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ACTIVITY BASED COSTING AND EFFICIENCY OF ITS APPLICATION IN THE WOODEN HOUSES PRODUCTION

Calculation based on performed activities and processes – so-called Activity-Based-Costing (ABC) is becoming an important tool for the costs management. In this paper we would like to present results of comparison of economic efficiency in traditional calculation system and modern calculation oriented to processes and activities. The results were achieved by using specific methodology in a chosen Slovak wood-processing company. On the basis of our designed methodology and obtained results we can recommend implementation of an alternative calculation system based on performed processes and activities.

Keywords: wood-processing industry, wooden houses production, process management, planning, budgeting, costing, controlling

Introduction

The effort of industrial producers to clarify the financial flows through the single cost centres necessarily evokes a question related to the definition of objective direct and indirect costs in the enterprise processes. Different intradepartmental cost centres are using in practice various metrics in the area of process evaluation; however there is a kind of mutual compatibility, but in its existing form, it does not allow an adequate comparison. Besides, a lot of indirect costs are directed “from central level” of the enterprise, while creation framers are working in some of cost centres, which involves unequal indirect costs allocation. The goal is clear: to optimise the enterprise manufacturing processes from the cost calculation point of view.

The present times can be characterised by significant changes almost in all spheres of life, including the economic life. An increasing competition will

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require a wide range of innovation activities related to product life cycle shortening and the competition will be more related to prices of products and services. The radical problem of many industrial countries resides in 30% higher products prices, which decreases their competition advantage in the international market. At the same time, in recent years we can see a strong change in company cost structure, which occurred with implementing of integration production systems into companies. From the cost structure point of view, a lower share of direct costs and increasing of indirect costs (overheads) are noticed. The share of indirect costs is often more than 50% of total company costs and their further growth in the future is expected. One of the possibilities of increasing profitability, efficiency of enterprise processes, competitiveness and gaining maximal customer satisfaction, all at once, is the possibility of cost management by the Activity-Based-Costing Method (ABC).

Stephen R. Covey in *Lessons from Activity Based Management Battlefield*: “Those, who look deeply into Activity Based Management will find an area of management that will empower them with solid information about their organization that enables them to exercise leadership and wisdom in decision making. Activity Based Management supports excellence by providing a formal management system that compels people to understand their work and how it contributes to achieving strategic objectives. Activity Based Management changes traditional management practices to guide managers to emulate the best practices and establish process control to ensure consistently good performance. Activity Based Management supports the quest for continuous improvement by providing managers with new insights into customers of activities and business processes and by permitting managers to adopt management practices with new insights into customers of activities and business processes and by permitting managers to adopt management practices that encourage greater value added by all associates. Activity Based Management is the effective planning of the enterprises activities and achieving of consistency in the performance of activities to achieve its objectives.”

In the Slovak Republic conditions for application of new access or knowledge in the cost area is strong dependent on transformation process of the whole economy. We can already see companies which are able to react promptly to changed conditions and they apply this method of calculation. But there are also many companies where costing and calculation are used only as a tool for cost monitoring according to calculation formula and these firms do not use another possibility which these calculations offer, such as calculation of indirect costs or Activity Based Costing. Therefore in these companies the elements of strategic management cannot be implemented and in departmental accounting the tasks are not observed as they should be. The implementation of Activity Based Costing and its further utilisation in practice gives companies a possibility of obtaining considerable economic benefits, but at the same time it causes an

increase of costs connected with information support. As Foltinova-Kalafutova says, the calculation with several cost drivers is much more difficult than traditional calculation, and therefore it demands more administration and is more expensive. Due to the above aspects it is not suitable for general application in such companies where supporting activities do not play a significant role. Activity based costing is a process of accumulating and tracing costs and performance data to firm's activities and providing feedback of actual results against the planned costs to initiate corrective action, where required. It is a tool for understanding costs. An activity based costing system assigns costs as they actually exist at a point in time, not as they should or could be performed.

We can say that mainly large companies implemented the ABC, but with various final effects. First, there are companies where managers think that they expend appropriate costs on ABC implementation compared with the benefits obtained from such implementation. Secondly, there are many companies where, in spite of the lack of exact calculations, costs expected in such calculation systems are considered extremely high and inadequate to achieved effects. As a result the whole process of implementation is expected to be a failure.

This paper presents chosen results achieved upon the comparison of traditional calculation system effects and Activity Based Costing effects in the chosen Slovak wood-processing company¹.

