COST ANALYSIS METHODOLOGY IN A "STANDARD COST" COSTING ENVIRONMENT

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Keywords: Standard cost, cost control, cost deviations, cost correction.

Abstract: Resource consumption analysis requires a thorough understanding of the resource consumption patterns within the processes carried out by different types of organizations. The information supplied by this kind of analysis is included in decisional models for resource consumption optimization. Traditionally resource consumption was covered by two different concepts: expenses and costs. Whereas expense analysis area is relatively well covered by multiple researches and a sound methodology, cost analysis was rather lightly considered and made use of in national business literature. Certainly the main difficulty related to cost analysis is represented by the great variety of costing methods and systems used in different enterprises, so that cost analysis is required to by customized to the content of informational output generated by each costing method.

This paper aims to devise a cost analysis methodology, as well as particularization of cost analytical modeling for a "Standard Cost" costing environment.

1. Literature review

Resource consumption analysis is a rather old research issue that was approached by many analysts at national level. The main direction of research in this field was focused on expense analysis, due to the great information accessibility regarding expenses in any informational system. Thus some researchers [Mihai 1994; Niculescu, 1997; Mărgulescu 1999; Gheorghiu 2004; Vâlceanu, Robu, Georgescu 2005] have approached this subject mainly by a factor analysis of expense variations, modeling expenses as production volume based indicators. Another widely spread model used for resource consumption optimization is expense value required to generate each 1000 monetary units of revenue [Pârvu, 1999; Cristea, 1997].

Despite the recent boost in interest accorded to costs as resource consumption indicator, costs have not been properly covered by a sound analysis methodology, in a real context, taking into account all the specific characteristics of cost informational subsystem design. Thus, this paper is intended to devise a proper structure for a cost analysis approach, with a customized factor analysis model for the case of "Standard Cost" costing method.

2. Cost analysis process structure

Cost analysis represents a process undertaken each time when there occurs a cost deviation from its projected value, or when it is required a cost optimization, even if the level of costs does not exceed the budgeted one.

The primary information source for cost analysis is cost accounting, as well as

other types of information of internal or external origin. Taking into account that the costing system represents, in most cases, an adaptation of a certain theoretical costing method to the specificities of a real enterprise, or a cross combination between two or more costing methods, the cost analysis is differentiated based on costing system informational outputs content and characteristics.

Also, the goal of cost analysis – resource consumption efficiency improvement regarding internal value creating processes, in other words – identification of durable cost reduction solutions, are influenced by the specifics of enterprise's activity as well as other factors.

All these assumptions lead to the conclusion that cost analysis could not represent a homogeneous approach, so that application of methodology needs to be adapted to the actual conditions of the enterprise which costs are being analyzed.

The structure of cost analysis methodology contains 4 distinct stages:

1) Isolation of object that is undergoing analysis;
2) Acquisition of information required to carry out the analysis;
3) Processing of the available information;
4) Identification of cost efficiency improvement solutions.

Following will be presented the content of each of the abovementioned stages regarding cost analysis process.

1) **Isolation of object that is undergoing analysis**. This first stage encompasses the determination of conditions that triggered the initiation of cost analysis. One of the reasons for cost analysis initiation could be represented by the continuous concern of decision making staff at the factory floor for optimization of resource consumption processes. In this case the cost efficiency improvement for all internal value creating processes implies identification of the most important sources for cost cuts as well as ways for to put these to good use.

Another factor that could initiate a cost analysis process could be the deviation of some cost component from the projected level. In this situation, the analysis regards particularly those cost components that had exceed the desired level, less the other cost cutting possibilities.

A third reason to commence a cost analysis process is a unsatisfactory result of a carried out expense analysis process. Sometimes, an expense analysis could come to the conclusion that a satisfactory improvement of resource consumption efficiency could not be obtained singularly through such a type of analysis. Thus, expense analysis suggests that a more thorough analysis should be carried out, so that there could be required a cost analysis. Such a conclusion is justified by the fact that techniques and information use in expense analysis (supplied by the financial accounting) could prove to be too synthetic in order to device a proper solution for resource consumption efficiency improvement. In such situations cost analysis is the most appropriate solution, because it is based upon information supplied by the cost accounting, which has a greater analytical content and coverage than that generated by financial analysis.

