

Life Cycle Cost Analysis (LCCA)

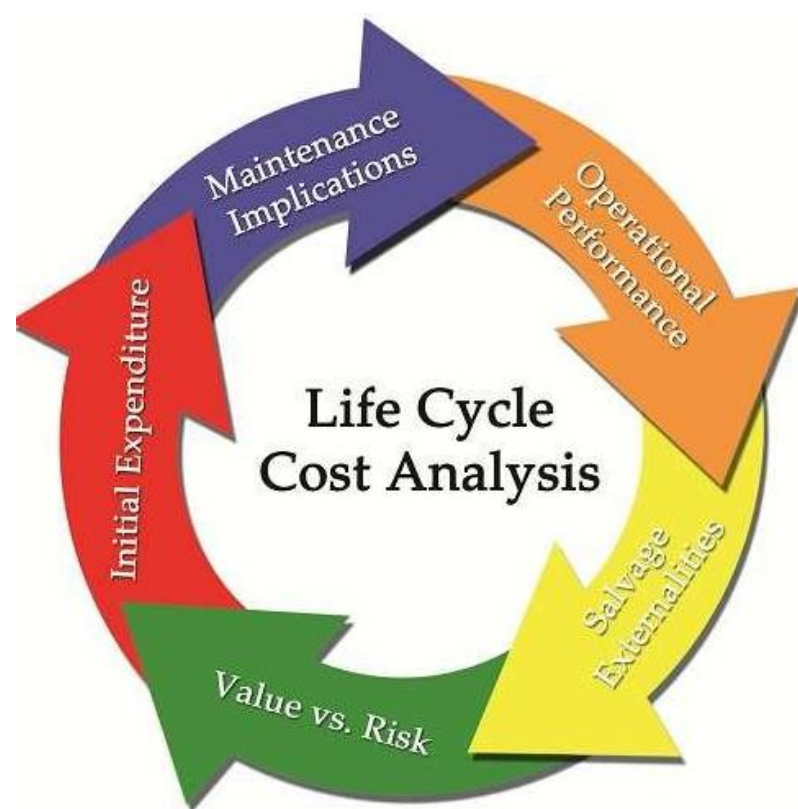
MSc Property and Facilities Management
Module: Management of the integrated working environment



Introduction

A Life Cycle Cost Analysis (LCCA) takes into consideration all costs associated with an asset or a potential asset during its entire lifespan. This includes from purchase or production until the end of life, extraction or renewal. It considers their whole economic impact during the lifespan (Kubba & Leed, 2016). This Method of analysis is widely used to aid companies when deciding on a new asset purchases and general affordability. This also determines whether the asset will provide a profit or not (Mahamadu, et al., 2016). The LCCA process is part of a wider Whole life cost process. This is where income, externalities and non-construction or asset costs occur i.e. employee wages. These should be taken into consideration when planning the purchase or installation/construction of an asset to show the complete cost.

The LCCA is used by designers, constructors, facility operators, cost consultants and other specialists (BSI Standards Publication , 2017).

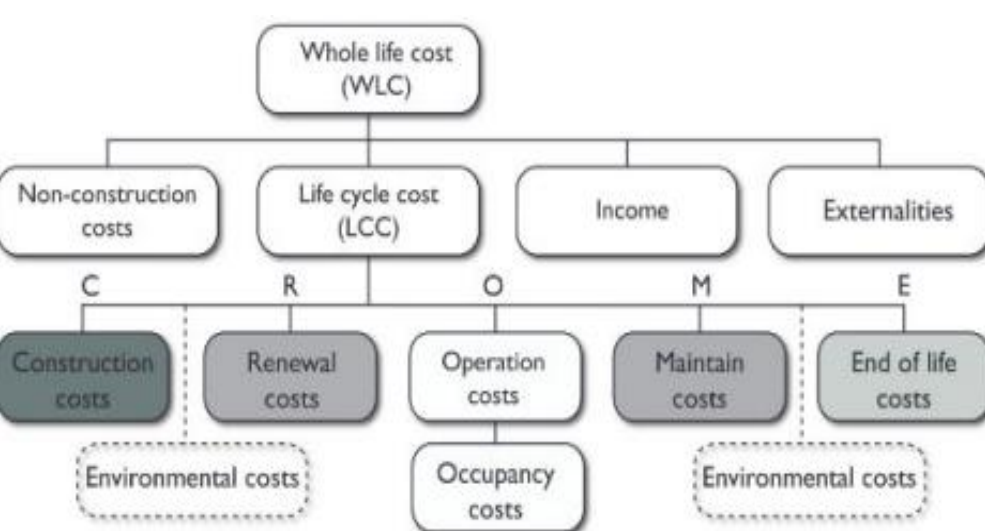


Formula / Method

The scope of the LCCA should be altered based on the clients requirements and should be identified with The LCCA method formula is as follows:

initial expenditure + maintenance implications + operational costs + disposal costs – salvage costs.

