Contents

1. Initial costs:

1-1- Introduction :

The costs Basis is the original value or purchase price of an asset or investment for tax purposes. The cost basis value is used in the calculation of capital gains or losses, which is the difference between the selling price and purchase price. Calculating the total cost basis is critical to understanding if an investment is profitable or not, and any possible tax consequences. If investors want to know whether an investment has provided those longed-for gains, they need to keep track of the investment's performance.

1-2 Initial costs definition :

the capital or initial expenditure on an asset when first provided.

- Cost In Use Technique :

Most cost budgets for construction projects only target initial capital cost of land, construction and professional fees consequently, materials and construction processes have been selected which are low in initial costs but which require frequent expenditure on maintenance and repair during the life of a building.

Ideally it is argued that if the architect were allowed to spend more money initially on better materials, running costs and some occupational charges would be lowered and in the long run pay for themselves. Fig. 1 shows Breakdown of Total Cost .

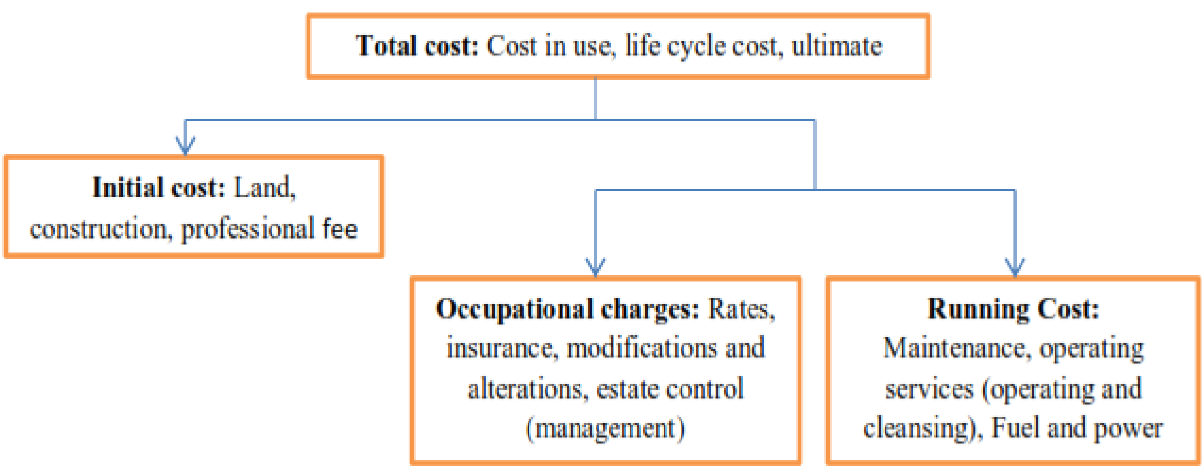


Fig. (1) Breakdown of Total Cost

- *EXAMPLE :*

Advising a client on alternatives for windows;

Softwood windows1000/- per m2 initially but requiring painting at the cost of 2500/- per m2 every 5 years

Toughened plastic costing 2000/- per m2 but requiring treatment every 10 years at the cost of 2000/-

Aluminum costing 2500/- per m2 initially and requires no maintenance throughout the life of the building.

Assumptions; The life of the building is 40 years. Assume 14% interest rate.

i. *Alternative A :*
ii.

Table 1

COST	PERIOD	PVF	AMOUNT (KShs.)
Initial cost	-	-	1,000.00
PV of painting	5th year	0.519	
	10th year	0.270	
	15th year	0.140	
	20th year	0.073	
	25th year	0.038	
	30th year	0.020	
	35th year	0.010	
		1.07 x 2,500	2,675.00
TOTAL COST IN USE		KShs.	3,675.00

iii. *Alternative B:*

Table 2

COST	PERIOD	PVF	AMOUNT (KShs.)
Initial cost	-	-	2,000.00
PV of Treatment	10th year	0.270	
	20th year	0.073	
	30th year	0.020	
		0.363 x 2,000	726.00
TOTAL COST IN USE		**Kshs.**	**2,726.00**

iv. *Alternative C to remain the same*

Therefore,

- A costs 3,675
- B costs 2,726
- **C costs 2,500**

Consequently, comparatively alternative C proves to be in the long run.

So it depends on what the developer will do with the product. If for sale, option A may be the best option as the developer will dispose, if it is for rent or owner occupier, then option C is the best option.

Difficulties of Assessing Cost in Use :

1. There is reluctance by professionals in the construction industry to use cost-in-use techniques to provide cost advice to clients because;

2. Lack of reliable historical data and the predicting useful life of materials leads to inaccurate assessment of maintenance and running costs of different materials, processes and systems.

3. There are three types of payments, initial, annual and periodic. These must be brought to a common basis for comparison purposes. This requires mastery of discounted cash techniques.

4. Income tax has a bearing on maintenance costs and needs consideration as it can reduce the impact of maintenance costs. Taxation rates and allowances are subject to considerable variation over the life of the building

5. The selection of suitable interest rates for calculations involving periods of up to 60 years is extremely difficult.

6. Inflationary tendencies may not affect all costs in a uniform manner, thus distorting significantly the results of cost in use calculations.

7. Where projects are to be sold as an investment on completion, the building client may show little interest in securing savings in maintenance and running costs

8. Where the initial funds available to the building client are severely restricted, or his interest in the project is short-term, it is of little consequence to him to be told that he can save large sums in the future by spending more on the initial construction stage.

2. Life Cycle Costing (LCC) :

2-1- Life Cycle Costing techniques :

- Life Cycle Costing is a form of modeling technique which can embrace a mixture of capital and running costs.