Goal of the study

Therefore the goal of this study, on the basis of theoretical outcomes, is to propose a scientific analysis and syntheses of knowledge of a specific costing model for the conditions of family houses produced from wood (acc. to the EU legislative the producer is a SME – small and medium-sized enterprise), with a specific accent to the area of overhead costs, that will reflect the newest scientific knowledge in this area of enterprise economy science and at the same time it will take into account the particularities of such production type in the conditions of market-oriented economy, as well as the requirements of their economical efficiency. The following partial steps of solution stem from the present goals and on the basis of scientific procedures and methods they aimed at:

- analysis of contemporary costing model that is used in the selected enterprise of wood-processing industry and identification of its weaknesses,
- definition of a costing model with the primary accent on the area of overhead costs management that takes into account the newest trends and

¹ The company belongs to the group of SME with 150 employees dealing with wood houses production.

- specific conditions and requirements characteristic for the selected wood-processing enterprise,
- identification of selected economical benefits from implementation of an alternative costing model and comparison of achieved results with the contemporary state,
 - proposition and verification of the methodology of economical efficiency evaluation by implementation of an alternative costing model with the support of specialised information software under given specific conditions.

Material and methods

In dynamically expanding and changing conditions of the market economy – more complexly production environment, but mainly competitive environment – traditional access to costing is insufficient [Vollmuth 1997]. With the increasing intensity of competition in the world markets the pressure on prices of supplied products and services is constantly raising, which in consequence causes search for new ways of cost management. We can distinguish “Process oriented cost accounting and calculations”² or “Goal oriented cost accounting and calculations”³. Both of these approaches are oriented towards customer requirements satisfaction through products and services that have not only the required attributes, but are characterised also by required costs or prices.

Vollmuth cites that, with growing competition and constantly increasing ratio of overhead costs to full costs, further application of classical costing methods is possible only in a limited scope. Keynote consists in the change of cost management philosophy. The primary task is to determine the cost of product manufacture, but how much it mostly costs on the market. The classic overhead rates costing as a tool of price making, so in the areas of strong competition it wanes. The price is set by the market and therefore a product cannot be offered for a higher price. Thus the enterprise must produce products at costs that are covered by such price:

$$\text{Target costs} = \text{Target price on the market} - \text{Required profit.}$$

Goal oriented cost accounting and calculations (Target costing) is sometime substituted for the term “goal oriented management” (Target management), because it is not about a technique of cost accounting, but more a tool of transformation process optimisation with the aim of obtaining allowable costs and satisfying customer requirements with product functionality and price.

² Foreign language literature featuring this term, e.g. “Prozeßkostenrechnung”, “Aktivitätsorientierte Kostenrechnung”, “Cost-Driver-Accounting”, “Activity-Based-Costing”.

³ Foreign literature featuring this term, e.g. “Zielkostenrechnung”, “Target Costing”.

Through the goal oriented cost management the amount of single product costs, processes and activities realised in the enterprise cannot be directly influenced. The necessary changes, above all in the enterprise areas characterised by high contribution of overhead costs, are possible to make only by implementation of process oriented cost accounting (Activity-Based-Costing), which can be regarded as a market-oriented cost accounting and calculation system. With help of this system an enterprise can survive in strong competition segments [Vollmuth 1997].

Process-oriented cost accounting, calculations and budgets have the only task of tracing the level of overhead costs connected with a single enterprise activity and allocating them directly to the cost bearers. It can be said that indirect costs will be calculated as quasi direct. The radical change is in accounting of cost centres and bearers, who instead of the abandonment of overhead costs through charges of overhead cost centres, will use so-called "rates of single activity costs". Such approach is desirable to be applied in the enterprise areas with a high contribution to the total enterprise costs and which also have a high contribution of overhead costs (for example research and development, production process planning, enterprise administration, logistics etc.). Instead of the correlation values, used in the differentiated overhead rates costing (for example production salaries, machine hours, production material etc.) the following correlation values will be used: number of parts, customers, product alternatives, special customer requirements, product changes etc.

It must be said, that it does not talk about a new area of cost accounting. It handles only the application of more objective monitoring and overhead cost calculating in the framework of cost accounting art, centres and bearers, with the aim of modifying cost accounting to the conditions of differentiated customer and market satisfaction. As Däumler-Grabe mentions, by the use of process oriented calculation traditional overhead rate costing is modified, whereby overhead costs are a more objective contribution to single products and services. A proportional addition of overhead costs to the products is not accurate, because it does not take into account the influence of fixed costs. With help of process-oriented calculation this effect can be eliminated [Däumler, Grabe 1995].

