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PRICING BASED ON PRODUCT LIFE CYCLE COSTING METHOD IN THE FRAME OF COST APPROACH: COMPARISION WITH TRADITIONAL METHODS

ABSTRACT

As a result of the increasingly competitive global market, it has become so difficult for corporations to survive. In order to be successful, corporations started to produce products that are customer focused and have low costs and high quality. In this sense composing systems that consider four main characteristics which are quality, functionality, cost and time are needed. So products have to include all these four characteristics at the same time. Developing such systems can be possible if corporations take into consideration all the phases of the product's life cycle. In order to provide competitive pricing, cost estimations have to be performed repeatedly throughout the products' life cycles. So it is possible to mention that there will be a deficiency in pricing when traditional costing methods are used. Product life cycle costing is an approach which supports the traditional cost accounting. The expression of product life cycle that was firstly used in the marketing literature has an important impact on cost and management accounting. In this study, the superiorities of product life cycle costing method when compared with the traditional costing methods are analyzed and what kinds of advantages this method creates in pricing are discussed.

Keywords: Product Life Cycle Costing, Pricing, Cost Accounting.

1. Introduction

Rapid changes in the production and information technologies make the continuity of corporations' lives difficult in the frame of globalization and increasing competition. Both national and global competition force firms to give much more importance to pricing. In the frame of the cost approach, firms make pricing according to costs of the products. It is appropriate to make pricing by considering costs of each product's life cycle phases.

All products have certain life cycles. The life cycle refers to the period that starts with the product's first launch into the market until its final withdrawal from the market. The starting and end points of the product's life are unique for each product. It is possible to assimilate it to the DNA or the finger print of a person (Cokins, 2001). Owing to the product life cycle; the return gained from each phase can be predicted, the decision process on financing, marketing and managerial activities can be simplified, and the comparability between existing and early products can be provided (Tek, 1999). The product life cycle concept undergoes a change in terms of manufacturer and consumer view points (Dogan, 2000). While a manufacturer will think in terms of the production perspective, a consumer will think in a different perspective.

The duration of the products' life cycles cannot be predetermined. Because, the formation and the duration of the product life cycle are depend on the frequency of technological revaluation, social and cultural developments, convenience to the market entrance etc. As mentioned in the Krozer's (2006) study, the life of the product has four main phases: *introduction*, *growth*, *maturity* and *decline phases*. However, with *product development phase* it can be thinking as five phases. As seen in Table 1, each phase has different characteristics in terms of strategic goal, competition, product, price goal, promotion goal, and distribution goal. Generally, firms try to make each of these phases' duration as long as possible. It is beneficial to examine each phase and related pricing in detail.

Table 1. Characteristics of Phases

	Development Phase	Introduction Phase	Growth Phase	Maturity Phase	Growth Phase
Strategic Goal	Make your product known and establish a test period	Acquire a strong market position	Maintain your market position and build on it	Defend market position from competitors and improve your product	"Milk" all remaining profits from product
Competition	Almost not there	Early entry of aggressive competitors into the market	Price and distribution channel pressure	Establishment of competitive environment	Some competitor s are already withdrawing from market
Product	Limited number of variations	Introduction of product variations and models	Improvement – upgrade of product	Price decrease	Variations and models that are not profitable are withdrawn
Price Goal	High sales to middle men	Aggressive price policy (decrease) for sales increase	Re-estimation of price policy	Defensive price policy	Maintain price level for small profit
Promotion Goal	Creation of public – market product awareness	Reinforcement of product awareness and preference	Reinforcement of middle men	Maintain loyal to middle men	Gradual decrease
Distribution Goal	Exclusive and selective distribution through certain distributions channels and creations of	General and reinforced distribution through all distribution channels available	General and reinforced distribution with good supply to the middle men but with low margins of	General and reinforced distribution with good supply to the middle men but with low margins of	Withdrawal from most channels of distribution except those used in the development phase

Reference: Avlonitis, G. 2001. *Strategic Industrial Marketing*, Stanoulis.

The product development phase starts with an innovation idea and its development. During this phase if the prototype is not agreed by the pilot customers, the product is redeveloped and updated. Consequently, this phase takes a long time and is too costly. On the other hand, the product development phase plays an audit role for whole cycle. As the cost of the product is determined according to its design, it provides a decrease in the costs of other phases. So, it is an important phase in making appropriate pricing. There is no sale in this phase and, so the revenues are negative.

