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**A TERM PAPER ON ENGINEERING LAW AND MANAGERIAL ECONOMICS FOR INFRASTRUCTURAL DEVELOPMENT IN NIGERIA :CHALLENGES AND THE WAY FORWARD**

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**CERTIFICATION**

This is to certify that the project is written by **OKPALA CHARLES CHIEMERIE** with matriculation number **17/ENG03/040** in the department of Civil Engineering College of Engineering Afe - Babalola University, Ado Ekiti (ABUAD) during the 2019/2020 academic session under my supervision.

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**DEDICATION**

 I would like to thank and dedicate this report to the Almighty God for his grace throughout the programme. Also I would like to appreciate my parents Engr. Chris Okpala and Lady Roseline Okpala for their financial, spiritual and mental support.

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 Firstly, I want to appreciate God for his love guidance and his mercy for making this programme a success.

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**ABSTRACT**

Engineers have added responsibility and that is to include economics in their calculation and decisions to solve real life problems. The purpose of managerial economics is to provide a systematic framework for problem analysis and solution. The pluses and minuses of various decision alternatives must be reliably measured time differences must be accurately reflected. Five civil engineering projects were studied to check the compliance with engineering law in the country and managerial economics strategy. Two capital projects were compared for adequate financial justification and compliance with the regulatory law. Analysis were done. It has been concluded that management is crucial to the success of engineering projects.

Infrastructure is a basic essential services that should be put in place to enable development to occur. Economic development of Nigeria can be facilitated and accelerated by the presence of infrastructure. If these facilities and services are not in place development will be very difficult and in fact can be likened to a very scarce commodity that can only be secured at a very high price and cost. The provision and development of infrastructures have been the subject of much theoretical analysis and empirical studies. This study in line with has tried to evaluate infrastructural development and economic growth of Nigeria, using simultaneous analysis. In this study, two models are specified, and after applying the substitution method (reduce from equation), the two models are specified and after applying the substitution method.

The study examines the role of infrastructure development in national economic growth. A model was specified for the purpose and secondary quarterly data was collected for the period 2000-2010. The objective of this research was primarily to investigate the level of telecom infrastructure development on the Nigeria economy.

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 **CHAPTER ONE**

**INTRODUCTION**

 It takes little analysis to see that infrastructure plays a role in the economy of a country whether developing or developed. The need for good infrastructure management is of great importance to the economics of countries all over the world and the various sectors of the economy need to be understood. The world is fast becoming a global village.

 Engineers perform services or creative works as consultation, testimony, investigation, evaluation, planning, analysis, design and design coordination of engineering works and systems, planning the use of land and water, performing engineering surveys and studies and the review of construction or other design products for the purpose of monitoring compliance with drawings and specifications. Engineering law (or law in engineering) is the empirical study of the application of laws and legal strategy in engineering. Law can be defined as those rules and regulation backed by sanctions when flouted, which guide the conduct and behavior of members of a community or society, which they accept and consider as binding.

 The knowledge of engineering law is important to every engineer as we are involved in construction, contracts, consultancy services on capital projects, design, analysis, fabrications, adjudication of tender, bill of engineering measurements and evaluation.

 When alternative courses of action are available the decision that produces a result most consistent with managerial objectives is the optimal decision. The process of arriving at the best managerial economics.

 Forecasting refers to the process of analyzing available information regarding economic variables and relationships and then predicting the future values of certain variables of interest to the firm or economic policymakers. A good forecast should be timely, simple to understand, accurate, reliable and cost effective.

**DEFINITION OF TERMS**

**Infrastructure;**  This refers to the basic physical and organizational structures needed for the operations of a society or enterprises or the service and facilities necessary for an economy to function. The term typically refers to the technical structures that support a society such as roads, water supply, sewers, electrical grids, etc. viewed functionally infrastructure facilities the production of goods and services

**Economy;** An economy consists of the economic system of a country or other areas, the labour, capital and land resources and the economic agents that socially participate in the production, exchange, distribution and consumption of goods and services of that area.

**Economic Growth;** This is defined as the increasing capacity of the economy to satisfy the wants of goods and services of the members of the society. Economic growth is enables by the increase in productivity which lowers the inputs (labour, capital, material, energy etc.) for a given amount of output. Economic growth is concerned with the long run trend in production due to basic causes such as industrialization.

**Economic Development;** This refers to the increase in the standard of living in nation’s population with sustained growth sustained growth from a simple, low income economy to a modern high income economy.

