

## Product Life-Cycle Costing in Management and Industrial Accounting

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### ABSTRACT

Many traditional industrial accounting systems lead to make a wrong decision on investment and production. For example, one of the problems is the ruining and reconstruction (environmental costs) which works out of the traditional accounting systems. One appropriate method to solve such a problem is to use product life-cycle costing. Although this method hasn't developed well in environmental concepts, the results based on such decisions have proven perfect. Product life-cycle costing provides a better perspective regarding traditional accounting systems. Therefore, besides primary investment costs, operational costs and others are considered during the estimated life cycle of a product. The first step in this method is to understand the nature of life-cycle and the activities that happen in all steps. As a result, in this paper, life-cycle is defined firstly and then the product life-cycle costing and the costs and practiced models are described. The research method is library based. The results indicate that unlike managers' expectations, product life-cycle costing and other measuring techniques can work as a guide and indicator for an improvement and they can't improve anything on their own.

**KEY WORDS:** product life-cycle, product life-cycle costing, life cycle costing, life cost analysis, life cost planning, life cost evaluation, LCC model.

### INTRODUCTION

Life-cycle costing was firstly used by the US defense ministry in 1960. The purpose of life-cycle costing then was to help the defense ministry to provide army equipment. Using such a method at that time showed that near 75% of all system costs are the costs except education and initial structuring. These costs mostly involved the operational and maintenance costs which would happen in the future. (Brindle, 2005:9-10). In 1970, life-cycle application was used in evaluation and comparison of different methods in decision making and it was then that it was used as an instrument in decision making and management thinking (Brindle, 2005:10).

This made organizations to spend their initial expenditures on what would occur in the future for that product and take that issue into their account and would try to predict and estimate all costs to make better decisions rather than spending that money on deciding different solutions. However, that prediction didn't happen with certainty, and some illogical and wrong estimation based on traditional information system would mislead decision makers.

Nowadays, due to extensive usage of costs in economic evaluations, financial evaluations, value management, risk and demand management, precise determination of these can be called an integrated part of management process.

**Product life-cycle:** it involves all necessary activities from designing the product and purchasing the material for structuring to product delivery and after sale services. These activities include all research and development features, product designing, production, sales, marketing, advertisement and after sale services. Figure (1) shows the product life cycle system suggested by Fiberiki and Blanchard.

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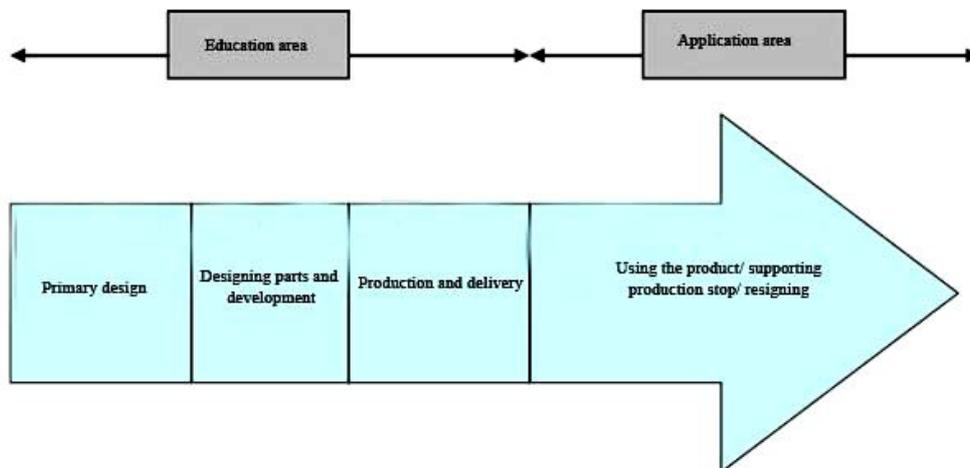


Figure (1) :the product life cycle system suggested by Fiberiki and Blanchard

**Product life-cycle costing:**

The concept of life-cycle costing in determining the costs of a product or special service mean to accept to pay attention to the environment, society, costs and economic benefits which happen in the life cycle of one product or service instead of limiting ourselves to initial investment price in selling and buying the material.

As an instance, costs related to a product or service usually occur in the following steps and processes (figure 2).

