LIFE CYCLE COSTING MODEL BASED ON TARGET COSTING AND ACTIVITY-BASED COSTING METHOD AND A MODEL PROPOSAL

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Abstract

Excessive levels of competition with globalization has forced businesses to differentiate into products and prices. Differentiation in price is only possible with lowest price. Businesses can create differetiation in products by increasing quality of the products and after sales services. To provide these, businesses have to know exact cost of the products and services and they need to design their products and services based on their costs. At this point, conventional cost systems become insuffi-cient and businesses need strategic cost management systems. One of these strategic cost manage-ment tools is the target costing method. Target costing method focuses on design stage of the product and aims to control and reduce the costs before they emerge. Conventional cost systems become insufficient in providing accurate data to target costing. At this point, activity based costing method provides more accurate data to target costing especially in indirect costs of products. After sales services which create differentiation in products have some costs and these costs need to be considered as costs of the products. In this study, a model is proposed for target life cycle costing based on activity based costing. In this model, all costs from design stage to after sales support in product life cycle are considered as product costs and target cost is calculated using activity based costing method. Finally, the model is explained using an example.

Keywords: Life Cycle Costing, Activity Based Costing, Target Costing

Introduction

Businesses need to keep lower prices from competitors in market in order to survive in competitive environment. To achieve this, they have to detect costs in the best way. At this point, the cost of the system used by the businesses to provide accurate information is very important.

Target costing, which is the one of these method aims to determine the cost of prod-uct at the design stage and reduce cost of the products before they emerge. The pur-pose of target costing is to manage costs before they emerge.

The activity-based costing which differs from conventional costing methods with the distribution of indirect cost method focuses on the activities. In this method, re-sources are consumed by activities and activities are consumed by products.

Businesses try to differentiate their products with after sales services in competitive environment. After sales services include warranty or installation of the product. Thus, these costs are need to be calculated in the cost of the product.

The purpose of this study is creating a model for target costing based on Activity based costing including whole life cycle costs of a product. The basis assumption of this study is target costing and activity based costing mutually complementary meth-ods. Featured aspect of this study is target cost includes the cost of all stages of product life cycle (from designing to after sales services) based on ABC.

Activity Based Costing

With the increase in competition it has become necessary to calculate the cost of produced goods and services more accurately. Conventional costing methods are insufficient to provide efficient cost information. Therefore, activity-based costing method has come into question.

Although activity besed costing method initially considered for detecting and controlling the indirect costs, its coverage expanded in the coming period. (Bengu, 2005).

In general, the activity based costing system can be defined as an accounting technology that calculates the cost of activities and reflects this costs to products and customers. Basic logic ot this method is that activities are obtained from a certain cost and it is based on the products and customers consuming activities at different percentage. (Alkan, 2005, s. 43).

Conceptual Framework of Activity-Based Costing

For a better understanding of the activity based costing process some of the basic concepts should be well known. These concepts are, resources, activities, cost factors and activity center:

Resources: Resources are managed or referenced economic factors to perform activities (Unutkan, 2010, s. 90). Resources are the elements that make up costs for a business. Examples of resources can be lease costs, labor costs, depreciation expenses, electricity, water and etc. expenses. In addition, some of the resources are directly related to the product (like direct labor,

direct materials), some of the products are not directly related to the product (like rent, general and administrative expenses). While the resources are consumed by products in the conventional cost management system, activities consume resources in activity-based costing system.

Resources are the elements that are the first financial inputs of activity based costing system. It is an important step which categories business resources will ve collected. In this point of view when deciding what the system's resources are and determining the costs the reference must be firstly the business ledger records (Alkan, 2005, s. 44).

Activities: Activities are actions that are performed during the production of a company's products and services (Unutkan, 2010, s. 91). The first step of the implementation of the activity based costing system is to determine the activities of the business. The basic function of an activity is to convert inputs (resources) to output (products). During this conversion activities consume resources. In other words, activities are the process that producing goods by consuming resources (Alkan, 2005).

Cost Driver: Cost drivers are factors that determine required the effort or workload to perform an activity (Unutkan, 2010, s. 91). In other words, cost driver is a factor that causes a change in the cost of activities (Bengu, 2005). When the number of activities increases, the number of cost driver is also increases. One of the main points of activity-based costing system to decompose the conventional costing system is the concept of cost drivers. While in ABC different cost drivers for each activity are used, in the conventional system it is used a single distribution key. This causes to produce erroneous report of the conventional cost system.