- It is an assessment of the whole life performance and cost of an asset over its lifetime.

- It takes into consideration initial capital costs and future costs, including operational costs, maintenance costs and replacement/disposal costs at the end of its life.

- It is an economic assessment of the discounted net present value of life cycle costs.

- The techniques discussed include; Discounted cash flow (DCF), net present value (NPV), internal rate of return (IRR) methods .

2-2 NET PRESENT VALUE (NPV)

- In Table 3, the life of the project is 10 years and both receipts and payments are not evenly spread over the years. The assumption is that the project would be replaced after 10 years.

- It is not sufficient to judge the success of a project by the net cash flow figure (25,000-11,000) giving the net cash flow of Kenya Shillings 14,000. this argument ignores the cost of using the capital say @15% per annum. To incorporate cost of capital into cash flow analysis, the concept of discounting or getting the NPV of an investment which is introduced in Table 3under the Internal Rate of Return (IRR).

- NPV is the capitalized difference between present values of all future receipts from a project and its future outgoings.

- NPV gives the surplus the investor can expect after allowing for the recovery of capital invested and for the current rate of interest and it will indicate whether the project is worth undertaking or not.

    - The investor will then decide upon the surplus whether it is large enough to compensate for the risk and responsibility entailed. Equa. 1.

$$\text{Net Present Value (NPV)} = A * \left(1/(1+i)^n \right) \quad \text{..................Formula 1}$$

Where ,

A = Project Cash Flow , n = Discount Period , I = Discount Rate

Equa. 1

<u>NET PRESENT VALUE (NPV)</u> Cont'd (Table 3)

Table 3

Year	CAPITAL (Kenyan Shillings)	RECEIPTS (Kenyan Shillings)	NET CASH FLOW (Kenyan Shillings)
0	6.000.00	-	- 6,000.00
1	1.500.00	500.00	- 1,000.00
2	-	2.000.00	2.000.00
3	-	2.000.00	2.000.00
4	3.500.00	2.500.00	- 1,000.00
5	-	3.000.00	3.000.00
6	-	3.000.00	3.000.00
7	-	3.000.00	3.000.00
8	-	3.000.00	4.000.00
9	-	2.000.00	2.000.00
10	-	4.000.00	2.000.00

<u>NET PRESENT VALUE (NPV)</u> Cont'd (Table 4)

Table 4

Year	CAPITAL Expendi-true	RE-CEIPTS	Cash Flows	20 Per Cent	Kshs DCF	15 PER-CENT	Kshs DCF
0	6.000.00	-	- 6,000.00	1.000	- 6,000.0	1.000	- 6,000.00
1	1.500.00	500.00	- 1,000.00	0.826	- 826,45	0.870	- 869.57
2	-	2.000.0	2,000.00	0.683	1.366.03	0.756	1.512.29
3	-	2.000.0	2,000.00	0.564	1.128.95	0.658	1.315.03
4	-	2.500.00	- 1,000.00	0.467	- 466,51	0.572	-571.75
5	3.500.00	3.000.0	3.000.00	0.386	1.156.63	0.497	1.491.53
6	-	3.000.0	3.000.00	0.319	955.89	0.432	1.296.98
7	-	3.000.0	3.000.00	0.263	789.99	0.376	1.127.81
8	-	3.000.0	3.000.00	0.218	652.89	0.327	980.71
9	-	2.000.0	2.000.00	0.180	959.72	0.284	568.51
10	-	4.000.0	4.000.00	0.149	994.57	0.247	988.74
	11.000.00	25.000	14.000.0	NPV2 = 288.28		NPV1 = 1.840.29	

In Table 4 the NPVs at 15% and 20% are given. The project has a positive NPV of 1,840.29 at 15% and a negative of (-288.28) at 20%.

The decision rule is to accept a project with a positive NPV and reject the one with a negative.

The magnitude of NPV can be subjected to further analysis if it is large enough to meet the requirements of the investor.

2-3 INTERNAL RATE OF RETURN (IRR) Cont’d

This is used to determine the rate of interest to adopt when preparing budgets.

IRR is the rate of return adopted where discounted receipts equal the discounted payments.

When this happens, the NPV=0. Because IRR shows the actual point of equilibrium for costs and receipts it is said to be the internal rate of return for the investment.

If money is invested in a project, one should allow the rate of return that the investor expects on the project to be say x%. This enables the investor to compare this rate of return directly with that of other projects or investments and this method is used to calculate the IRR.

$$NPV = \sum_{n} A_n / (1 + i_r)^n \quad \text{.................................. Formula 2}$$

Where,
A= Project Cash Flow; n= Discount Period; ir= Internal Rate of Return

Equ. ***2***

The figures used in Table 4 are needed to illustrate how the IRR can be calculated from the NPVs. From the table, the IRR is less than 21% because the NPV is negative and higher than 21% because NPV is positive. Thus, IRR lies between 15 and 21% and possibly closer to 21% .

Table 5

NPV at 15 % is 1840,29 NPV at 20 % is -288,28				
Step 1	Range of NPVs	1840.29 + 288.28	=	2,128.57
Step 2	Range between Discount Rates	21-15		6.00
Step 3	Amount of NPV at 1 %	2128.57/6		354.76
Step 4	Percentage points required to bring 1840.29 to zero	1840.29/ 354.76		5.19
Step 5	IRR	15 + 5.19		20,19
	Alternatively % points required to wipe out – 288.28 to zero	288.28/ 354.76		0,81
	IRR	21 – 0.81		20.19

2-4 DISCOUNTED CASH FLOWS (DCF)

- With IRR, one is looking for a discount rate that equates the NPV to zero. That is that break even rate that equates expenditures to receipts by the end of a project, which is in this case 10 years.

