

**ENGINEERING LAW AND MANAGERIAL
ECONOMICS FOR INFRASTRUCTURAL
DEVELOPMENT IN NIGERIA:
CHALLENGES AND WAY FORWARD.**

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ABSTRACT

A key concern for any engineer is where and how to focus limited resources to solve real life problems. Managerial economics is important for the improvement of managerial decisions and providing solutions to problems. Engineers are faced with a lot of challenges and the Nigerian engineers are no exception. This paper discusses the following:

- Engineering profession.
- Engineering law.
- Engineering ethics.
- The history of Engineering in Nigeria.
- Engineering challenges in Nigeria and the way forward for sustainable development.

Keywords; Engineer, Engineering, Engineering law, Engineering challenges, Sustainable development.

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INTRODUCTION

Engineering law refers to the application of laws applying to the practice of professional engineering. Engineering law is the study of how ethics and legal frameworks should be adopted to ensure public safety surrounding the practice of engineering.

The practice of engineering is largely separated from the practice of a natural scientist by engineering law. A semiconductor physicist and an electrical engineer, practising at a large company are mainly differentiated by the laws they are practising under and the licence they carry. The laws and the licence will affect the tasks that can be performed by the engineer compared with the tasks that can be performed by a natural scientist. Engineers are held to a specific legal standard for ethics and performance while a natural scientist is not. Engineers are subject to disciplinary measures such as fines or loss of licence for professional misconduct and negligence.

Nigeria as a nation has faced several engineering issues and challenges since her independence in 1960. These issues, such as power supply, water supply, housing, roads, hospitals, communication, educational buildings, etc., are basic requirements for the social and economic well-being of the nation.

The issue now is the extent to which Nigerian Engineers respond to these engineering challenges for sustainable development. Much has been written about sustainable development. The varying definitions are based on the economic, social, environmental and political realities. Sustainable development suggests a condition wherein the decisions undertaken today do not prevent possible alternative decisions in the future. In addition, it is generally accepted that sustainable development is driven by a need to demonstrate increased environmental awareness in our day-to-day lives and decision making. Hence, Nigerian Engineers just as their counterparts in other parts of the world who have acquired the knowledge which would enable them to harness and direct the resources of nature for the benefit and convenience of mankind, should be able to harness and direct the resources of nature for the economic, social, environmental and political well-being of mankind.

ENGINEERING (PROFESSION)

The American Engineers' Council for Professional Development defines Engineering as: "The 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 behaviour under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property."

Engineering is the use of scientific principles to design and build machines, structures, and other items, including bridges, tunnels, roads, vehicles, and buildings.

The term *engineering* is derived from the Latin *ingenium* meaning, "cleverness" and *ingeniare*, meaning "to devise".

A profession is an occupation founded upon specialized educational training, the purpose of which is to supply disinterested objective counsel and service to others, for a direct and definite compensation, wholly apart from expectation of other business gain. It is a paid occupation, especially one that involves prolonged training and a formal qualification. There are a number of characteristics which distinguishes a profession from other less formally constituted trades and occupations:

- (i) The professional discipline has a command of a specialized body of knowledge necessary for planning, design, construction and operation of physical structures or engines/machines.
- (ii) The body of knowledge is transmitted through recognized training and regularly updated on behalf of the professional body to ensure certified standards of proficiency.
- (iii) A code of Ethics and standards govern the practice of the profession and ensure the satisfaction and safety of the client in particular and the society in general.
- (iv) The members are committed to constant educational renewal through a lifelong learning of latest technology and professional development.

- (v) The professional body is legally to regulate itself, discipline its members and control the practice of the profession. The engineering profession exists in every aspect of human endeavour cutting across religious, socio-cultural, economic and political barriers; hence engineering is a way of life.

ENGINEERING ETHICS

Ethics is defined as “moral principles that control or influence a person’s behaviour”. Engineering ethics is the field of system of moral principles that apply to the practice of engineering. The field examines and sets the obligations by engineers to society, to their clients, and to the profession.

The following is an example from the American Society of Civil Engineers:

- i) Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.
- ii) Engineers shall perform services only in areas of their competence.
- iii) Engineers shall issue public statements only in an objective and truthful manner.
- iv) Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
- v) Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
- vi) Engineers shall act in such a manner as to uphold and enhance the honour, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.
- vii) Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.
- viii) Engineers shall, in all matters related to their profession, treat all persons fairly and encourage equitable participation without regard to gender or gender identity, race, national origin, ethnicity, religion, age, sexual orientation, disability, political affiliation, or family, marital, or economic status.