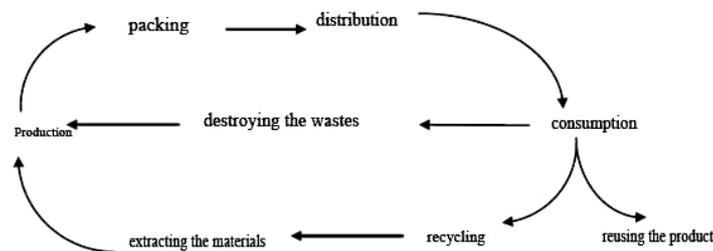


Figure 2: steps and processes of costs related to a product or service

Production, packing, distribution, consumption, reusing the product, recycling, extracting the materials, destroying the wastes.

Fiberiki and Blanchard (1991) have defined product life-cycle costing as the following (Brindle, 2005:11): Product life-cycle costing involves all costs that are determined in the life cycle of a product and they are related to a product or system. This method can be used to evaluate different solutions related to system designs, product designs and supporting systems. Life-cycle costing is a method in accounting management which occurs on total costs of a product in its life cycle. These total costs can be viewed from different angles (e.g. producers, consumers or owners or even more expansive the society). Product life cycle costing takes most of estimations and evaluations into account which a product faces in its life cycle. These costs develop from production costs to packing away and restructuring costs. This method makes cost evaluations possible in all levels of a product life cycle. These costs include investment consumption, operational costs, specifying overloads to a product or service (using costing based on the activity) and sometimes they are used in infrastructures and demand related services. Investigating product life-cycle involves the present value identification of costs which are predicted to occur in the system activity. Blanchart (1998) stated that life-cycle costing and life cycle engineering are different from other costing and engineering because when life-cycle costing is used, it covers all the system life-cycle in any levels of development (Brindle, 2005:12).

Woodward (1997) indicated that life cycle costing covers long term investment perspectives in decision making process by purchasing simple possessions with low initial education costs rather than economizations in short term (Brindle, 2005:12). The main purpose of product life-cycle costing is that it should be eliminated or

controlled before making commitments of capacities and it can't be accomplished after the capacity costs have been established and they operation process has started. Despite the fact that costs of most manufactured goods are determined at the last step like production and distribution, product life-cycle costing mentions that most costs can be determined at the early steps because in the research and design step, there is a great commitment for the costs. That happens because design related costs occur before production process and they can determine most of costs. Cooper and Slegmalder's findings show that 80% to 95% of products long term costs are determined at the R & D step (Brindle, 2005:13). Knowing the initial costs happens at the early stages of a product life-cycle system and it makes engineers and managers to be active in order to make a decision in the designing stage and they will make suitable decisions in this level so that they can control life-cycle costs. At the early stages of a product life cycle, there is little information about the product designs, therefore, estimating cost information faces some problems. In designing and predicting product life-cycle costs, the life of the designed product is considered and it can be determined through marketing and product researches, designing processes, production process, confidence, and support and maintenance. The decisions made at the designing stage are effective in the costs which will occur in the further usages. Low initial investment costs don't lead to lower costs of product life cycle. Financial economization, which is created due to choosing low costs in design stage, can be rejected by extra-costs in the future (especially for the products that have a long life cycle). For example, production with low quality and cheap material can have unfavorable environmental effects and it will increase social costs. Product life-cycle costs are divided into three groups and their related samples are shown in figure (3). While evaluating and measuring some costs are easy, there are some costs which sound difficult because they will be determined in the future. Most of related costs to the after production stage can fall in this group (such as after sale services, product guarantee, destruction, and its environmental issues, recycling and etc.)