In introduction phase, the product is introduced to the market. For this reason the advertisement costs are too high. The sales continue to be low until customers are aware of the product and its benefits. So the aim is to introduce the product to customers as soon as possible and increase the sales. Since the first distribution of the product actualizes in this phase, its distribution costs are very high compared with others. Because of this, some firms prefer outsourcing. Also, costs per customer are high and the customer profile is innovative. When these high costs combined with low sales, profits decrease. As there are few competitors in this phase and the product is new for the market, the price of the product is generally high. In this phase, the firm may apply the “skim pricing strategy” by making the prices high or may apply the “penetration pricing strategy” by setting the prices low in order to make gain market share rapidly (NMBA, 2008).

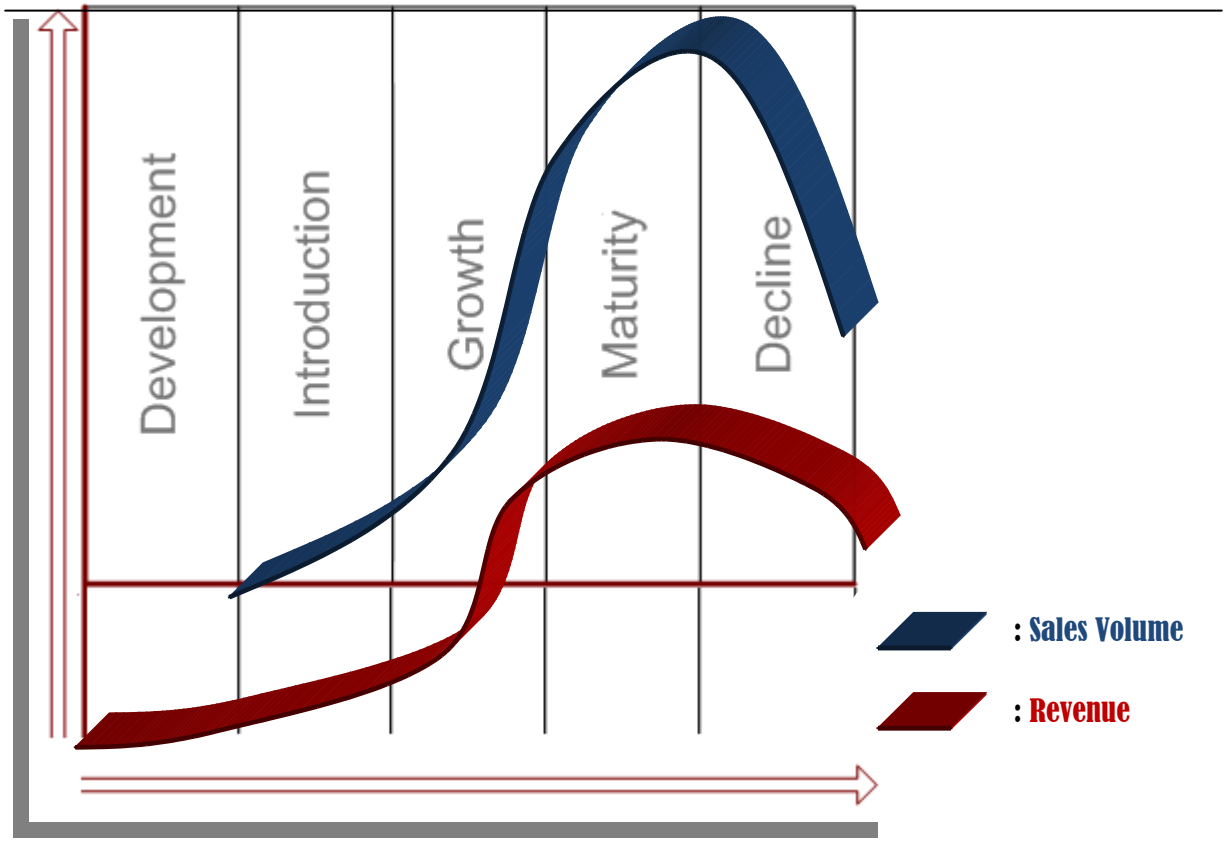
In growth phase, the sales and profit increases rapidly. Also there is an increase in the number of competitors and cost per customer is in a normal level – not too high, not too low. In this phase, the main aim of the firm is to maximize the market share. The customers in the growth phase buy the product by the gained references. However they are still in the group of first buyers. In order to prevent copying, firms may differentiate their products or use the barriers such as licenses and copyrights. Although promotion and advertising activities continue in this phase, they are not as much as in the introductory phase. Two strategies can be applied as a pricing strategy. One of these is to keep the prices high depend on the high demand. The other is to hold the prices down in order to obtain additional customers.