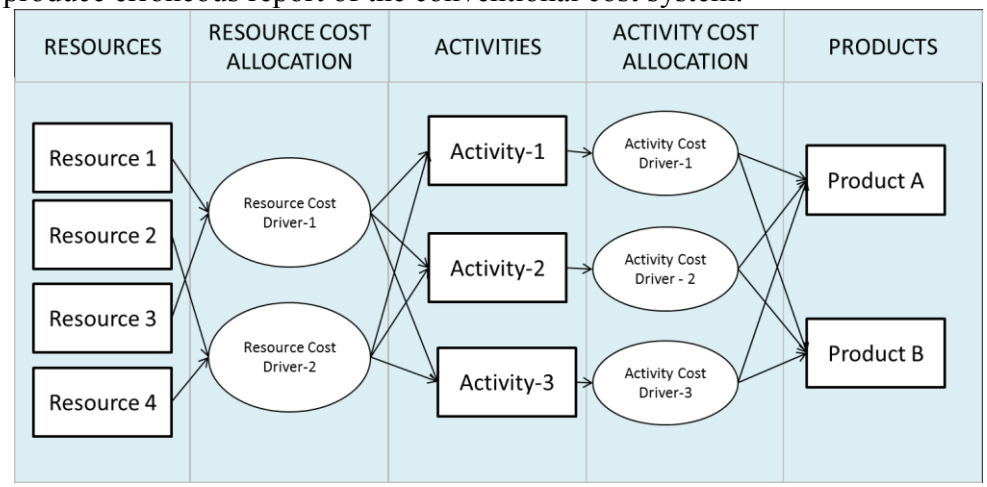


Figure 1. Cost Drivers in ABC (Pazarceviren, 2004)

There are two different cost drivers in activity based costing system. One of them is used for carrying resource costs to activities and the other one

is used for carrying activity costs to the products (Pazarceviren & Celayir, 2013).

Application of Activity Based Costing

Specific steps for the establishment of activity-based costing system must be followed. These steps consist of two stages. The first stage is the stage of costing activities. The second stage is the stage of the installation of the activity costs to the products. The basic assumption of this system is that the activities consume resources and the products consume the activities.

This two-stage consists of five steps (Bekcioğlu, Gurel, & Kizilyalcin, 2014):

- **Identifying activities:** It is the most important step in application of the activity based costing system. In this step all business activities should be analyzed in detail.
- **Classifying activities:** In a business many activities of a product come out during the ABC application. Because monitiring these activities seperately is not applicable and economic, activities are grouped according to a certain criteria. In this stage similar activities can be combined and grouped. The costs of these grouped activities are distributed to products by a single carrier.
- **Costing activities:** After finding activities and activity centers, cost of the activities process needs to be done. The first step is to calculate the cost factors. The next step is to distribute the costs to activities according to cost factors. Cost factor (supply factor) is the measure that define the relationship between activity and resource costs. These are the measures like volume, weight, number of workers, man-hours, the number of bulbs, the number of equipment and etc.
- **Selecting accurate cost factors for allocating costs to the products:**

The production process must be examined carefully for determining used cost factors for allocating activity costs to products. Cost factors should be determined in accordance with cause-and-effect relationship at this stage. Three points are important during the selection of cost drivers (Bekcioğlu, Gurel, & Kizilyalcin, 2014, s. 24):

- ✓ Ease in providing the necessary data for cost factor (measuring cost),
- ✓ The relationship between selected cost factor and the actual consumption of activities (the degree of correlation),
- ✓ Behavior demonstrated by cost factors (behavioral factors).

- **Charging activity costs to products:** In the stage of charging activity costs to products, first, unit cost of cost drivers. Then how many units consumed from these factors by products are calculated. Finally, unit

cost of factors and unit consumption of products is multiplied and product allocation cost is calculated. When the same process is applied to all activities belonging to a product, the activity-based cost of a product is calculated.

Target Costing

It's become an obligation for businesses to estimate the price paid in the market accurately, calculate the product costs accurately and assign an accurate price. At this point, target costing is getting important.

Although the target costing method is expressed firstly by Henry Ford, it is a concept that is developed by Toyota in the 1960s, used by many Japanese businesses and conferred in the literature by the Japanese. (Aksoylu & Dursun, 2001).

Target costing method is used in the first stages before the design and create a new product's production methods. In this method, the process is directed by customers, is focused on designing products and is spread over the entire life cycle. (Coşkun, 2002, s. 25). Target costing is a strategic profit and cost management process to reduce product costs throughout the course of the product life (Alagoz, Yilmaz, & Ay, 2005).

Due to the occurance and development of target costing in Japan it is defined by Japanese researchers in different ways. The prominent names are Hiromoto, Sakurai and Monden. Target costing is defined as the main function of market orientation and dynamic cost management by Hiromoto where as it is defined as effective cost management tool in reducing product costs through other departments by Sakurai and Monden. According to Peter Horvarth and Werner Seidenschwarz target costing is a strategic cost management method that converts information about the product, market and resources to a quantitative measure based on the strategic foundation (Pazarceviren & Celayir, 2013).

