

# ENGINEERING PRACTICE IN NIGERIA: MECHANICAL ENGINEERS ROLE FOR NATIONAL DEVELOPMENT

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**Abstract:** The paper encapsulates engineering practice in Nigeria with special focus on mechanical engineers role for National Development. It employs a secondary data source and direct observation in generating relevant information for this study. The paper highlighted in detail the concepts, role of mechanical engineer, in national development, the historical development of engineering. It also outlined the job openings for mechanical engineers and that of self-employment opportunities for mechanical engineers and that of the challenges of mechanical engineers in Nigeria. It is therefore concluded that mechanical engineers emerged as specialist in industrial machinery and mining that contributes immensely towards national developments and meaningful recommendations were made to improve on mechanical engineering as Nigerian undergraduates practically trained and oriented and host of others.

**Keywords:** Engineering, Engineers, Mechanical Engineers, Development, National Development.

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## 1. INTRODUCTION

Engineering is the field and job using technical and scientific cognizance, and using natural regulations and physical resources to design and accomplish materials, structures, machines, devices, systems and processes that realize a desired objective and meet specified criteria, (American Engineers' Council for Professional Development – AECPD, 2000).

According to the World Encyclopedia Book (WEB, 2010), engineering is the profession that puts scientific knowledge to practical use. The word “engineering” comes from Latin word “ingeniare” which means to design or to create. Engineers use principles of science to design structures, machines and products of all kinds. They look for better ways to use existing resources and often develop new materials. Engineers have had a direct role in the creation of most modern technology – the tools, materials, techniques and power sources that make our lives easier.

Engineering, much like science, is a broad discipline which is often broken down into several sub-disciplines. These disciplines concern themselves with differing areas of engineering work. Although initially an engineer will be trained in a specific discipline, throughout an engineer's career, the engineer may become multi-disciplined, having worked in several of the outlined areas. Historically, the principal fields of engineering are classified as:

- Aerospace Engineering – The design of aircraft, spacecraft and related designs.
- Chemical Engineering – The conversion of raw materials into usable commodities (chemical products)
- Civil Engineering – The design and construction of civil works such as infrastructures bridges, buildings

- Electrical Engineering – The design of electrical systems, such as transformers, as well as electronic goods, power source.
- Mechanical Engineering – The design of physical or mechanical systems such as engines, power trains, kinematic chains, vibration isolation equipment with the fast rate of technology advancement, other new areas are gaining importance and new aspects are coming up like computer engineering, materials engineer, Nuclear Engineering, Machine engineering, Environmental engineering, Petroleum engineering, Transportation engineering, Textile engineering, Agricultural engineering, etc. For every of these new areas there are significant overlap, particularly in the aspects of sciences to their field like chemistry, physics and mathematics.

The Engineering Practice in Nigeria is a noble profession in which we have highly trained and experienced Engineers, Engineering Technologists, Engineering Technicians and Engineering craftsmen and Draughtsmen. All our Engineers are either registered or registerable by the council for the Registration of Engineering in Nigeria (COREN) and Nigerian Society of Engineers (NSE). The Registered Engineers who are trained must be conversant with American Professional Engineers Institute Standards, British Standards of Engineering etc.

Arising from the study, we shall discuss in detail the role or place of mechanical Engineers in National Development.

## 2. LITERATURE REVIEW

In this study, we shall have a conceptual discourse of who is an Engineer, historical development of Engineering, the role or place of Mechanical Engineer and its related career opportunities for national development in Nigeria.

### Conceptualizing “Engineer”.

The concept “Engineer” refers to the person that carries out engineering and the ones authorized to do so have more proper designation known as Professional Engineer, Chartered Engineer or Incorporated Engineer. The Engineers are conversant with the required engineering standards to operate. They have creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes or works utilizing them singly or in combination, or to construct or operate the same with full cognizance of their design or to forecast their conduct in line with particular operating conditions entirely like regards a purposeful duty, economics of activity and security life and property.

Engineers utilize their understanding of science, mathematics and the right experience to proffer solution to a challenge or to make improvements to the status quo. However, Engineers now need to have the understanding of appropriate sciences for their designed projects, as due to this, they continue the learning of new materials throughout their career.

Engineer is any person who by virtue of his or her education and training acquires scientific knowledge and methods, he or she understands materials, procedures, techniques, systems and design and construct products, Engineer is an expert in designing and constructing engines and other related services with the aid of tools. Engineers are artists, scientists, economists and adroit managers of materials and human resources. He or she has been taught to design engines, machines and applying scientific knowledge of properties of matters and natural laws to transform for the better.

