BANGLADESH COST ACCOUNTING STANDARDS

BCAS - 11

Life Cycle Costing

BCAS 11: Life Cycle Costing

11.1 Introduction

Cost accounting provides information for both management accounting and financial accounting. It measures and reports financial and non-financial informations that relate to the cost of acquiring and consuming resources by an organization. Cost accounting as a main part of management accounting is continuously changing, developing and improving. To produce quality product or provide quality services with optimum prices, managers of business organization are using various cost accounting techniques. Life Cycle Costing (LCC) is an advanced technique that can be used by the business organizations according to their requirements. The concept of LCC first came in the United States while they used the term in a military related document. After that many practices and theory of LCC have been developed and many publications on it have appeared. Mainly the development of the LCC techniques have been evolved in USA, UK, Japan and Germany. LCC is a tool which synthesizes data and contributes to making a logical decision. LCC analysis is a method of economic evaluation of alternatives which consider all relevant costs (and benefits) associated with each alternative activity or project over its life. LCC analysis is primarily suited for the economic comparison of alternatives. Its emphasis is on determining how to allocate a given budget among competing projects so as to maximize overall net return from that budget. It refers to all costs associated with the system as applied to the defined life cycle. In general, LCC includes research and development cost, production and construction cost, operation and support cost, retirement and disposal cost. This standard provides general guidelines on the application of LCC.

11.2 Objectives

The main objective of this standard is to ensure that each element of cost of the life cycle has been considered during planning stage. Planning and controlling costs requires not only an understanding of the elements of the life-cycle cost but also the magnitude and timing of each element.

11.3 Scope

11.3.1 This standard shall be applied to identify all pertinent cost over each phase of the life cycle.

11.3.2 More specifically, the concept of life cycle costing is important in evaluating product, long term projects, construction contracts, long term service agreements and other related ancillary issues covering a longer period of time subject to externalities. It can be used in following two cases:

a) The design, development, and production (or construction) of a new system.
b) The evaluation of an existing system capability, with the objective of implementing a "continuous-product/process-improvement" approach to increase the effectiveness while reducing the life-cycle cost of that system.

11.3.3 This standard may be followed by companies and other business or non-business organizations where cost and management accounting is in practice either as a statutory obligation or to support management decision making process.

11.4 Key Features

The key features of this standard are pointed below -

- a) Presenting the concept of life cycle costing as a part of cost management;
- b) Identifying different costs incurred during different phases of development;
- c) Bringing total cost of ownership as an important part of decision making process;
- d) Bringing the concept of invisible costs as a part of total costs for analytical issues; and
- e) Presenting different methods of applying life cycle costing.

11.5 Definition

The following terms are used in this standard with the meanings specified -

11.5.1 11.5.1 Life Cycle Cost: The Life Cycle Cost (LCC) of an asset is defined as the total cost throughout the life including planning, design, acquisition and support costs and any other costs directly attributable to owning or using the asset. LCC adds all the costs of alternatives over their life period and enables an evaluation on a common basis for the period of interest (usually using discounted costs). This enables decisions on acquisition, maintenance, refurbishment or disposal to be made in the light of full cost implications.

11.5.2 Development stages: The appraisal of costs is usually made with reference to all the development stages of a product or service life which generally include design, introduction, growth, maturity, decline and eventually abandonment.

11.5.3 11.5.3 Product: Product refers to goods or services since the general concept applies equally to both.

11.6 Standards

11.6.1 The life-cycle cost should include all costs that a product imposes on the organization. The life-cycle cost calculation should be presented so that it identifies the amount, type, and timing of each life-cycle cost element. Moreover, the cost estimate should include reasonable allowances for cost savings due to reengineering, continuous improvement (kaizen activities), and activity-based management activities during the product's lifetime.

11.6.2 Life-cycle costing should support the process of evaluating product profitability. The overall profitability of a product should be evaluated during the product planning and design stage. The present value of the product's estimated life-cycle costs should be compared with the present value of the product's estimated revenue in order to determine whether the product's projected net present value is positive.

11.6.3 **Each element of the product lifecycle cost should be estimated using the principle of cause and effect. Product life-cycle cost components should not be estimated during the planning stage using allocations of existing costs.**

11.6.4 For internal costing and decision making purposes, a product's life-cycle cost estimate should be allocated uniformly to each period of the product's lifetime. Costs should not be charged to the product as an expense attributable entirely to the period in which the cost was incurred.

11.6.5 There are five distinct phases in a product's life-cycle:

- a) Planning and development;
- b) Introduction and growth;
- c) Maturity;

- d) Decline; and
- e) Abandonment or renewal.