Generally the cost analysis objective is development of solution for future resource consumption efficiency improvement, as well as identification of conditions that follow to change in future periods compared to past analyzed periods. The second possibility is represented by the analysis of future costs.

2) **Acquisition of information required to carry out the analysis**. In this stage there are identified all the available sources of information as well as the content of the information these provide.

Information that cost analysis is based upon could be of one of three types, depending on the costing method used within the enterprise, as well as the complexity of cost information required by the cost managers:

- **Historical information** regarding exclusively past period; the period that historical information refers to depends on the average duration of periods that are used in cost accounting to develop cost information. Thus, the vast majority of costing systems supply historical information on a monthly basis, some times the period of costing being even shorter; for instance, consider the case of a order-based costing system, when all orders are completed in less that a month and if both direct costs as well as overhead proportion of costs that are allocate to each order are known;
- **Real time information** in the case of costing systems that widely use IT costing hardware and software. This type of costing systems could be adapted to almost any costing method. Implementation restriction of such a costing system are represented by usually a high investment cost for software, hardware and cost systems users' training as well as other costs regarding of such a system;
- **Planned of projected information**, each time when costing method implies both past and future cost calculations. Methods that implicitly provide such information are "standard cost", "normal cost" etc. In case there are available planned or projected information, there are met all conditions for a comparative analysis of these with the current level of costs. Such an analysis is the most proficient regarding operative and efficient identification of cost cut solutions aimed to increase resource consumption efficiency, especially if the costing system generates information regarding real time costs.

Thus, the vast majority of costing systems supply historical information meanwhile some of them generates information regarding the planned or projected cost level. Real time costing systems are those that are based upon an Enterprise Resource Planning system, i.e. an integrated IT software application that covers all the functions of an enterprise.

Between the planned and projected level of costs there is a certain semantic difference. Thus, **planned** cost level reflects the desired value of costs, planning representing a willingness expression of management, an engagement within the decisional framework of an enterprise. The **projected** cost level reflects on the other hand a certain level that will be generated in certain conditions or circumstances, reflecting the extrapolation, in those conditions, of current cost behavior.

In order to devise a pertinent analysis, cost information on which such an analysis is based should be complete and correct. One should bear in mind that an analysis is as pertinent as information on which it is based is exact and closely reflect resource consumption processes. Thus, any deficiency or inadvertency of cost information will have a negative effect on quality of solution identified to increase resource consumption efficiency of internal value creating processes.

In order to verify the quality of available information, there should be made a complete or partial analysis of its content, using ways and means that the analyst has at its disposal.

3) **Processing of the available information**. The cost analysis has as an objective the optimization of cost to results (production volume) correlation, a causal type correlation, the analysis being oriented towards improvements in resource consumption efficiency. Such an approach is an introspective one, expressing resource consumption efficiency through the perspective of creating the most value with least resource

consumption. The objective function of cost analysis is that of cost required to generate each unit of production.

The factors that determine the total level of cost are the production volume, specific consumption of resources and their acquisition price. From the perspective of cost analysis, the main cost cutting reserves are related to specific consumption of resources, rather that acquisition price reduction. This is due to the fact that specific consumption should be generated by internal decisions, as long as acquisition prices for consumed resources are governed by the conditions of resource acquiring processes.

Thus, this stage of cost analysis begins with modeling of per unit cost function. The form of this function depends on the way the costing system approach the calculation of per unit cost, the most important factor being the costing method adopted in each enterprise.

A next step will consist of a factor analysis of per unit cost function, in order to identify the direction and amount of each factor influence on unit cost. This operation implies a comparison between the past, current or future level of unit cost to a reference value that could be considered the planned level of costs or the one generate by the different standard cost methods.

A following analyzed aspect is that of quantification of effects factor variation on per unit cost. In this sense will be applied on the following methods:

- Cost structure analysis;
- Per unit cost index analysis;
- Marginal cost analysis;
- Cost-volume-profit analysis;
- Value analysis.

The results of this stage are represented by the conclusions of application of the abovementioned cost analysis methods upon the information regarding cost level and structure. These results are expressed in both value units and physical ones.

4) **Identification of cost efficiency improvement solutions**. The final stage of cost analysis has a predominantly qualitative character, contrary to previous stages. This stage includes evaluation and organization of a hierarchy for quantitative results obtained in the previous stage, so that there could be decided what are the optimal solutions for resource consumption efficiency improvement, in other words – for cost reduction.

