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Increase of company performances and shareholders' satisfaction by using design for adaptability (DFA)

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Abstract. *The article handles the increase in performances of an electrical appliances company and in the satisfaction degree of its shareholders by using the design for adaptability method. A strategic decision is based on the quality of accounting information provided by the company's management. The design for adaptability method and the target costing method highlight the importance of the reliability of accounting information provided by both of them for the solid foundation of strategic decisions taken by the company's management. In the current domestic and global economy, in order to guarantee correct decisions, management turns their attention to a multi-dimensional analysis of used information, which will ensure a number of long-term advantages. The article closes with the authors' conclusions on the importance of obtaining accurate accounting information and substantiation of final decisions taken by managers and shareholders, by obtaining superior performances by means of the design for adaptability and target costing methods.*

Keywords: design for adaptability, target costing, management accounting, performance, shareholders.

JEL Classification: M41, M21.
REL Classification: 14I.

1. Introduction

The article highlights the importance of using the design for adaptability method (DFA) for underlining the increased performances of a company and the use of obtained information for substantiating the decisions of managers or heads of departments. The preparation of clear reporting statements provides an alike clear image to the company's shareholders, who can thus create a niche for penetrating certain markets, both among civil and industrial consumers. The aim of this study is to highlight the advantages of applying the design for adaptability method (DFA) to increase the company's performances and the satisfaction of its shareholders in terms of information and financials. The article tries to show from both theoretical and methodological standpoints the way how information obtained by means of DFA and TC methods help the company's specialists, accountants, heads of departments or managers to understand the consistency and requirement of using multi-dimensional databases for substantiating decisions, which ultimately influences the increase of the company's performances.

2. Literature review

Target Costing has been the subject of many specialists, research institutes (Institute of Management Accounting) or consortia (Consortium for Advanced Manufacturing-International) worldwide. Their results were discussed at numerous conferences and workshops, and published in specialised literature. They show the actual usefulness of Target Costing for continuous decrease of the costs of products or lines of products. Since the emergence of the target cost concept at Volkswagen (Germany) and Marks-Spencer (Great Britain) in the 1930's, there was significant progress on the method's systematic application and development at Toyota in Japan, in the 1960's. Expansion from the Asian continent to the European and American ones only occurs in the 1980's, and starting with 2000, the method is more intensely studied on the West-European segment, where the contribution of several specialists is noted (Dekker and Smidt, 2003). In terms of analysing the factors for implementing or not implementing the Target Costing method (competition intensity, industrial affiliation, uncertainty degree in business environment or strategy perceived by managers), there is a number of studies conducted by experts in this field (Ansari and Bell, 1997; Dekker and Smidt, 2003; Hibbets et al., 2003). The results of West-European studies have shown that adoption of Target Costing is related to competition intensity, and not adopting it is related to perception degree in an uncertain environment (Dekker and Smidt, 2003). East-European results have shown that the most solid argument for adopting Target Costing is based on forecasts of clients' requirements and competitors' market behaviour (Briciu and Căpuşneanu, 2013).

The most negative argument for not adopting Target Costing is based on rigid targets identified in the forecasts on clients' requirements and perception degree in an uncertain environment, which suggests for the method to be used only as a tool for maintaining competitiveness. Institute of Management Accounting advises companies that Target Costing may be applied for new products, including those undergoing changes in assortment and range. When sufficiently motivated, a company may change its production technique, which can lead to different production costs and profitability. If some managers believe that primary change is only possible during the manufacturing process, companies could lose significant strategic opportunities. In fact, Target Costing can contribute to the planned change of the product, by using the design for adaptability method.

According to experts, design for adaptability is a new method for designing a manufacturing line or a finished product, which states that the decrease of a system's value is due to the increase of stakeholders' needs and desires, but also to its adaptation capabilities in relation to real options available to the company. Based on this definition, several paradigms were developed with a focus on improving the features of a product right from the design phase (Boothroyd, 1983). Most studies conducted by experts argue that the design determines the features of a product, and the decision taken in the design stage is essential (Ulmann, 1992; Boothyard, 1994; Kushnir and Sheehan, 2003; Simpson, 1998; Condoor, 1999). In order to check the method's reliability, a number of tests were conducted, from both a theoretical standpoint, by means of the academia environment, and an empirical standpoint, by means of the industrial environment. From a theoretical standpoint, the results were not surprising. These have not revealed great achievements applicable in practice (Tate, 1995). Practical tests have shown significant achievements and led to the split of product development into two sub-processes: design and product/production (Reich, 1992; Cross, 1980). Design adaptability gains a new form and a new meaning, which was already evident for most experts. Thus, DFA is used for changing an existing design and for adapting it to clients' new requirements. In other words, a product is reconfigured based on its components, starting from the existing ones and by their partial or total replacement (Gu et al., 2009). The replacement of a manufacturing line or product should meet the needs of stakeholders for a longer period of time, but should also provide the possibility of rapidly adapting to market conditions and shareholders' preferences.