It is possible to understand that the maturity phase arrives when the market becomes saturated with the product and competitors present alternative products. In this phase sales are at the top level, so profit is high. Cost per customer is at a low level. As the product awareness is high,

advertisement costs are low. Products produced by different firms in the market become similar. For this reason, firms prefer sales promotion. The main aim of the firms in this phase is to maximize the profit with maintaining the market share.

In the decline phase both sales and profit decrease as seen in Figure 1. It is time to stop the production of the product and withdraw it from the market. The number of competitors starts to be low. The customer profile in this phase is like a group who delay to buy the product and buy it at the supreme moment. The main aim is to minimize the product expenses and to gain the last benefits from the product. As the product becomes obsolete, production takes place in low costs locations (PLC, 2008). As a pricing strategy, prices can be maintained at a low level in order to abate the inventories; or it may be maintained for continued products serving a niche market.

Figure 1. Sales Volume and Revenue Levels



The necessity of making pricing according to the product life cycle obliges the development of the modern costing approaches in order to support the traditional methods. The aim of this study is to examine one of the modern costing approaches called as *product life cycle costing method* which helps firms to take strategic advantage in global competition and to determine the costs much more appropriately.

The rest of the paper is organized as follows. Section 2 describes the modern costing approaches. Section 3 presents the product life cycle costing method. Section 4 discusses the differences between the product life cycle costing method and the traditional ones. Section 5 concludes the paper.

2. Modern Costing Approaches

Globalization causes producers to become perfectionist in their activities. The reason of this is the existence of more conscious customers. Firms have to inhere producing high quality products with low costs whenever and whatever customers demand. Also, almost in all countries service industry starts to become the primary sector because of the tendency of being knowledge society. Consequently, item-intensive products turn to knowledge-intensive (Savas, 2008). In addition, there are rigid developments in the production systems, methods, and technologies of countries. These are the reasons why traditional costing methods cannot meet current demands on costing. As a result of this costing approaches, which can optimize production system capability by considering product's life cycle, are started to be designed (Westkamper, 1998).

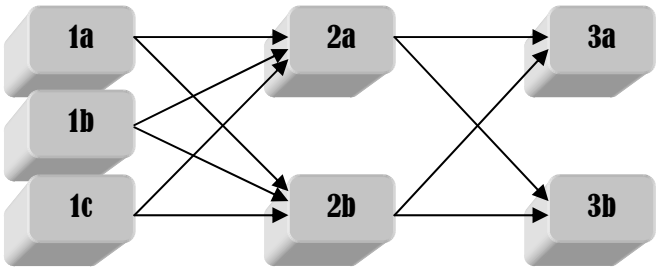
Traditional costing methods are mostly related with the costs appeared during production processes. So, firms cannot obtain desired results. In literature it is mentioned that the design of the product influences between 70% and 85% of its total cost (Seo, 2006). On this account, in order to make a competitive pricing, firms have to consider all the costs appeared in pre-production, production and post-production stages. So, an efficient cost management system should consider each phases, having different characteristics, of product's life cycle. In other words, cost management systems should be interested in not only today's costs but also costs of the future (Ozer, 2003).

Especially after 1980s, the variety in customers demand causes differentiation in firms' production processes. Also, firms having similarity in quality and price tend to differentiate in order to be successful in the competition area. Firms search for new solutions to decrease cost which are fundamental for maintaining and/or increasing the market shares. Product life cycle costing method is one of these solutions in the frame of cost management.