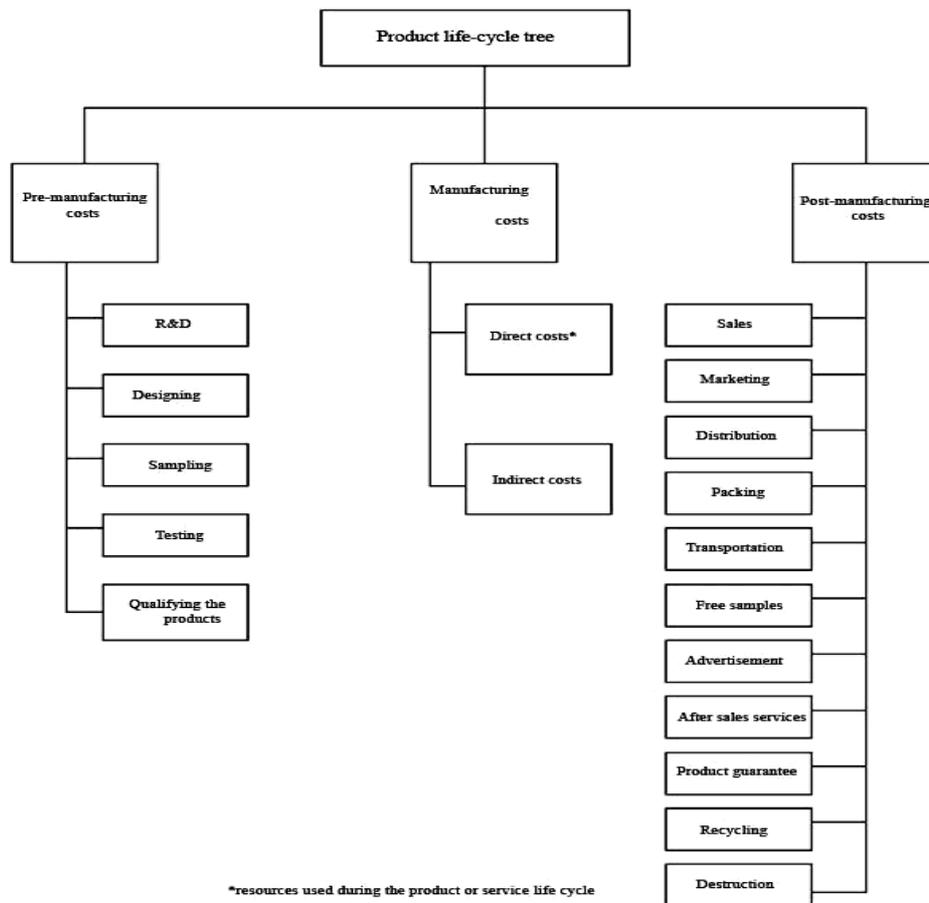


Figure 3: Product life-cycle costs and their related samples

The feature of product life cycle costing is that it can cover all the life cycle of a product and it can be used at any stages of product development.

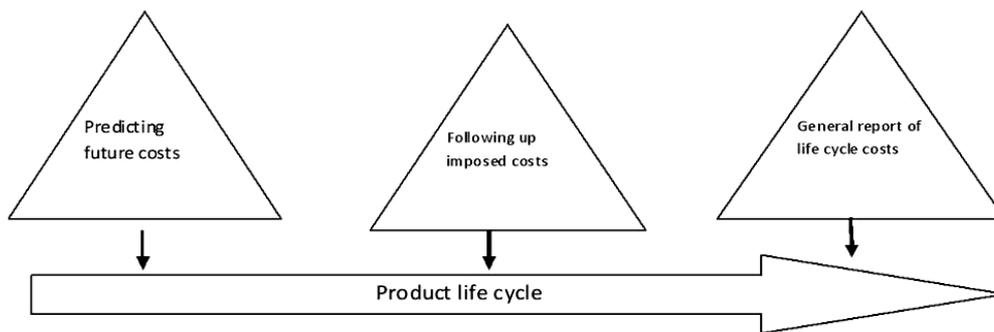
System costs should be broken down to the level that they require some basis for problem evaluation and different methods for system design and development, production and operational and supportive usages. The aim is a distinctive structure of costs that can grant cost motivating factors (the factors that have the most effects on system price) to the management.

These cost motivators can be different from one product to another and it makes the definition of main motivators more challenging. That is why operational data collection is one the main elements of product life cycle costing because these data can be used in determining the related costs to any products.

Product life-cycle costing model: product life-cycle costing includes many parameters. For example, these parameters can be system physical environment, preservation, confidence, labor rates, energy rates, tax and inflation. These parameters can help to make some cost models to analyze product life cycle costs. Before introducing these models, the concept of life cycle cost analysis and life cycle planning have been presented.

