THE COST FOR THE ENTIRE LIFE CYCLE OF THE PRODUCT RESPECTING QUALITY STANDARDS

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Abstract: This article presents issues concerning life cycle of products. Taking into account the limitation of the life cycle of products and strategic investments that require the use of certain technologies, the decision of setting forth a new product on the market should rely upon the costs of its life cycle.

Keywords: life cycle of the product, quality standards, optimization

Introduction

Taking into account the limitation of the life cycle of products and strategic investments that require the use of certain technologies, the decision of setting forth a new product on the market should rely upon the costs of its life cycle.

Each setting forth of a new product determines: research and development costs, equipment costs, pre - industrialization costs and implementing costs, production costs, marketing costs, logistics costs (that is costs with storage, distribution and transport), administration cost[s], and costs of the customer focused services, etc[1].

The success of such a setting forth should be based on optimizing the global cost of the product life cycle. Such an optimisation consists in choosing between the decrease of *development costs* in case subsequently it will be necessary to operate several changes of the product due to industrialization problems or due to a poor adaptation to the customer's demand or the decrease of production costs that might determine a series of quality find guarantee term drawbacks, and the increase of post - selling service costs (guarantee term)[2].

The stages of conceiving the product, of choosing its fabrication procedure are difficult, having consequences upon the evolution of future costs, and making useless the optimization of a single stage without taking into account the impact upon the others.

Accordingly, it is necessary to determine a cost that has in view most of the problems of the life cycle of the product (that is a global cost), and to optimize the product's conception by using the target costing technique (that is an objective costs)[3].

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In order to determine the global cost of the product's life cycle it is necessary to have in view both the drawbacks of the traditional methods as the traditional ways of determining it lead to an answer which is not adapted to the demands of the life cycle of the product as they divide time into annual exercises, connecting the costs to the period in which they have been done (research and development costs, pre-exploitation, industrial and commercial setting forth costs, as well as the other movement costs having a general character are usually registered during the period in which they have been done) and the consideration of the costs of the product's life cycle as real costs, depending on the product's success, as all the costs that are investments from an economic point of view (research, development, new technology costs) represent immobilizations and are the object of a paying off depending on the wear of the whole life cycle of the product (the costs of cycle ending are covered and the initial research costs may remain uncovered without determining incomes)[4].

In case the product is not viable, its "life" stops at the conception stage. As the costs determined by this already dead product do not generate any income, they can be assimilated to the general costs that must be covered by the profitableness of certain products.

When the product prematurely dies, at the beginning of the exploitation stage, a cover from incomes is already present; nevertheless it is not sufficient to cover all the costs engaged (especially those that are paid off during the envisaged life cycle). The real annual cost will be superior to the estimated cost and the loss will be sustained by the product itself.

In case the product's life is prolonged (the product having a sequence with double cycle or a cycle comprising the resuming of the activity), the real costs of conceiving it as well as those included within rejects are already covered by the sales that took place during the envisaged cycle. The only costs that should be taken into account during the supplementary period are accordingly those that come out of the extension of the cycle, namely marginal costs.

The correct estimation of the life cycle (services associated to the product) is based upon its prevision calculation that requires the determination of both technological risk and of commercial risk.

Technological risk manifests itself either during the product's conception, in case the product seems to be too complex, or after the product's conception in case a new technology makes it look obsolete. The immediate consequence is that the product dies before being born, that is before being marketed[5].

Commercial risk appears when, despite technological success, the product does not encounter any demand or only an insignificant one. The product dies during the planning stage or, in case it has already been marketed, it dies before the envisaged date.

Once having evaluated these two types of risk, the estimation of quality costs during the life cycle of the product may be done taking into account the two possibilities of conceiving the new product:

the optimization of the global cost of the product's life cycle by comparing estimated cost to target cost

In order to do such an optimization it is necessary to take into account the reasoning that starts with a market research (the evolution of the needs and technologies) and with an analysis of the competitors, defining the characteristics of the product that respond the demands of the customer and determining accordingly a target price that should let the company be competitive (to conquer a certain market share).