In Nigeria, Engineering Professionals are Engineer, Engineering Technologists, Engineering Technicians, Engineering Craftsmen and Draughtsmen etc.

### Historical Development of Engineering

The idea of engineering has been since the ancient time as when man developed basic innovations like the wheel, pulley, and lever. Every of the innovations is in constant alignment with present time definitions of engineering, using rudimental mechanical principles to produce workable tools and objects.

The term “engineering” on its own has a recent etymology, getting its origin from the engineer, which on its own dates back to 1325, an engineer (in effect), on that runs an engine, primarily referred referred to “a constructor of military engine”. In this discourse, although obsolete now, an engine referred to military machine, ie a mechanical gadget utilized in war (for instance, the catapult). The word “engine” on its own is of ancient origin, fundamentally got its derivation from the latin ingenium (C.1250), denoting inherent quality, particularly mental power, so a clever innovation. Later like the design of civil constructions like bridges and edifices mature like a technical field, the term civil engineering went into the wordbook in a way to differentiate between those majoring in the construction of non-military projects and those involved in the older discipline of military engineering, the original meaning of the word “engineering,” now largely understanding of appropriate

sciences for their design works, due to the result, they continue to hear modern materials through their profession of various options available, engineers consider various design options on their advantages and decide and accept the best solution that matches requisites.

With the scientific knowledge of engineering, the engineers' significant and peculiar function is to distinguish, comprehend and explain the challenges on a design to produce a thriving result. It is normally not sufficient to come up with a technically successful product, it must also meet further requirements, constraints may include available resources, physical, imaginative or technical limitations, flexibility for future modifications, and additions and other factors such as requirements for cost safety, marketability, productibility and serviceability. By comprehending the challenges, engineers obtain specifications for the bounds inside that is available, things or systems can be developed and put to use.

### **The Role of Mechanical Engineer in National Development**

Mechanical Engineers function in variety of establishments in countries such as power generation companies, public utilities, transportation companies and types of manufacturing which constitutes national development.

Mechanical engineers are engineers who are highly trained with scientific knowledge in engineering specialized in designing and developing engines and other systems which primarily convert energy to useful mechanical forms. The mechanical engineer according to Egboh (2009) is an engineer who specialized in mechanical machine design, thermodynamics/ heat transfer, air conditioning and refrigeration, computer aided design in mechanical engineering systems.

The concept of National development pertains to the capability of a nation or nations to enhance the social wellbeing of the populace by making available social amenities such as qualify education, employment opportunities, portable water, transportation, infrastructures, and medical care (Fosu, 2010). From this view, a country gets national development at the time unfavorable conditions of social difficulties are properly handled by maintaining a very active social system. Webster (2004), in Ahiakwo (2007) sees National development as the sum total of the results of the functional relationship between manual and intellectual labour of a nation in the struggle for self-sustenance. It involves everything that is done within a nation with a view to uplifting nation with view to uplifting the standard of men, women and materials. National development to be achieved in nation, social challenges must be effectively tackled particularly because unfavorable conditions, situations or circumstances in an economy that are consequences of absence of effective social systems or failure of the existing ones are evidences of an under developed nations (WESS, 2013). National Development according to Benemone (2021) refers to nation building which encompasses national cohesiveness, universal literacy, improved health and living conditions among the peoples, peoples, peoples wellbeing in the economic field, provision of good infrastructures, electricity, portable drinking water, good communication systems employment opportunities, transportation.

The predominant role or function of mechanical engineer in national development cannot be over reemphasized. Most importantly, mechanical engineers contributed tremendously towards national development in the following ways:-

- (1) Mechanical engineers design, operate and test all kinds of machines for the efficient and effective use by all people within and outside a nation, which promotes the standard of living of peoples.
- (2) Many Mechanical Engineers focus on research and development because new types of machines are continually in demand, therefore they involved in almost every other branch of engineering and design a new or improved machine, device or piece of equipment for the required in the nations.
- (3) Mechanical engineers develop and build engines that produce power from steam; gasoline, nuclear fuels and sources of energy.
- (4) They also develop and build wide range of machines that use power including air conditioning, heating and ventilation equipment, automobiles, machines tools and industrial processing equipment
- (5) Mechanical Engineers are engaged in every phase of the development of a machine, from the construction of an experimental model to the installation of the finished machine and the training of workers who will make use of it.
- (6) Mechanical engineers function in various establishments in nations such as power generation companies, public utilities, transportation companies and all types of manufacturing because they are the key to maintenance and repairs of all kinds of machines.

(7) Mechanical engineer makes adjustments to a wind turbine as well as involved in every phase in the development of a machine from its design to its final installation and again developed related facilities for reducing traffic problems of a nation.