Table 2. Traditional Costing Systems

1. METHODS DETERMINE THE SCOPE OF COSTS
1a. Full Costing Method *(also: Absorption Costing Method)*
1b. Normal Costing Method
1c. Variable Costing Method *(also: Direct Costing Method or Marginal Costing Method)*
2. METHODS DETERMINE THE TIME OF COSTING
2a. Historical Costing Method
2b. Standard Costing Method
3. METHODS DETERMINE THE CONFIGURATION OF COSTING
3a. Job Order Costing Method
3b. Process Costing Method

System Choices



1.1a-2a-3a
2.1a-2a-3b
3.1a-2b-3a
4.1a-2b-3b
5.1b-2a-3a
6.1b-2a-3b
7.1b-2b-3a
8.1b-2b-3b
9. 1c-2a-3a
10. 1c-2a-3b
11. 1c-2b-3a
12. 1c-2b-3b

Traditional costing methods deal with which expenses are installed when and how to products (Buyukmirza, 2007). While before 1980s traditional cost accounting systems were applied, as a result of the global competition and developments in information systems new dimensions concerned with the costing system is created. Methods and choices for traditional cost

accounting systems and modern costing approaches are shown in Table 2 and Table 3 respectively.

Table 3. Modern Costing Approaches

APPROACHES PROVIDE OPTIMUM DECISION MAKING IN GLOBAL COMPETITION ENVIRONMENT
- PRODUCT LIFE CYCLE COSTING METHOD
- STRATEGIC COST MANAGEMENT
- STRATEGIC COST ANALYSIS
APPROACHES INCREASE EFFECTIVENESS OF RESOURCE UTILIZATION
- TOTAL QUALITY CONTROL
- JUSY-IN-TIME INVENTORY METHOD
- ELIMINATING COSTS THAT DO NOT CREATE VALUE
APPROACHES PROVIDE SUCCESFULL DETERMINATION OF PRODUCTS' COSTS
- ACTIVITY BASED COSTONG METHOD
- TARGET COSTING METHOD

According to this new classification, the systematic of costing methods is widely broadened when compared with the traditional methods. The product life cycle costing method becomes important in terms of considering all costs of each phase of the cycle.

3. Product Life Cycle Costing Method

The term of *product life cycle* is firstly mentioned in the marketing literature and after the idea of taking into account of all costs related with the cycle, the product life cycle costing has taken place in cost accounting literature (Ersoy, 2002). Product life cycle costing method was developed by Ministry of Defense of United States of America in the years of 1960s in order to make weapon purchase systems more effective (Dogan, 2000). Although, this new method was not considered as an important subject at the beginnings, after the adoption of ISO 14040's first chapter, product life cycle costing method started to be accepted. Costs related

