

Engineering Law and Managerial Economics of Developmental Projects in Nigeria

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ABSTRACT

Engineers have an added responsibility and that is to include economics in their calculation and decisions to solve real life problem. 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 carefully measured and weighed. Costs and benefits must be reliably measured; time differences must be accurately reflected. Five civil engineering projects were studied to check 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.

Keywords---- Engineers, Engineering law, Managerial Economics.

I. INTRODUCTION

Engineers perform services or creative work 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 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.

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.

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 decision, or best problem resolution, is the focus of 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

Sources of law

Sources of law means the origin from which rules of human conduct come into existence and derive legal force or binding characters. It also refers to the sovereign or the state from which the law derives its force or validity. There are many different sources of law in any society. Some laws will be written in the country's Constitution; others will be passed by the legislature (usually a parliament or congress); others will come from long social tradition.

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 are regarded as the sources of law.

There are many different sources of law:

- **The Constitution**
- **Customary law**
- **Common law**
- **Legislation**
- **Case law**

There are different participants in the law:

- **Those who pass laws (legislature)**
- **Those who apply laws (judiciary)**
- **Those who enforce laws (police and others)**

1) *Criminal and civil law*

Not all court cases involve crimes. Many of them do, of course; but many others involve what is called civil law, rather than criminal law.

Criminal law deals with offences by people against society as a whole. Prosecutions are usually brought in the name of the Head of State, or of the State itself.

Civil law deals with offences by people against other individuals. This may include disputes over fences and other land matters, defamation cases, damaged property, broken promises or a host of other disputes between people.

In a criminal court, the two sides are called the *prosecution* and the *defence*. In a civil court the two sides are called the *plaintiff* (that is the person who is bringing the complaint) and the *defendant* or in some cases, the *respondent*.

In a criminal court, the judgment at the end of the hearing will be that the defendant is either *guilty* or *not guilty*. In a civil case there is no question of guilt, because nobody has been charged with any crime; the judgment will simply be either *for the plaintiff* or *for the defence*.

In a criminal court, a defendant who has been convicted (that is, found guilty) will be *sentenced* - usually by either a fine or imprisonment. In a civil case, there is no sentence. However, if judgment is for the plaintiff (that is, the person bringing the complaint wins), the court may award damages against the defence. This means the court agrees that the plaintiff has been wronged by the defendant, and orders the defendant to pay a sum of money (called *damages*) by way of compensation. The court may also, under certain circumstances, order the losing side to pay all the legal *costs* of the winning side. This would happen usually if the judge considers that the loser has acted unreasonably in fighting the case at all, and should have settled out of court without forcing the other person into expensive legal proceedings.

There are two main kinds of law: Criminal law AND Civil law

Civil Law versus Criminal Law

Civil law and criminal law are two broad and separate entities of law with separate sets of laws and punishments. According to William Geldart, Introduction to English Law 146 (D.C.M. Yardley ed., 9th ed. 1984),

"The difference between civil law 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 wrongdoer; 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 include cases of burglary, [assault](#), [battery](#) and [cases of murder](#). Civil law applies to cases of [negligence or malpractice](#), for example.

Comparison chart

	Civil Law	Criminal Law
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 incarceration 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

1. An offer which is made and accepted,
2. Mutual intent to enter into the contract,
3. Consideration,
4. Capacity, and
5. 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 a *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 the 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 a condition for the innocent party to consider the contract discharged by the breach.

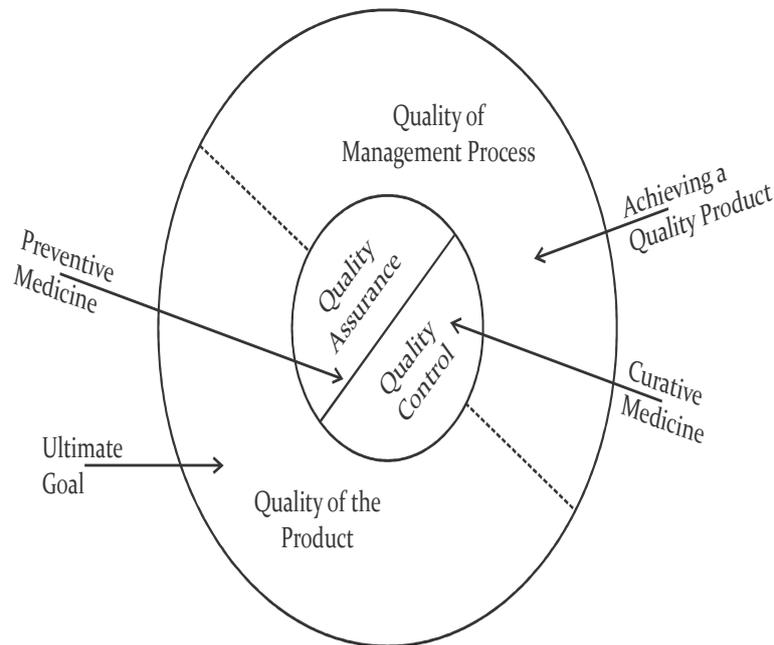


Fig 1: Pre-requisites to achieving quality on Construction Projects

- 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
- “Managerial Economics is concerned with the application of economic concepts and economic analysis to the problems of formulating rational managerial decisions.”

