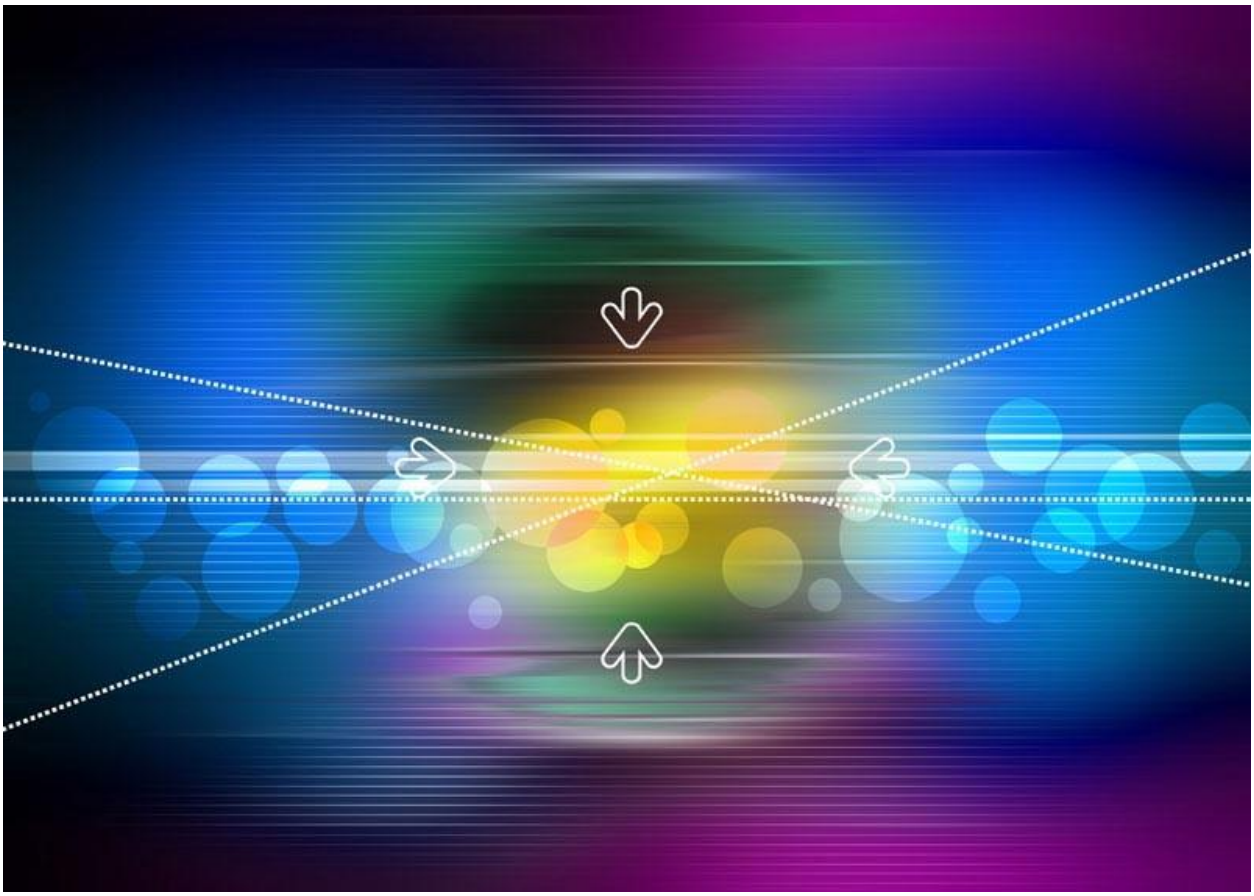
Using Cost-benefit analysis (CBA) as a Technique on Public Sector

(Infrastructure Projects)



(Development Economics and Plan Assignment)

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Ayman Melouk
S/N: 000526536

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1. Introduction

A history for **Cost Benefit analysis** dates back to the nineteenth century, when governments began to play an active role in the resource allocation process during the latter half to the twentieth century, at 1960's the CBA technique become widely accepted in Britain. By increasing controversy surrounding, CBA become more popular, and has tended to be used when conducting major appraisals like new motorway and individual building projects (Andrew J., 1996).