It typically involves improvements in a variety of indications such as literacy rate, life expectancy, and poverty rates. A country’s economic development which encompasses among other things health and education.

 **CHAPTER TWO**

**ENGINEERING LAW**

 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. California law defines engineering as the professional practice of rendering services or creative work requiring education, training and experience in engineering sciences and the application of special knowledge of the mathematical, physical and engineering sciences in such professional or creative work as consultation, investigation, evaluation, planning or design of public or private utilities, structures, machines, processes circuits, buildings, equipment or projects and supervision of construction for the purpose of securing compliance with specifications and design for any work. By comparison Ontario lists safeguarding of life and public welfare in its definition.

 Ontario law defines engineering as the act of planning, designing, composing, evaluating, advising, reporting, directing or supervising that requires the application of engineering principles and concerns the safeguarding of life, health, property, economic interest, the public welfare or the environment, or the managing of any such act.

 The practice of engineering is largely separated from the practice of a natural scientist by engineering law. A Semiconductor physicist and an electrical engineer, practicing at a large company are mainly differentiated by the laws they carry. The laws and the license 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. Engineers are subject to disciplinary measures such as fines or loss of license for professional misconduct and negligence.

 Sources of law is a legal term that refers to the authorities by which law is made. There are a number of different sources that are used to define the creation and force of law, though not all are used equally. Some examples of sources include legislation, government, regulation, court decisions and custom.

 Several factors of law have contributed to the development of law. These factors include

* The constitution
* Customary law
* Common law
* Legislation
* Case law

These are the participants in the law

* Legislature
* Judiciary
* Police and others

**There are two main kinds of law: CRIMINAL LAW and CIVIL LAW**

 Civil law and Criminal law are two broad and separate entities of law with separate sets of laws and punishments. The difference between civil and criminal law turns on the difference between two different objects which law seeks to pursue, redress or punishment. The object of civil law is the redress of wrongs by compelling compensation or restitution the wrongdoer is not punished he only suffers so much harm as is necessary to make good the wrong he has done. The person who has suffered gets a definite benefit from the law, or at least he avoids a loss. On the other hand, in the case of crimes, the main object of the law is to punish the wrong doer, to give him and others a strong inducement not to commit same or similar crimes, to reform him if possible and perhaps to satisfy the public sense that wrongdoing ought to meet with retribution.

 Examples of criminal law includes cases of burglary, assault, Battery and cases of murder. Civil law applies to cases of negligence or malpractice

|  |  |  |
| --- | --- | --- |
| Definition  | Civil law deals with the disputes between individuals, organizations, or between the two, in which compensation is awarded to the victim | Criminal law is the body of law that deals with crime and the legal punishment of criminal offenses. |
| Burden of proof  | “Preponderance of evidence” The burden of proof falls on the plaintiff. | “Beyond a reasonable doubt” Burden of proof is always on the state/government |
| Examples  | Landlord/tenant disputes, divorce proceedings, child custody proceedings, property disputes, personal injury etc. | Theft, assault, robbery, trafficking in controlled substances, murder, etc. |
| Type of punishment | Civil litigation usually involves some type of compensation for injuries or damages as well as disposition of property and other disputes. | A guilty defendant is punished by incarnation and/or fines or in exceptional cases, the death penalty. Crimes are divided into two broad classes; felonies and misdemeanors |
| Case filed by  | Private party | Government  |
| Appeal  | See state court jurisdiction | See state court jurisdiction and case flow |

**CONTRACTS**

A contract is a legal agreement between two parties which is enforceable in a court of law or by binding arbitration. In other words, a contract is an exchange of promises with a specific remedy for breach of those promises.

A contract must contain

* An offer which is made and accepted
* Mutual intent to enter into the contract
* Consideration
* Capacity and
* Lawful purpose

A contract will contain a number of terms as well perhaps supporting documentation. A term requiring performance of one of the parties is said to specify an obligation for that party. An obligation essential to the contract is called a condition while a non essential obligation is called a warranty. A term obligating a party to not do something is negative covenant.