Life cycle analysis: life cycle analysis covers costs of creation, operational and destruction of selected solution during the product life cycle in order to create a decision potentiality to reduce costs. Life cycle analysis is used as a basis for cost attention and management during the product life cycle. This tool facilitates better prediction and balance of product life cycle costing. What costs should be used in LCC analysis depends on the purpose of costing. Evaluating future costs which is a main characteristic of LCC should be accomplished by supervision and cost revision during the product life cycle. It should be noted that during the product life cycle, the emphasis of LCC moves from cost evaluation to cost supervision. Using management control systems such as life-cycle costing may depend on economical structure. The companies that present products at their early life cycle are interested to use LCC as a design tool rather than using it as a control tool while the companies with an abundant of products pay more attention to control. At the early life cycle of a product, LCC puts more emphasis on future costs, but in the time process, the focus will be gradually transferred to supervising costs and future evaluation costs will be more based on previous costs at this stage. At the end of the cycle, cost evaluation for decision makers will have lower value because collecting correct data will lead to provide a life cycle costing report and it will show the general effects of the product on the organization. Figure (4) shows the focus changes of LCC during the product life cycle.

Life cost planning: life cost planning attends to evaluation and solution comparisons at the design stage. Life cost planning usually covers all costs and they are considered in evaluation of solutions, resources and incomes.



**Figure 4:** Life cost planning

**Model LCC:** LCC model is an accounting structure which involves elements and titles which facilitate the estimation and prediction of product costs.

An LCC model should have the following features:

- It should be comprehensive enough to identify the related and effective elements of LCC.
- It should be easily understandable and updatable and it can be changed and improved.
- It should present the characteristics of the product that it analyzes such as appropriate environment, operational designs, supports and any restrictions.

Establishing cost models to analyze product life cycle costs usually fall in three groups:

- A) Conceptual models: these models include group communications of hypotheses in one quality framework. These models are very flexible in general and they can adapt themselves to the systems.

- B) Analytical models: these models are based on mathematical designs to describe specific features of a system. Describing such features of systems is usually based on some conditions and hypotheses that their occurrence is definite and certain.
- C) Mind models: these models are used for some specific conditions and they can't be used in other circumstances. One of the characteristics of these mind models is their ability to present explanations for events that happened in the past or they are based on the existing relationships in the model and it is expected that they occur in the future. One pitfall of these models is that they are mind based.

Regarding the mentioned items, product life cycle costing process comes into two main stages:

- 1) Life cost planning stage
- 2) Life cost analysis stage

This process has been shown in figure (5).

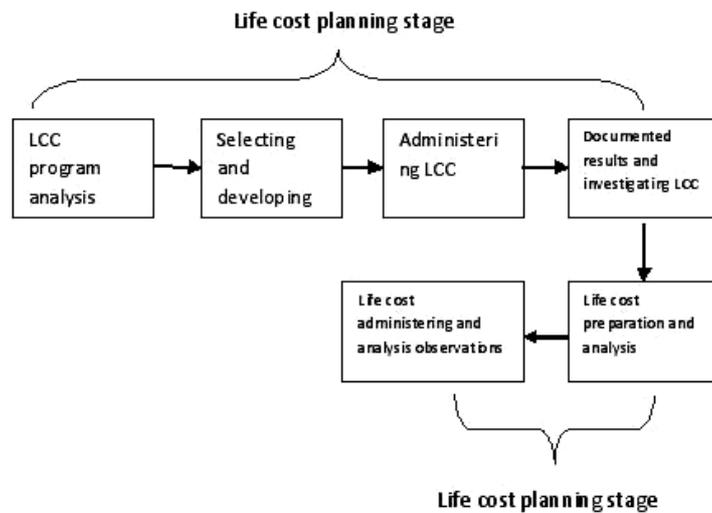


Figure (5): analyze product life cycle costs

In the planning stage, future data prediction should happen. This prediction is mostly based on the collected data and their analysis. After practicing the model, the obtained results are documented and the model is evaluated. In the next stage which is the life cost analysis, the company uses a desirable management and does all the related calculations and then the model is analyzed. Finally, this analysis can lead to the efficiency of the model or change and its improvement.