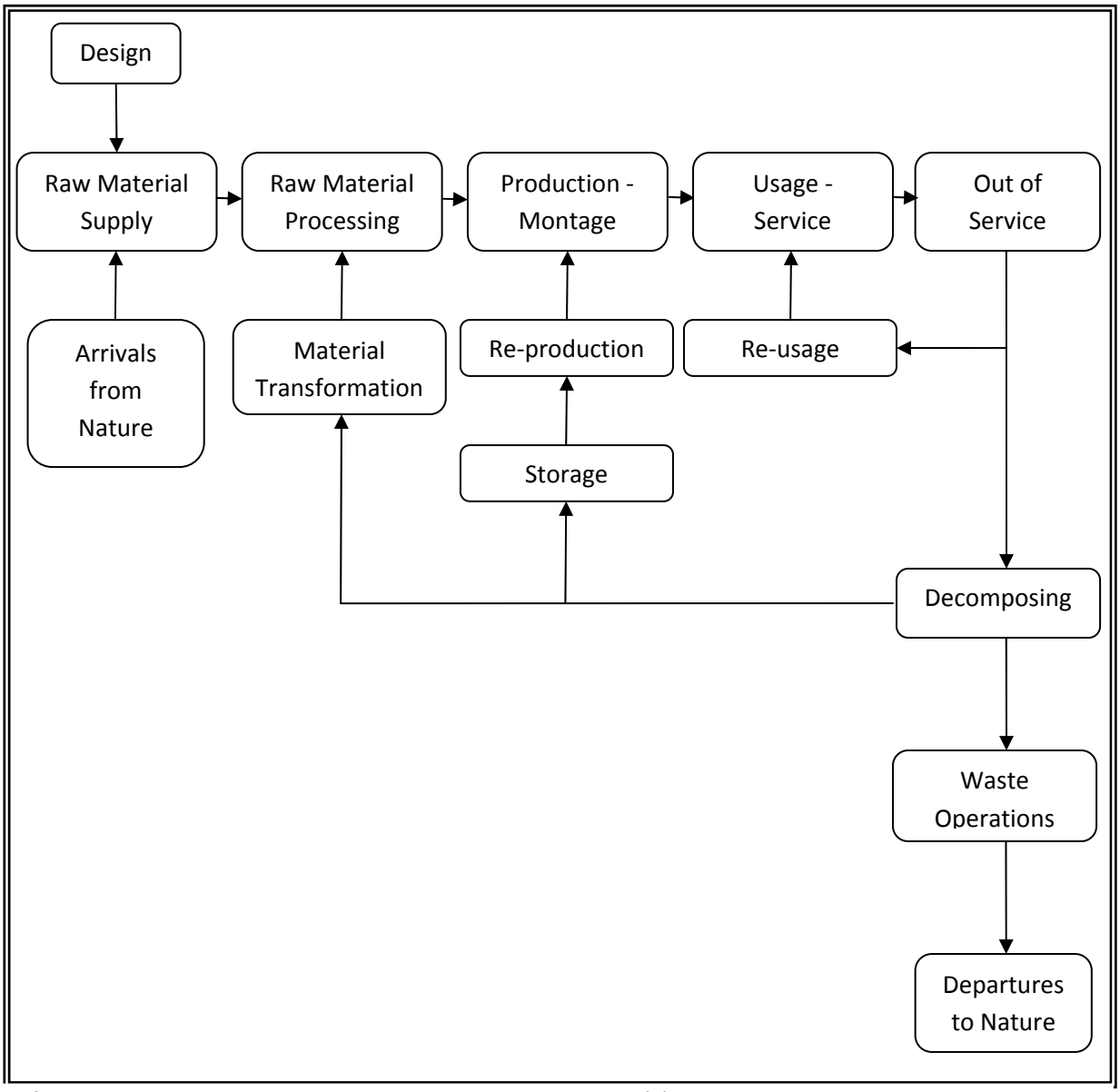
with the activities occurred in the life cycle of a product are accumulated according to the product life cycle costing method. In this approach the main aim is to manage all the costs appeared during the cycle (Park, Seo, Wallace and Lee, 2002).

The life cycle costing process includes identification of items to be monitored, identification of the cost structure, definition of links to estimate costs and establishing a method formulating life cycle costs (Woodward, 1997). Product life cycle costing is a model that examines each item of product's costs and gives information about all occurred expenses. In the calculation of products' costs this model takes into consideration not only production costs but also all costs of research, design, development, marketing, distribution, maintenance service, and customer services (Janz and Sihn, 2005). Energy and environment costs are also evaluated by included into the analysis of product life cycle costs (Celik, 2006). The benefits of the product life cycle costing method can be specified as providing the comparability of costs actualized and planned to be actualized and helping firms in situations such as taking appropriate pricing decisions, determining the product's profitability, producing environment-friendly products, and determining the after sales factor etc (Dunk, 2004). So, it is possible to say that, the applications of the product life cycle costing method are too wide.

Product life cycle costing method creates an important framework in order to determine and develop management strategies. This approach relies on a philosophy discussed that each product has a limited life and this life consists different phases. In this method most of costs are predetermined. Consequently, producers need to have a successful vision for applying this method.

As seen in Figure 2, the start point of product life cycle costing circle is the design stage. The path of circle continues with raw material supply, after sales stages, and disposal. Product life cycle costs are sum of the all costs appeared during all these stages.

Figure 2. Circle of Product Life Cycle Costing Method



Reference: Ersoy, M. 2002. Omre Dayali Maliyetleme. MODAV, 4 (2), p.51.