Public sector investment, when it comes to investments in the public sector, there is a difference; this difference is mainly seen in the beneficiaries of the investment and the nature of the investors' capital. Goods and services provided by public sector are known as "public goods", which have 2 characteristics, (influence their optimum provision and pricing but they are differ significantly from goods or services typically provided by the private sector).

Those **characteristics** are:

- **Non-excludability** means it is available to all if a good has been provided
- **Non-rivalry** means one unit of the good can satisfy more than one customer,

Some public goods are non-rivalry but excludable since it would be possible to enforce a charge (bridge, tunnel).

The methodology of this assignment is "To understand the relationship between public sector and Cost Benefit Analysis and how CBA effect on the decision of public sector investment".

From this point, the assignment divided to three parts;

- **First part;** about understanding the definitions, and identifying cost benefit analysis.
- **Second part**; undertaking cost benefit analysis by measuring costs and benefits and determine discounting for any project.
- **Third part** determining the investment for public sector and the techniques used by Cost Benefit Analysis, and by taking Cross-rail Line project in London as a case study.
- Ending the assignment, finished by; recommendation, conclusion and references.

2. Determination for Cost Benefit Analysis

2.1. Definition:

Cost-benefit analysis (CBA) is "a technique for comparing the flows of expenditure (costs) and the flows of revenue (benefits) as a guide to choosing between alternative investments".

Other definition; "CBA is a technique used to help governments decide whether to go ahead with various project such as a new motorway, a bypass, an underground line, a hospital, a health care programme, a dam, and so on". CBAs are usually commissioned either by a government department or by local authority. All costs and benefits are identified.

CBA can be divided into two main types; economic and social, both of their analysis are the same.

- Economic cost benefit analysis concerning with private sector to evaluate any investment project and its analysis referred to 'financial analysis', but;
- Social cost benefits analysis concerning with public sector and applied to large-scale infrastructure projects. The costs and benefits include 'intangibles' cannot easily be measured in monetary terms and 'externalities' that affect society as a whole (Craig A., Grace K., 2001).

A monetary value is assigned to each cost and benefit. Account is taken both of; the likelihood of a cost or benefit occurring, and the timing of the cost and benefits. It is possible to compare the benefits and costs of a policy using at least three different formulas:

• Net Benefits = Total Benefits – Total Costs

• Benefit/Cost Ratio = Total Benefits/Total Costs

• Percentage Rate of Return = 100% × (Total Benefits−Total Costs)/ Total Costs (Bellinger, William K., 2007)

2.2. Identifying (CBA)

Identifying costs and benefits are relatively easy, although there are some problems in predicting what types of external effect are likely to occur.

COSTS: Include all intangible costs (noise, environmental damage) as well as the construction and on-going costs of the project. Costs have 2 types:

- Direct (private) monetary costs; these include all the construction costs and the operating and maintenance costs.

- External costs fall into two categories: Monetary costs, such as the loss of profits to competitors. Non-monetary costs, as pollution, spoiling the landscape, noise and various other forms of inconvenience local residents. In some projects, such as a tunnel.

BENEFITS: Determine by willingness to pay criteria (WTP) and must therefore be estimated indirectly where zero or close to zero user change. Benefits have 3 types:

- Direct (private) monetary benefits are also easy to identify.

- Private non-monetary benefits to consumer over and above what they actually pay.

- External benefits to the nonusers of the project.

3. Undertaking a Cost Benefit Analysis

When undertaking a BCA for determining the ideal scale for a single project is fairly basic. One calculates the marginal benefits and marginal costs of the project, and stops expanding when marginal benefits equal the marginal costs. The optimal scale is pictured in (Fig.1).