The main purpose of target costing could be specified like this: (Alagoz & Ceran, 2006, p. 66):

✓ Consolidate being market-oriented; product planning within the framework of activity planning area; customer, competition and supplier oriented.

✓ In conjunction with with the Value Engineering, in reducing costs based on customers and competition correcting designs and forcing improvements

✓ At all levels of production forcing to a full-time control for specific and / or external development and specific and / or external production,

✓ In conjunction with capacity utilization planning and capacity planning forcing a Simultaneous Engineering.

Target Price, Target Profit and Target Cost

Target costing concept has emerged as the result of two important factors related to cost and market. One of them is the price determined by the market. Nowadays as a result of increasing competition businesses have lost the control over determining the price of products. Therefore, the price is determined by the market. The other cause that has a influence on the emergence of target costing is that determining the large part of the products' costs at the product design stage (Pazarceviren & Celayir, 2013).

Target cost simply is the cost of resources consumed in producing the product to sell a product at an targeted profit (Coşkun, 2002).

Target costing has quite a simple formulation and calculated as follows (Alagoz, Yilmaz, & Ay, 2005):

- The product sale price on the market is determined.
- Targeted profit margin deducted from the sales price.
- The remaining figure is the cost required to produce the product. This cost is the product of target cost.

Target Cost = Target Price – Target Profit

Target sales price and sales volume is determined by the information obtained from customers. The target profit, concernng the desired rate of profit in all product life cycle is found by the result of long-term profitability analysis. Target cost is the difference between the two (Coşkun, 2002).

Basic Principles of Target Costing Method

There are six basic principles of target costing. Because these principles take a different approach in terms of the cost management they reveals completely different approach than conventional systems in terms of cost and profit planning. These six key principles are (Swenson, Ansari, Bell, & Kim, 2003):

- **Costing in accordance with the price:** Market prices are used to determine the target cost. The target cost is calculated using the following formula. Market Price - Needed Profit = Target Cost
- **Concentrating on customer:** Considering and analysing the customers needs and expectations on the quality, cost and time for product design and process decisions.
- **Concentrating on product design:** Cost control starts at the stage of the product design. Therefore, engineering changes must be made before production begins. Target costing aims to make cost savings before the product produced. 80-85% of the cost of the product arises in the product design process. Therefore, the design stage is the most important principle of target costing (Hacirustemoğlu & Sakrak, 2002).

- **Extensive involvement:** Participation in the whole process from the design of the product to final state with cross-functional product and process team.
- **Paying attention to value chain:** All members of the value chain (such as suppliers, distributors, customers) are included in the target costing process.
- **Costreduction during whole product life cycle** (A life-cycle orientation): Costs that are over the entire life cycle of the product should be reduced. Costs include purchasing costs, operating costs, maintenance costs, a distribution and service costs.

Target Costing Process

Target costing is composed of the following three processes simultaneously or sequentially with each other:

- **Market level costing:** Starting point of target costing is the costing at market level. Due to the market level costing the information is collected about customer needs and prices they are willing to pay for their needs (Cooper & Slagmulder, 1999). By conducting the market analysis in this stage new products' position in the market could be detected and also products' costs at an acceptable level could be detected. The information taken from there will be transferred to the product level.
- **Product-level costing:** Acceptable costs detected in the stage of costing at market level acceptable costs of target costing are transferred to the product level. At this stage working on product design and production process starts. Designers work with the cost pressure. The purpose of the costing at product level is to provide designers focus on the cost of the product and discipline the costs.
- **Unit- level costing:** After the target cost at product level is determined target costs received from product level are transferred to the compponents of product. Thus for the unit that will be purchased to the suppliers target cost is indicated. Suppliers are obliged to produce the units assigned to them in the framework of target costs. By this way according to the target cost obtained at market level suppliers must discipline their costs.

Relation Between Target Costing and Activity-Based Costing

Target costing is related to the activity-based costing on three points. The first one is determining the estimated cost. Activities that are used on the indirect areas depending on the product, can be analized by original activity costs. The second, activity-based costing can determine the cost drive of the product planning and the design offer. Subjects such as product diversification, usage of standard parts, chain of distribution, purchasing and

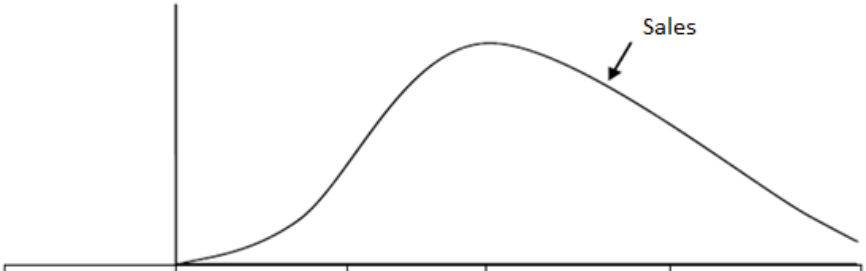
production, has to be compatible with market requirements. While target costing provides information formarket requirements and cost goals, activity based costing can present cost structures of design alternatives. The third, activity-based costingcan be used as a tool for achieving target cost. Activity-based costing which identifies the activities required to realize specific product functions and related to this, determines the cost allocation keys, assists to determine the optimal value area by transferring activity costs to product (Horvath, Gleich, & Schmidt, 1998).