Then, taking into account the unitary profit estimated by the company, a unitary target cost is to be determined, according to the formula:

$$Cut = Pusc - Puep \quad (1)$$

where:

Cut - represents the unitary target cost;

Pusc - the unitary target sales cost;

Puep - the estimated unitary target profit

The unitary target sales cost for this product can be determined as follows:

$$Pusc = Pus + (f_1 + f_2 + f_3 + ... + f_n) \quad (2)$$

where:

Pus - represents the unitary sales cost of the already existent product that resembles the best the new product;

f_1, .., f_n - the unitary value of the functioning changes added to the new product and accepted on the market.

If the new product will be set forth on the market in a Q amount of units corresponding to a cautious prevision, then the target business figures will be determined as follows:

$$Ctf = Pusc \times Q \quad (3)$$

where:

Ctf- represents the target business figures;

Q - the product's retail amount

The target total estimated profit will be determined as follows:

$$Ptt = Ctfxp \quad (4)$$

or

$$Ptt = Pusc \times Q \quad (5)$$

where:

Ptt - represents the target total profit;

P - the percent of the target profit in target business figures.

The target total cost is determined as follows:

$$Ctt = Ctf\text{-}Pt \quad (6)$$

or

$$Ctt = Cut \times Q \quad (7)$$

where:

Ctt - represents the target total cost.

The target total cost may also be determined as follows:

$$Cut = Ctt/Q \quad (8)$$

At the same time, in order to check at the beginning whether the target cost is achievable, an estimated cost is going to be determined; it shows the whole amount of the company's costs (including its common procedures and operational abilities); it also shows whether the company is capable to set forth on the market and observe a certain conception scheme.

The target unitary cost of the new product may be determined as follows:

$$Cues = Cues_0 +/- A + \ldots m_i \quad (9)$$

Where:

Cues - represents the target unitary estimated cost of the new product;

$Cues_0$ - the unitary cost of the existent product that mostly resembles the new product;

A - the variation of the cost due to the difference in the retail volume between the existent product and the new product (Q_0 - Q);

m_i - the change of the cost that accompanies the change in design or in the level of comfort of the "i" part of the product.

Once this first evaluation is accomplished, we generally get only a rough sketch of the new model. The evaluation is done by conception engineers depending on the technical problems that such an achievement implies. Then, as the sketch evolves, the calculus will be progressively adjusted. Beginning with the conception stage an opinion on the supplementary investments should be formulated in order to evaluate during the first stage the supplementary debts to be included in the cost.

The comparison between the target cost (an outer point of view) and the estimated cost (an inner point of view) allows the noticing of a deviation that can be eliminated, either by acting upon the conception parameters or upon the product's functionality.

In order to watch over such technical adjustments upon subsequent commercial aspects and at the level of future quality, various stages of the estimated cost can be determined.

And, in order to assure the profitableness of the new product during its entire life cycle, one should: attach target costs to its main components; identify the administration conditions that do not accept the exceed of such target costs; establish a commonly agreed reference which guarantees that during the stages subsequent to production the real cost is going to be inferior to the target cost.

The model of evaluating the estimated cost is, at the beginning, quite approximate, taking into account the lack of experience and the necessity of not getting an excessive complexity. Accordingly, as any other instrument of simulation, it will enrich itself while gaining in experience and integrating o deeper knowledge of the companies' economic mechanisms; it will ultimately become better.

Let's take into consideration a P product that would determine during its life cycle the following costs and incomes (Table no. l -M.U.: million lei).

No.	*Year*	*Specification*	*Total*
1.	N	Costs with the conception of the new product	80
2.	N+l	Cost of the market research	30
		Research and development costs	10
		The market research shows that 3,000 tons of the product (successively 500 tons, 2,000 tons, 500 tons) can be sold at a price of 1.2 million lei/ ton; direct costs with materials and labor should increase to 0.5 million lei	450
		The prevision of sales costs for 3 years	600
		The amortization of technical equipment (for 5 years)	

3.	N+2	Setting forth commercial costs 500 tons of P products manufactured and sold	200 600
4.	N+3	2,000 tons of P products manufactured and sold Sales costs	2400 200
5.	N+4	1,000 tons of P products manufactured and sold (either 500 tons in addition to the estimated previsions) Sales costs (45 million lei in addition to the planned level due to the sales increase)	1200 95

Table l. The structure of the costs and incomes of the P product

In case the traditional method is being used, the level of the estimations according to the data in Table no. l is that contained by Table no.2 - M.U.: million lei.