Activity Based Costing has to cover the amount of indirect costs per particular activity and allocate it directly to costs bearers. So it can be said that indirect costs will be calculated as direct ones. A significant change in calculation of costs centres and costs bearers consists in accounting by so-called costs rates in particular activities instead of costs centres charges in indirect costs. Such a process can be applied mainly in divisions with a high contribution to total company's costs and at the same time with a high share of indirect costs (e.g. R&D, technical support of the production, administration, supply activities etc.).

From the point of view of effective management of departmental enterprise processes using ABC has the following assets:

- exact calculation scheme,
- unambiguous and exact measurement of products profitability, customers and distribution canals, identification of flat production or loss products, customers and distribution canals,
- costs measurement and evaluation of activity-process cost effectiveness, exact information about cost activities in the enterprise,
- evaluation and clearing of processes and activities that are actually realised in the enterprise,
- quantification of “added value” for internal and external customers,
- analysis of relations between the enterprise departments and their activities,
- overhead cost analysis by activities,
- implementation of reengineering as a tool of continuous enterprise change,
- optimisation of price policy and product structure by customers according to the enterprise strategy and marketing plan,
- improvement of inter-departmental management.

As negative aspects of ABC the following can be mentioned:

- in the enterprise with a small number of products and customers there are positive effects of traditional calculation,
- a lot of time needed for preparation of ABC on the basis of input information about activities and their drivers that serves for cost calculations – this results in higher costs connected with ABC application,
- high requirements as regards personnel qualification and knowledge connected with implementation of ABC,
- the need for costs scheduling will be observed as the change lies in activity allocation to separate products through the cost basis.

From the technical point of view, implementation of ABC method must take into account such cost types which must be compensated by the expected assets. In the enterprise of very complicated structures it is very positive to solve this problem through a specialized software package which enables flexible view on the actual cost of separate activities, products, and customers. One of the necessary conditions for successful implementation of such method is declared support of all interested employees for such access to cost mapping.

According to Vollmuth [Vollmuth 1997], from the methodological point of view, application of process-oriented calculation requires these four particular steps:

1. Analysis of realised activities and processes,
2. Definition of correlation values,

3. Setting of costing charge of realised activities,
4. Overhead costing on performances.

It is about modification of overhead rate costing which utilises charges of overhead costs. Single cost calculation can pass by the following scheme:

Scheme 1. Calculation scheme of ABC – Activity Based Costing (ABC Model)

Schemat 1. Schemat kalkulacji ABC – Kosztorysowania opartego na działaniach (Model ABC)

Direct material / <i>Materiały bezpośrednie</i> Direct salaries / <i>Place bezpośrednie</i> Costs of production activities <i>Koszt działań produkcyjnych</i>	<ul style="list-style-type: none"> • Production process planning / <i>Planowanie procesu produkcji</i> • Logistics / <i>Logistyka</i> • Production / <i>Produkcja</i> • Others / <i>Inne</i>
PRODUCTION COSTS/KOSZTY PRODUKCJI	
Sales activity costs / <i>Koszty działalności sprzedażowej</i>	
Development activity costs / <i>Koszty działalności rozwojowej</i> Administration activity costs / <i>Koszty działalności administracyjnej</i>	
TOTAL COSTS INCURRED / CAŁKOWITE PONIESIONE KOSZTY	

Instead of the referring parameters used in differentiated contribution calculations (e.g. workers wages, hours of machinery under operation, production material etc.) the following parameters are used: number of segments, number of customers, number of products alternatives, number of special customer's demands, number of changes in a product etc.

To obtain the assessed goal of the research we have followed these particular steps:

1. Analysis of contemporary calculation model used in the chosen wood processing company and identification of its weaknesses.
2. Projection of Activity Based Costing model with the emphasis on the management of indirect costs.
3. Identification of the chosen economic benefits coming from alternative calculation model.
4. Projection and verification of the methodology for the evaluation of economic effects coming from the implementation of alternative calculation model with the support of specialized information software under given specific conditions.