Product life cycle can be thought as having three fundamental stages: *pre-production stage*, *production stage*, and *post-production stage*. A huge part of costs related with product's life cycle is a result of decisions made in pre-production stage. For this reason, product life cycle costing method deals with the pre-production stage in contrast to traditional costing methods. By expending much more money in pre-production stage, producers can make saving in other stages. As a result of giving much more importance to pre-production stage, producers can produce high quality enduring products. So, the benefit obtained from the product will become to top level. The thought of an increase in the products quality will also increase the costs is out of date. Nowadays, producers think that by increasing the product's quality the

customer demand will increase and in order to meet this demand the production will increase and by reason of economies of scale, costs will decrease.

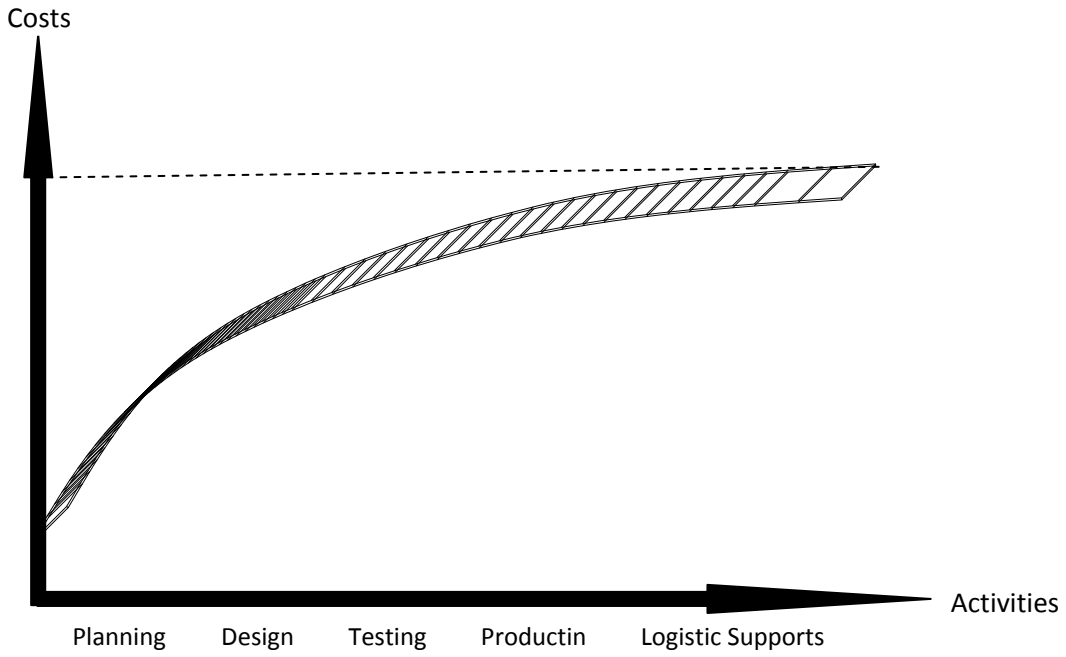
Previously, the duty was selling the products to the customer. However, nowadays customers have variety of options for product return. So, the post-production stage has become important for producers. Producers have to take into account the costs actualized and the needs of customers in the post-sales – *customer support stage* (Weinscheng, 2000).

Life cycle costing becomes more and more crucial when the technology changes rapidly and the product life cycles become shorter (Lapasinskaite and Boguslauskas, 2005). Product life cycle costing method is the one that should be used especially for products having short life cycles. Most of the time products, that have short life cycles, can not meet the costs made for them and also they do not have long life cycles to make some changes in their pricing policies. For these reasons, attaining the earning target level of these products becomes a critical aim and producers dwell upon these products more detailed.

The main aims of the firms are profit maximization. The important point is not to actualize the profit maximization in each phase separately. On the contrary, maximizing the total profit throughout the life cycle is much more important for the firms. The profit of any phase increases the total profit by avoiding the loss in other phase (Sevim, 2002). Producers should separate the costs, which they predict to actualize, phase by phase in the calculation of total costs. A graph about the expected costs throughout the product's life cycle is shown in Figure 3. In the graph, it is predicted that the expected costs will increase decreasingly. The expected costs give direction to the profit.

