**A TERM PAPER**

**ON**

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

**PREPARED BY**

**AJISAFE BOLUWATIFE AYOMIDE**

**17/ENG03/008**

**SUBMITTED TO**

**CIVIL ENGINEERING DEPARTMENT**

**COLLEGE OF ENGINEERING,**

**AFE BABALOLA UNIVERSITY, ADO-EKITI,**

**EKITI STATE, NIGERIA.**

**IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE BACHELOR OF ENGINEERING (B. ENG.) DEGREE IN CIVIL ENGINEERING.**

# **ABSTRACT**

 Engineers in their quest to provide sustainable development and economic growth through infrastructural development now have to put into consideration the various engineering laws and managerial economics in their processes for solving real life problems. The need for engineers need to have a systematic framework for problem analysis and solutions is the aim of imputing managerial economics in order to carefully analyze the advantages and disadvantages of various decisions. The need for adequate supply of infrastructure has long been viewed as a key ingredient for economic growth and sustainable development, both in the academic literature and policy debates. With the quest for economic development by governments in developing countries and the consequent emergence of public-private partnerships to deliver major infrastructural projects on time, within the approved budget and in accordance with the preset specifications. 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.

# **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. 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 such work. 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. It does not mean that the legal profession plays a part in every contract; the majority of contracts are executed with both parties satisfied with their involvement and these never come to the court. However, when there is a dispute, provided that the courts are satisfied that a valid contract existed, they will enforce the details of the agreement. 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. 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. In recent decades, the importance of infrastructure finance on economic, industrial, technological and social development of a country has dominated the policy discussions of developing countries, international donor agencies and developed countries. Financing infrastructure projects remains a major constraint in the delivery of efficient and improved infrastructural facilities across developing countries in general and Nigeria in particular. Infrastructure finance may be defined as all means or methods available for mobilizing the resources required to finance physical assets and services which are fundamental to the growth and development of an economy. Provision of good infrastructure can accelerate economic development and prosperity in developing countries just as maintenance of existing infrastructure can ensure that developed countries remain developed. The level of accumulated infrastructure facilities is, no doubt, one of the major indices for measuring development of an economy. With the rising demand for infrastructure co-moving with the accelerating pace of globalization and urbanization, the total global infrastructure investment requirement by 2030 for transport, electricity generation, transmission and distribution, water and telecommunications, according to the OECD, amounts to $71tn. The European Commission estimates that, by 2020, Europe will need between euro 1.5tn and euro 2tn of infrastructure investments. Kawalya-Kwaga (2014) emphasizes that the infrastructure gap in Africa per annum is $93 billion. Every month in the developing world more than five million people migrate to urban areas (Schwartz et al, 2014). Fast growing populations and rising urbanization rates in developing countries have also led to a global shortage of infrastructure services such as roads, rail, mobile and fixed line telecommunications, water and electricity, among others (Water UK, 2013). In such a rapidly growing and evolving global infrastructure market, there is need for proper understanding of infrastructure financing and its challenges in not only Nigeria but globally, since infrastructure finance has become a global business. While most infrastructure investments are local, the sources of finance are increasingly global. More so, the continuing need for infrastructure investment places huge demands on financial markets. The aggregate capital sourced by unlisted infrastructure equity funds (operating internationally) since 2004 is close to US$200bn for water infrastructure only (Water UK, 2013). In Nigeria road infrastructure, on an average, the annual funding requirement is estimated at N500b against an average budgetary allocation of N120bn with a deficit of N380bn. In 2012, out of the N143bn budgetary allocation for road infrastructure development only N110bn was released with deficit of N33bn unimplemented (Federal Ministry of works, 2013). This clearly depicts the dilemma of infrastructure financing using the traditional method of government budget. Pearson (2013) observes that if Africa is to effectively participate in the global trading environment and reach its true economic potential, it will require a level of investment in infrastructure that goes well beyond the capacity of the government. The private sector will need to be involved and if this is to happen then instruments to reduce risk level and increase returns will need to be developed – that is the public-private partnership (PPP). PPP, according to Brusewitz (2005), is a medium to long-term venture in which there are key contractual or legal relationship between the public and the participating private sector. PPP therefor refers to a project in which there is cooperation between the public and private sector(s) in one or more of the development, construction, operation, ownership or financing of infrastructure assets, or in the provision of services. Under a PPP arrangement the private sector is typically contracted to design, build, operate, manage and finance new infrastructure and meet government obligations for a set period of time. The major objective of this paper, therefore, is to present an overview of infrastructure finance through PPP and to examine some its challenges to the infrastructure development in Nigeria. Immediately preceding this introduction are methods of providing financing infrastructural development, its challenges and solutions.