- In DCF, the investor obtains NPVs per period as shown in Table 4, but cumulatively adds them up to see at which period the NPV starts to be positive, hence the break even point.

- NPVs beyond that point will be a measure of the magnitude of the profits.

- The shorter the break even period and the greater the amount of NPV, the more acceptable the project. The pattern and incidence of cash flows is also a major consideration in DCF consideration.

- For example, in table 3, the project only begins to break even in the 8th year when a cumulated NPV of 282/- is realized. The amounts received in the 9th and 10th years are therefore profits.

- Higher than 15% rates of discount or cost of capital will increase the period at which break even takes place so that at 20.19%, this point is reached in the 10th year.

- Lower discount rates (less than 15%) or cheaper capital will bring the break even point earlier than in the 8th year.

2-5 Benefits of life cycle costing;

- Encourages communication between the stakeholders and leads to an improved project definition .
- Clarifies the cost of ownership and occupation .
- Optimizes the total cost of ownership/occupation .
- Enables early assessment of risks ,
- Promotes realistic budgeting .
- Encourages discussion and decisions about materials choices.
- Enables best value to be attained.
- Provides actual figures for future benchmarking.

2-6 Nature and Sources of Cost Data

- Rate build up from first principles .
- Analysis of past tenders and adjustments as may be necessary.
- IQSK maganize .
- JBCC price index .
- Some suppliers offer supply and fix prices and recommended retail prices, from which data can be compiled .
- In other countries we have price books .
- Monthly cost information from subscribed data banks .

A narrow definition of the construction industry restricts official statistics to the "location" activities of companies involved in construction and infrastructure. As shown in Table 6, these data are typically broken down by residential buildings, private commercial buildings, infrastructure and civil engineering, repairs and maintenance, etc. Across Europe, some common trends can be identified. Aggregated data from 28 European countries show that 23% of construction work is repair and maintenance, 27%

is residential, 20% is infrastructure and 30% is non-residential (FIEC 2007).

Table (6) The construction industry – narrowly defined

Areas of Construction	Examples of type of work
Intrastructure	Water and sewerage Energy Gas and electricity Roads Airports, harbours, railways
Housing	Public sector/housing associations Private sector (new estates)
Public non-residential	Schools, colleges, universities Health facilities Sports and leisure facilities Services (police, fire, prisons)
Private industrial	Factories Warehouses Oil refineries
Private commercial	PFI (and similar public private partnerships) Schools/hospitals (where privately funded) Restaurants, hotels, bars Shops Garages Offices
Repair and maintenance	Extensions and conversions Renovations and refurbishment Planned maintenance

A modern alternative, however, is to expand the statistical definition beyond the narrow constraints created by international classifications to include the entire life cycle of a building: design, production, use, facility management, demolition, etc. Strictly speaking, the Pearce report (2003) argues that a full understanding of what a sustainable industry means requires data on a broad range of building productivity, including its environmental and social impacts. (The new approach adopted in this book will help clarify the sector's contribution to these broader concerns.) As defined by Pearce (2003: 24), a broad definition should include mining and extraction of raw materials, manufacture and sale of construction products and related professional services such as those of architects, engineers and facility managers.

For example, a detailed analysis of current available data in Great Britain indicates that in addition to the 1,500,000 workers employed in the traditional construction sector, there are a total of approximately 350,000 engineers, architects, facilities managers and chartered surveyors supplying professional services relating to construction and property, about 400,000 employed in the manufacture of building products and equipment,

For example, a detailed analysis of available data in the UK shows that in addition to the 1,500,000 workers employed in the traditional construction industry, there are around 350,000 engineers, architects, facility managers and chartered surveyors providing professional services related to construction and real estate, and around 400,000 employees in the manufacture of building products and construction equipment,

Bon (1989)'s book "should take the first steps towards a theoretical framework for the economics of construction", where he proposes that "construction economics is about measuring the consumption of scarce resources over the life cycle of a building to maintain frugality.. .....". and refers to “the application of uniform investment decision-making criteria to buildings as special category capital investments”. Johnson (1990) adopted a similar definition and suggested that “…knowledge of economics can provide a basis for the difficult trade-offs involved in building design and long-term management”.

Ruegg and Marshall (1990) promise to show the reader "...how to apply the concepts and methods of economics to decisions concerning the siting, design, engineering, construction, management, operation, restoration and disposal of...buildings". Drake and Hartman's (1991) view is also project-oriented, viewing the economics of construction as related to the goals and scarce resources of the construction industry" and lists what it contains techniques, mainly measurement techniques. Raftery (1991) proposes that "construction economics" is primarily a combination of engineering skills, informal optimization, cost accounting, cost control, price forecasting, and resource allocation. Finally, Bowen (1993) puts "construction economics" Economics” is described as “focusing on the application of quantitative techniques to provide financial advice to design teams using financial criteria” .

The usual way to implement value management is through structured workshops led by an independent facilitator to address issues related to design, construction, operations and management. In short, the Value Management workshop is multidisciplinary. The purpose is to review the performance and cost of the project throughout its life cycle.