Companies need the following items in order to achieve life cycle costing effectively in the decision making process:

- 1) There are some tools and methods to measure life cycle costing: measuring all social, economic and environmental benefits and costs which are related to one specific product or service is a complicated process that requires extensive data in order to make the evaluation reliable.
- 2) They need a framework to achieve this concept that which costs are the most important ones.

According to the product life cycle theory, goods and industries pass three stages as infancy, middle age, and elderly. If the structure and the market function in that the movement of one product from stage one to the next faces some problems, the structural and technological processes will face a problem and they will slow down.

## Conclusion

Developing life cycle costing in one organization is a long term project. Management, officials and staffs can help to follow up the behavior of product cost in long term. This issue can be one of the most important reasons to collect product cost records. It seems that the most important element is to use a realistic product design in order to have a useful and beneficial life cycle costing. This applicable pattern should not be formed at the beginning, but if it needs changes, it should be updated during the product life. Updating this applicable pattern needs collecting data related to the product life cycle which is required to have a strong product life costing feature. Based on the

studies in this field, it has been recognized that evaluation and estimation of costs is one the most important elements of LCC so that investigating some reliable data in order to have logical evaluations is of a great value.

Organizations and companies may have the following challenges and limitations to practice LCC:

- 1) Practicing LCC in organizations and small companies or with individual ownership is always difficult and costly.
- 2) In order to achieve LCC purposes, data are in different forms, but they are not accessible in a unified form.
- 3) Data collections cost a lot.
- 4) Having low quality and contrasting data, and lack of accessibility to suitable data have made analytical life cycle costing problematic.
- 5) Since companies' data are not crystal clear enough, and most companies use traditional and outdated methods, the evaluation results are always controversial.
- 6) Cost management requires full and comprehensive collaboration of the involved people during the product life cycle.

Undoubtedly, if there is a strong will power in LCC administrators and managers' eager, some of these problems can be tackled and the limitations can turn into opportunities. Nowadays, computerized systems play an essential role in appropriate data collection and they are effective in LCC analysis which can lead to economical consumption of LCC administration and analysis. Managements' familiarity with the product life cycle costing that focuses on long term operation not only helps them in their cost management, but also can be used as a decision making tool so that there have been enormous attempts to practice this technique. It is hoped that in the near future, companies can get acquainted with this subject more and they can use it in their evaluations and analysis. It is suggested that researchers investigate the possibility of LCC application in different Iranian organizations in the future and describe how it is used. Advantages and pitfalls of LCC practice can also be analyzed experimentally.

#### REFERENCES

- 1) Amri Asrami, M. (1384), product life cycle and its costing methods, Accountancy periodical, No.168
- 2) AL-Haji , A. & Aouad , G. *The Development of An Integrated Life cycle Costing Model Using Object Oriented And VR Technologies*, Construction Information Digital Library <http://itc.scix.net/>
- 3) Barringer, H.Paul.(2003).*A Life Cycle Cost Summary*, International Conference of Maintenance Societies,
- 4) Brindle, Kari Elizabeth . (2005). *The Relationship Between life- cycle Costing and Performance: An Exploratory Analysis*
- 5) Gluch , Pernilla & Baumann , Henrikke .(2004) . *The Life Cycle Costing (LCC) Approach: A Conceptual Discussion of Its Usefulness for Environmental Decision-making*, Building And Environment, No.39, pp.571-580
- 6) Krozer , Voram . (2008). *Life Cycle Costing for Innovations In Product Chains*, Journal of Cleaner Production, No.16, pp.310-321
- 7) Lindholm , Anni & Suomala , Petri .(2007) .*Learning By Costing :Sharpening Cost Image Through Life Cycle Costing ?*,International Journal Of Productivity And Performance, Vol.56 ,No.8 , pp.651-672
- 8) Lindholm,Anni & Suomala , Petri .(2004). *The possibilities of Life Cycle Costing In Outsourcing Decision Making* , Frontiers of E-Business Research , pp.226-241
- 9) Steen , Bengt . (2005) .*Environmental Costs and Benefits in Life Cycle Costing*, Management of Environmental Quality: An International Journal, Vol.16, No.2, pp.107-118