11.6.6 Since product renewal generally results in what is effectively a new product, renewal returns the product life-cycle to phase one. Therefore, the discussion in this standard will treat the product as effectively being abandoned. The life-cycle cost includes the following costs:

- a) design cost
- b) development costs;
- c) introduction costs;
- d) manufacturing costs;
- e) selling and logistical costs;
- f) service and warranty costs; and
- g) abandonment costs.

11.6.7 A complete life cycle cost projection analysis may also include other costs, as well as other accounting/financial elements (such as, interest rates, depreciation, present value of money/discount rates, etc.).

11.6.8 There are four broad purposes for life-cycle costing. LCC targets -

a) to identify whether the operating profits earned during the product's active or manufacturing phase will cover the costs incurred in the planning and abandonment phases;
b) to identify, during the planning period, significant nonmanufacturing costs associated with a given product design (such as warranty or product environmental costs) and to motivate changes to the product design to eliminate or reduce those costs;
c) to support cost comparisons among different product designs. For example, one product design might promise lower manufacturing costs but higher warranty costs. By comparing the total product life-cycle costs of alternative product designs, planners can make more informed choices among alternatives; and
d) to identify the nature and timing of costs so that they can be effectively planned and controlled. Product life-cycle costing is particularly valuable for products that create significant cost burdens at discrete points, rather than continuously during the product's life. Examples include planning and development costs for a new jet aircraft and decommissioning costs for a nuclear generating facility.

11.6.9 **Because different types of costs tend to predominate in different phases of the product life-cycle, by identifying the timing and nature of significant costs in advance organizations can develop more effective means of budgeting and controlling these costs.**

11.6.10 For example, research and development costs tend to predominate during the product's planning and development phase, whereas warranty and service costs tend to predominate during the late stages of product maturity when the greatest numbers of products are in the customers' hands. Therefore, while the primary role of life-cycle costing is to support during the product planning stage, the analysis of the product's lifetime profitability, life-cycle costing information also helps planners to control costs more effectively since it focuses on cost behavior during each unique phase of the product life-cycle. Effective planning and control of the individual elements of product life-cycle costs requires both an understanding and recognition of the varying nature of costs during the product life-cycle. Moreover, there is evidence from practice that the

failure to recognize the uneven flow of costs during the product's life cycle can motivate undesired and inappropriate decision-making.

11.6.11 The Life Cycle Costing process can be as simple as a table of expected annual costs or it can be a complex (computerized) model that allows for the creation of scenarios based on assumptions about future cost drivers. The scope and complexity of the life cycle cost analysis should generally reflect the complexity of the assets under investigation, the ability to predict future costs and the significance of the future costs to the decision being made by the organization.

11.6.12 The life cycle cost of an asset can be expressed by the following formula:

Life Cycle Cost = initial (projected) capital costs + projected life-time operating costs + projected life-time maintenance costs + projected capital rehabilitation costs + projected disposal costs - projected residual value.

11.6.13 **Cost Breakdown Structure can also be used to visualize and estimate life cycle cost precisely and accurately.**

11.6.14 The application of LCC may result any of the following intervention or treatment:

a) Do-nothing - The Do-Nothing option is literally not investing any money on any form of maintenance or renewal, including that recommended by the design engineer.
b) Status Quo - The Status Quo option is defined as maintaining the current operations and maintenance behavior, typically that is defined by the manufacturer or the design engineer.
c) Renewal (Major Repair, Rehabilitation or Replacement) - Assessment of different rehabilitation or replacement strategies requires an understanding of the costs and longevity of different asset intervention strategies. Each strategy is costed for the expected life of that strategy, converted to an equivalent present worth, adjusted for varying alternative life lengths, and compared to find the least overall cost.
d) Non-Asset Solutions - In certain circumstances the non-asset solution (providing the same level of service without a major additional investment) can be a viable alternative (for example, using pricing strategies to reduce the consumption of water).
e) Change Levels of Service - Most life cycle costing assumes a constant Level of Service across options being compared. When such is not the case (which is not infrequent in reality), comparisons across alternatives with different levels of service (that is, different levels of benefit) must introduce a projected benefits section for each alternative in addition to the cost projections. This, of course, takes the analysis into the realm of benefit cost analysis.
f) Dispose - Disposal of the asset is retiring the asset at the end of its useful life. Perhaps the function or level of service originally desired from the asset is no longer relevant.

11.6.15 A single intervention option for the entire life cycle is not likely to be the best approach to maximizing the life extension for an asset. Multiple strategies and options will need to be studied to determine the optimal strategy or combination of strategies for maximum life extension.