In Figure 2 we depict a typical project life cycle to emphasize that the earlier the value management research is conducted, the greater the opportunity to benefit from it. This is especially important because in most cases there is only one value management intervention (Ellis et al., 2005:486). Therefore, if value management is to be used successfully, most participants agree that they need to be involved early in the project cycle when clear decisions need to be made. For example, hold workshops to examine the business case outlined, providing time and discussion for all stakeholders to better understand the project, improve efficiency and overall value for money. If value management activities take place before the bidding stage, there is still an opportunity to discuss different options, seek better solutions, accommodate design changes and often eliminate unnecessary costs. Ideally, this would be followed by a series of value management events over the course of the project, with several special cases where value management events would spread over several years.

Value management is clearly an organized effort to analyze function, value, cost and sustainability. In short, it treats the construction project as a whole. Not surprisingly, the Office of Government Commerce (OGC) strives to meet business needs and deliver successful projects, encouraging value management reviews of all large and complex projects. Where value management techniques are applied, OGC has seen significant defect reduction, efficient redesign of critical operating areas, lower maintenance costs, and an average overall cost savings of 15% (OGC 2007).

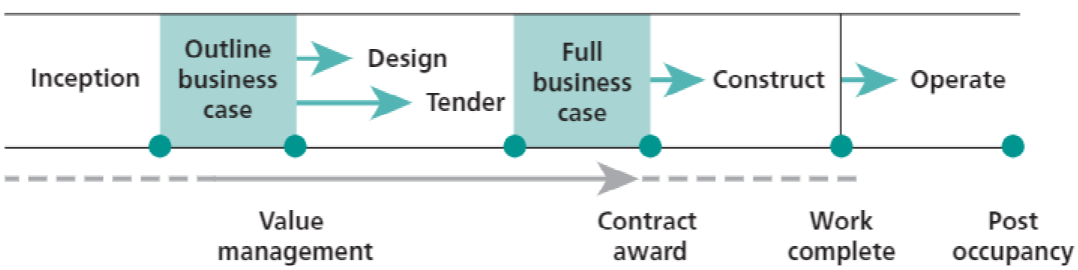


Figure 2 Project life cycle

The United States Federal Highway Administration is even further committed to value management and has made it compulsory for projects exceeding $25 million (£13.8 million). As a consequence, it can refer to some impressive state-of-the-art examples. To take just one instance, in 2004 a project began to replace the Antler's bridge crossing across the Sacramento River arm of Lake Shasta with a new £58 million structure. A total of eight value management studies were undertaken – at the design stage, at the preliminary engineering stage, and so on.

These resulted in an all-embracing value management process far ahead of anything currently carried out by the UK government. One major distinction was that this particular value management exercise included an assessment of the non-monetary benefits, such as travelling time and reducing the impact on nesting eagles, alongside the assessment of conventional monetary benefits such as construction and maintenance costs. An assessment of the revised design for the Antler's bridge crossing (following value management) showed a 19 per cent overall performance improvement. This was achieved at a reduction in cost of £7 million or 12 per cent. According to a formula used by the Californian government (dividing benefits by savings), these figures overall represented a 35 per cent improvement in value for money (OGC 2007).

Finally, in the context of this part of chapter, it should not be forgotten that value management equally provides an excellent opportunity to build a competent team and achieve effective collaboration between clients and contractors.

2-7 LIFE CYCLE ANALYSIS:

This approach aims to take into account the whole life costs incurred during a project. The analysis covers the total cost of ownership, including the initial investment, and production, operation and maintenance costs.

It should be apparent that any firm interested in producing products for the green market needs to consider a broad range of criteria. And the few firms that have begun to take their environmental performance seriously have adopted auditing procedures that go far beyond narrow financial measures. By auditing how much energy is used and how much waste is generated at each stage of a product's life, producers can increase resource efficiency and reduce the environmental impact of the product. But deciding where to start and where to stop with these environmental analyses is a contentious issue and the boundaries need to be clearly defined. For example, a construction firm could consider energy efficiency, the reuse of building materials, the energy embodied in the manufacture and transport of materials to site and the use of the building throughout its entire life span, etc. In fact, there seems to be ample opportunities to break into many new markets. In an ideal world, the complete 'cradle-to-grave' aspects of a building would be analyzed, but this would take a business into making detailed assessments of first, second and third generation impacts. The important message is to identify carefully the quality and specifications of the product to be marketed, before deciding what is the 'cradle' and what is the 'grave' for specific purposes. Such an approach would take a firm on an incremental journey that would make its product differentiation clear and accountable. Figure 3 shows a very simplified model of the opportunities that life cycle analysis might offer to construction.

Figure (3) Life cycle analysis of buildings and infrastructure .In this simplified model, the environment is the source of fossil fuel and raw material inputs and a sink for waste outputs.

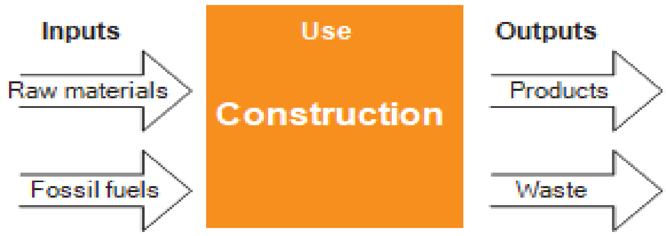


Figure (3)

It is evident that, at each stage, the construction process burdens the environment with many costs. At the beginning of the life cycle, a large amount of natural input is needed for the construction phase and, as is well documented, across Europe the construction industry consumes more raw materials than any other industrial sector. During the operational stage, buildings are also responsible for a very significant amount (40–50 per cent) of greenhouse gas emissions, as buildings rely heavily on carbon-based fossil fuel energy for heating, lighting and ventilation. And finally, at all stages up to and including demolition, there is a large amount of associated waste. In fact, it is estimated that the construction industry accounts for 50 per cent of the total waste stream in Europe.

