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POSSIBILITIES FOR OPTIMIZATION OF DISTRIBUTIVE INDICES FOR AVERAGE COSTS CALCULATION IN JOB ORDER AND SMALL SCALE SERIAL PRODUCTION

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ABSTRACT

Calculation of total costs is often associated with distribution of costs like overhead which cannot be placed to one or another product costs at the end of planning period or just period of time. Furniture in Bulgaria consists mostly of small enterprises which produce individual customized products. In these cases, exist wide variety of approaches that could be implemented. In this paper is made an attempt to find an optimal solution of cost distribution mechanisms, suitable to furniture.

Key words: calculation, costs, optimization.

INTRODUCTION

Nowadays costing in Bulgarian Furniture is an absolute antipode to the theoretical concepts. Managers and enterprise owners do not know and implement scientifically based methods for costing and pricing. Directions for helping the business are as following:

- Improvement of some of the standard approaches;
- Implementation of new-innovative ones.

Cost management systems can be classified as functional-based and activity-based. Both of these systems are found in practice of woodworking enterprises all over the world. Currently, the functional-based cost management systems (called here Traditional) are more widely used than the activity-based systems (Hansen, Don R., Maryanne M. Mowen, Liming Guan, 2009). This is changing, however, as the need for more accurate cost information increases. This is particularly true for enterprises faced with high diversity, more product complexity, shorter product life cycles, increased quality requirements, and intense competitiveness (Hansen, Don R., Maryanne M. Mowen, Liming Guan, 2009). These organizations often implement advanced manufacturing technology. For furniture enterprises operating in contemporary economic environment, the functional-based cost management system can be accepted like no more appropriate because of the requirements of information. More and more accurate information for time consumption and overhead is sufficient for these enterprises to build a sustainable long-term competitive advantage. The question remains whether such a complicated system is appropriate for every enterprise in furnishing production.

The main purpose here is to provide an approach of optimizing the assignment coefficients of overhead in unique or small scale serial production.

Tasks:

- Basic methods reviewing in practice;
- Optimization model formulation;
- Experimenting the model and recommend its usage to particular cases.

The researching object is small enterprises with unique furniture production.

The main subject is the process of determination of assignment coefficients in the

case of unique production in the different intensity of purchases and different times of furniture accomplishment.

A functional based cost accounting system uses only unit-based activity drivers to assign costs to cost objects. This means that units of furniture produced are the main distinguishing units to separate overhead, like transportation and administrative costs. Since unit-based activity drivers usually are not the only drivers that explain causal relationships. A functional-based operational control system assigns costs to organizational units. Performance is measured by comparing actual outcomes with standard or budgeted outcomes. This standard in job-order productions like furniture is often the budgeted consumption of labor for each type of operation, related to the type of each order, and consequently planned fixed costs, transferred to variable in the actual costing process.

The activity-based costing (ABC) method focuses on the cost of activities and then allocates these costs to products using a variety of activity bases (Kesavan, R., C. Elanchezhian, B. Vijaya Ramnath, 2009). Buoyed by early successes, ABC emerged as a powerful profit analysis tool. These successes stemmed from ABC's ability to reveal the hidden sources of profitability and embedded cost, and to serve as a catalyst for decisions to improve profitability (Turney, Peter B.B). Under activity-based costing, factory overhead costs (some authors exclude administrative and marketing costs, but in this research they have been taken into account of overhead or so called total costs for management) are put in activity cost pools. These cost pools are related to a given activity, such as machine usage, inspections, moving, production setups, and engineering activities but all of them are not directly connected to the volumes produced. At the same time it is not an easy task to allocate indirect costs to the direct ones without an appropriate information system. This is reality and especially Bulgarian business environment of furniture could be difficult to implement. So, here come traditional methods with some extensions like optimized elements of cost allocation. Using the unit-level drivers and optimization approach to the overall results of business could be improved. In the same furniture enterprises should not be ignored and missed the possibility for ANC implementation.

In a traditional costing system, a unit-level driver is used. There are five commonly used unit-level drivers:

1. Units produced.
2. Direct labor hours.
3. Direct labor value.
4. Machine hours.
5. Direct materials value or cost.

MATERIALS AND METHODS

Due to revealing the functioning of traditional system and results of optimization in this article are implemented the following approaches:

From the investigated firm was taken accounting information for direct and indirect costs.

Particular situation was modelled with different incoming purchases, with different amount of materials implemented and times for accomplishment.

The main activities included in indirect costs are shown in Table 1.

Table 1: Value of direct and indirect costs, lv./y.