Product Life-Cycle Costs

With the increasing competition suppliers whose profit margin has been shrinked must determine the prices in a more clear way. Therefore, they need to calculate the endured costs throughout product's all life stages from the product's research and development stage to the after sales costs.

Figure 2. Life Cycle of A Product (Blocker,vd., 1999, p.134)

Product life cycle of a new product to be introduced to the market can be determined as before market and after market at two stages. Market entry stages are defined as the process from the idea stage to the commercialization stage. After market entry stages are evelopment, maturity and decline stages. During each stage of the product life of the product should be evaluated according to different criteria.



	Introduction	Growth	Maturity	Decline
Sales	Low	High	High	Low
Competition	Low	High	Very High	Low
Price	High	Downtrend	Low	Low

Figure 3. Product Life Cycle Stages (Kaygusuz, 2011)

In Figure 3 changes that occurs during the product life of a product take part. Whereas sales volume is low in the entry stage, it increases in the development stage, slows down in maturity stage and quite decreases in

decline stage. In contrast, whereas prices are high in entry stage, they decreases at later stages.

As shown in Figure 3, it is the product price that set by the market and is the main issue of target costing. Because price of the product is determined by the market and a profit determined based on this price and target cost of a product calculated according to this.

Due to the cost of the product during product life cost occurs in three stages:

✓ Activity costs came forward to place on the market until the commercialization stage of product (Kaygusuz, 2011). Market research costs, research and development activity costs, design and testing costs are included at this stage.

✓ Production and activity costs occurred after the product commercialization (Kaygusuz, 2011). Production and distribution costs occur at this stage.

✓ Activity costs occurred after the sale of the product. Technical service, return etc. costs are included in this group.

The difference introduced in this study is that in target costing method it is considered the whole life cycle of the product and activity-based costing system is used in calculation of the target cost.

A Model Proposition For Determining Product Life-Cycle Cost

Effective and cocsistent target costing process requires the activity based costing model. Thus, value obtained from the model will be much. During the application of activity based costing method whole life cycle of the product must be considered. Because the purpose of the activity based costing is revealing the product costs in the best way.

In this study the whole life cycle of the product is considered and then a target costing model is set out. Data used in target costing obtained from the activity based budgets in our model. The costs incurred in the life cycle of the product is handled in three periods:

✓ Costs incurred before production

✓ Costs incurred during the production and sales,

✓ Costs incurred after sales

Difference presented in this study is that costs occured during the life time of the product are included target cost by activity cost method.

Costs incurred before production are costs like research and development costs, market research costs, general and administrative costs and financial costs. These costs are generally indirect fixed activity costs.

The costs incurred during the production and sale are fixed / variable and direct / indirect resource and activity costs.

Costs incurred after the sale are distribution costs and after sales support costs. After sales support costs are included technical support costs as well as costs of collected, repaired or exchanged and re-delivered to customers of returned products from customers. In the meantime bussinesses have to consider the activity costs of maintenance and spare parts for a certain proportion of products sold and include in their budgets. Because these costs are proportional with the amount of sales they are defined as direct variable costs. On the other hand it must be considered that technical support also has a fixed cost. This cost is assessed as indirect fixed resource cost.