The life cycle analysis of a building is complicated further by fact that there may be several occupiers with different regimes of repair, maintenance and improvements throughout its life span. At all times, however, there is a flow of resources from the natural environment to the constructed product and vice versa, with varying impacts on the environment at different phases. Consequently, no matter how exemplary the initial environmental specification at the construction stage, the overall impact of a building will be dominated by the way in which it is used.

For our purposes, it is important to remember that we are not dealing here with environmental science. *This text seeks to introduce economic concepts and:*

- compare ideas of mainstream economists with their environmental counterparts
- understand the interrelationships between the economy and the environment.

Figure 4 show the project cycle .

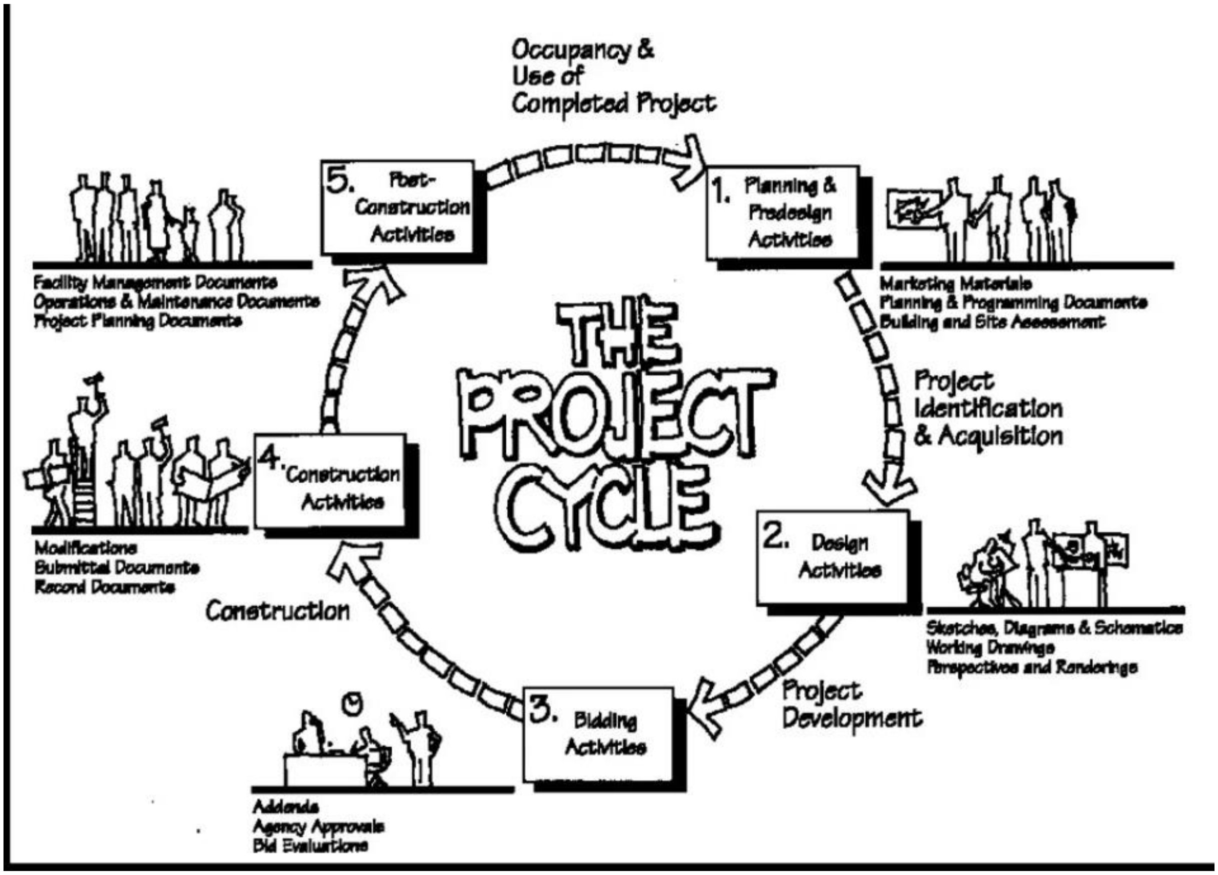


Figure 4 the project cycle

3 - Environmental Economics :

Effective protection of the environment forms a key part of any text concerning sustainability. Environmental economics is important for several reasons: first, because the environment has an intrinsic value that must not be overlooked; second, because the sustainability agenda extends the time horizon of any analysis to assure equity between generations; and, third, demands must be viewed on a whole- life basis and this is particularly important in the context of products that last for more than 30 years. Any model of analysis that seeks to identify general principles of sustainable development must include, at the very least, these three dimensions.

Consequently, to gain a comprehensive understanding of construction activity, it is advisable to embrace three perspectives – a broad macro overview of the economy, a specific sectoral study of the industry, and a detailed microanalysis of the individual markets in which construction firms operate. Studying the complete text, therefore, should provide a greater understanding of winning and completing projects in an efficient and sustainable manner. Figure 5 summarizes how these three elements contribute to a fuller understanding of a project. In many ways, it models the overall approach of the text.