**INTERPRETING A CONTRACT**

 The rule of contra proferentem is used in interpreting the terms (i.e against the party drafting the term) and while there may be implied terms (see the Moorcock, 1889), no addition or variation to terms can be made by parol evidence(by verbal but not written terms)

 **DISCHARGING A CONTRACT**

 The contract is discharged (concluded) when all parties have satisfied their obligations, when there is an agreement to discharge, by the terms of the contract, or by frustration

 **BREACH OF CONTRACT**

 If a party, under the terms of the contract, fails to perform one or more obligations, it is said to be the defaulting party and it has breached the contract with the innocent party. The breach of an obligation may result in damages to the innocent party for which the innocent party may seek a remedy, but it requires a breach of condition for the innocent party to consider the contract discharged by the breach.

 **CHAPTER THREE**

 **MANAGERIAL ECONOMICS**

 Managerial economics deals with the application of the economic concepts, theories, tools and methodologies to solve practical problems in a business. In other words, managerial economics is the combination of economics theory and managerial theory. It helps the manager in decision making and acts as a link between practice and theory. It is sometimes referred to as business economics and is a branch of economics that applies microeconomic analysis to decision methods of businesses or other management units.

 As such, it bridges economic theory and economics in practice. It draws heavily from quantitative techniques such as regression, analysis, correlation and calculus. If there is a unifying theme that runs through most of managerial economics, it is the attempt to optimize business decisions given the firm’s objectives and given constraints imposed by scarcity for example through the use of operations research, mathematical programming game theory for strategic decisions and other computational methods

 Managerial economics is a discipline that combines economic theory with managerial practice. It tries to bridge the gap between the problems of logic that intrigue economic theorists and the problems of policy that plague practical managers. It is also concerned with the application of economic concepts and economic analysis to the problems of formulating rational managerial decisions

**THE ROLE OF MANAGERIAL ECONOMICS INCLUDE**

* He studies the economic patterns at macro level and analysis its significance to the specific firm he is working in.
* He assists the business planning process of a firm
* He also carries cost benefit analysis
* He assists the management in the decisions pertaining to internal functioning of a firm
* A managerial economist helps the management by using his analytical skills and highly developed techniques in solving complex issues of successful decision making and future advanced planning
* Project management
* The application of knowledge, skills tools, and techniques to project objectives to meet stakeholder needs and expectation.
* Achieving quality on projects
* Quality of the management process
* Quality of the product

Study of managerial economics helps in the enhancement of analytical skills, assists in rational configuration as well as solution of problems.

 Management can be defined as the organ or body of an organization specifically charged with planning, organizing, directing and controlling the use of the organization’s resources effectively and economically to attain the organization’s objectives.

 Managerial economics for engineers is concerned with the systematic evaluation of the costs and benefits of proposed technical and business projects. It involves technical-economic analysis with a decision assisting objectives; mathematical modelling with emphasis on the economic effects is the primary analytical technique used to select between defined feasible alternative

 **CHAPTER FOUR**

**THE BENEFITS OF INFRASTRUCTURE IN NATIONAL DEVELOPMENT**

 The African Development Bank (ADB) has made infrastructure development a cornerstone in its development agenda with regional member countries (TMSA, 2012). The Bank recognizes that lack of adequate social and economic infrastructure is one of the key constraints to short- and medium-term poverty reduction in Africa, and has thus been a major force in private and public sector infrastructure development through the provision of financial and technical resources. At the same time, the Bank recognizes the increasing importance of governance for infrastructure development and has made good governance an imperative in its lending and non-lending operations.

 There have been considerable changes in the delivery of national infrastructure services across Africa. While Nigeria has improved its telecommunication infrastructural situation, it has not improved in other areas like health, education, airport infrastructures, electricity, housing and transportation. However, performance in terms of infrastructure service delivery and quality continue to vary across countries. Infrastructure is the medium of production of goods and services and forms the national asset of any nation. According to Kathmandu Final Workshop Report (2009), infrastructure can help solve four problems: social; health and environment; development; and, economics. A region's infrastructure network, broadly speaking, is the very socio-economic climate created by the institutions that serve as conduits of trade and investment. Some of these institutions are public, others private. In either case, their roles in the context of integration are transformative, helping to change resources into outputs or to enhance trade by removing barriers. Therefore, an improvement in regional infrastructure is one of the key factors affecting the long-term economic growth of a region. The linkages between infrastructure and economic growth are multiple and complex. Not only does infrastructure affect production and consumption directly, it also creates many direct and indirect externalities. It also involves large flows of expenditure, thereby creating additional employment. Studies have shown that infrastructure can have a significant impact on output, income, employment, international trade, and quality of life. Infrastructure development can reduce stress and promote good health. It will also reduce crime level.