# **WAYS OF PROVIDING AND INFRASTRUCTURAL DEVELOPMENT FOR ECONOMIC GROWTH; CHALLENGES AND WAY FORWARD**

1. **ROAD INFRASTRUCTURE AND ECONOMIC GROWTH:**

To access the contribution of road infrastructure to economic growth, a number of studies specified an aggregate production function that included transportation infrastructures among the explanatory variables. Antle in Uwagboe (2011), for example estimated a Cobb-Douglas production function for 47 developing countries and 19 developed countries. Infrastructure was specified as gross national output from transportation and communication industries per-square kilometer of land area. Antle found that transportation infrastructure was an effective factor of production. Canning and Bennathan (2000), using a co-integration method, estimated the rate of re-turns to paved roads for a period of 41 countries over the past four decades. Canning found out that the highest rate of return to roads infra-structure occurs in countries with infrastructures shortages. Canning and Bennathan (2000) also analyzed whether physical capital, labor and other infrastructure variables are complement or substitute to road is highly correlated with physical and human capital. He however found that the margined return to roads decline rapidly if the length of paved roads increased in Isolation from other inputs. A study carried out by Fan et al. (2005) on the impact of road investment a promoting production growth in China consistently showed the importance of road in-vestments in promoting production growth in China.

 Table 1: The contribution of road transportation to gross domestic product 1981-2013