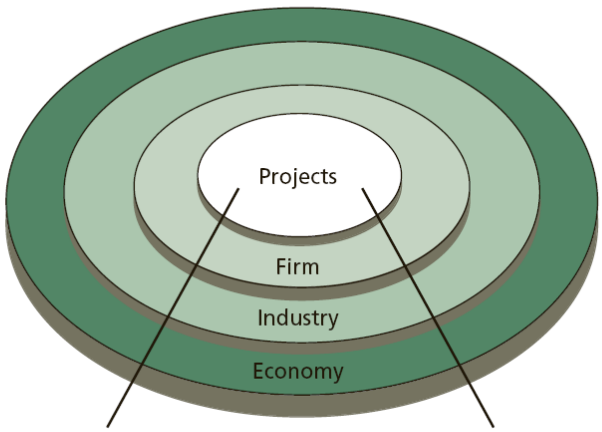


Figure 5 A model for construction economics: a new approach

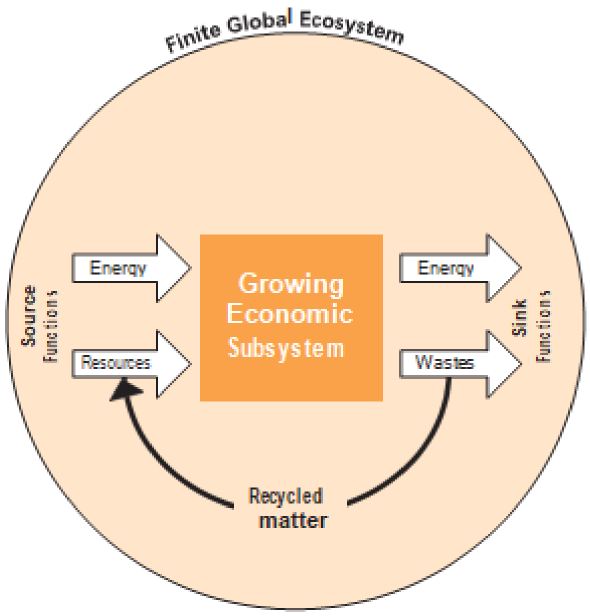
Mainstream neoclassical economics suggests that market forces determine the specific resources allocated to construction. We introduced these ideas in, where we explained how freely adjusting prices provides an efficient signaling system that determines what is made, how it is made and for whom. From this perspective, economists can easily account for why energy intensive, man-made substitutes might be used in place of more environmentally friendly products. Using neoclassical analysis, if inputs become scarce, the price rises; this, in turn, creates an incentive for an enterprising person to identify a gap in the market and produce a substitute. These substitutes often depend upon the clever use of technology and, as time goes on, more natural products are replaced (or substituted) by these man-made equivalents

So, for example, the sharp increases in oil prices during recent decades, which are outlined briefly as a cause of global inflation, have highlighted the increasing problem of demand for oil outstripping its supply. Indeed, the price of a barrel of oil reached an all time high in 2008. These significant and persistent price hikes push up the price of petrol and heating, and signal a need to substitute energy derived from oil with energy derived from other sources and to utilize developments in technology to improve energy efficiency. The reason we have presented this seemingly stark simple scenario, in which no explicit account is paid to the environment, is to stress that in traditional economic analysis the whole system is self-determining. In neoclassical terms, there is no need to resort to any form of government intervention to achieve a low-carbon economy, as given time the freely operating forces of the market will make it an economic inevitability.

In direct contrast, environmental economics does not accept that the ecosystem, or nature, is merely another sector of the economy that can be dealt with by market forces. Environmental economists proceed from the basic premise that there is an extensive level of interdependence between the economy and the environment; and there is no guarantee that either will prosper in the long term unless governments enforce measures that make firms acknowledge the complete life cycle costs arising from their economic activity. Daly (1999: 81) has crudely characterized the ideas of the neoclassical school: 'The economic animal has neither mouth or anus – only a close loop circular gut – the biological version of a perpetual motion machine.'

The important concept that Herman Daly and his environmentally conscious contemporaries bring to economics is the greatly undervalued contribution that the environment makes to the economic system. Indeed, the environment provides all the natural resources and raw materials needed to start any process of building or infrastructure, such as land, fuel and water. The environment also provides mechanisms for absorbing the emissions and waste. In short, in this modern view, the economy is viewed as a subsystem of the environment!

In discussions of sustainability the environmental dimensions cannot be ignored, yet traditional mainstream economic textbooks do not refer to life cycle analysis or any of the equivalent auditing systems that measure environmental impacts. The sole reference point is money and the economy is presented as a linear system – similar to that portrayed by Figure 5. To correct this misleading picture, environmental economists usually represent the economic linear system within a larger box, or circle, to represent the environment.. It is used to illustrate that there is an interdependent relationship between the environment and the economy; that the environment provides resource inputs and carries away the waste outputs and cannot be taken for granted. As an example of a representation of the environmental approach see Figure 6.



Source: Adapted from Goodland, Daly and El Serafy (1992)

Figure (6) Empty world

Unfortunately, however, the conventional mindset of those presently managing firms in the construction industry mirrors the approach taken by neoclassical economists. For this to be replaced with a genuine sustainable perspective, a commitment to understanding the ideas of environmental economics becomes most important.

It is worth closing this chapter with the observation that both neoclassical and environmental economists share a common belief that consumers and producers express preferences through their willingness to pay. This may appear ironic, but it seems that in the final analysis most economists are preoccupied with expressing everything in monetary value. This suits neoclassical economists whose main point of reference is the trade of material goods and services in markets at specified prices. It is far more problematic for environmental economists who seek to place monetary values on environmental goods and services that are commonly treated as 'free' goods..

Figure 7 The economic effect of a pollution tax .The supply curve S is based on the costs to the firm producing the good, without any consideration of its environmental costs. If a tax is introduced, the firm's total costs costs increase and the supply curve shifts upwards, by the amount of the tax, to S1. In the uncorrected situation, in which pollution was being taken for granted, the equilibrium price is Pe and the equilibrium quantity is Qe. After the tax is introduced, the equilibrium price rises to Pt and the quantity sold falls to Qt.