As the product life cycle is divided into three stages, it is also possible to separate costs into three groups by associating with these stages. These are *pre-production costs, production costs, and post-production costs*. Pre-production stage starts with the formation of the idea of the product. In this stage, the market research is made in order to determine the preferences of customers. The decisions taken in that stage affect the performance of the product throughout its life cycle. The design costs are the biggest item among the pre-production costs. While determining the pre-production costs, it will be beneficial to use the *target costing method*. By the help of that method, designs are actualized in accordance with the targeted costs.

Figure 3. Expected Cost Curve



Target costing is firstly applied and developed in 1969 by Toyota which is a Japan firm (Ceren, 2003). This costing method provides both items such as quality, security, meeting the customer needs and also proving a decline in costs of preparing prototypes, research and development, and planning stages. So, it is possible to express the target costing method as a method that aims decreasing the product's life cycle costs (Altınbay, 2006).

Operation and maintenance costs have important places in production costs. The costs of the production stage can be minimized by using the methods such as *kaizen costing method* and *just-in-time production method*. Kaizen costing method is a process of constant improvement for determining a target cost and attaining that cost. That method is mostly used in order to decrease the costs of production stages where high technology is used (Turk, 1999).

Just-in-time production is on the leading edge of technological advancement. Just-in-time systems are designed to keep inventory costs at a minimum level. This means that inventory levels of raw materials, work in progress and finished goods can be kept in minimum level.

4. The Comparison of Product Life Cycle Costing Method with Traditional Ones

Expenses made in the production stage compose the cost of the product in traditional costing methods. However, pre-production and post-production costs take place in financial statements as period costs. On the contrary, the product life cycle costing method consists of all three stages and the product's cost made up of all expenses occurred in these three stages. In this sense, all of the pre-production, production, and post-production costs are included in the cost of the product.

Direct material costs, direct labor costs, and indirect costs are items that formed the product's cost in traditional costing methods. The expenses occurred in pre-production and post-production stages such as research and development expenses, marketing-sales-distribution expenses, and general administrative expenses are qualified as period costs.

In traditional costing methods, the revenue of the related period is compared with that period's costs and expenditures because of the periodicity concept. In other words, costs are reported period by period. However, in the product life cycle costing method, costs are accumulated and reported along the products' life cycles instead of periodic reporting. So, the performance of the product can be seen as a whole, throughout its life cycle. However, we can own an opinion about the period's performance by only looking into the periodic results, but that opinion is not enough to make a successful decision.

The control of the costs actualized at the end of the period is critically important in traditional costing methods. However, the product life cycle costing method deals with the cost management by considering all costs related with the product. So, the future costs can be managed and analyzed in this costing method. In this sense while cost control is retroactive, cost management is future oriented. The differences between traditional costing methods and product life cycle costing method are mentioned in Table 4.

Table 4. The Comparison

Traditional Costing Methods	Product Life Cycle Costing Method
Pre-production and post-production costs are period expenditures.	Pre-production and post-production costs are also included in the cost of the product.
Only production costs are considered in the calculation of the product's costs.	The cost of the product consists of all expenditures.
Costs are reported periodic.	Costs are reported throughout the life cycle of the product.
Only production costs are taken into consideration in the cost control.	Cost management is actualized by considering all the costs related with the product.

Reference: Erden, S.A. (2004). *Stratejik Maliyet Yönetimi.* İstanbul: Türkmen Kitabevi. s. 210.

5. Conclusion

Pricing decisions become gradually important in terms of firms in the global competition area. Especially in the frame of the cost approach, it is so important to determine the costs correctly and definitely in the point of making strategic pricing decisions. The traditional costing methods are inadequate for pricing due to two main reasons. Firstly, traditional costing methods count in only production costs in order to determine the cost of the product. The costs of marketing, distribution and others are not embodied to the unit cost of the product. The second weakness is that traditional costing methods are periodical based reporting. In this sense, according to traditional costing methods, costs occurred during pre-production and post-production stages are not included to unit cost of the product.

Weaknesses of traditional ones can be avoided by product life cycle costing method. This method was firstly mentioned in the marketing literature and is accepted as a modern approach nowadays in cost accounting literature. Product life cycle costing method identifies the unit cost as a function of all actualized costs during product's life. In this sense, all costs related with the product and occurred during pre-production and post-production stages are reflected to the unit cost of the product. This approach provides the integration between marketing and cost system, and more efficient pricing.

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