11.6.16 The application of Life Cycle Cost analysis to find that alternative with the lowest life cycle costs is important, but there will also likely be organizational cash flow issues that need to be considered. There will always be competing demands for the available cash resources of the organization at any given time.

11.6.17 **Life cycle costing should consider both visible and invisible costs into its formulation to make the decision worthy. Understanding the 'iceberg effect' may provide a useful guideline to understand the invisible costs attached with a decision scenario.**

11.6.18 In addressing the issue of cost-effectiveness, one often finds that there is a lack of total cost visibility. For many systems, the costs associated with design, production, the initial procurement of capital items, etc., are relatively well known. We deal with, and make decisions based on, these costs on a regular basis. However, the costs associated with utilization and the maintenance and support of the system throughout its planned life cycle are somewhat hidden. In essence, we have been successful in addressing the short-term aspects of cost, but have not been very responsive to the long-term effects. Importance of hidden cost is very significant which may even change the decision.

11.7 Recording and Reporting

11.7.1 Life cycle costs associated with activities such as research, design, production, operation, maintenance, and disposal must be viewed on an integrated and long term basis.

11.7.2 Life Cycle Costing to be used as Life Cycle Cost Management is life cycle thinking from producer, user, consumer and societal or environmental perspective.

11.7.3 Procurement and production costing technique considers all life cycle costs. In procurement, it aims to determine the lowest cost of ownership of a fixed asset considering the quality (purchase price, installation, operation, maintenance and upgrading, disposal, and other costs) during the asset's economic life.

11.7.4 In manufacturing it aims to estimate not only the production costs but also how much revenue a product will generate and what expenses will be incurred at each stage of the value chain during the product's estimated life cycle duration.

11.8 Effective Date

This standard will be effective from January 1, 2017 onwards.

Appendix 11A

This section provide an example of using life cycle costing

Life-cycle costing is motivated by the observation that life-cycle costs do not occur uniformly over the product's lifetime for two reasons.

First, different types of costs tend to predominate during each phase of the product life-cycle. For example, research and development costs tend to be concentrated in the planning and development phase; investment in plant and facilities, marketing costs, and advertising expenses tend to be highest in the introduction and growth phase; and product service and warranty costs tend to be highest during the decline phase.

Second, some types of costs tend to be higher than others. Therefore, if a cost type is concentrated in a particular product phase, that phase will show a high level of costs. The recognition that product life-cycle costs have important individual components that can vary in terms of amount and timing has two important decision-making implications.

Although characteristics vary by product, Table 1 summarizes the activity levels for each of the product life-cycle stages.

Table-1: Activity Levels in Product Life-Cycle

Cost Using	Planning and Development	Introduction and Growth	Maturity	Decline	Abandonment
Research	High	Moderate	Low	Low	None
Design	High	Moderate	Low	Low	None
Investment	High	Moderate	Low	Low	None
Cost control	Moderate	Low	High	High	Moderate
Reengineering	None	Low	High	Moderate	None
Profit levels	Low	Moderate	High	Moderate	Low

Appendix 11B

Steps in Applying Life Cycle Cost Analysis

A systematic use of Life Cycle Cost Analysis requires the following steps:

1) Define System Requirements,
2) Describe the System Life Cycle and Identify the Major Activities in Each Phase,
3) Develop a Cost Breakdown Structure,
4) Estimate the Costs for Each Phase of the Life Cycle,
5) Select a Computer-Based Model to Facilitate the Analysis Process,
6) Develop a "Baseline" Cost Profile,
7) Develop a Cost Summary and Identify the High-Cost Contributors,
8) Determine the Cause-and-Effect Relationships Pertaining to High-Cost Areas,
9) Conduct a Sensitivity Analysis,
10) Conduct a Pareto Analysis to Identify Major Problem Areas,
11) Identify and Evaluate Feasible Alternatives,
12) Select a Preferred Design Approach.

Appendix 11C

Cost Breakdown Structure

Cost Break-Down Structure in a hypothetical example following top-down approach is presented in the figure below:

Total LCC				
One - Off Costs			Recurring Costs	
Purchase Activities Cost	**Purchase Cost**	**Disposal Cost**	**Operational Cost**	**Maintenance Cost**
Purchase Management + Set up new Facilities + Documentation + Transportation & Installation	Equipment + Support Equipment + Initial Spares	Salvage Value (net)	Operational Management + Operator Manpower + Insurance + Fuel & Consumable + Utilities	Maintenance Management + Maintenance manpower + Spares + Spares Storage + Modification

Appendix 11D

Iceberg Effect

The following figure shows the invisible costs in a hypothetical scenario.