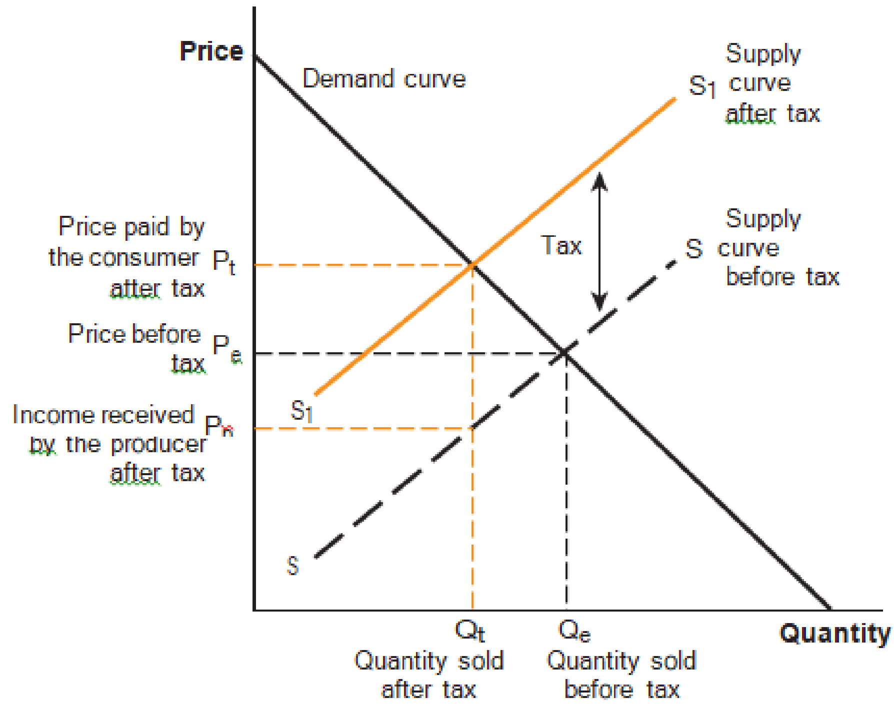


Figure 7 The economic effect of a pollution tax

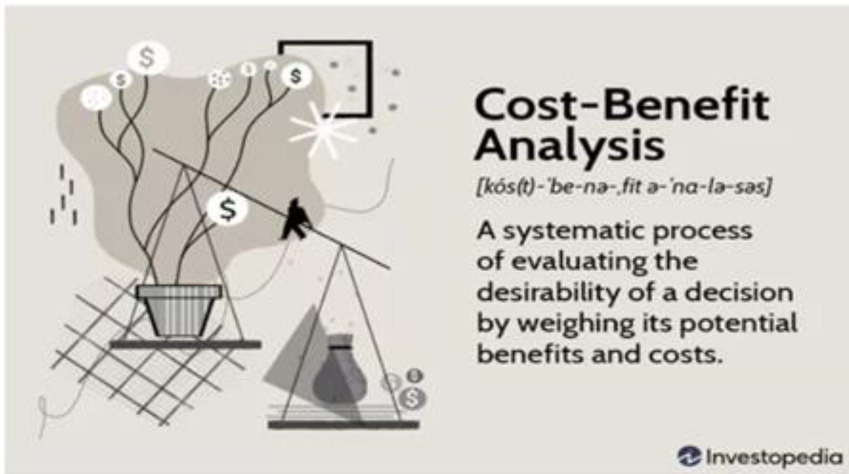
4. Benefit-Cost Ratio (BCR):

4-1 Benefit-Cost Ratio (BRC) Definition:

The benefit-cost ratio (BCR) is a ratio used in a cost-benefit analysis to summarize the overall relationship between the relative costs and benefits of a proposed project. BCR can be expressed in monetary or qualitative terms. If a project has a BCR greater than 1.0, the project is expected to deliver a positive net present value to a firm and its investors.

Benefit Analysis:

Cost Benefit Analysis shows in Figure 8 .



Investopedia / Michela Buttignol

Figure 8

- The benefit-cost ratio (BCR) is an indicator showing the relationship between the relative costs and benefits of a proposed project, expressed in monetary or qualitative terms.
- If a project has a BCR greater than 1.0, the project is expected to deliver a positive net present value to a firm and its investors.
- If a project's BCR is less than 1.0, the project's costs outweigh the benefits, and it should not be considered.

4-2- How the Benefit-Cost Ratio (BCR) Works

Benefit-cost ratios (BCRs) are most often used in capital budgeting to analyze the overall value for money of undertaking a new project. However, the cost-benefit analyses for large projects can be hard to get right, because there are so many assumptions and uncertainties that are hard to quantify. This is why there is usually a wide range of potential BCR outcomes.

The BCR also does not provide any sense of how much economic value will be created, and so the BCR is usually used to get a rough idea about the viability of a project and how much the internal rate of return (IRR) exceeds the discount rate, which is the company's weighted-average cost of capital (WACC) – the opportunity cost of that capital.

The BCR is calculated by dividing the proposed total cash benefit of a project by the proposed total cash cost of the project. Prior to dividing the numbers, the net present value of the respective cash flows over the proposed lifetime of the project – taking into account the terminal values, including salvage/remediation costs – are calculated.

4-3- the BCR Tell us :

If a project has a BCR that is greater than 1.0, the project is expected to deliver a positive net present value (NPV) and will have an internal rate of return (IRR) above the discount rate used in the DCF calculations. This suggests that the NPV of the project's cash flows outweighs the NPV of the costs, and the project should be considered.