Direct	312774
Indirect	2033
Administrative	20380

In the researched enterprise were distinguished different orders, that are presented below:

Table 2: Orders for furniture producing and their parameters

	Order-1	Orders par	Order-3
materials, лв.	1200	2300	6000
labor, лв.	480	960	2880
time	3 weeks	1 month	2 months

The main Markup: 'practice in the enterprise: 1.4–2 per order

If cost structure of direct materials is used: 1.196 per order

Here optimization is made using the simple linear model for optimal distribution of resources. Model allows allocation of indirect costs during direct costs per unit. The method is well known transportation heuristic. The analytical form is presented below:

$$f(x) = \sum_{i=1}^{4} \sum_{j=1}^{3} C_i p_{ij} \rightarrow min \qquad (1)$$

where i are orders on which overhead will be added;

j – number of orders

C_i – overhead of product I;

P_{ij} – overhead per indirect costs

Table 3: Enterprise's activities that frame the indirect costs and their units (cost drivers)

Activity	Cost driver
Internal transportation	[t/km]
Inventories control	[number]
Customer service operations	[number]
Stock Placement	[hours]
Administrative activities	[hours]
Inspection	[number]

The main results of enterprises' businesses are calculated by means of one, of the main ones profitability ratio- profitability of sales:

P_s = (gross profits)/(total costs) **(2)**

RESULTS

ABC costing has an appropriate procedure, which has some modifications in the context of the firm's policy and practice. The first and second steps are allocation of each activity to each type of costs. Allocation is, at first only connection and secondly determining the individual participation of each cost in each activity (statistically or by expertise). These two steps are shown in table 4.

Table 4: Allocation of indirect costs to activities in ABC

	Cost driver	Administration wages	Warehouse workers-salaries	Quality inspectors salaries	Depreciation	Petrol products	Energy
Internal transportation	t/km				0.40	0.60	
Inventories control	number		1				0.1
Customer service operations	number	0.3					0.4
Stock Placement	hours				0.30	0.25	
Administrative activities	hours	0.7			0.25		0.3
Inspection	number			1	0.05	0.15	0.2
Σ=	%	100 %	100 %	100 %	100 %	100 %	100 %

Third step is to evaluate costs for each activity (Table 5).

Table 5: Evaluated costs for each activity

	Administration wages [BGN]	Warehouse workers-salaries [BGN]	Quality inspectors salaries [BGN]	Depreciation [BGN]	Petrol products [BGN]	Energy [BGN]	Σ [BGN]
Internal transportation	0	0	0	24000	18000	0	42000
Inventories control	0	35000	0	0	0	30000	65000
Customer service operations	18000	0	0	0	0	120000	138000
Stock Placement	0	0	0	18000	7500	0	25500
Administrative activities	42000	0	0	15000	0	90000	147000

	Administration wages [BGN]	Warehouse workers-salaries [BGN]	Quality inspectors salaries [BGN]	Depreciation [BGN]	Petrol products [BGN]	Energy [BGN]	Σ [BGN]
Inspection	0	0	18000	3000	4500	60000	85500

Other steps- allocation of each cost driver to each product and calculation of are shown in Table 6.

Table 6: Cost drivers- norms for each product

	Internal transportation [(t*km)/m^3]	Inventories control [number/m^3]	Customer service operations [number/m^3]	Stock Placement [hours/m^3]	Administrative activities [hours/m^3]	Inspection [number/m^3]
boards	0.5	4	0.5	0.10	0.044	0.08
planking	0.3	4	0.6	0.12	0.044	0.07
beams	0.2	4	0.5	0.14	0.044	0.05

Cost drivers per unit production again can be calculated statistically or by expertise. All other stages depend on the Monte Carlo simulation, which is shown in Table 7

Table 7: Simulated number for production volumes in m^3

Period	1	2	3	4	5
boards	937	4304	9880	5507	6467
planking	7328	3177	4825	0	2829
beams	1959	7985	5772	7327	6676

The overall results include profitability of sales for entire enterprise and by each assortment. Differences between ABC and Traditional costing give answer about applicability of both methods in real business. Differences are shown in tables 8–9.

Table 8: Total differences between profitability per unit in ABC and traditional costing

Period	1	2	3	4	5	6
Difference	0.16 %	-0.23 %	0.05 %	-0.08 %	-0.09 %	-0.19 %

Table 9: Differences between profitability per unit in ABC and traditional costing by products

	Period	1	2	3	4	5
Difference	**boards**	-0.65 %	-0.77 %	-0.27 %	-0.93 %	-0.54 %
	planking	-0.29 %	-0.57 %	-0.20 %	0.00 %	-0.42 %
	beams	1.42 %	0.64 %	0.63 %	0.70 %	0.70 %

Tables shown above reveal the main characteristics of both costing approaches. They are very small and in the current case for overall enterprise that benefit from implementation of such a complicated system like ABC seems to not be economically valid. But in a closer look (Table 6) it is obvious that economic efficiency from ABC is not the same for each product. For boards and planking efficiency it is not positive and ABC is not necessary. For beams efficiency is positive and especially in the first period. Searching for answers, in this paper are taken into account two main statistical indicators, which are easy to be calculated in each enterprise- average volume and standard deviation

of sales. Beams have the biggest average volumes and the smallest standard deviation. This result gives the main answer- when to implement ABC. The most efficient way is for production with stable sales and bigger volumes. In the same time there is another constraint for the enterprise. The overall savings of implementation should be higher than costs for it. It is a matter of management decision.

CONCLUSION

Implementation of ABC is not a simple task. In woodworking exist two main situations in which the approach can be used: high diversified production line or stable simple line with large volumes. By means of this research can be made the conclusion that in woodworking ABC is very necessary for large and stable productions and for unstable, but much diversified ones. In the first case ABC would transmit indirect costs from unprofitable to profitable products and thereby give opportunity to enterprises to lower the prices. In the second case ABC would give a universal method for costing in totally different products. But in both cases ABC gives information – a priceless source for planning and control.

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