Year Total Contribution of Growth rate of

 GDP(NM) road transport road transport

1981 47,619.7 2,328.7 -

1982 49,089.3 1,905.1 18.2

1983 53,107.4 1,860.9 2.3

1984 59,622.5 2,089.8 12.3

1985 67,908.6 3,030.5 45.0

1986 69,147.0 3,171.1 4.6

1987 105,222.8 3,430.0 8.2

1988 139,035.3 3,710.0 8.2

1989 216,797.5 4,019.6 8.3

1990 267,550.0 4,886.6 21.6

1991 312,139.7 5,293.8 8.3

1992 532,613.8 8,050.8 52.1

1993 683,869.8 13,548.2 68.3

1994 899,863.2 29,826.6 120.2

1995 1,933,211.6 46,687.5 156.5

1996 2,702,719.1 66,621.7 29.8

1997 2,801,972.6 69,876.1 15.3

1998 2,708,430.9 90,067.6 28.9

1999 3,194,015.0 106,212.1 17.9

2000 4,582,127.3 116,336.7 19.5

2001 4,725,086.0 129,967.8 11.7

2002 6,912,381.3 160,679.9 23.6

2003 8,487,031.6 205,936.7 28.2

2004 11,411,066.9 344,913.0 67.5

2005 14,572,239.1 362,605.3 5.1

2006 18,564,594.7 416,240.3 14.8

2007 20,657,317.7 444,990.0 6.9

2008 23,842,170.7 472,495.3 6.1

2009 718,977.33 17534.51 6.8

2010 776,332.21 18727.95 6.9

2011 834,000.83 20017.89 6.9

2012 888,893.00 21394.38 5.85

2013 9,29,1515.40 23073.84 7.85

Source: Various issues of CBN Statistical bulletin and

other periodicals

 From Table 1, it is clear that the contribution of road transport to GDP has not being encouraging in spite of government effort at revamping road development. The table shows that as at 1981, the total contribution of road transportations to GDP was 2,328.7 representing 4.89%of the total GDP. This fell to 1,860.9 in 1983 rep-resenting 3.50% of the total GDP leading to -2.3growth rate of road transportation. This, how-ever, increased to 46687.5 in 1995 representing2.42% of the total GDP leading to 156.5 growth rate of road transportation. In the year 2000, the growth rate of the sector was 19.5%, this rate was not sustained, the rate fell to 5.1% in 2005, rose a little to 6.9% in 2010 and rose again in2013 to 7.85%. This indicates an improvement in the sector.

Table 2: Contribution of rail transport and pipeline to real gross domestic product in Nigeria (1981-2013)

Year Total Contribution of Growth rate of

 GDP(NM) road transport road transport

1981 47,619.7 110.6 —

1982 49,089.3 128.3 16.0

1983 53,107.4 110.5 -13.9

1984 59,622.5 109.3 -1.1

1985 67,908.6 131.5 20.3

1986 69,147.0 138.3 5.2

1987 105,222.8 93.7 -32.3

1988 139,035.3 79.8 -14.8

1989 216,797.5 58.7 -26.4

1990 267,550.0 50.9 -13.3

1991 312,139.7 59.3 16.5

1992 532,613.8 42.7 -28.0

1993 683,869.8 58.7 37.5

1994 899,863.2 2.9 -95.1

1995 1,933,211.6 2.4 -17.2

1996 2,702,719.1 2.9 20.8

1997 2,801,972.6 3.7 27.5

1998 2,708,430.9 3.9 5.4

1999 3,194,015.0 4.2 7.7

2000 4,582,127.3 4.5 7.1

2001 4,725,086.0 4.9 8.9

2002 6,912,381.3 5.4 10.2

2003 8,487,031.6 5.9 9.3

2004 11,411,066.9 6.4 8.5

2005 14,572,239.1 6.9 7.8

2006 18,564,594.7 7.5 8.7

2007 20,657,317.7 9.6 2.8

2008 23,842,170.7 11.8 22.9

2009 718,977.33 2.12 5.7

2010 776,332.21 2.24 5.8

2011 834,000.83 2.37 5.9

2012 888,893.00 2.51 5.9

2013 9,29,1515.40 2.67 6.47

Source: Various issues of CBN Statistical bulletin and

other periodical

 Table 2 reveals that out of the total GDP of47,619.7 in 1981, rail transport and pipeline transportation contributed 110.6 representing 0.23%of the total GDP. In 1994 and 1995, rail transport contributed 2.9 and 2.4 respectively leading to a negative growth rate of 95.1 and 17.2. However, in 2008, rail and pipeline transportation contributed 11.8 to GDP leading to a growth rate of22.9%. The year 2008 witnessed the highest growth in the sector. Since then, the sector witnessed a sharp fall to 5.7% in 2009. The sector maintained stead rates in 2011 and 2012 which are 5.9% respectively. In 2013, the sector man-aged a marginal growth rate to 6.47%.