If the BCR is equal to 1.0, the ratio indicates that the NPV of expected profits equals the costs. If a project's BCR is less than 1.0, the project's costs outweigh the benefits, and it should not be considered.

4-4 Example of How to Use the BCR

As an example, assume company ABC wishes to assess the profitability of a project that involves renovating an apartment building over the next year. The company decides to lease the equipment needed for the project for $50,000 rather than purchasing it. The inflation rate is 2%, and the renovations are expected to increase the company's annual profit by $100,000 for the next three years.

The NPV of the total cost of the lease does not need to be discounted, because the initial cost of $50,000 is paid up front. The NPV of the projected benefits is $288,388, or ($100,000 / (1 + 0.02)^1) + ($100,000 / (1 + 0.02)^2) + ($100,00 / (1 + 0.02)^3). Consequently, the BCR is 5.77, or $288,388 divided by $50,000.

In this example, our company has a BCR of 5.77, which indicates that the project's estimated benefits significantly outweigh its costs. Moreover, company ABC could expect $5.77 in benefits for each $1 of costs.

4-5- Limitations of the BCR

The primary limitation of the BCR is that it reduces a project to a simple number when the success or failure of an investment or expansion relies on many factors and can be undermined by unforeseen events. Simply following a rule that above 1.0 means success and below 1.0 spells failure is misleading and can provide a false sense of comfort with a project. The BCR must be used as a tool in conjunction with other types of analysis to make a well-informed decision.

4-6-the Benefit-Cost Ratio (BCR) Used for :

The BRC is used in cost-benefit analysis to describe the connection between the costs and benefits of a potential project..

4-7 -Calculation of the Benefit-Cost-Ratio:

The Benefit-Cost-Ratio is determined by dividing the proposed total cash benefit of a project by the proposed total cash cost of the project.

4-8 -a Benefit-Cost-Ratio Over 1.0 :

A reading over 1.0 suggests that on a broad level, a project should be financially successful; a reading of 1.0 suggests that the benefits equal the costs; and a reading below 1.0 suggests that the costs trump the benefits.

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$$\textbf{BC Ratio} = \frac{\text{Present Worth of Gross returns}}{\text{Present worth of costs}}$$

Equa. 3

5. Cost Control :

7-1 Cost Control Definition :

Cost control is the practice of identifying and reducing business expenses to increase profits, and it starts with the budgeting process. A business owner compares the company's actual financial results with the budgeted expectations, and if actual costs are higher than planned, management has the information it needs to take action.

As an example, a company can obtain bids from different vendors that provide the same product or service, which can lower costs. Cost control is an important factor in maintaining and growing profitability.

Corporate payroll, for example, is often outsourced, because payroll tax laws change constantly, and employee turnover requires frequent changes to payroll records. A payroll company can calculate the net pay and tax withholdings for each worker, which saves the employer time and expense.

- Cost control is the practice of identifying and reducing business expenses to increase profits, and it starts with the budgeting process.

- Cost control is an important factor in maintaining and growing profitability.

- Outsourcing is a common method to control costs because many businesses find it cheaper to pay a third party to perform a task than to take on the work within the company.

Understanding Cost Controls

Controlling costs is one way to plan for a target net income, which is computed using the following formula:

Sales - fixed costs - variable costs = target net income

Equa. 4

Assume, for example, that a retail clothing shop wants to earn $10,000 in net income from $100,000 in sales for the month. To reach the goal, management reviews both fixed and variable costs and attempts to reduce the expenses. Inventory is a variable cost that can be reduced by finding other suppliers that may offer more competitive prices.

It may take longer to reduce fixed costs, such as a lease payment, because these costs are usually fixed in a contract. Reaching a target net income is particularly important for a public company, since investors purchase the issuer's common stock based on the expectation of earnings growth over time.

Outsourcing is used frequently to control costs because many businesses find it cheaper to pay a third party to perform a task than to take on the work within the company.

7-2 Cost Control and Variance Analysis at Work

A variance is defined as the difference between budgeted and actual results. Managers use variance analysis as a tool to identify critical areas that may need change. Every month, a company should perform variance analysis on each revenue and expense account. Management can address the largest dollar amount variances first, since those accounts are most likely to have the biggest impact on company results.

If, for example, a toy manufacturer has a $50,000 unfavorable variance in the material expense account, the firm should consider obtaining bids from other material suppliers to lower costs and eliminate the variance moving forward. Some businesses analyze variances and take action on the actual costs that have the largest percentage difference from budgeted costs.

7-3 Cost Control Important for Businesses:

In a competitive marketplace, the low-cost producers are the ones that can earn the highest profits. Reducing costs is therefore a key objective for most businesses since it increases both efficiency and profitability.

7-4 Types of Costs do Businesses Incur:

In general, business costs can be categorized as fixed vs. variable and direct vs. indirect.

- Fixed costs are those that do not change, such as rent or insurance payments.
- Variable costs will change with productivity such as wage labor or energy usage.
- Direct costs are those involved with production or operations, such as costs of raw materials.
- Indirect costs include things like overhead, which are not directly related to the business's core operations.

7-5 Households Implement Cost Controls:

Cost controls are often associated with increasing the operating efficiency of a business; however, individuals and households can also benefit from such strategies to increase savings and cash flows. Establishing and sticking to a budget is one key strategy. Shopping around and comparing competitors' prices is another way to keep prices down. Look to shop when items are on sale and consider second-hand goods if possible.

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