The role of managerial economist includes:

- Spencer and Siegelman have defined the subject as “the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management.”
- He studies the economic patterns at macro-level and analysis it’s significance to the specific firm he is working in.
- He has to consistently examine the probabilities of transforming an ever-changing economic environment into profitable business avenues.
- 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.
- Accurately values all operations (support and production) of an entity (i.e. the supply and consumption of resources) in monetary terms.
- Provides information that aids in immediate and

future economic decision making for optimization, growth, and/or attainment of enterprise strategic objectives.

- Project Management
- planning, directing, and controlling resources (people, equipment, material) to meet the technical, cost, and time constraints of the project.
- The application of knowledge, skills, tools, and techniques to project objectives to meet stakeholder needs and expectations
- Project as “an organization of human, materials and financial resources in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, defined by quantitative and qualitative objectives so as to achieve a beneficial change”.
- Achieving Quality on Projects requires:
- Quality of the management process (most important)
- Quality of the product (ultimate goal)

Study of Managerial Economics helps in 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 concern 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 modeling with emphasis on the

economic effects is the primary analytical technique used to select between defined feasible alternatives.

Essentials in Cost Control are:

- Ensure that documentation is complete and clear
- Ensure that no ambiguity among documents
- Do not accept unreasonably low bids
- Do not grant variations that have not been costed
- Do not delay payment
- Ensure instructions are given timely (including drawings, etc)

Control quality of works

Objectives & advantages of costing

1. To get clear picture of financial situation
2. Identifying profitable and non profitable segments and taking action accordingly
3. To decide pricing of services and discounts
4. To decide for out sourcing of services
5. Helps in identifying wastages

6. Helps in budgeting, planning

2. Materials and Methods

Forecasting Techniques

Opinion polls and market research

- Expert opinions
- Surveys
- Trend Analysis
- Projection / Extrapolation Techniques
- Econometric Models
- Barometric Techniques

2.4.1. Figures Caption

Two projects A and B are to be compared in terms of their benefit-cost ratios and net benefit on present worth basis. The applicable discount rate is 10% per annum compounded yearly. The following table shows the benefits and the costs in thousands of Naira at the end of each year. Which project is more economical?

PROJECT A					PROJECT B				
FUTURE WORTH					PRESENT WORTH				
Year	Construction cost C	Benefit B	B/C	Net Benefit	Year	Construction cost C	Benefit B	B/C	Net Benefit
				B-C					B-C
1	100		0	-100	0.909091	90.90909	0		-9.090909
2	10	20	2	10	0.826446	8.264463	3	16.5289	8.264462
3	10	40	4	30	0.751315	7.513148	9	30.0525	22.53944
4	10	60	6	50	0.683013	6.830135	1	40.9808	34.15067
5	10	80	8	70	0.620921	6.209213	1	49.6737	43.46449
				TOTAL		119.7		137.2	17.51

Figure 5. Part A and Part B

PROJECT B

Year	FUTURE WORTH				PRESENT WORTH			
	Construction cost C	Benefit B	B/C	Net Benefit	Cost C	Benefit B	Net Benefit	Net
				B-C			B-C	B/C
1	100		0	-100	0.909091	90.90909	0	-90.90909
2	100		0	-100	0.826446	82.64463	0	-82.64463
3	20	40	2	20	0.751315	15.0263	30.05259	15.02629
4	20	60	3	40	0.683013	13.66027	40.98081	27.32053
5	20	80	4	60	0.620921	12.41843	49.67371	37.25527
6	20	100	5	80	0.564474	11.28948	56.44739	45.15791
7	20	140	7	120	0.513158	10.26316	71.8421	61.57897
							4	419
8	20	160	8	140	0.466507	9.330148	74.64118	65.31103
				TOTAL		245.5	323.6	78.0963

Figure 5. Part A and Part B

2.4.2. Figures Numbering & Citation

- For Project A, = 1.146
- Present worth of net benefits = N 17.51 X 10³
- For Project B, = 1.318
- Present worth of net benefits = N 78.16 X 10³
- As the Present ratio for project B is greater than that of A (1.318 > 1.146) and also the present worth of net benefits is more for project B than that of A, Project B is

more economical .

- The decision is simple:
- If B/C ≥ 1.0, accept the project as economically acceptable for the estimates and discount rate applied.
- If B/C < 1.0, the project is not economically acceptable

Figure 6. A large figure in one column

Table 1. Specific data of Column/Row

We are very grateful to experts for their professional advice, notable and constructive suggestions to improve this research work.

III. CONCLUSION

Economists, engineering managers, project managers, and indeed any person involved in decision making must be able to analyze the financial outcome of his or her decision. Quality and cost control are basic requirements for successful engineering projects and so we should take them with the seriousness that they deserve

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