Chosen results

Strengths and weaknesses analysis of alternative costing models

Following the conducted analysis crucial weaknesses of the existing overhead costing monitoring and calculation system for the wooden family houses, and possible advantages of alternative costing model ABC (Activity-Based-Costing), were gathered within the following points:

With the use of ABC Model:

- from the cost point of view standard houses will be cheaper, and non-standard houses will be more expensive as till now,
- under certain conditions and assumptions small-sized houses will be relatively more expensive and bigger houses relatively cheaper than now,
- it will be possible to reduce the number of houses variants in wooden houses production, which will excessively increase enterprise overhead costs,
- work productivity and capacities use in single enterprise centres and departments will rise.

Vice versa, the use of traditional form of overhead costing results in the following:

- non-standard houses will seem more profitable in comparison with standard version, as they really are,
- non-standard and small-sized houses will be in more demand by customers, because in the case of such houses there will be undervaluation of their costs by the calculation,
- number of house variants and their production difficulty will rise, whereby the profit will still rise and enterprise activities will stagnate or fall.

Determination of ratio coefficient

One of the particular results of the study solution is determination of ratio coefficient (c) as a rate of the whole panel flat, used by the wooden family houses production, defined in m^2 or a useful area of houses, defined just so in m^2 . The determination of the ratio coefficient was necessary for the comparison of alternative costing models. To this aim the methods of correlation analysis were used and a linear model in the following form is proposed:

$$y = c \times x$$

where:

- y – panel flat in m^2 ,
- x – useful area of house in m^2 ,
- c – ratio coefficient.

Besides correlation analysis method the method of variance analysis was used for quantification of a relation between useful area and panel flat and for verification of results achieved by correlation analysis, because the correlation analysis does not give explicit results for comprehensively examined value set. For this reason the whole statistical set was segmented by the size of useful house flat into several subsets – categories. The primary goal was to verify the reliability of ratio coefficient c defined by correlation analysis in dependence on the size of useful house flat. To perform this action the Tukey HSD test was used.

Table 1. Specific indexes derived with the aim of constructing an alternative calculation model and their economic efficiency evaluation

Tabela 1. Specyficzne wskaźniki opracowane w celu skonstruowania alternatywnego modelu kalkulacji kosztów oraz ocena ich wydajności ekonomicznej

Monitored value <i>Monitorowana wartość</i>	Categorization alternative <i>Alternatywa kategoryzacji</i>					
	A		B		C	
	Useful area in m ² <i>Powierzchnia użytkowa w m²</i>					
	Small houses <i>Małe domy</i>	Large houses <i>Duże domy</i>	Small houses <i>Małe domy</i>	Large houses <i>Duże domy</i>	Small houses <i>Małe domy</i>	Large houses <i>Duże domy</i>
	< 175	> 175	< 125	> 125	< 150	> 150
Average useful area in m ² / house <i>Przeciętna pow. użytkowa w m²/dom</i>	124,18	224,85	106,23	158,56	118,23	188,19
Quota in the whole production in % <i>Udział w całej produkcji w %</i>	91,15	8,85	48,67	51,33	78,76	21,24
Average ratio coefficient c unified for all size categories (defined by correlation analysis) <i>Średni współczynnik proporcji c ujednolicony dla wszystkich kategorii wielkości (określony poprzez analizę korelacji)</i>	4,57990					
Average ratio coefficient c differentiated by the size categories (defined by variance analysis) <i>Średni współczynnik proporcji c zróżnicowany względem kategorii wielkości (określony poprzez analizę wariancji)</i>	4,59620	4,41208	4,86854	4,3062	4,65617	4,29710

The results achieved in the framework of ratio coefficient definition c by methods of correlation analysis and variance analysis are summarised in the following Table 1, that summaries specific indexes derived with the aim of constructing an alternative calculation model and evaluating its subsequent economic efficiency as well as comparing it with the traditional model used in the mentioned enterprise.

Alternative calculation model and quantification of selected economic effects

In the following text further particular results of the study will be presented – they compare the results achieved by application of traditional and process-oriented access in the costing area and monitoring of enterprise economic effectiveness of a wooden houses producer.

Table 2 presents budget of overhead costs of single departments in the mentioned enterprise.

Table 2. Budget of the firm overhead costs (in SKK/ year)

Tabela 2. Budżet kosztów ogólnych przedsiębiorstwa (w SKK/rok)

	Department <i>Dział</i>						Enterprise sum <i>Przedsiębiorstwo ogółem</i>
	Trade <i>Handel</i>	Economics <i>Ekonomika</i>	PPP <i>PPP</i>	MPP <i>MPP</i>	Production <i>Produkcja</i>	Fabrication <i>Fabrykowanie</i>	
Budgeted value <i>Wartość założona w budżecie</i>	9 070 072	3 230 700	4 386 425	472 446	25 770 795	11 881 561	56 812 000

By construction of process-oriented calculation model we follow the above mentioned methods.

