The ABC Method – Proposed Implementation in a Structural Steel Industry

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Abstract: **Nowadays there are a large variety of contributions in the area of costing systems describing a lot of different possibilities. The difficulty lies in choosing the best one for each company. As a matter of fact each company is different from another and it is necessary to "look inside" each one and understand very clearly how their costing structures function. Know where company's costs lie is the best way to reduce them and to determine the correct price of the product. It is thus essential that the company may have a good costing system that will allow it to possess the highest level of information and will be a support to the decision making process.**
From among all the new approaches, this paper will analyze the costing system based on Activities (ABC). Its objective is to understand the application of ABC as a costing system and to classify implementation methodologies. The ABC costing system was implemented in Martifer Construções, a Portuguese industrial company that manufactures metallic structures, as an alternative method. Work took place within company production facilities and a check has been carried out of costing problem details and the company's expenses system.
The purpose of this study is to validate the ABC method in this company, to provide a tool to support work and to reach a conclusion about the real advantages and disadvantages of implementing this method. This study will help leaders and managers of the company to make decisions about implementation of the method, as well as helping to increase knowledge of the matter, providing a useful tool to the company.

Keywords - Accounting, costs, costing systems, ABC.

1. Introduction

Consider Technology advances and the increasing complexity of production systems in many companies, change more and more the vision of management decision makers in organizations.

Costing systems are an important source of information and a supporting system for decision-making. However, inconsistency with traditional systems resulted in new emerging theories. Among them is activity based costing - ABC.

There are many ways to calculate costs. Traditional ways are concerned mainly with policies and legal regulations. The new ways are also concerned with efficiency and consequently with competitiveness that nowadays exist in the business environment (globalization).

2. Considerations about some methods of costing – general consideration

Methods of costing/expenses are ways of determining the entities: goods and services cost values. As in Martins (2001), the purpose of costing methods is to determine the way in which costs are allocated to products.

There are various methods to determine the costs of products and we can't say one is better than the other or can replace it because its application depends on the characteristics of the company, product line and management requirements.

On choosing a costing system management sets up a series of coordinated criteria satisfying the company mission, always respecting the cost/benefit relation. It is not worthwhile to implement very detailed costing where the information generated doesn't justify the amount spent to produce them.

2.1 *Traditional costing methods*

For the purpose of this work, five different types of costing were studied: variable costing, costing by absorbing, costing by customizing, costing by process and standard costing.

As mentioned before we can't say a costing system is better than another since it depends of the type of company and the mission of each one. But no matter the mission or type of company, all of them need information to make decisions and to provide management with orientation. However, for better understanding, before discussing costing methods, some accounting and costing/expenses concepts will be described. The table below summarizes the main characteristics of general accounting and management accounting.

Table 1- Fundamental Characteristics of Financial Accounting and Management Accounting

	Financial Accounting	Management Accounting
Information Receivers	People and foreign entities with interest. The organization such as: partners/shareholders, creditors (suppliers, banks and others), fiscal authorities.	Organization's staff, namely: workers, managers, top corporate executives and, possibly consultants.
Information purposes	Inform the interested foreign entities in a summarized manner, the organization's past financial performance.	Provide feedback about the decisions made by the managers and in simultaneous supply data in order to carry out the operational performance control.
Type and scope of information	Only highly aggregated financial data are supplied, presenting the company's financial situation as a whole.	Financial, operational and physical data on the processes, technologies, suppliers and clients are supplied; the information is disaggregated to the product level and/or the sector allowing to obtain information on the individual actions.
Information Nature	The accounting is regulated, with specific rules defined by accounting principles and by the governmental authorities which make it objective, consistent and precise.	The accounting is not regulated: the information systems are internally defined in order to satisfy the organization's strategic and operational needs; it's more subjective and subject to different interpretations but it's simultaneously more relevant for the management.

The internal accounting has the costs as its bigger and most important tool and their management as their biggest goal. Industrial companies often create an industrial accounting, gathering information concerning the transformation of production factors and accompanying the value creation process.

However, Horgren's perspective (2003) says that costs accounting is the information basis for the management and financial accounting. As shown in the picture, the costs accounting is the information basis for management accounting as well as for Financial accounting.

In this context, Horgren (1994) defines as cost management the sets of measures undertaken by the managers with the purpose of maintaining the satisfaction of the consumers by developing a process of continuous cost reduction and control. Also here no distinction is made between the process of obtaining information on the costs and the subsequent stage in terms of analysis and treatment of such information.

2.1.1 *Variable costing*

At variable costing, only variable costs are considered product costs, and period costs are all the fixed costings. Only those costs varying with production are considered production costs.