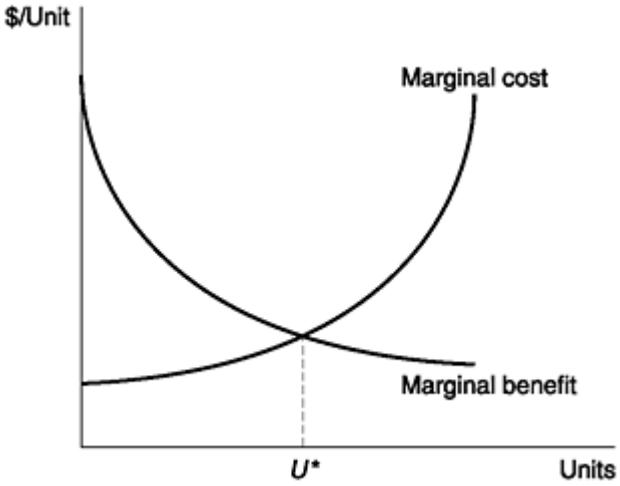


Figure 1: Optimal scale for one project (Bellinger, William K., 2007).

3.1. Measuring the cost and benefits

The Difficulties in measurement depend on the type of cost and benefit. These are four types (John S., Alison W., 2009).

a) *Direct private monetary costs and benefits:* The simplest to measure, nevertheless, there are two problems; what will these financial costs and income be? And should be taken into account that the prices will often be smashed by the domination power?

b) *Non-monetary private benefits:* To estimate this type you have to;
   - Estimate the demanded curve and then estimate the shaded area or;
   - Estimate of air traffic (for new airport building) but it had often proved wrong because the increasing of the world economic and the gained of consumer surplus (as one of a private benefit).

c) *Monetary externalities:* In a project like a new underground line, which include the loss of profits to taxi and bus companies, it would be counted at external monetary costs.

d) *Non-monetary externalities:* The hardest measure, however, there are two approaches to find how much people would be able to pay to gain the benefits or avoid the costs:

d.1. *A questionnaire:* How much the people would need to be rewarded instead of two problems: Ignorance (people have no idea how much they will suffer until the project is finished), and Dishonesty (people will tend to inflate the situation they would need).

d.2. *Make inference from people's behaviour:* By taking problem like noise; what is the actually reaction of people; (costs for insulating material and techniques), if they suffer; how much the costs to move somewhere more quit, does the loss of consumer surplus need to be measured(John S., Alison W., 2009).

3.2. Discounting

One of the problems economics face within the public sector domain and as part of adjusted for risk and uncertainty, however, costs and benefits of a project often happen within a short, separate time period, when the majority of economic agents, or householders, reveal a time preference for the costs they gain and the benefits they accept, and as the possibility of investing money in interest-bearing bank, thus, it may be argued that CBA should integrate this possibility when costs and benefits are being compared. To make economics avoid and solving this problem is to consider the scenario of an individual being paid interest on a bank deposit (Andrew J., 1996).

Because of the high discount rate is important, it could be the reason in decreasing the motivation to support the society in the future, by signifying the opportunity cost of pushing the project which is supported by the monetary issues, that is when the economics policy of the market is willingness to pay by decreasing the inflation. In that case, by placing low value in the future market, the majority of projects are able to be going on with high interest/ discount rates see (fig.2).

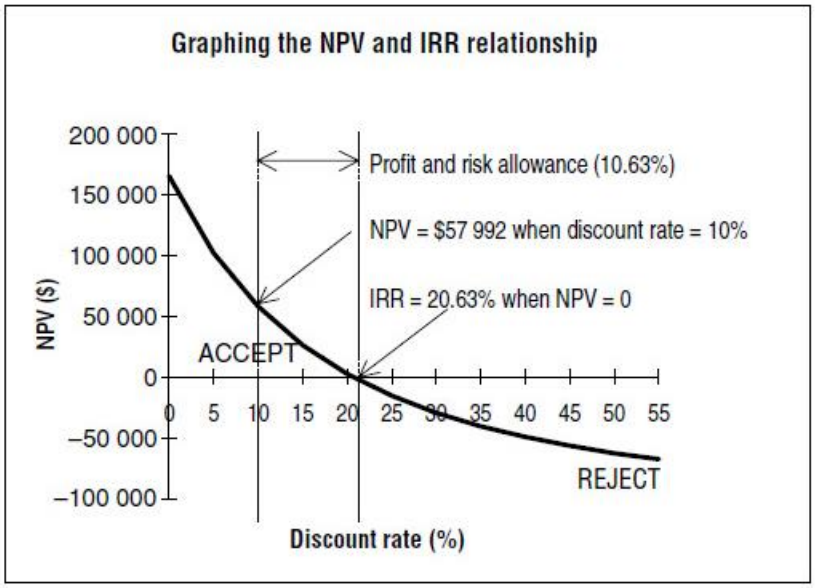


Figure 2: Net present value and internal rate of return (Craig A., Grace K., 2001)