(8) Mechanical engineers deal with such items as motor, control mechanisms, transport systems, (automobiles, trains, space vehicles etc), refrigeration and air conditioning systems, propulsion systems, etc.

#### **Career Opportunities for Mechanical Engineers.**

The Mechanical Engineers according to Egboh (2009) find their professional career opportunities in almost all areas of government, industry and society at large in Nigeria because of the broadness and versatility of this discipline. In fact, there is hardly any industry or organization where an engineer is not employed and a mechanical engineer will not be needed where as the reverse is often found.

Thus, mechanical engineers do work in places varying from hospitals to steel companies. Mechanical engineers form the bulk of the Engineers in both upstream sub-sectors of the oil industry. Typical sectors which are employers of mechanical engineers include; lecturing, construction, steel, machine tool, Government Parastatals /Agencies/Departments/Ministries, Consulting firm, Research Institute, Oil and Gas Companies, Brewing Industries, Petro – Chemical, Manufacturing companies, Marketing etc.

There are also many self-employment opportunities for mechanical engineers in Nigeria such as;

- Opening Mechanic Workshop for vehicle repairs
- Plant Maintenance and servicing
- Air-conditioning and refrigeration design
- Installation, repairs and services of garri processing machines
- Services and maintaining welding fabrication machines.
- Training and developing mechanics, Technologists
- Training and developing of mechanic technicians, craftsmen and draughtsmen
- Machine Marketing and Consultancy Services etc.

#### **Challenges of Mechanical Engineers in Nigeria**

Mechanical engineers have dual career opportunities both in the Government (ie Public Sector) or in the private sector and in self-employment opportunities. Today, many new fields of engineering are continually emerging as a result of scientific and technological breakthroughs. At the same time, the boundaries between the various fields are becoming less and less clear-cut. Numerous areas of engineering overlap and engineers from different specialties often work together on projects may be sidelined in other works.

In Nigeria today, most of our engineers are practically trained in our tertiary institutions to meet up most of the demands of the peoples in the society because the educational systems of Nigeria is much more on theoretical because we inherited this from the British Colonial Masters in the Colonial era. Today, many mechanical engineers in Nigeria cannot design and develop a machine though, we may one out of hundreds can produce machine or design and create machine. Generally, this is a serious problem in Nigeria in which the school management right from the secondary should encourage effective practical science works.

Another challenge is discrimination in Nigeria certificates of inequality between HND holders and DEGREE (B.ENG) holders as the result of that many companies and Government offices give preference to Bachelor's degree than Higher National Diploma Certificates for employment. This in fact, truncates many Nigerians from going to polytechnic education for engineering courses. To be precise, engineering comprises of four groups of personnel whose jobs are interwoven with one another. They are Engineers, Technologists, Technicians and Craftsmen/Draughtsmen. These are persons who graduated from the University's five years engineering degree programme and who use the knowledge of mathematics and natural sciences gained by study, experience and practice, applied with judgment to solve problems for the benefit of

humans. Among these four engineering groups, apart from the Engineers proper, other three groups Technologists, Technicians and Craftsmen/Draughtsmen are discriminated by the Engineers.

One other challenge is greed for money making, then most mechanical engineers do not maintain standards in performing or discharging their real mechanical projects well. In fact, the Nigeria Society of Engineers (NSE) ought to have strict adherence to the engineering ethics or code of operations by the performance of their members as well as quality standard maintenance is now so loosed that engineering works may sometimes be haphazardly done or not done at all, which invariably truncates the stability of the economy.

Low standard of Engineering of Education in Nigerian Universities and Polytechnics is another challenge to our nation, at least a complete year in the five years B.(Eng) degree Programme or two years HND engineering programme should be for practical works as well as special engineering projects to be undertaken practically so as to enhance their vocational skill before graduation. But this is not put in place. This retards the practical knowledge of our engineering graduates today in Nigeria.

### 3. CONCLUSION AND RECOMMENDATIONS

We have discussed so far the engineering practice in Nigeria with special focus on mechanical engineers role and challenges in national development. Precisely, mechanical engineers emerged as specialists in industrial machinery and mining. Both Government and Universities/Polytechnics Management should encourage practically based training mechanical engineering programmes for Nigerians. Then every undergraduates of mechanical engineering both in University and Polytechnic education should try as much as possible to be practically vast in the course.

Another recommendation is that the policy makers should try as much as possible to make a new policy to balance all engineering course graduates on equal level of promotion and employment in the Public sector. Still in this, there should be no discrimination between B. Eng (degree) and HND in engineering courses. The government at all levels should encourage practical engineering education in Nigeria.

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