3. Research methodology

3.1. Instrumentation. Data analysis

This study is based on a qualitative research because it involves an interpretative approach of the subject, it is subjective and describes in detail some relevant aspects based on specialised literature. The paper goes rather in depth, being focused on the benefits of using the design for adaptability and target costing methods within companies manufacturing appliances in Romania. The research is intensive and it aims at discovering the peculiarities of using design for adaptability for companies in this field. In order to achieve our goals, we will verify two assumptions:

I1. Does the DFA method increase the performances of appliances companies in Romania?

I2. Are the information provided by the DFA method reliable and do they meet the informational needs of managers and shareholders?

For our scientific approach, we used as research tools the analysis (information evaluation, recognition of main ideas and concepts, establishing relationships between them) and synthesis (focused consistent and easily accessible presentation of information on the studied subject). For achieving our objectives, respectively to discover the benefits of using DFA for designing a production line and how this method and the Target Costing method influence the increase of the company's performances, the research also involved the preparation of a complex case study within a Romanian appliances manufacturing company.

Our study is based on a questionnaire with two questions based on identifying the main objectives pursued for evaluating the results. Questionnaires were sent to 42 respondents in a Romanian appliances manufacturing company. Respondents were divided into three main categories: management (8 persons), department specialists (25 persons) and shareholders (9). After collecting the questionnaires, data review, and validation, the situation was as presented in Table 1:

Table 1. *Categories of respondents*

Questions	Answers per categories of respondents					
	Management		Department specialists		Shareholders	
	Yes	No	Yes	No	Yes	No
1. Do you believe that the design for adaptability and target costing methods can contribute to increased company's performances?	5	3	18	7	6	3
2. Do the design for adaptability and target costing methods provide reliable information for all categories of users (managers, heads of departments, shareholders)?	6	2	22	3	8	1

In terms of graphics, the situation is presented in Figure 1:

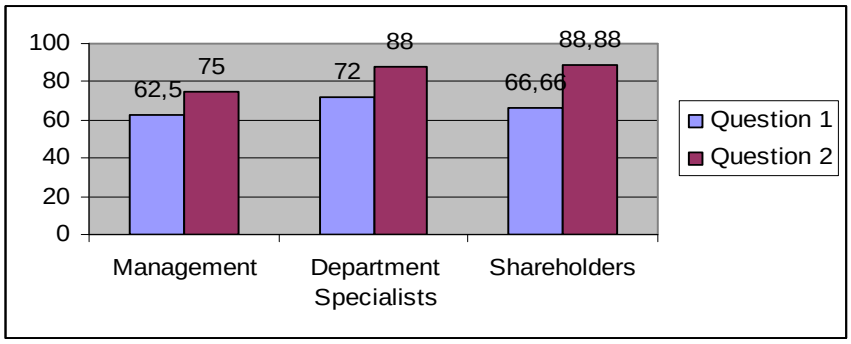

Figure 1. *Graphical representation of the weight of positive answers of the three categories of respondents*

As you can notice, most of the three questioned categories are in favour of using the design for adaptability method in order to increase the performances of an appliances manufacturing company.

3.2. Product life cycle analysis based on Target Costing

The company's management must know the life cycle of manufactured goods, in order to be able to take the most appropriate decisions for ensuring continuous production of a certain product, as long as sales fully cover the costs and profit is made. The variety of goods obtained in the production process moves at different speeds within the cycle, and speeds can also vary within a category of goods. It is well-known that generally products go through several stages in a particular market during their life, as follows:

1) *Launch* (the product is launched on the market and sales slightly increase);
2) *Increase* (the product is accepted and enters the market, rapid increase in sales);
3) *Maturity* (sales increase slow down);
4) *Stagnation* (sales reach a peak and are stable);
5) *Decline* (product demand decreases and sales also decrease accordingly).