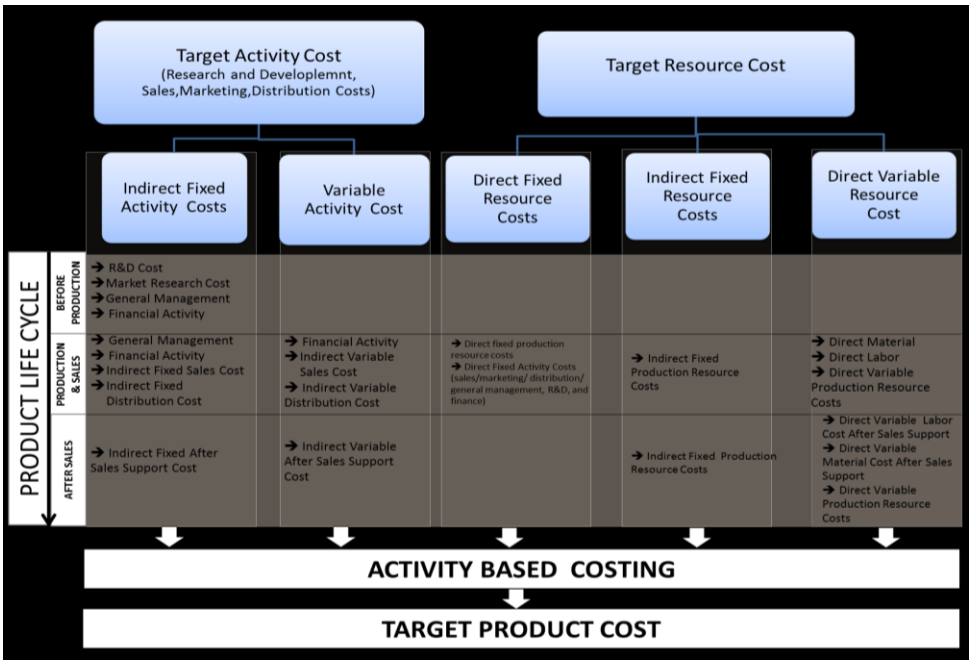


Figure 4. Life Cycle Costing Model Based on Target Costing and Activity-Based Costing Method

Costs that will occur throughout the product life cycle (before production, during production, sales and after-sales period) are included into the target costs according to the activity based costing system.

Table 1.Life Cycle Costing Model Based on Target Costing and Activity-Based Costing Method

Res. / Act.	Fixed / Variable	Life Cycle	Cost Elements	Cost Accounts	Data Source
Activity Costs	Indirect Fixed Activity Costs	Before Production	Indirect fixed R&D activity costs of the products in R&D departments	R&D Cost	Activity Cost Budget System Of The Business
			Indirect fixed market research activity costs of the products in R&D departments	Market Research Cost	Activity Cost Budget System Of The Business
			Indirect fixed general management activity cost before production	General Management Cost	Activity Cost Budget System Of The Business
			Indirect fixed Financial Activity Cost before production	Financial Activity Cost	Activity Cost Budget System Of The Business
		Production & Sales	general management budgeted activity costs during production and sales	General Management Cost	Activity Cost Budget System Of The Business
			Finance departments budgeted activity costs during production and sales	Financial Activity Cost	Activity Cost Budget System Of The Business
			Indirect fixed expenses during production and sales	Indirect Fixed Sales Cost	Activity Cost Budget System Of The Business
		After Sales	Indirect fixed expenses of distribution	Indirect Fixed Distribution Cost	Activity Cost Budget System Of The Business
			Indirect fixed expenses of after sales support	Indirect Fixed After Sales Support Cost	Activity Cost Budget System Of The Business
	Total Indirect Fixed Activity Costs				
	Variable Activity Cost	Production & Sales	Financial cost of production and sales activities	Financial Activity Cost	Activity Cost Budget System Of The Business
			Indirect variable costs of the products in sales & marketing departments	Indirect Variable Sales Cost	Activity Cost Budget System Of The Business
		Total Production & Sales			
		After Sales	Indirect variable costs of the products in sales & marketing departments	Indirect Variable Distribution Cost	Activity Cost Budget System Of The Business
			Indirect variable resource costs of the products in after sale support departments	Indirect Variable After Sales Support Cost	Activity Cost Budget System Of The Business
	Total Variable Activity Cost				
Total Activity Costs (Fixed + Variable)					
Resource Cost	Direct Fixed	Production & Sales	Direct Fixed Production Resource	Direct fixed production	Activity Cost Budget System Of The

Res. / Act.	Fixed / Variable	Life Cycle	Cost Elements	Cost Accounts	Data Source
	Resource Costs		Costs Of The Products in Departments	resource costs	Business
			Direct Fixed Activity Costs Of The Products in Departments	Direct Fixed Activity Costs	Activity Cost Budget System Of The Business
			Total Direct Fixed Resource Costs		
	Indirect Fixed Resource Costs	Production & Sales	Indirect Fixed Production Resource Costs Of The Products in Departments	Indirect Fixed Production Resource Costs	Activity Cost Budget System Of The Business
			Total Production & Sales		
		After Sales	Indirect Fixed After Sale Resource Costs Of The Products in Departments	Indirect Fixed Production Resource Costs	Activity Cost Budget System Of The Business
			Total Indirect Fixed Resource Costs		
			Total Fixed Cost (Direkt+Indirect)		
	Direct Variable Resource Cost	Production & Sales	Direct Labor Expenses	Direct Labor Cost	Direct Labor Time And Pay Sets Of The Products Based On Direct Labor Operation List
			Direct Material Expenses	Direct Material Cost	Standard material quantity and price sets of the products based on product tree
			Energy Expenses	Direct Variable Production Resource Costs	Resource consumption amount and price sets of the products
			Other Direct variable Expenses	Direct Variable Production Resource Costs	Resource consumption amount and price sets of the products
		After Sales	Direct after sales support labor expenses	Direct Variable Labor Cost After Sales Support	Direct labor consumption amount and price sets of the products based on saled products
			Spare parts and other material expenses after sale	Direct Variable Material Cost After Sales Support	Standard material quantity and price sets of the products based on product tree
			Electricity and other Direct variable Expenses	Direct Variable Production Resource Costs	Resource consumption amount and price sets of the products based on saled products
			Total Direct Variable Resource Cost		
			Total Resource Cost (Fixed + Variable)		
			PRODUCT COST (Total Activity Cost + Total Resource Cost)		

In this model cost of the product that will produce is obtained in two stages:

✓ Calculating the production cost of products to be produced.