The method can be extended to fit the needs/costs of the asset. If you are investing in an item such as a large construction machine then the consideration of inflation/deflation would come into consideration when selling the item/ salvage. Smaller items such as lightbulbs this step wouldn't be considered as the difference wouldn't have an outcome in the product usage.



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Cost Variables and Value vs Risk.

Every LCCA will have a time profile. This will usually be either fixed or variable over a specific length of time. This can be converted into a LCC estimates using a computer spreadsheet or software. Future predictions should be as specific as possible. However the value of the asset that the LCCA is being completed on should look at the current real value and not predicted future values. The risk to an assets values depreciating can be taken into consideration and an present-value analysis completed. (BSI Standards Publication , 2017). There are 4 methods to work out costs. These are Real costs; Nominal costs; Discounted costs; and present value. The formulas for these are below: (except real costs as this does not require a formula).

a is the expected percentage increase per annum
n is the number of years between the base date and the occurrence cost
d is the expected real discount rate per annum
c is the cost in year, n
q is the discount factor
p is the period of analysis

Nominal Costs

$$q_{i,d} = (1 + a)$$

Discounted Costs

Real > Discounted Nominal > Discounted

$$q_d = \frac{1}{(1 + d)^n} \quad q_{d,nc} = \frac{1}{(1 + d)^n (1 + a)^n}$$

Net present value

$$X_{NPV} = \sum (Cn \times q) = \sum_{n=1}^p \frac{Cn}{(1 + d)^n}$$

Method in Application to Light bulb replacement

Lightbulbs come in many different shapes, sizes and types. For the purpose of this research/ exemplar we will be comparing the use of Halogen, Incandescent and LED lightbulbs, and all will be from the same UK company. To undergo a lifecycle cost analysis, we first need to understand the general differences of the lightbulb types. The lightbulb types are seen below:

Average Types	Average Lifespan	Wattage	Average Price (Per Bulb)
Incandescent	1000h	60 w	1.94
Halogen	2000h	30 w	2.70
LED	15000h	7 w	3.26

From looking at the general differences between the types of lightbulbs you can see that the LED Lightbulb lasts longer than both other bulbs by a significant difference and requires only 7w in comparison to the 30-60w the other bulbs require. However, the bulb is significantly more expensive than the halogen and incandescent bulbs.

Theoretical Scenario (LCCA) EXAMPLE	
Opening times Every day of the year minus Christmas Day	7:00-22:00 (15hrs)
Lightbulbs they require	236
LCCA Duration	5 Years
Electricity cost	£0.12378

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LCCA Stages		Incandescent	Halogen	LED
Initial Cost (per bulb)	Cost of Lightbulb	£1.94	£2.70	£3.26
Operation Cost	Energy used = Energy Consumed x hours x days x years Cost of energy x energy used = Cost of energy used per bulb	60w x 15 x 364 x 5 = 1,638,000 £0.12378 x 1,638 = £202.75	30w x 15 x 364 x 5 = 819,000 £0.12378 x 819 = £101.36	7w x 15 x 364 x 5 = 191,100 £0.12378 x 191.100 = £23.65
Maintenance cost	Total open hours / total lifespan of bulb = replacements needed. Replacements needed x bulb value = cost of replacements	27,300 /1000 =27.3 =28 replacements per bulb =28 x £1.94 =£54.32	27,300/ 2000 =13.65 =14 replacements per bulb =14 x £2.70 =£37.80	27,300/ 15,000 =1.82 =2 replacements per bulb =2 x £3.26 =£6.52
Total LCC	Initial cost + operation cost + maintenance cost = Total LCC	£1.94 + £202.75 + £54.32 = £259.01	£2.70 + £101.36 + £37.80 = £141.86	£3.26 + £23.65 + £6.52 = £33.43
Differences		54.8% more expensive than halogen 12.9% more expensive than LED	54.8% cheaper than incandescent 23.6% more expensive than LED	12.9 % cheaper than Incandescent 23.6% cheaper than Halogen
Overall cost of Total Bulbs		£256.01 x 236 =£60,418.36	£141.86 x 236 =£33,478.96	£33.43 x 236 =£7,889.48



Conclusion and Recommendations

From the Scenario, you can see that the LED Lightbulbs are overall the cheaper option even when the bulb themselves cost more. The company would save £50,000 by installing the LED bulbs instead of the incandescent bulbs. At first glance some company's may go for the cheaper option of lightbulbs at its initial cost. However, by taking the time to complete a LCCA you can see that the company is saving a lot more money by investing in the more expensive LED lightbulb. The researcher recommends using the LCCA throughout the companies decision making process so the company can analyse the best decision. The Future value of the Light bulbs however are unknown and therefore this LCCA is an estimated value. The lightbulb value could cost more or less when the replacements are issued, Similarly, when the lightbulbs need replacing there could be a newer more developed lightbulb available and a new LCCA should be done when replacing the items.

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