 Infrastructure has always played a key role in integrating economies within a region. Well developed and efficient infrastructure is essential for a region's economic development and growth. In a dynamic concept, infrastructure is seen as a regional public good that moves factors of production within and across countries, thus helping the region attain higher productivity and growth.

 **CHALLENGES AND WAY FORWARD**

 The provision of infrastructure services to meet the demands of business, household and other users is one of the major challenges of economic development.

 The provision of economic infrastructure can expand the productive capacity of the economy by increasing the quality and quantity of such infrastructure. The transformation curve or the production possibility frontier or curve would shift with the expansion of the economic infrastructural base, thereby accelerating the rate of economic development. Better management of economic infrastructure would have positive output, income and employment effects on the economy. Moreover, it will impact directly on the poor, thus reducing poverty. Education is a very important source of economic growth. It is also an economic investment since it enhance the stock of human capital.

 Road infrastructure has been found to be a significant factor of economic growth and development. The development of seaports as an economic infrastructure assumes that like roads, communications and other economic infrastructure ports have a positive impact on the growth and developments of countries. Without ports America might not have been explored. Today the United States of America is one of the leading economic global power. Seaports are an economic infrastructure with significant multiplier effects on the domestic economy. Infrastructure will provide benefits to rich and poor equally because of the non-exclusionary nature of the consumption of public goods and services it provides. To the extent that infrastructure improves the quality of life for the poor; the development of infrastructure is likely to alleviate poverty

 Infrastructure of any country is of immense importance to that country whether developed or developing. It is therefore of utmost necessity that the various infrastructure of a country should be managed in proficient ways which will serve not only as pride to such country but also as an encouragement to other countries towards economic development.

**CHALLENGES OF INFRASTRUCTURAL DEVELOPMENT IN NIGERIA**

The challenges of infrastructure development in Nigeria are:

- **Dearth of Visionary Leaders**: Visionary leaders are the builders of a new dawn, working with imagination, insight, and boldness. They present a challenge that calls forth the best in people and brings them together around a shared sense of purpose. Visionary leaders are change agents. Nigeria contains few change agents and therefore lacks theD needed infrastructure to develop the nation.

- **Demand and supply**: Due to poor performances of most past leaders in the area of infrastructure provision, the agitation for infrastructure development overwhelms the provision. With a land mass of 9,110,000 square kilometers of land and over 150,000 million people, Nigeria has a total road network of 193,200KM. This comprise of 34,123KM federal roads, 30,500KM state roads and 129,577 KM local government roads. Unfortunately, over 70% of the federal roads are in bad state of repair. In the area of housing, Nigeria requires about 17 million housing units and 60 trillion naira in order to meet its housing needs.

**- Pestles analysis**: The challenges of infrastructural development in Nigeria can be discussed under PESTLES Analysis. Challenges infrastructural development can be: political, economic, social, technology, legal, environmental and safety. Political environment has to do with the political stability, policy formulation and politics of the project environment both within and without. Economic environment deals with issues like interest rate, inflation, currency exchange rate, price fluctuation etc. Social environment has to do with workforce diversity including cultural difference, age difference etc. Technology environment deals with the machineries which are used for the execution of projects. Physical environmental issues like site topography, geology and climatology is also essential. Safety issues have to do with health and safety and security of resources on site, that is, human, material and financial. While some countries have been able to implement individual projects to alleviate those difficulties, Nigeria does not have common strategic targets for infrastructure development. Good governance is crucial for ensuring the effective and efficient provision of infrastructure. This is largely because, firstly, good governance means that resource allocations will reflect national developmental priorities and thus respond to societal demands.

- **PARETO Analysis**: Pareto analysis is a statistical method in decision making that is used for the identification of a specific number of tasks that produce major impact. It uses the Pareto Principle (which is also called the 80/20 rule). It originated the idea that by doing specific 20% of the work, you can generate 80% of the benefits of doing the whole job. In terms of quality improvement, a large majority of defects (80%) are produced by a few key causes (20%). This is also known as the vital few and the trivial many. In project management, 80% of project delays are caused by 20% of tasks etc. It can also mean that 80% of the tasks are done by 20% of the workforce. The people in charge should strive to improve the number of workforce that are genuinely working.

- **Development Matrix**: The four requirements of any physical infrastructure projects are: design, finance, technology and management. The appropriate designs that will ensure value for money are not adopted. The finance is not adequate, is procured at high interest rates and financial management is lacked by most Nigerian contractors. The technology of construction is scarce and the management of infrastructure is lacking. The maintenance culture of Nigerians is poor thereby allowing most projects to decay.