ENGINEERING LAWS

Engineering law refers to the application of laws applying to the practice of professional engineering. Engineering law is the study of how ethics and legal frameworks should be adopted to ensure public safety surrounding the practice of engineering.

Law can be defined as those rules and regulations, backed by sanctions when flouted, which guide the conduct and behaviour of members of a community or society, and which they accept and consider as binding.

Engineering law is important to every engineer because they help guide with construction, contracts, consultancy services on capital projects, design, analysis, fabrications, adjudication of tender, bill of engineering measurements and evaluation.

These laws are gotten from various sources. These sources include;

- i) The constitution
- ii) Customary law
- iii) Common law
- iv) Legislation
- v) Case law
- vi) International treaties

HISTORY OF ENGINEERING IN NIGERIA

Government establishments and private entrepreneurs in Nigeria have been addressing themselves to the problem of developing technology that is definitely a solution to improving the quality of life of the people, maximization of the use of available resources and creation of more job opportunities. The history of engineering in Nigeria traces its roots to the establishment of the Public Works Department (P.W.D) of Southern Government in Lagos in 1896. The Public Works Department comprised mainly of three sections (Civil,

Mechanical and Electrical). It was responsible for the management of engineering problems in Nigeria.

However, modern engineering in Nigeria revolves around two main bodies, namely;

NIGERIAN SOCIETY OF ENGINEERS (NSE)

Nigerian Society of Engineers is the umbrella organization for the Engineering Profession in Nigeria. The Society looks after the professional needs of members through well-structured programmes and regular interactions among the different cadre of membership, enhancing high professional standard and ethical practices.

The Organisation was founded on 16th February, 1958 major challenge by a group of young Nigerian graduate engineers and students in the UK, the Society was inaugurated at the Nigerian House in London. The NSE is registered with the Corporate Affairs Commission as a company Limited by guarantee.

It was incorporated as a Company limited by guarantee and not having a share capital in 1967. The original Memorandum and Articles of Association were amended on 1st December 1998. Like some of its counterparts in other professions, the Society has distinguished itself through progressive and imaginative programmes to become the avenue for the professional development of its members as well as technological development of the country.

COUNCIL FOR THE REGULATION OF ENGINEERING IN NIGERIA (COREN):

The Council for the Regulation of Engineering in Nigeria, COREN, was established by decree 55 of 1970 and amended by Decree 27 of 1992, now the “Engineers (Registration, etc.) Act, CAP E11 of 2004” Law of the Federal Republic of Nigeria. The Act establishes COREN as a statutory body of the Federal Government empowered to regulate the Practice of Engineering in all aspects and ramifications in Nigeria.

ENGINEERING CHALLENGES IN NIGERIA

Engineers are, by definition, problem solvers and innovators. Whether it is to do with transportation, buildings, medical devices or energy sources, engineers are always looking for ways to make everyday life better for their fellow human beings. With the rapid rate at which changes are taking place in Nigeria today and the world as a whole, we all have to keep on our toes to stay ahead of the curve, and this is especially true in the engineering world. To this end, here are some of the greatest challenges engineers' faces in Nigeria today:

NO MOTIVATION FOR RESEARCH AND DEVELOPMENT:

In advanced countries, Engineers are given special grants and an enabling environment to research about their profession and bring out lasting solutions to problems of technology in the country. But it is no longer news that Nigeria isn't interested in such a program. The government has left everything to chance and even those who try to come with exciting ideas that could solve a specific problem technologically would not receive enough motivation or special grants to carry on the project. This therefore kills the creativity of Engineers in Nigeria.

LACK OF SUITABLE JOBS:

In most government and private establishments in Nigeria, engineering personnel are assumed to know all. A civil engineer can be employed to do the work of an electrical engineer, chemical engineer, Mechanical Engineer etc. at the same time instead of seeking the services of engineering professionals in these other areas of engineering.. How can their expertise be utilized given the fact that their job description is totally out of what they are trained for? Situations where engineering graduates are employed in the banking sector as accountants and they are made to learn on the job constitute some of the challenges engineers face.

CORRUPTION:

Most engineering projects in the country are carried out using the “fifty percent 50%) rule”, thereby eating the capital and not the profit. That is, contractors giving even more than 50% of the total cost of a project to some corrupt government officials and politicians before actually embarking on a project and in most cases, since the remaining part of the money will not be enough to do the job, the project may not be carried out and if it is carried out at all, it is usually sub-standard or abandoned.