The advantages conveyed by the variable costing system are related to the information level you may obtain production at the time of the decision making. However, though the variable costing presents advantages, it also has disadvantages. First of all, there is a difficulty to separate the variable costings from the fixed ones. The evaluation of existences considering only the variable costings may be too conservative. It analyses the costs for short term decisions, and ignores fixed costings, related to production capacity and long term planning, which may cause future problems.

2.1.2 *Absorption Costing*

In the absorption costing is considered as product costs the variable and the fixed costings, the latest on the whole or partially. Should all costs be included in the product cost, the costing system is defined as full absorption.

Horgren (2003), defines the absorption costs as a technique on which all costs, variable and fixed, are considered product costs. The products absorb all the costs.

Based on the Padoveze (2000) article, the biggest advantage of the absorption costs is that it is in accordance with the Portuguese Plano Oficial de Contabilidade (POC-Official Accounting Plan). The other advantage also mentioned by the same author is that the method is less expensive in implementation, as there is no separation of the production costs in the fixed and variable components.

As disadvantage one may consider the non-existence of the advantages which variable costing has in terms of decision making. It is not possible to extract the contribution margin, and fixed costs are not considered as expenses within the period. In valuing stocks it considers all costs (fixed and variable), originating values which are higher than in variable costing.

2.1.3 *Order Cost*

The costing method may be based on the orders (or production orders), being the costs established according to the direct method for each order or manufacturing batch.

The usage of this system allows, on the one hand, to know the profit margin of the several orders and, on

the other hand, allows for the calculation of the costs for future orders. The cost object is identified during the whole manufacturing process and in the long term.

2.1.4 *Process Cost*

In this costing method, the costs are accumulated on a periodical basis, after which the average costs are calculated taking into account the production of such period (indirect method).

In this case it's only possible to calculate the average cost of the products. Contrarily to the order costing, in the process costing it is fundamental to refer to the production centers, which previously determined costs should reflect upon the manufactured products. In that sense, one should first determine the amount of work units produced by each center in order to obtain a certain product and the cost of each of those units. This information allows for the calculation of the cost of the product.

2.1.5 *Standard Cost*

The standard cost system is a special costing system which allows essentially for the measurement of the productive efficiency. The standard costs are predetermined costs. However, not all predetermined costs are standard costs.

The standard costs are obtained based on results referring to previous periods and assume a set of conditions showing the normal efficiency of the factors.

3. The ABC Costing Method

The analysis of any company or institution depends on its critical factor. The strategy to be implemented depends on what the company wants to achieve.

The activities are the focus of the activity based costing. Before identifying the activities one should analyze the company's chain of value, which gives us relevant data for this strategy to be implemented or defined. Usually, the output is measured by each activity in order to better describe the necessary activities' rates, for the calculation of the products' cost.

3.1. *ABC Usages Goals*

A cost system based on activities has the purpose of improving costs quality, content, importance and information. With this information, the precision of costs attributions and the global quality and relevance of the information on all costs in an activity, from the raw materials to the final product. This system is capable of providing all costs information's, to support the management of any company, having a better planning of the activities, costs control and decision making.

3.2. *ABC Implementation*

The ABC implementation requires a careful analysis of the company's internal control system. For example, definition of functions and process flow. Without the procedure, its application will not be efficiently and effectively viable.

The ABC management system, can be implemented more or less rigorously, depending always on the need of management information, as it is intimately connected to the company's activity area.

3.3. *Advantages and Disadvantages*

For a better understanding it is presented the advantages and disadvantages of the ABC's application costing method.

As advantages may be enhanced: An ABC costing system generates more correct information on the products, most of all in the cases of great product diversity and when the indirect costs which are not related to the volume appear to be quite expressive.

ABC emphasizes the analysis contemplating several cost object, assuming it's role as a tool for decision making at a strategic level.

The ABC allows a more careful analysis on the costs behavior, identifying the various factors to which these are sensitive and provide information which can be used in the productive process control and management.

On the other hand, several disadvantages may be listed:

- High implementation costs;
- Constant need for revision;
- Takes too many data into account;
- Difficult extraction of information;
- Difficult involvement by the company's worker's;
- Need for company's reorganization before the implementation;
- Difficulty on information integration between departments;
- Lack of competent, qualified and experienced staff for implementation and follow-up;
- Greater concern to generate strategic information rather than for using it.

4. Example of ABC Usage at a Metallic Structures Industry

The industry where this example was carried out uses the order based costing system to calculate its costs. It therefore works on manufacturing order.

The company manufactures metallic structures for construction. As they work based on orders, hardly do they carry out equal constructions, therefore the work is carried out to the preference of the client.

