number of challenges including, poor linkages with industry. Financial resources, poor quality teachers, poor quality and relevance educational provisions, lack of human resources etc. these challenges need to be addressed jointly and urgently by governments, engineering education institutions and industries.

Although several recent regional initiatives are already underway to address some of these challenges as noted in the paper and these need to be supported. This is because SSA needs development in roads construction, bridges buildings, etc. also in manufacturing and power, and finally in achieving the MDGs especially in rural areas. The issue of the ratio of engineer to technicians and craftsmen is also a serious issue of consideration.
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