4. Techniques of Cost- Benefit Analysis to Public Project

4.1. Public Sector Investment

Investments in the public sector have many differences which mainly seen in the beneficiaries of the investment and the nature of the investors' capital. Goods and services provided by public sector are known as "public goods", they have tow special characteristics to influence their optimum provision:

- Non-excludability means it is available to all if a good has been provided
- Non-rivalry means one unit of the good can satisfy more than one customer,

Some public goods are non-rivalry but excludable since it would be possible to enforce a charge (bridge, tunnel) (fig.3). Public supply is still preferable since the optimum price is zero and a positive charge would effectively exclude some potential consumers, as an example, (fig.4) shows museum charges introduced in 1987 and 1989 respectively.

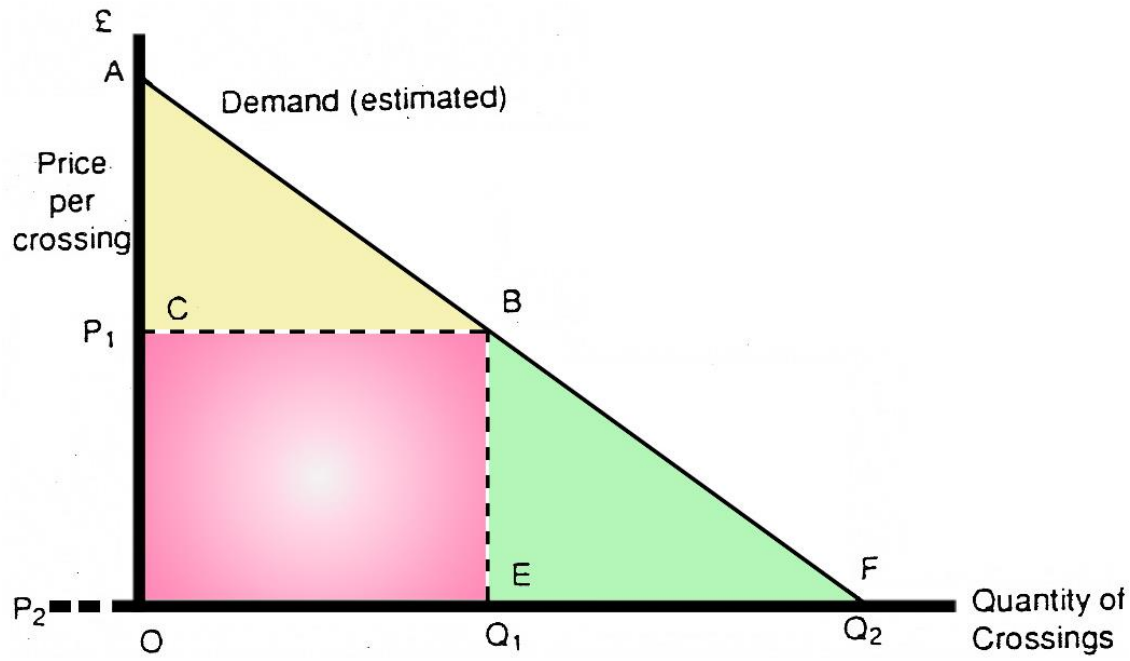


Figure 3: Demands for crossings of new bridge (Brent, R.J., 2006)