1. **PUBLIC-PRIVATE PARTNERSHIP(PPP):**

One of the modern methods of infrastructure financing is private sector initiative. The history of private sector participation in infrastructure development is quite old. Private sector participation in the transport sector, for example, dates back to seventeenth century canal and road concessions in Europe and the United States of America. Private companies built the American railways in the nineteenth century. Many early public transport systems in European and American cities were also developed in this century by the private sector under various municipal charter or franchise arrangements with revenues coming from fares and land development. Another method of infrastructure financing that has been adopted in recent times in Nigeria is public-private partnership (PPP). It involves construction of a project or provision of services in cooperation between the public and private sector(s). In the view of Trabant and Allard (2008), PPP first emerged in the United Kingdom in the wake of the conservative revolution of Margaret Thatcher. Beginning in the early 1990s, the government began to explore avenues of co-production of public services with the private sector. PFI, as it was called in the UK (Private Financing Initiative) spread quickly across sectors and took various forms, depending on the exact role that each project assigned to the private and public sectors. PPP project generally fill a gap between traditionally procured government projects and full privatization. PPP or P3 model describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. Typically, one or more private sector companies form a consortium and are generally described as “Special Purpose Vehicle”. The consortium may mainly consist of a project sponsor, Bank lender etc. More so, the consortium will be developed in a manner as to account for the technical, financial, legal, environmental and social aspects of the PPP transaction. The proponents of PPP posit that it bring forward the delivery of infrastructure projects, draw on private sector expertise and offer an alternative financing vehicle to traditional government procurement. They also submit that bundling of PPP services for major infrastructure projects provide whole-of-life cost savings, and increased efficiency by delivering services of a higher-quality or at a lower cost. Two major surveys of PPP projects conducted by the British government, according to Trabant & Allard (2008), estimated average savings of 17% on the completed projects, due mainly to the avoidance of cost overruns in the construction phase. They also discovered that 80% of PPP projects had met their initial delivery time targets, compared to 20% for comparable public-sector projects. The reports concluded that the main source of the savings was that risks of delays or overruns had effectively been transferred from the public to the private sector. This effective reallocation of risks is the main benefit of PPPs and is the issue that must be addressed most effectively when PPP contracts are negotiated. The opponents of PPP, on the other hand, argue that PPP contracts involve high transaction costs and efficiency is undermined by limited competition in the bidding process. They also claim that PPPs do not offer value for money because the premium required by the private partner is in excess of the risk they assume, and that inadequate risk transfer has occurred in some projects and government, and ultimately the taxpayer, has had to bear the financial consequences.

The following are the models available for PPP transactions in Nigeria:

1 Design-Build (DB) or Turnkey Contract;

The private sector designs and builds infrastructure to meet public

sector performance specifications, often for a fixed price. The cost of

overruns is transferred to the private sector.

2 Service Provision Contract;

A private operator, under contract, operates a publicly owned asset for

a specified period. Ownership of the asset remains with the public

entity.

3 Management Contract;

A private entity contracts to manage a Government owned entity and

manages the marketing and provision of a service.

4 Lease and Operate Contract;

A private operator contracts to lease and assume all management and

operation of Government owned facility and associated services, and

may invest further in developing the service and provide the service for

a fixed term.

5 Design-Build- Finance Operate (DBFO);

The private sector designs finance and constructs a new facility under a

long term lease and operates the facility during the term of the lease.

The private partner transfers the new facility to the public sector at the

end of the lease term.

6 Build-Operate-Transfer (BOT);

A private entity receives a franchise to finance, design, build and

operate a facility (and to charge user fees) for a specified period, after

which ownership is transferred back to the public sector.

7 Buy-Build-Operate (BBO);

The transfer of a public asset to private or quasi-public entity usually

under contract that the assets are to be upgraded and operated for a

specified period of time. Public control is exercised through the contract

at the time of transfer.

8 Build-Own-Operate (BOO);

The private sector finances, builds, owns and operates a facility or

service in perpetuity. The public constraints are stated in the original

agreement and through on-going regulatory obligations.

9 Build-Own-Operate Transfer (BOOT);

This is an extended version of the BOT model where the private sector

builds, owns and operates a facility for a specified period as agreed in

the contract and then transfers to the public.

10 Operating License;

A private sector receives a license or rights to build and operate a

public service, usually for a specified period. Similar to BBO

arrangement.

11 Finance Only;

A private entity, usually a financial services company, funds a project

directly or uses a mechanism such as long-term lease or bond issue.