No.	*Specification Years*	*N*	*N+l*	*N+2*	*N+3*	*N+4*
1.	Sales incomes			600	2400	1200
2.	Conception, research & development costs	80	10			
3.	Materials and labor costs			250	1000	500
4.	Amortization of technical			120	120	120
5.	Product's abandoning costs					240
6.	Commercial costs		30	200	200	95
7.	Financial result	-80	-	30	1080	245
8.	Coefficient financially resulted/incomes from sales			5%	45%	20%

Table 2. The influence of the P product cost upon the results of the financial exercise according to the traditional method of estimation during the product's life cycle

The calculus of amortization has been done according to the method of linear repartition for 5 years (600/5 = 120)

In case the method of the global costs during the product's life cycle is employed, then the results are those specified in Table no.3 - M.U.: million lei.

No.	*Specification Years*	*N*	*N+l*	*N+2*	*N+3*	*N+4*
1.	Sales incomes			600	2400	1200
2.	Differentiated costs (1), (3)			15	60	15
3.	Materials and labor costs			250	1000	500
4.	Amortization of technical equipment (2), (3)			100	400	100

5.	Provisions (4)	80		- 80		
6.	Commercial costs (5)			800	320	125
7.	Financial results	-80		235	620	460
8.	Coefficient financially resulted/ incomes from sales			39%	26%	32%

Table 3. The influence of P product cost upon the results of the financial exercise according to the method of the global costs during the life cycle of the product

1. They correspond to the whole of research and development costs (80 + 10) million lei amortized by the 3,000 tons of P products envisaged to be sold according to an established plan;
2. The amortization of technical equipment is done according to the estimated quantity of P products sold (500 tons, 2,000 tons, 500 tons);
3. In N + 4 the plans regarding the amortization of technical equipment and the delayed costs do not modify due to the fact that, in case the intensive production rhythm (500 tons P product in addition to the initial level) justifies a revise, it nevertheless does not affect the level of amortization previously established;
4. They regard the first research costs as the establishment of provisions is done at the beginning as it is not sure that research generates incomes. In year N + l a supplemental endowment is not necessary as the market research shows product's viability; in year N + 2 the endowment is in fact a taking over when the first incomes effectively show;
5. The estimated commercial costs (30 + 450) million lei are included in the costs to be distributed; later they are distributed according to financial exercises that generate incomes according to the envisaged level of P product (500 tons, 2,000 tons, 500 tons). In year N + 4 the marginal cost is being added (45 million lei) determining a sale of P product higher than the prefigured level.

The use of the global cost exhibits the company's activity in a realistic vision. The positive profitableness of the company obtained in year N + 2 is due to the re-employment of provisions; in case they lack, profitableness would be (235 - 80) / 600 = 26 %.

The re-employment of provisions determines the re-compensation of the assumed risk; the profitableness of 38 % of year N + 4 is the effect of a performance superior to previsions as if real sales would have the envisaged level, then profitableness could maintain its 26 %.

Summary

The optimization of the global cost of the life cycle of the product starting from its utility cost for consumers, as quite useful could be the appreciation of the

costs the buyer has to pay during the use of the product; also the question regarding the acceptability of such costs for the buyer may be asked.

Such estimations are going to direct conception towards products that are easily disassembled and fixed, that are rapidly adjusted, having a long life cycle, with drawbacks that comprise few components and whose elements are inter-changeable with common elements, etc.

By calculating the costs of non-quality and those regarding the quality of the product's life cycle, accounting is not only a means of analyzing but it becomes a control instrument. In such a case we propose the method for the calculus of the costs of dissatisfied customers, employed by Original Research, a counseling company in Chicago, specialized in measuring the degree of fidelity.

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Streszczenie: Artykuł prezentuje kwestie dotyczące cyklu życia produktów. Biorąc pod uwagę ograniczenia cyklu życia produktów oraz inwestycje strategiczne, które wymagają wykorzystania określonych technologii, decyzja o wdrożeniu nowego produktu na rynek powinna opierać się na kosztach ich cyklu życia.

产品质量标准的生命周期成本

摘要：本文介绍了产品生命周期问题。考虑到产品生命周期的限制和运用特定技术的投资策略，所以，产品的市场定位应依据它本身的生命周期成本。