The identified solutions should meet certain conditions, such as:

- **Realistic character**, so that there exist the possibility of their implementation
- **Timely character**, so that they are more important that other solutions for cost cuts;
- **Efficient character**, so that the solutions for cost reduction will generate higher effects in reducing costs that those required to implement them;
- **Durable character**, so that through their implementation would not be negatively affected any other enterprise performance indicator (for instance: reduction of finishing cost will lead to a worse aesthetic aspect of the product, and, in turn, to a reduction of product's sales).

3. Analysis of costs calculated using "Standard Cost" method

At the pinnacle of standard costing are the fundamental or primary standards, expressed in physical units, also known as physical or natural standards. Quantitative material standards, those expressed in time units has as basis the product or service that

is manufactured which, in turn, requires certain standard amounts of materials, standard equipment, standard conditions for development of purchasing, manufacturing processes, standard labor force, standard inventories of materials, unfinished goods etc.

Based on physical standards are calculated monetary standards, by multiplying with evaluation instrument (acquisition price for materials, hourly wage for labor etc.).

Application of standard cost method implies passing several stages, each requiring important efforts [Epuran et al., 1999; Ebbeken et al., 2001; Iacob, 1998]:

1. Calculation of standard costs;
2. Organizing the cost deviation evidence system;
3. Deviation analysis in order to make correction decisions;
4. Cost control.

The first stage, **calculation of standard costs**, refers to determination of several elements:

- direct materials standard costs; these are based upon physical standard consumption and standard acquisition price;
- direct labor standard cost; there are based on labor time consumption, determined by the product itinerary within the plant and standard wage tariffs for each manufacturing operation;
- standard overhead costs;

Of all these three categories, the most difficult to asses is the overhead amount, as well as its allocation to each cost object based on some logical criteria that support causality principle and that of rational allocation [Cristea, 1997, p. 218]. The level of these costs is determined based of standard prices and tariffs. Their amount is determined by the degree of capacity usage, expressed in labor-hours.

Common costs are treated as cost of processes they reflect, relative to which they have a direct relationship. Some other cost elements cannot be calculated relative to a certain process, so that there are no measurement means (heating costs, lighting, general water consumption etc.), these being allocated to processes by some allocation criteria (secondary repartition).

Thus, the calculation of unit standard costs (sc) is based on the following formula:

$$sc = \frac{\sum_{i=1}^{n} Qf \times cs_{si} \times pa_{si} + \sum_{j=1}^{m} Qf \times tn_{sj} \times sh_{sj} + \sum CC_s}{Qf} \qquad (1),$$

where: cs_s – standard specific consumption of materials;

pa_s –standard acquiring price;

i – type of direct materials, that takes values from 1 to n (total number of direct material types);

tn_s –standard labor time consumption;

sh_s –standard hourly wage;

j – employee category, that takes values from 1 to m (total number of employee categories);

CC_s – standard common (overhead).

Overhead costs are structured in three parts: indirect manufacturing costs, general administration costs and marketing costs. Indirect manufacturing costs and marketing costs are in turn of two types: variable and fixed. In case of indirect variable standard costs there could be determined different level of costs for different degrees of manufacturing capacity usage, determining common standard costs ratios. On the other

hand, indirect fixed costs make part of a common cost ratio and transform into proportional costs, even if such an approach is not real.

In order to carry out the analysis, standard direct costs do no present any interest because usually these reflect a level close to optimal one or even the optimal itself. The only unsolved problem is related to the indirect costs – overhead, especially to its fixed components. In order to further deepen the analysis, indirect costs are approached separately by their fixed and variable components.

On the other hand, one of the most interesting aspects of this costing method is represented by the deviations of current costs from standard ones. Standard cost method supply information regarding **deviations of monetary consumption** from the standard amounts on both place of generation as well as causes of deviations.

Deviations from standard material costs could be mathematically negative, but economically favorable, as well as mathematically positive and economically unfavorable. Deviations could be of three types:

- ⇨ quantitative = $\sum q_1 cs_1[gs_s]pa_s - \sum q_1 cs_s[gs_s]pa_s$ (2);
- ⇨ structural = $\sum q_1 cs_1[gs_1]pa_s - \sum q_1 cs_1[gs_s]pa_s$ (3);
- ⇨ determined by purchasing price = $\sum q_1 cs_1[gs_1]pa_1 - \sum q_1 cs_1[gs_1]pa_s$ (4),

where: q – quantity of production; gs – specific weight (proportion); 1, s – current and, respectively, standard level of the indicator.