For the definition of planned performance volume and process-oriented budget of overhead costs for the enterprise as a whole and for single process centres – Activity Based Budgeting (ABB) – see table 3 which foregoes construction of calculation acc. to ABC model.

From the results achieved for the trade departments it follows that the alternative ABC calculation model radically constraints proportional attribution of overhead costs ($p = 1.18$). The performance deviation by the changes of the enterprise performance size structure is enabled as well as identification of coefficient of useful potential of overhead costs ($c_{OC} = 93.2\%$).

When we analyse the results of process model testing presented in Tables 3–5, we can observe that by the change of production size structure the performance deviation in the trade department amounts to:

$$D_p = \text{planned performance} - \text{actual performance}$$

$$D_p = 99.000 \text{ work. min} - 92.298 \text{ work. min} = 6.702 \text{ min}$$

which in financial formulation gives the value of:

$$D_p = 6.702 \text{ min} \times \text{CPOCd} = 6.702 \times 91.62 = 614.037,- \text{ SKK.}$$

Table 3. Overhead costs of activities realised in the framework of trade department – ABB

Tabela 3. Koszty ogólne działań realizowanych w ramach działu handlowego – ABB

Activity code <i>Kod działania</i>	Activity description <i>Opis działania</i>	Activity measurement unit <i>Jednostka miary działania</i>	Volume of activity realised (number/ year) <i>Ilość zrealizowanych działań (liczba/rok)</i>		Estimated time of 1 activity unit (min) <i>Szacunkowy czas wykonywania jednostki działania (min)</i>		Estimated activity time per 1 year (min/ year) <i>Szacunkowy czas poświęcony na działanie w ciągu roku (min/rok)</i>	Overhead costs of activity per year (SKK/ year) <i>Koszty ogólne działania w ciągu roku (SKK/rok)</i>
			Small house (120 m ²) <i>Mały dom (120 m²)</i>	Large house (240 m ²) <i>Duży dom (240 m²)</i>	Small house (120 m ²) <i>Mały dom (120 m²)</i>	Large house (240 m ²) <i>Duży dom (240 m²)</i>		
1	2	3	4	5	6	7	8	9
1	Processing of calculation bases <i>Przetwarzanie podstaw kalkulacji</i>	Units of bases <i>Jednostki</i>	66	6	24	24	1 728	158 314
2	Preparation of bases to fabric realisation <i>Przygotowanie podstaw do realizacji struktur</i>	Kit of bases <i>Zestawy</i>	66	6	720	720	51 840	4 749 420
3	Preparation of contracts with a customer <i>Przygotowanie umów z klientami</i>	Contract number <i>Liczba umów</i>	132	12	96	96	13 824	1 266 512

Table 3. Continued**Tabela 3. c.d.**

1	2	3	4	5	6	7	8	9
4	Performance billing <i>Fakturowanie działań</i>	Bill number <i>Liczba faktur</i>	330	30	16	16	5 760	527 713
5	Base preparation to labour permits <i>Przygotowanie podstaw do otrzymania pozwoleń na pracę</i>	Kit of bases <i>Zestawy</i>	66	6	16	16	1 152	105 543
6	Coordination activity in the time of order realisation <i>Koordinacja działań w trakcie realizacji zleceń</i>	Contact number <i>Liczba kontaktów</i>	990	90	5	5	5 400	494 731
7	Trucks clearance <i>Odprawa ciężarówek</i>	Truck number <i>Liczba ciężarówek</i>	198	30	10	10	2 280	208 887
8	Other comm. activities <i>Inne ogólne działania</i>	Panel flat <i>Ryczałt na powierzchnię</i>	36 274	6 595	0,29	0,29	12 528	1 147 776
9	Other undefined activities <i>Inne działania</i>	Panel flat <i>Ryczałt na powierzchnię</i>	36 274	6 595	0,10	0,10	4 488	411 177
	Total <i>Razem</i>						99 000	9 070 072

Table 4. Calculation of overhead costs and their values achieved by application of alternative calculation model – trade department**Tabela 4. Kalkulacja kosztów ogólnych i ich wielkości otrzymane poprzez zastosowanie alternatywnego modelu kalkulacji – dział handlowy**