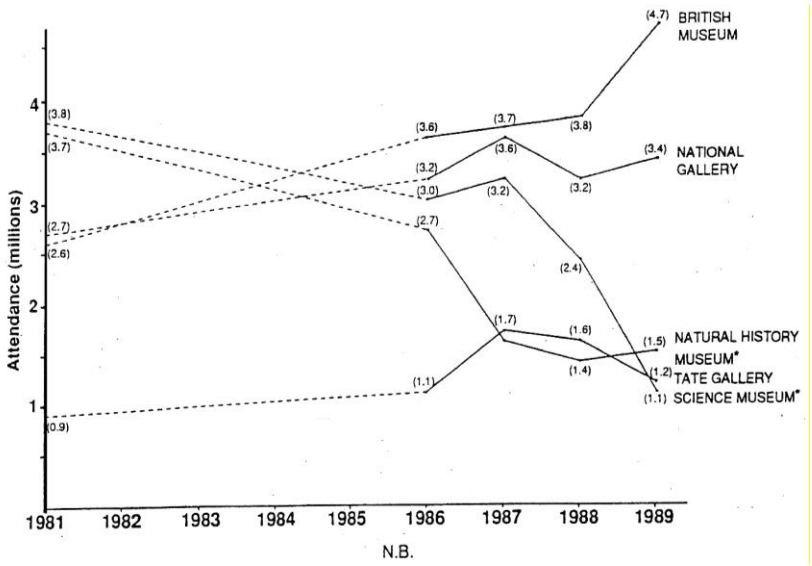


***Figure 4*:** Museums charges and attendance since 1981 till 1989 (Bellinger, William K., 2007)

4.2. The techniques

The study benefit–cost is the basic of policy analysis, and any measurement for the benefit and costs of any public policy will be involved by recommended benefit–cost analysis, however, for each capital investment for private or public sector; the cost benefit analysis is an critical tool for evaluating the return of the investment and the related risks, and other variables that affect the costs of the investment on one hand and the benefits of the investment on the other hand.

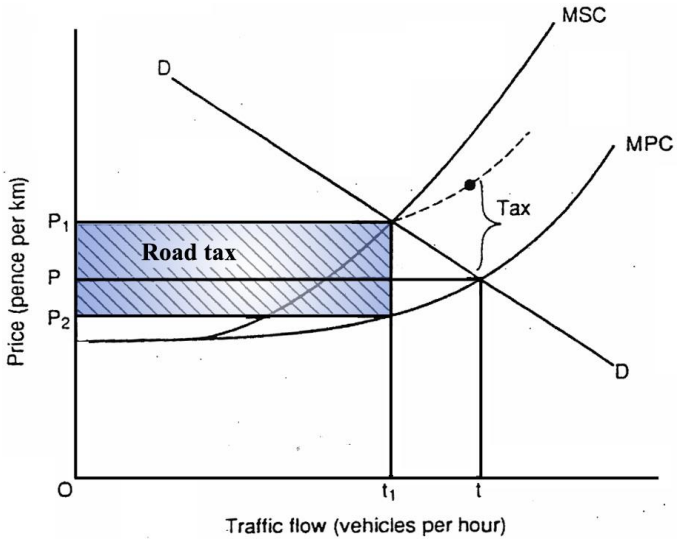
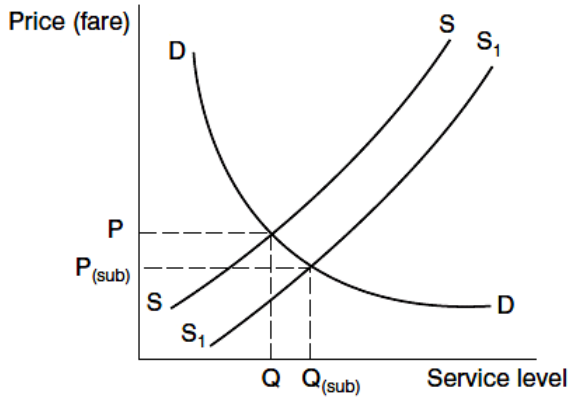


Figure 5: Road pricing Theory (from the Smeed Report 1964)

The demand for the construction of roads, as an example for public project, is derived, but roads are not demanded for their own intrinsic value but to facilitate the achievement of other objectives. Hypothetical, benefits of new network of roads will be reflected in the prices and

quantities of goods and services produced in an economy. For example if a new road increases the speed at which products can be delivered to markets, then any diminution in transport costs can be passed on to consumers in the form of lower prices. And cost-benefit studies typically implement a less motivated agenda that focuses specifically on the journeys that would be undertaken on the road.