Although it has little practical value for many basic goods, the concept of *life cycle* is applicable for most industrial and consumer goods. For establishing the research programmes it is necessary to know at what stage the product is at a certain time. Profitability tends to decrease sooner and faster than sales. When statistics show that sales of a product decreased over a period of time or even stopped this may indicate that the product has reached its maturity or decline stage, and no longer has prospects on that market. This does not mean that the respective market should be eliminated, but a „new product" must be created,

which can begin a new life cycle. Often products get a new life cycle by means of some basic changes or presentation form.

There is a big difference between the price paid by the final consumer (user) and producer's price. Market prices are based on supply and demand, and therefore producers pay special attention to actual costs of obtained products, which compared to sales prices show the efficiency or inefficiency of activities and competitiveness level. According to production companies, the price paid by final consumers is also influenced by other factors besides supply and demand, such as: full commercial costs and marketing costs. Full commercial costs influence the price paid by consumers.

3.3. Multi-dimensional analysis of data based on DFA and TC methods

One of the key objectives of a modern management accounting system is to provide managers and employees knowledge of their company's economic structure and costs, and to encourage them to ask profound questions on the behaviours of their company's costs. Under current circumstances, the combination of DFA and Target Costing methods provides transparency in product design and increased visibility on a certain target segment, and also contributes to determining costs. As companies put more emphasis on learning and discovering, managers and employees will be encouraged to explore more unanswered questions than by means of traditional and standards reports (which to not provide answers fast enough).

The multi-dimensional analysis allows visualization of same costs on several categories, such as: goods, clients, distribution channels (e.g.: wholesale, retail), sales regions, sales types (e.g.: marketing, standard, special) etc. Multi-dimensional reporting allows final users to separate, mix, sort, predict, pivot and aggregate data on organisational structures. Commercial multi-dimensional software can turn to minutes the one-day analysis efforts of employers used to work with month-end standard reports. This allows them to interactively explore and analyse company costs at entity and cost drivers levels. For the first time, managers can truly understand what it means to actually manage a business. In the future, integrated software will be designed for occasional users, and business analysis will expand from professional analysts to all managers and employees with computerized workstations and laptops connected to a network. Instead of few analysts who spend all their time analysing and trying to communicate findings, all managers will spend part of their time navigating and analysing data by means of multi-dimensional software. They will navigate intuitively with the DFA and TC data system that matches their mental model in the chain of activities and flow of internal and external costs of the accumulated supply chain.

3.4. Complexity of information related to management decisions

Decision-making is an action that occurs at all company levels, covering both short-term and long-term perspectives. Plans are activated by decisions, and for a significant number of decisions it is required to have the contribution of a financial or quantitative analysis for reaching rational conclusions, as the case may be. The fundamentals of decision-making are critical in determining what accountants should provide for substantiating a decision. Although accountants are familiar with the entire decision-making process, their most important contribution consists in performing quantitative analogies between existing alternatives, thus providing decision-makers with relevant and financially documented information for ultimately taking optimal decisions. An important factor for decision-making is managers' attitude to risk. The role of accountants is to provide information required for making decisions that reflect the effects of risks and uncertainty and the most likely level of results. With information centralised by means of software, accountants can provide an overview of what is pursued through the company's objectives.

3.5. Case study

A company that annually manufactures product *A* wishes to improve this product by re-designing certain functional elements and is on the point to launch it on the market under the name *Super A*. Estimates of the company's design specialists show that the new product will have a lifetime of three years in three stages: *launch*, *increase* and *maturity*. The company considers a functional decomposition based on product analysis, by taking into account the client's repeated needs. The situation of production capacities, estimated selling prices, and targeted profit margins are presented in Table 2:

Table 2. *Situation of analysed factors during the three stages*

Explanation	**Stage 1** *Launch*	**Stage 2** *Increase*	**Stage 3** *Maturity*
Estimated quantity	5000	7000	8000
Target selling price per unit	200	150	100
Target profit margin	15	9	5
Target cost per unit	185	141	95
Target turnover	1000000	1050000	800000
Target profit margin	75000	63000	40000
Target cost	925000	987000	760000
Weight of profit margin in turnover	7.5%	6%	5%
Weight of target cost in turnover	92.5%	94%	95%

Target costs per unit for each cost element and stage, as well as their weight in the cost of products is presented in Table 3:

Table 3. *Situation of target costs per unit for each component and stage*

Cost components	Weight in product costs	Target costs per unit for each component and stage (lei/pc.)		
		Stage 1 Launch	*Stage 2 Increase*	*Stage 3 Maturity*
Raw materials	20%	18.5	18.8	19
Direct salaries	10%	9.25	9.4	9.5
Maintenance	25%	23.125	23.5	23.75
Assembling	20%	18.5	18.8	19
Plots management	15%	13.875	14.1	14.25
Advertising	10%	9.25	9.4	9.5
Total	**100%**	**92.5**	**94**	**95**

Actual costs incurred over the three years are as follows: 107.5 lei, 109 lei, and 100 lei. The company's management wants to present the evolution of target costs for *Super Alpha* over the three stages, and to perform value engineering for reducing costs in each stage. The company's management requires such information for taking correct and well-grounded decisions, which will impact production policies, competition policies and estimates on future benefits. The company uses Target Costing for presenting the evolution of target costs, and for the changes in product design they will use the design for adaptability method (DFA). Based on the data disclosed above, the situation over the three years is presented in Table 4:

Table 4. *Target costs per costs and stages*

Cost components	Weight in product costs	Target costs per cost components and stages (lei)		
		Stage 1 Launch	*Stage 2 Increase*	*Stage 3 Maturity*
Raw materials	20%	92500	131600	152000
Direct salaries	10%	46250	65800	76000
Maintenance	25%	115625	164500	190000
Assembling	20%	92500	131600	152000
Plots management	15%	69375	98700	114000
Advertising	10%	46250	65800	76000
Total	100%	**462500**	**658000**	**760000**

Deviations determined based on comparing actual costs (per unit and total) with target costs (per unit and total) for each stage are presented in Table 5:

Table 5. *Deviations per stages*

Cost components	*Stage 1 Launch*					
	Actual costs		**Target costs**		**Deviations**	
	per unit	**total**	**per unit**	**total**	**per unit**	**total**
Raw materials	21.5	107500	18.5	92500	3	15000
Direct salaries	10.75	53750	9.25	46250	1.5	7500
Maintenance	26.875	134375	23.125	115625	3.75	18750
Assembling	21.5	107500	18.5	92500	3	15000
Plots management	16.125	80625	13.875	69375	2.25	11250

Cost components	*Stage 1 Launch*					
	Actual costs		**Target costs**		**Deviations**	
	per unit	**total**	**per unit**	**total**	**per unit**	**total**
Advertising	10.75	53750	9.25	46250	1.5	7500
Total	**107.5**	**537500**	**92.5**	**462500**	**15**	**75000**
Cost components	*Stage 2 Increase*					
	Actual costs		Target costs		Deviations	
	per unit	total	per unit	total	per unit	total
Raw materials	21.8	152600	18,8	131600	3	21000
Direct salaries	10.9	76300	9.4	65800	1.5	10500
Maintenance	27.25	190750	23,5	164500	3.75	26250
Assembling	21.8	152600	18,8	131600	3	21000
Plots management	16.35	114450	14.1	98700	2.25	15750
Advertising	10.9	76300	9.4	65800	1.5	10500
Total	**109**	**763000**	**94**	**658000**	**15**	**105000**
Cost components	*Stage 3 Maturity*					
	Actual costs		Target costs		Deviations	
	per unit	total	per unit	total	per unit	total
Raw materials	20	160000	19	152000	1	8000
Direct salaries	10	80000	9.5	76000	0.5	4000
Maintenance	25	200000	23.75	190000	1.25	10000
Assembling	20	160000	19	152000	1	8000
Plots management	15	120000	14.25	114000	0.75	6000
Advertising	10	80000	9.5	76000	0.5	4000
Total	**100**	**800000**	**95**	**760000**	**5**	**40000**

Based on consultations with clients, the company decides to reduce cost components. The company's specialists have used design for adaptability and redesigned product A by eliminating some small components. The new target price will be the old actual cost of the product, and the adjustments of new actual costs over the three stages are presented in Tables 6.1, 6.2 and 6.3.