- **Capital Flight, Capital Sink and Capital Stagnancy**: Infrastructure development projects in Nigeria suffer from capital flight, capital sink and capital stagnancy. A lot of materials and managerial services are procured outside the country. The contracts are full of loop-holes that allow leakages of funds. In some cases, there are over-design for the designers to earn more professional fees which are percentage of the contract sum. Capital stagnancy due to abandoned projects are also rampant.

- **Project Management**: Project management approach in project delivery evolved in the late fifties in the United States of America (USA) when it was first used by the American Army for military projects execution. The success recorded through project management approach in the Defense sector led to its establishment as a reliable method of project delivery in other sectors like construction, manufacturing, health Information Technology (IT), media, pharmaceutical, education and entertainment (Oyedele, 2012). The approach was introduced into United Kingdom (UK) in the early sixties. Countries like Hong Kong, Malaysia, Canada and Ireland have adopted this approach, but it is still unpopular in developing countries, especially in Nigeria. Risk management is necessary for all Nigerian projects.

- **Procurement Method**: The procurement methods being adopted are prone to criticisms. The Public Finance Initiatives, especially the Concession Method and Public/Private Partnership (PPP) are questionable and seems to mortgage others who are not part of the arrangement to the scheme’s future. The 105-kilometre Lagos-Ibadan Expressway which, under the PPP scheme, the federal government did concession to Bi-Courtney Consortium in 2009 for N89.53 billion for 25 years is not the best arrangement possible and has not change the situation of the road.

**- Corruption**: Corruption does not only raise the price of infrastructure, it can also reduce the quality of, and economic returns from, infrastructure investment. The corruption in Nigeria is very high and unbearable for effective infrastructural development. The Bureau of Public Procurement (BPP), the Independent Corrupt Practices Commission (ICPC) and Economicand Financial Crimes Commission (EFCC) have not been able to eradicate corruption in the country. The BPP has saved the country a whopping sum of N216.6 billion during the 2010 Appropriation year from its review of contract processes before the issuance of Certificate of No Objection.

**SOLUTION AND WAY FORWARD**

The only way Nigeria can solve its many problems is by giving its youth more opportunities to participate in the government, economy, and society. Young people are the prime beneficiaries of school improvement, and the percentage of youth in higher learning institutions is currently very high. If young people were in charge, the educational system in Nigeria would not be in its current state, and unemployment would be reduced.

At the same time, young people shouldn’t wait for good things to come to them; they need to take individual initiative. Youth empowerment and initiative will improve life for all Nigerians. Nigerian government officials and other elites need to share power with the country’s youth and listen to young peoples’ ideas for how to better the country. The young men and women of Nigeria are tomorrow’s elders and, if included, could transform Nigeria. Without the energy of youth, society will decay and perish.

In addition to minimizing corruption in the country, Nigerians should cultivate the habit of being patient. Many indulge in corrupt practices is because they are impatient and want to make quick money. In developed countries of the world like the United States, many Nigerians are locked up in the prisons and some have been killed because of their corrupt practices.

**CONCLUSION**

The challenges of infrastructure development in third world countries are many. The demand surpasses the supply and finance that will stimulate rapid provision is not there. Due to wide gap between provision and needs, the leadership classes are in arrears in all sectors. The political situation is not encouraging to foreign investors. Governments do not set the priority right in infrastructure development. Projects are supposed to meet objectives, but in most cases, projects embarked upon are white elephant projects.

Good governance will be the only antidote that can bridge the wide gap. Secondly, good governance promotes accountability, reduces corruption and therefore minimizes resource wastage through inefficiency. And finally, good governance ensures stability (economic and political) and reduces the level of risk associated with large and lumpy infrastructure investments. This in turn facilitates the mobilization of both public and private sector financing resources that are critical for infrastructure development.

The country has a big land mass that makes it possible to spread out. Connecting the people of Nigeria with roads, National Grid and potable water will be tasking. High cost of materials for infrastructure development is also a challenge. The local content of production of goods and services must be increased to reduce production cost. Corruption level in Nigeria is too high and allows incompetent hands to handle contracts. Professionals are not allowed to handle projects due to corruption. The cost of governance and recurrent expenditure are so high leaving little for capital expenditure. The high level of unemployment is a dis-incentive to market and to capital development.

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