✓ Calculating the activity costs (non-production costs)

Another discrepancy in this model is including the costs occured after sales into the target product cost. Costs incurred after the sale are as follows:

✓ **Distribution costs:** Logistics and distribution costs incurred to deliver the product to the customer after the sale of the product

✓ **Technical support costs:** Technical support costs provided to customers to use the product after reaching to customer. After the product has been sold it is important to include offered as free technical support costs into the product.

✓ **Repair and maintenance costs within the Warranty Period:** To include warranty costs within the warranty period for the product into the product is important. In this part variable direct labor, direct variable material costs and indirect fixed costs are used. In the target costing process, it must be budgeted that this cost has a certain percentage in the sold product.

✓ **Return Product Cost:** After the product reached to customer sometime it may be returned for some reason. At this time return product costs are occured. Costs incurred in this case they are reverse logistic costs. In the target costing process, it must be budgeted that this cost has a certain percentage in the sold product.

The following example is used to illustrate the above.

In the sample target cost of a product is calculated as of year. It has been a R&D study for the product for a year. The product is planned to be sold throughout 5 years.

In addition because of having a warranty period of two years costs that occur after sales are also considered. In other words, after the product sold throughout 6 years the cost of after sales will occur for two years. Although product remains on the market throughout five years business will bear a cost for 9 years.

Target costs over the life cycle of products is summarized in the Table 2.

Table 2. Cost of the Products in Life Cycle

Period/Years	Before Production	Production & Sale	After Sale
1st	R&D Costs		
2nd		Direct/Indirect Resource / Activity Costs	After Sales Support Costs
3rd		Direct/Indirect Resource / Activity Costs	After Sales Support Costs
4th		Direct/Indirect Resource / Activity Costs	After Sales Support Costs
5th		Direct/Indirect Resource / Activity Costs	After Sales Support Costs
6th		Direct/Indirect Resource / Activity Costs	After Sales Support Costs
7th		Direct/Indirect Resource / Activity Costs	After Sales Support Costs
8th			After Sales Support Costs
9th			After Sales Support Costs

Target costs of the products is calculated by using activity based costing method over the years. Activity based costing method provides more accurate cost information to target costing. In the calculation of unit costs, costs are classified into two parts as resource costs and activity costs. Resource costs are clasified into two parts as fixed costs and variable costs. In addition, all costs in whole life cycle of the product (before production and after sales support costs) are included in the target cost products.

Table 3. Unit Direct Variable Resource Costs

Direct Variable Resource Cost	1.year (TL)	2.year (TL)	3.year (TL)	4.year (TL)	5.year (TL)	6.year (TL)	7.year (TL)	8.year (TL)	9.year (TL)	Total (TL)
Direct Material Costs		150.000	309.000	353.496	297.901	202.572	170.499			1.483.468
Direct Labour Costs		200.000	420.000	480.480	412.776	280.688	240.924			2.034.867
Direct Var. Prod. Res. Costs		125.000	257.500	294.580	248.251	168.810	142.082			1.236.223
Direct Variable Finance Costs		8.000	16.480	18.853	15.888	10.804	9.093			79.118
Direct Variable Sales Costs		50.000	103.000	117.832	99.300	67.524	56.833			494.489
Total		**533.000**	**1.105.980**	**1.265.241**	**1.074.116**	**730.399**	**619.430**			**5.328.166**
Budgeted Sales Amount		100.000	200.000	220.000	180.000	120.000	100.000			920.000
Unit Direct Variable Cost (TL/unit)		**5,33**	**5,53**	**5,75**	**5,97**	**6,09**	**6,19**			**5,79**

Direct variable resource costs are shown on Table 3. Direct variable resource costs include direct material costs, direct labour costs, direct variable production resource costs, direct variable finance costs and direct variable sales costs. Unit direct variable resource costs is calculated by dividing direct variable resource costs to total quantity in every year.