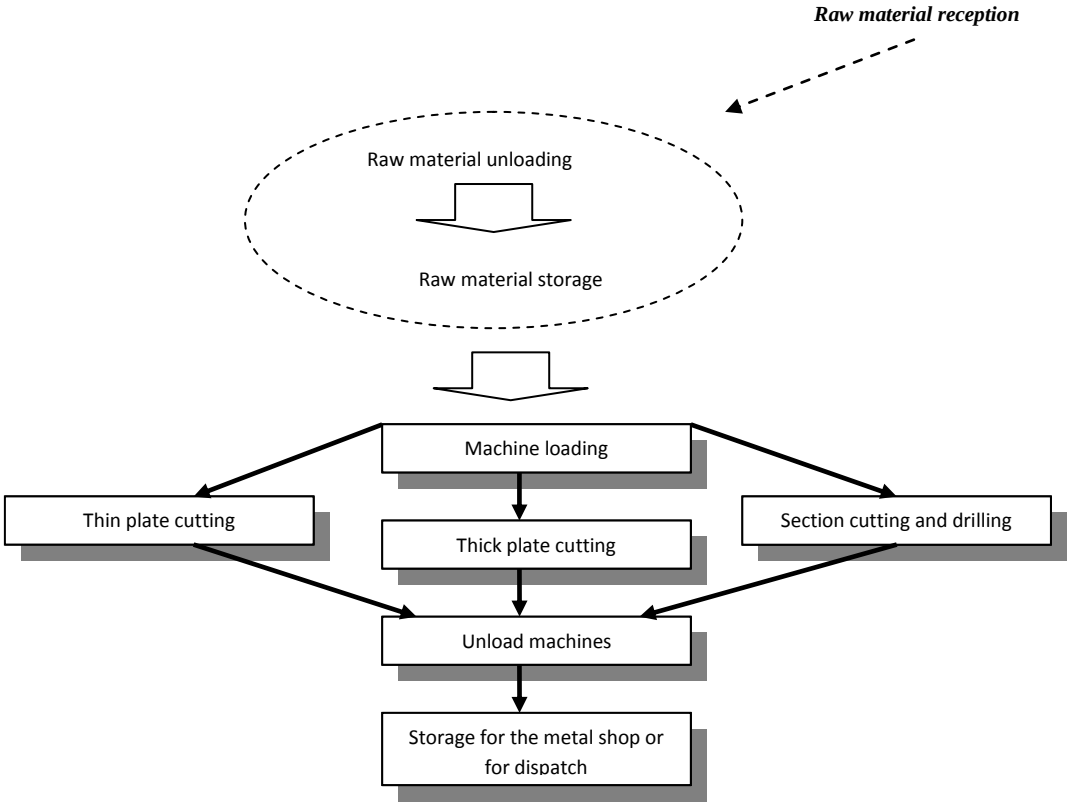
The data referring to the resources, the activities, the cost objects and the inducers are represented according to the work of Roztocki (1999), exemplified by Resource-Activity and Activity-Product Matrixex.

Source *– company internal report.*

Figure 1- Resource Identification Matrix

Raw-Material	826.000,00 €
Labour	206.402.56 €
Energy	25.400.28 €
Oxi-cut	3.468,00 €
Robot-Plasma	1.536,00 €
Robot-FP(1000)	2.938,00 €
Supervisor	13.224.84 €
Building	20.329.54 €
Scale	138,00 €
	,00 €
	,00 €

Figure 2 - Operations of the plate and section cutting process at industry



1*	M	M	E	O	PL	F	S	ED	B	P	E
R		0,					0,	0,8	0,	0	0,
PE		0,					0,			0	
CC		0,	0,		1		0,	0,0			
CC		0,	0,	1			0,	0,0			
CF		0,	0,			1	0,	0,0			
TS		0,					0,			0	0,
A		0,					0,		0,		
M	1										

1- The line represents Resources and the column represents Activities.*

Figure 3 - Activity-resource Matrix

2*	RMP	PEL	CCF	CCG	CFP	TSP	ARZ	MP
C.F. C	0,03	0,03	1			0,03	0,03	0,03
CGC	0,67	0,38		1		0,38	0,38	0,67
PFC	0,30	0,59			1	0,59	0,59	0,30

2- The line represents Activities and the column represents Products.*

Figure 4 – Activity-Product Matrix

4.1 *Cost Calculation*

Finally, the multiplication of matrixes shall be carried out in order to obtain the cost of each activity and the cost to manufacture each product.

The activity-product and resource-activity matrixes may multiply between themselves, making it possible to calculate the resource-product matrix, (figure 5), in which each element means the contribution of each resource for the several cost objects.