P = price (ie fare charged) determined by market forces
Q = quantity (frequency; size of network) provided on a financially viable basis
S_1S_1 = supply curve provided following subsidy
$P_{(sub)}$, $Q_{(sub)}$ = price and quantity supplied if a subsidy is paid

Figure 6: Comparison of the effects of the price mechanism and subsidy (Bellinger, William K., 2007)

4.3. Case Study; "London CrossRail Line"

Crossrail's name refers to the first of two routes which are the responsibility of Cross London Rail Links Ltd. this project is to build a major new railway connections under central London and has tow route; the first route based around an east-west tunnel with a central section from Paddington to Liverpool Street station, while the second route is the Chelsea–Hackney line.

4.3.1. History of CrossRail line in London

The project was approved in October 2007 and the Crossrail Act received Royal Assent in July 2008. The final funding agreement, which committed full finance for the project, was signed in late 2008. Gordon Brown and Boris Johnson, the Mayor of London attended a ceremony at Canary Wharf on 15 May 2009 when construction of the project started. On 7 September 2009 the project received £1bn in funding, and the Transport for London has been lent the money from European Investment Bank. In planning of this project putting in it's consider that services will

begin in 2017 with no delays (http://www.crossrail.co.uk/the-railway/getting-approval/background).

4.3.2. Analysis of Costs and benefits

A non-monetary cost-benefit analysis of Crossrail exposes the following projected user benefits:

1- Value of time savings for current public transport users and motorists; the rationale for this benefit is that once the new Cross Rail link opens, many users will reduce travel times. The opportunity cost of these travel time savings is that it is a benefit to such groups.
2- A reduction crowding and improved journey quality; this benefit will take the form of improved comfort for users transferring to Cross rail from other congested transport modes.
3- Reduced operating costs for road users and a reduction in accidents; these benefits will accrue to road users who continue to make their journeys by road whilst a reduction in accidents will also generate some benefits to the local community and the health services.

USER BENEFITS	**£ m (PV)**	**COSTS**	**£ m (PV)**
Leisure/ commuting trips			
Time savings	7,985	Capital costs	10,626
Improved quality	2,889	Maintenance costs	1,606
Other	355	Operating costs	1,670
Business trips			
Time savings	4,847		
Other	17		
TOTAL BENEFITS	**16,097**	**TOTAL COSTS**	**13,902**

Table 1: total costs and benefits for Cross Rail Links, 2005 cited in Cross rail (2007)

The table shows the summary of the monetary values of costs (such as costs of construction, maintenance costs and operating costs), and benefits (such as trips made in the course of work and those made for leisure and commuting purposes) and it appear that the benefits of this project will recover all costs mentioned before.

5. Conclusion

- Cost-benefit analysis (CBA) can help a government decide whether or not to go ahead with a particular public project, or which of alternative projects to choose. On the other hand, all costs and benefits must be identified. These include the direct costs of construction and operating the project. However, in CBA it is very difficult to place a value for intangible, such as pollution and illness. The analysis may then be bised in favour of some groups and against others.
- Direct monetary costs and benefits are relatively easy to measure. Nevertheless there is still uncertainty about their future values. But non-monetary private benefit is difficult to estimate because of the difficulty of estimating the shape and position of the demand curve. However, non-monetary externalities are much more difficult to estimate.
- To adjusting for risk and uncertainty, timing and distribution affects discount techniques have to be used to reduce future benefits and costs to a present value. In this case, a recommendation to go ahead with the project will probably be given if it's net present value.
- Mega-projects such as great infrastructure projects are commonly inundated by technical and social difficulty. Benefit–cost analysis involves measuring and weighing the benefit and costs of any public policy, and recommending that policy if its benefits minus costs are greater than those of other alternatives.

Wards Account: 2315 wards

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