Table 4. Unit Direct Fixed Resource Costs

Direct Fixed Resource Cost	1.year (TL)	2.year (TL)	3.year (TL)	4.year (TL)	5.year (TL)	6.year (TL)	7.year (TL)	8.year (TL)	9.year (TL)	Total (TL)
Direct Fixed Production Resource Costs		20.000	20.000	20.000	20.000	20.000	20.000			120.000
Direct Fixed Marketing Resource Costs		40.000	41.200	42.848	44.133	45.016	45.466			258.664
Direct Fixed Sales Resource Costs		50.000	52.500	54.600	57.330	58.477	60.231			333.137
Direct Fixed Distribution Resource Costs		40.000	41.200	42.848	44.133	45.016	45.466			258.664
Direct Fixed Finance Resource Costs		6.000	6.180	6.427	6.620	6.752	6.820			38.800
Direct Fixed GM Resource Cost		40.000	42.000	43.680	45.864	46.781	48.185			266.510
Total		**196.000**	**203.080**	**210.403**	**218.081**	**222.043**	**226.168**			**1.275.775**
Budgeted Sales Amount		100.000	200.000	220.000	180.000	120.000	100.000			920.000
Unit Direct Fixed Resource Cost (TL/unit)		**1,96**	**1,02**	**0,96**	**1,21**	**1,85**	**2,26**			**1,39**

Table 4 shows the unit direct fixed resource cost of the product. Direct fixed resource costs include direct fixed production resource costs, direct fixed marketing resource costs, direct fixed sales resource costs, direct fixed distribution resource costs, direct fixed finance resource costs and direct fixed general management resource costs. The unit direct fixed cost is calculated by dividing total direct fixed resource cost to total quantity in every year.

Table 5. Unit Indirect Fixed Resource Costs

Indirect Fixed Resource Cost	1.year (TL)	2.year (TL)	3.year (TL)	4.year (TL)	5.year (TL)	6.year (TL)	7.year (TL)	8.year (TL)	9.year (TL)	Total (TL)
Indirect Fixed Production Resource Costs		20.000	20.000	20.000	20.000	20.000	20.000			120.000
Indirect Fixed Marketing Resource Costs										
Indirect Fixed Sales Resource Costs										
Indirect Fixed Distribution Resource Costs										
Indirect Fixed Finance Resource Costs										
Indirect Fixed GM Resource Cost										
Total		**20.000**	**20.000**	**20.000**	**20.000**	**20.000**	**20.000**			120.000
Budgeted Sales Amount		40.000	42.000	43.680	45.864	46.781	48.185			266.510
Unit Indirect Fixed Resource Cost (TL/unit)		**0,50**	**0,48**	**0,46**	**0,44**	**0,43**	**0,42**			**0,45**

Table 5 shows the unit indirect fixed resource cost of the product. Indirect fixed resource costs include indirect fixed production resource costs, indirect fixed marketing resource costs, indirect fixed sales resource costs, indirect fixed distribution resource costs, indirect fixed finance resource costs, indirect fixed general management resource cost. The unit indirect fixed cost is calculated by dividing total direct fixed resource cost to total quantity in every year.

Table 6. Unit Indirect Fixed Activity Cost

Indirect Fixed Activity Cost	1.year (TL)	2.year (TL)	3.year (TL)	4.year (TL)	5.year (TL)	6.year (TL)	7.year (TL)	8.year (TL)	9.year (TL)	Total (TL)
Indirect Fixed Production Activity Costs		20.000	20.600	21.218	22.067	22.729	23.183			129.797
Indirect Fixed Marketing Activity Costs		3.500	3.605	3.713	3.825	3.939	4.057			22.639
Indirect Fixed sales Activity Costs		45.000	46.350	47.741	49.173	50.648	52.167			291.078
Indirect Fixed Distribution Activity Costs		12.000	12.360	12.731	13.113	13.506	13.911			77.621
Indirect Fixed Finance Activity Costs		5.000	5.150	5.305	5.464	5.628	5.796			32.342
Indirect Fixed GM Activity Costs		9.500	9.785	10.079	10.381	10.692	11.013			61.450
Total		**95.000**	**97.850**	**100.786**	**104.021**	**107.142**	**110.129**			**614.927**
Budgeted Sales Amount		100.000	200.000	220.000	180.000	120.000	100.000			920.000
Unit Indirect Fixed Activity Cost (TL/unit)		**0,95**	**0,49**	**0,46**	**0,58**	**0,89**	**1,10**			**0,67**

Table 6 shows the unit indirect fixed Activity cost of the product. Indirect fixed activity costs include indirect fixed production activity costs, indirect fixed marketing activity costs, indirect fixed sales activity costs, indirect fixed distribution activity costs, indirect fixed finance activity costs and indirect fixed gm activity costs. Unit indirect fixed Activity costs are calculated by dividing total indirect fixed Activity cost to total quantity in every year.