**CHALLENGES**

The major challenges of infrastructure finance are as discussed below. First, exposure to currency risk is a critical feature of infrastructure financing. Infrastructure project revenues are often generated in local currencies, while servicing of foreign capital, whether debt or equity, involves payment in foreign currency. Fluctuations in the exchange rate of the domestic currency, as well as capital controls limiting currency convertibility and transferability, pose a particularly difficult problem for foreign investors and financiers**.**

Second, infrastructure investments are typically up-front, with a high degree of asset specificity and risky revenue streams stretching many years into the future. Investors are hesitant to make investments in such circumstances without adequate contractual protection.

 Third, the scope for divesting equity holdings in infrastructure investment through IPOs is limited in many developing countries. As a result, project promoters would be locked in their investments for several years.

 Fourth, there are very few bankable projects. The project preparation process is not yet sophisticated enough to address bankability issues from the onset. Challenges in the project preparation stage include securing funding for costly feasibility tests and limited project precedents due to the short history of PPP projects in Nigeria.

 Fifth, inadequate legal and regulatory framework hinders infrastructure financing. The Federal government and a number of state governments have made significant strides to create a suitable legal and regulatory framework that will encourage private sector participation in infrastructure development projects. However, this framework is yet to be fully established and tested, which may create apprehension and reluctance in the private sector.

 Sixth, there is high preference for ‘Quick Win’ Sectors. Most private sector investments in African infrastructure have been in quick return sectors such as telecoms. Telecoms projects have a quicker gestation period whilst investment in concessions will be recouped over a much longer period ranging from 25 – 30 years.

 Seventh, relatively high cost of projects discourages infrastructure financiers. Due to economic and political factors, the cost of undertaking PPP projects in Nigeria is relatively higher compared to costs of similar projects in other countries. Thus the opportunity cost of financing infrastructure development projects in Nigeria is relatively high.

# **CONCLUSION**

 The linkage between infrastructural development and economic growth outcomes is one of the most popular topics for debates in recent scientific literature and economic research. The quality of infrastructure has direct effect on business productivity and growth, and different investments to infrastructure capital from inequality between regions and countries. The role of infrastructural development on economic is a vital issue for strategic and development country policy management for a country with weak quality of infrastructure base. Efficient infrastructure attracts centers of production and consumption, gives greater access to markets and education centers and that timely access to health care, facilitated by transport can prevent maternal deaths and lower infant mortality rates.

# **RECOMMENDATION**

 Infrastructure development is one of major elements of structural reforms in developing economy like Nigeria because of its expected large economic and social impact. As can be inferred from the studies by other researchers, infrastructure investments alone do not have significant influence on economic growth. The institutional environment is a very important complement, allowing infrastructure investments to be translated into economic growth. Based on this, the following are the recommendations of this study: In the area of transportation, more roads should be constructed and the existing one adequately maintained particularly the ones al-ready taken over by gully erosion as it will lead to the reduction of production of firms as well as inability of the firms to evacuate consumables both final and intermediate from rural to urban centers. The government should enhance the com-petition between and the efficiency in infrastructure industries, (especially electricity) and with it, the government can make an indirect contribution to economic development. The railways sector should receive government blessing as exemplified by the Chinese and Indians governments. This is because since passengers and goods are carried by railways cheap and significant compared to other means of land transportation. Demand for infrastructure is said to expand significantly in the decades ahead, driven by major factors such as global economic growth, technology progress, urbanization and growing congestion. The researchers propose that government should as a matter of priority create more favorite institutional policy and regulatory frame-work to meet up these challenges.

# **REFERENCES**

* <https://www.researchgate.net/publication/321217508_Infrastructural_Development_and_Economic_Growth_in_Nigeria_Using_Simultaneous_Equation>
* <https://www.academia.edu/14583270/Engineering_Law_and_Managerial_Economics_of_Developmental_Projects_in_Nigeria>
* <https://www.researchgate.net/publication/282448401_INFRASTRUCTURE_FINANCE_MECHANISM_AND_CHALLENGES_IN_NIGERIA>