3*	MP	MOD	ENG	OXI	PLM	FP	SPR	EDF	BLÇ	PR	EMP
C.F C	0,03	0,21	0,59	0,00	1,00	0,00	0,21	0,06	0,03	0,03	0,03
C.G.C	0,67	0,38	0,04	1,00	0,00	0,00	0,4	0,63	0,53	0,53	0,53
P.C.F	0,30	0,41	0,37	0,00	0,00	1,00	0,39	0,31	0,44	0,53	0,44

3- The line represents Resources and the column represents Products*

Figure 5 - Resource product Matrix

From the result between the resource-activity matrix and the resource matrix, the activities matrix is obtained (Figure 6), showing the costs related to each activity.

Raw-Material Recp	40.614,87 €
Element Prep	22.696,00 €
Thin plate cutting	56.848,75 €
Thick plate cutting	48.991,43 €
Frame cutting and	54.615,57 €
Transportation	21.529,80 €
Storage	21.369,12 €
RM	826.000,00 €

Figure 6 – Activity Matrix

The products matrix (figure 7) may be calculated in two different ways:

a) using the resource-product matrix and the resource matrix, or,

b) multiplying the activity-product matrix and the activity matrix.

Cut thin plate	84.815,00 €
Cut thick plate	654.549,00 €
Cut and drilled frames	353.301,00 €

Figure 7 – Products Matrix (Production cost of each product)

The cost of the product using the MP quantity, therefore taking into account a waste factor of 2%, reaches a corrected cost.

$$Cost/Ton_{corrected} = \frac{Cost/Ton}{98\%}$$

The ABC corrected cost per sold ton is therefore the one in the table below.

Product	Cost year(€)	Ton/ year(Ton)	Cost/ton (€/ton)
Cut thin plate	84.815	40	2.120,38
Cut thick plate	654.549	790	828.54
Perfil cut and crummy	353.301	350	1009,43

Figure 8 – ABC corrected cost

With this table it is possible to calculate in greater detail the costs to manufacture the three products.

Through ABC costing, the unit price of thin plate and sections, 1.832,98 € and 1.062,65 € respectively, is higher than the sale price of 1018 €, originating a loss of (32.574,40 €) and (15.418,00 €) respectively, which is absorbed by the profit connected with thick plate and / or subsequent activities. With the ABC analysis it is possible to find out that the cost of thin plate is being undervalued by the company and in this context the price is much lower than it should be.

The absence of differentiation of indirect costs within products implies the adoption of sales prices not adjusted to the company, as well as the creation of mechanisms of interconnection of profits across products.

5. Conclusion

From this work several important conclusions come out, giving an idea of the set of possibilities for future research.

In the general cost theory, the accounting and cost engineering concepts undertake a very important role in what concerns the exact definition of the goals to outline their field of action which, in concept, will have to encompass aspects such as industrial costs and all other cost concepts, the distribution of indirect costs by the cost objects and the role of the costing systems in company management. The traditional costing systems were underdeveloped for the market requirements, given the globalization, generating the study of more efficient and effective approaches for resource usage.

The usage of new costing approaches is related to the technological development, granting the organizations an increase in price.

In between the few costing approaches, the ABC seems to be an alternative to the traditional costing systems.

The ABC assumes that companies do not manage costs, but instead, activities. It is assumed that products use activities and those, in turn, use company resources. And that usage may be explained with cost inducers.

The central elements of an ABC model are resources, activities, cost objects and cost inducers.

ABC is not a truly original concept, as its roots may be found in the last century.

However, there are many companies, mostly those of smaller size, which don't adopt this tool, facing difficulties to implement it.

In the practical case it was possible to prove that the usage of ABC may change the value attributed to the cost of each product.

On the other hand, the model shows the characteristics of the production process and techniques, and may therefore be very useful for those having to manage the production and manufacturing processes. By generating useful information for the management and most of all, for the analysis and optimization of the productive process, it allows for the classification of activities which may be reduced or eliminated for not adding any value. It also translates in a more visible way the cost construction process, showing the chain of value.

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Abreviations

ABC – Activity Based Costing

ARM - storage

BLÇ- scales

CAM – consortium for advanced management

CIMA – chartered institute of management accounting

CCF – thin plate cutting

CCG – thick plate cutting

CFC – cut thin plate

CGC – cut thick plate

CFP – cutting and drilling of sections

EMP - stacker

EN - energy

FP- cutting and drilling Robot

MP – raw material

OXI – Oxi-cutting

PCF – cut and drilled sections

PLM - Plasma

PR – rolling bridge

RMP – raw material reception

SPR - Supervisor

TSP – Transport