Table 7. Unit Fixed Life Cycle Cost

Fixed Life Cycle Cost	1.year (TL)	2.year (TL)	3.year (TL)	4.year (TL)	5.year (TL)	6.year (TL)	7.year (TL)	8.year (TL)	9.year (TL)	Total (TL)
Direct Fixed R&D Resource Cost	20.000									20.000
Indirect Fixed R&D Resource Cost	15.000									15.000
Indirect Fixed R&D Activity Cost	30.000									30.000
Indirect Fixed After Sales Support Cost		30.000	30.900	32.136	33.100	33.762	34.100	34.100	34.100	262.197
Direct Fixed After Sales Support Cost		31.000	31.930	33.207	34.203	34.887	35.236	35.236	35.236	270.937
Indirect Fixed GM Activity Costs	5.000	5.000	5.150	5.356	5.517	5.627	5.683	5.683	5.683	48.700
Total	**70.000**	**66.000**	**67.980**	**70.699**	**72.820**	**74.277**	**75.019**	**75.019**	**75.019**	**646.834**
Budgeted Sales Amount		100.000	200.000	220.000	180.000	120.000	100.000			920.000
Unit Fixed Life Cycle Cost (TL/unit)										**0,70**

Table 7 shows the unit fixed life cycle costs of the product. Fixed life cycle costs include direct fixed R&D resource cost, indirect fixed r&d resource cost, indirect fixed R&D activity cost, indirect fixed after sales support cost, direct fixed after sales support cost and indirect fixed gm activity costs. unit fixed life cycle costs of the product are calculated by division of total fixed life cycle costs to total budgeted quantity in every year. Unit fixed life cycle costs of the product are put as same value in each year.

Table 8.Unit Variable Life Cycle Cost

Variable Life Cycle Cost	1.year (TL)	2.year (TL)	3.year (TL)	4.year (TL)	5.year (TL)	6.year (TL)	7.year (TL)	8.year (TL)	9.year (TL)	Total (TL)
Direct Variable After Sales Support Material Cost		5.791	21.718	30.405	28.957	21.718	15.927	14.479	5.791	144.787
Direct Variable After Sales Support Labor Cost		4.000	4.200	4.368	4.586	4.678	4.818	4.818	4.818	36.288
Total		**9.791**	**25.918**	**34.773**	**33.544**	**26.396**	**20.745**	**19.297**	**10.610**	**181.075**
Budgeted Sales Amount		100.000	200.000	220.000	180.000	120.000	100.000			920.000
Unit Variable Life Cycle Cost (TL/unit)										**0,20**

Table 8 shows the unit variable cost of the product. The unit variable costs of the product include direct material and labor cost of the after sales service. These costs occur during after sales services during warranty period of the product. Thus, it's assumed to be continued for two years after last sold product.

Table 9.Unit Target Cost

Unit Target Cost (TL/unit)	1.year (TL/unit)	2.year (TL/unit)	3.year (TL/unit)	4.year (TL/unit)	5.year (TL/unit)	6.year (TL/unit)	7.year (TL/unit)	8.year (TL/unit)	9.year (TL/unit)	Average (TL/unit)
Unit Direct Variable Cost		5,33	5,53	5,75	5,97	6,09	6,19			5,79
Unit Direct Fixed Resource Cost		1,96	1,02	0,96	1,21	1,85	2,26			1,39
Unit Indirect Fixed Resource Cost		0,50	0,48	0,46	0,44	0,43	0,42			0,45
Unit Indirect Fixed Activity Cost		0,95	0,49	0,46	0,58	0,89	1,10			0,67
Unit Fixed Life Cycle Cost		0,70	0,70	0,70	0,70	0,70	0,70			0,70
Unit Variable Life Cycle Cost		0,20	0,20	0,20	0,20	0,20	0,20			0,20
Unit Target Cost		**9,64**	**8,41**	**8,52**	**9,09**	**10,16**	**10,87**			**9,20**

Unit target costs are calculated in Table 9 year by year. It shows the target costs in each year and average cost of the product. Life cycle costs are put as same value in each year.

Activity based costing method is used in this model to get target cost in whole product life cycle. This model provides more accurate cost information than conventional cost models to get target costs.

Conclusion

With the increasing in competition, the cost calculation of the products has become more important for businesses. Businesses needs more accurate cost information in order to right pricing and compete in the market. Thus, they have to know costs of the products before production or design. Target costing provides this information but in order to get right cost information from target costing, target costing method should be based on activity based costing method. Another point is the life cycle costs of the products. These costs should be placed into Activity costing method to get right cost information.

In this study a model is proposed for target costing. In this model, all costs from des-ing stage to after sales support stage is taken into consideration. In addition, activity based costing method is used for target costing. Activity based costing is important for allocation of indirect costs to products. By this model, the more accurate product costs are calculated.

Using activity based costing method which is improved as an alternative of the con-ventional costing in target costing including product life cycle costs give right cost information of products.

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