NON-ENGINEERS CARRYING OUT ENGINEERING CONTRACTS USING ENGINEERING CREDENTIALS:

Most engineering contractors carry out engineering projects using engineering credentials of engineering professionals in order to win or get engineering contracts.

EXISTING ENGINEERING FACILITIES AND INFRASTRUCTURES NOT BEING UPGRADED OR MAINTAINED:

Most engineering establishments ever since they were commissioned have not been upgraded, thereby not able to meet up with the present-day demand.

Our industries and infrastructures are built “once and for all” without any routine maintenance work, the result is the general decay of industries and infrastructures in the country.

ENGINEERS NOT FELLOWSHIPING WITH COLLEAGUES:

Most engineering personnel occupying managerial positions are not registered with the Nigerian society of Engineers (NSE) and the council for the regulation of engineering in Nigeria. (COREN). Hence, such people may seem not concern with the advancement of engineering and technology in the country.

WAY FORWARD

- 1) Government should make money available for engineering research and development, in order for the country to advance technologically.
- 2) Different engineering personnel in various fields should be employed in all engineering Departments in both government and private establishments, so that specific jobs can be given to an engineer in his/her chosen area of specialization. That is, there should be division of labour.
- 3) Engineers should be disciplined and avoid non-engineers using them to achieve their selfish aim. They should only tender their certificate when they are involved in a project. And establishments should be mandated by the Nigerian society of engineers, to employ at least one registered engineer.
- 4) Routine maintenance work should be carried out, on a regular basis after a project have been commissioned, this will increase the life span of such infrastructures and facilities.
- 5) Existing engineering facilities and infrastructures should be upgraded with the present-day state of the art facilities in order to meet up with the present-day demand.
- 6) Engineering conferences organized in Nigeria should always adhere to workshop sections after technical paper presentation; this will go a long way to develop our local technology.
- 7) Just as the office of the Attorney General is occupied by a lawyer, the offices of the ministers and commissioners of Energy, Works and Housing, Environment and Transport should be especially for engineers.
- 8) Reverse engineering should be introduced into our educational curriculum, in order to make technology transfer very easy, we should all embrace the popular "Igbo-made "and stop using foreign labels on our locally manufactured goods.
- 9) Engineers should be mandated to belong to their professional bodies and without this, they should not be allowed to practice. That is, they should be mandated to fellowship with their professional colleagues.

10) The pay package of engineers in Nigeria should be commensurate with their counterparts in Europe and America, so that they will not be tempted to eat the capital of any project.

CONCLUSION

In conclusion, it is my candid opinion that if the above challenges highlighted are seriously attended to by adopting the above solutions, our country Nigeria and the world at large will be a better place and human life will be better safeguarded.

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ENGINEERING (PROFESSION)

- Engineering is the application of science to the optimum conversion of the resources of nature to the uses of mankind.
- One who practices engineering is called an Engineer.
- Engineers find suitable solutions to the problems at hand.

ENGINEERING ETHICS

- Ethics is defined as moral principles that control or influence a person's behaviour.
- Engineering ethics is the field of system of moral principles that apply to the practice of engineering.

ENGINEERING LAWS

- Laws are rules of conduct developed by the government or society over a certain territory.
- Engineering law is the study of how ethics and legal frameworks should be adopted to ensure public safety surrounding the practice of engineering.

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- NO MOTIVATION FOR RESEARCH AND DEVELOPMENT.
- LACK OF SUITABLE JOBS.
- NON-ENGINEERS CARRYING OUT ENGINEERING CONTRACTS USING ENGINEERING CREDENTIALS.

ENGINEERING CHALLENGES IN NIGERIA

- **CORRUPTION**
- **EXISTING ENGINEERING FACILITIES AND INFRAASTURES NOT BEING UPGRADED OR MAINTAINED.**
- **ENGINEERS NOT FELLOWSHIPPING WITH COLLEAGUES.**

THE WAY FORWARD

- IMPROVED GOVERNMENT AIDS
- ENGINEERS SHOULD DISCIPLINED
- ENGINEERING CONFERENCES AND WORKSHOPS SHOULD BE ORGANIZED
- REGULAR UPGRADE AND MAINTENANCE OF FACILITIES AND INFRASTRUCTURE

CONCLUSION

In conclusion, if the above challenges highlighted are seriously attended to by adopting the above solutions, our country Nigeria and the world at large will be a better place and human life will be better safeguarded.

THE END