Table 6.1. *Deviations in stage 1*

Cost components	*Stage 1 Launch*					
	New actual cost		**New target cost**		**Deviations**	
	per unit	**total**	**per unit**	**total**	**per unit**	**total**
Raw materials	22.5	112500	19.8875	99437.5	2.6125	13062.5
Direct salaries	11.25	56250	9.94375	49718.75	1.30625	6531.25
Maintenance	28	140000	24.859375	124296.875	3140625	15703.125
Assembling	20	100000	19.8875	99437.5	0.1125	562.5
Plots management	12	60000	14.915625	74578.125	-2.91563	-14578.125
Advertising	9	45000	9.94375	49718.75	-0.94375	-4718.75
Total	102.75	513750	99.4375	497187.5	3.3125	16562.5

Table 6.2. *Deviations in stage 2*

Cost components	*Stage 2 Increase*					
	New actual cost		New target cost		Deviations	
	per unit	total	per unit	total	per unit	total
Raw materials	21.8	152600	20.492	143444	1.308	9156
Direct salaries	10.9	76300	10.246	71722	0.654	4578
Maintenance	26	182000	25.615	179305	0.385	2695
Assembling	20	140000	20.492	143444	-0.492	-3444
Plots management	15	105000	15.369	107583	-0.369	-2583
Advertising	9	63000	10.246	71722	-1.246	-8722
Total	102.7	718900	102.46	717220	0.24	1680

Table 6.3. *Deviations in stage 3*

Cost components	*Stage 3 Maturity*					
	New actual cost		New target cost		Deviations	
	per unit	total	per unit	total	per unit	total
Raw materials	21	168000	19	152000	2	16000
Direct salaries	10.5	84000	9.5	76000	1	8000
Maintenance	24	192000	23.75	190000	0.25	2000
Assembling	19	152000	19	152000	0	0
Plots management	12	96000	14.25	114000	-2.25	-18000
Advertising	9	72000	9.5	76000	-0.5	-4000
Total	95.5	764000	95	760000	0.5	4000

The situation of results obtained per product over the three years is presented in Table 7.

Table 7. *Results obtained by using DFA and Target Costing*

Explanations	*Stage 1 Launch*	*Stage 2 Increase*	*Stage 3 Maturity*
1. Turnover	537500	763000	800000
Consumption of raw materials	99437.50	143444	152000
Cost of direct salaries + related costs	49718.75	71722	76000
2. Direct costs – total	149156.25	215166	228000
3. Margin per direct costs (1 - 2)	388343.75	547834	572000
Consumed activities			
- machine maintenance	124296,875	179305	190000
- assembling	99437.500	143444	152000
- plots management	74578.125	107583	114000
- advertising	49718.750	71722	76000
4. Total costs per activities	348031.25	502054	532000
5. Total costs (2+4)	497187.50	717220	760000
6. Contributory margin (3 - 4) % of turnover	40312.50 7.5%	45780 6%	40000 5%

3.6. Data interpretation

Based on the analysis of product evolution over the three stages, the findings are as follows:

1) In the first stage (launch), target costs are of 497187.50 lei, calculated by taking into account clients' recommendations (using DFA) to reduce product costs, and the contributory margin stands at 7.5% of the new target turnover. In stage 2 (increase), target costs are of 717220 lei, calculated by applying the Kaizen Costing technique, and the contributory margin stands at 6% of the target turnover. In stage 3 (maturity), target costs are of 760000 lei, and the contributory margin stands at 5% of the target turnover. In conclusion, the company meets its contributory profit margin in each product development stage, but considering the cost reduction requested by clients, the obtained profits are reduced in the first two stages, while in stage 3 profits correspond to those set in the forecast stage.

2) By applying the principles of Target Costing and Kaizen Costing methods, the company is able to be efficient, which is also highlighted by the fact that costs are covered from total revenues, and there are profits in each stage of the product's life cycle.

4. General conclusions

The complexity of data provided by the combined system - Design for Adaptability (DFA)/Target Costing (TC) – leads to a set of synthesis documents that help managers or shareholders to focus on several aspects, some of which being immaterial at first glance. Thus, managers or shareholders shall be informed on the context and alternatives, and capable to take optimal decisions based on the company's strategy for achieving its objectives. The multi-dimensional analysis of obtained data can be used at any time, both in the prediction stage and in the current stage, or whenever required in the simulation stage, based on the requests of information users (department specialists, managers or shareholders). We believe that only information obtained accurately by using DFA and TC, and their weight lead to correct substantiation of managers'/shareholders' decisions, and consequently, to an effective management by increasing performances and shareholders' satisfaction.

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