Moreover, there are volume based deviations, if standard production volume is exceeded. In that case volume deviation is calculated in the following manner

$$\sum q_1 cs_s[gs_s]pa_s - \sum q_s cs_s[gs_s]pa_s \quad (5)$$

In the case of **deviations from labor standard costs**, these are analyzed using following formulas:

- ⇨ labor time deviation = $\sum q_1 tn_1 sh_s - \sum q_1 tn_s sh_s$ (6);
- ⇨ hourly wage deviation = $\sum q_1 tn_1 sh_1 - \sum q_1 tn_1 sh_s$ (7);
- ⇨ production volume deviation = $\sum q_1 tn_s sh_s - \sum q_s tn_s sh_s$ (8)

Deviation from standard overhead costs (common costs), contrary to direct costs, could not be determined other than based on the level of periods for which information regarding this cost component is centralized (usually monthly). Deviations could be determined differently: either at the end of the shortest period for which there are available centralized information regarding this cost type, or in the moment of common cost budget depletion.

Deviation of current overhead costs from standard values could be of different types:

⇨ deviations related to changes in the volume of indirect costs, which could be:

- deviations of current common costs (CC_1) from the initial standard overhead budget (CC_s): $A_{Bs} = CC_1 - CC_s$ (9);
- deviations of current overhead costs from the recalculated budget for changes in variable overhead (CC_a): $A_{Ba} = CC_1 - CC_a$ (10), where: $CC_a = CC_F + CC_V \times \frac{H_1}{H_s}$ (11), in which CC_F – fixed overhead, CC_V – variable overhead; H_s,H_1 – standard and current activity volume, expressed in standard hours.

⇨ deviations related to changes in capacity usage degree:

- deviations of standard common costs recalculated in terms of current efficiency (CC_{sr}), compared to standard overhead costs (CC_s): $A_c = CC_s - CC_{sr}$ (12), where: $CC_{sr} = CC_s \times \frac{H_1}{H_s}$ (13);

- deviations standard overhead recalculated in terms of current efficiency (CC_{sr}), compared to the recalculated budget for changes in variable overhead (CC_a): $A_c = CC_a - CC_{sr}$ (14);

⇨ deviations of efficiency, that represent the difference between standard costs corresponding to current activity time (CC_{sr}) and standard costs for current manufactured volume (CC_sQ_1): $A_r = CC_{sr} - CC_s[Q_1]$ (15), where: $CC_s[Q_1] = \frac{Q_1}{Q_s} \times CC_s$ (16)

In order to analyze the deviations of current overhead costs compared to standard overhead, an analysis could be carried out as described above.

4. Conclusions

Cost analysis in "Standard cost" costing environments in capable of providing operative information to be used in management of resource consumption throughout an organization. Using information provided by this costing method there could be easily developed cost corrective decisions and thus it is provided a basic framework for a rigorous cost control system.

Cost deviation analysis used for corrective decision making is based upon research of causes as well as identification of factors that triggered the deviation of a certain cost item from its standard level. Depending upon cost deviation type (favorable or unfavorable) certain decisions could be devised in order to maintain or to drive the cost level into the desired direction. If favorable deviations compared to standard costs that provide cost savings have a permanent character, then standards are adjusting in corresponding manner.

Of a special importance in the cost deviation analysis process is a proper organization of cost data evidence by place of resource consumption as well as by process of consumption.

Cost control introduced by the "Standard cost" costing method extends to the level of resource consumption place. The most appropriate management method for a costing system based upon "Standard cost" is represented by "Exception Management". Such a management approach represents the main driving factor for decentralizing the cost control system, so that, as long as cost deviations are minimal, correction could be maid solely by the decision making people that have responsibility at each cost center level. If cost deviations increase in amplitude, higher decision making levels get involved, that have a greater decisional freedom in order to correct the important cost deviations from standards.

By contrast to other costing methods, by using "Standard cost" method, the factor analysis of costs regards not the analysis of unit costs defined by the formula (1), but the deviation of current costs versus standard costs. Thus, solutions suggested for cost reductions do not regard directly the unit cost, rather they are concerned with reducing unfavorable deviations, as well as generalization and making permanent favorable cost deviations (cost savings).

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