Activity code <i>Kod działania</i>	Activity description <i>Opis działania</i>	Activity measurement unit <i>Jednostka miary działania</i>	Small houses (120 m ²) <i>Małe domy (120 m²)</i>		Large houses (240 m ²) <i>Duże domy (240 m²)</i>		Proportionality coefficient <i>p</i> <i>Współczynnik proporcjonalności p</i>
			Production unit calculation <i>Kalkulacja na jednostkę produkcji</i>	Periodical calculation <i>Kalkulacja okresowa</i>	Production unit calculation <i>Kalkulacja na jednostkę produkcji</i>	Periodical calculation <i>Kalkulacja okresowa</i>	
1	2	3	4	5	6	7	8
1	Processing of calculation bases <i>Przetwarzanie podstaw kalkulacji</i>	Units of bases <i>Jednostki</i>	2 199	145 121	2 199	13 193	1,00
2	Preparation of bases to fabric realisation <i>Przygotowanie podstaw do realizacji struktur</i>	Kit of bases <i>Zestawy</i>	65 964	4 353 635	65 964	395 785	1,00
3	Preparation of contracts with a customer <i>Przygotowanie umów z klientami</i>	Contract number <i>Liczba umów</i>	17 590	1 160 969	17 590	105 543	1,00
4	Performance billing <i>Fakturowanie działań</i>	Bill number <i>Liczba faktur</i>	7 329	483 737	7 329	43 976	1,00
5	Base preparation to labour permits <i>Przygotowanie podstaw do otrzymania pozwoleń na pracę</i>	Kit of bases <i>Zestawy</i>	1 466	96 747	1 466	8 795	1,00
6	Coordination activity in the time of order realisation <i>Koordinacja działań w trakcie realizacji zleceń</i>	Contact number <i>Liczba kontaktów</i>	6 871	453 504	6 871	41 228	1,00
7	Trucks clearance <i>Odprawa ciężarówek</i>	Truck number <i>Liczba ciężarówek</i>	2 749	181 401	4 581	27 485	1,67

Table 4. Continued*Tabela 4. c.d.*

1	2	3	4	5	6	7	8
8	Other comm. activities <i>Inne ogólne działania</i>	Panel flat <i>Ryczałt na powierzchnię</i>	14 715	971 195	29 430	176 581	2,00
9	Other undefined activities <i>Inne działania</i>	Panel flat <i>Ryczałt na powierzchnię</i>	5 271	347 919	10 543	63 258	2,00
	Total <i>Razem</i>		124 155	8 194 229	145 974	875 843	1,18

Table 5. Calculation of overhead costs per production unit and periodical calculation – results achieved by the size structure change – trade department*Tabela 5. Kalkulacja kosztów ogólnych na jednostkę produkcji oraz kalkulacja okresowa – wyniki uzyskane w drodze zmiany struktury wielkości – dział handlowy*

Activity code <i>Kod działania</i>	Activity description <i>Opis działania</i>	Activity measurement unit <i>Jednostka miary działania</i>	Small houses (120 m ²) <i>Małe domy (120 m²)</i>		Large houses (240 m ²) <i>Duże domy (240 m²)</i>		Proportionality coefficient <i>Współczynnik proporcjonalności p</i>
			Production unit calculation <i>Kalkulacja na jednostkę produkcji</i>	Periodical calculation <i>Kalkulacja okresowa</i>	Production unit calculation <i>Kalkulacja na jednostkę produkcji</i>	Periodical calculation <i>Kalkulacja okresowa</i>	
1	2	3	4	5	6	7	8
1	Processing of calculation bases <i>Przetwarzanie podstaw kalkulacji</i>	Units of bases <i>Jednostki</i>	2 199	118 735	2 199	26 386	1,00
2	Preparation of bases to fabric realisation <i>Przygotowanie podstaw do realizacji struktur</i>	Kit of bases <i>Zestawy</i>	65 964	3 562 065	65 964	791 570	1,00
3	Preparation of contracts with customers <i>Przygotowanie umów z klientami</i>	Contract number <i>Liczba umów</i>	17 590	949 884	17 590	211 085	1,00
4	Performance billing <i>Fakturowanie faktur</i>	Bill number <i>Liczba faktur</i>	7 329	395 785	7 329	87 952	1,00

Table 5. Continued*Tabela 5. c.d.*

1	2	3	4	5	6	7	8
5	Base preparation to labour permits <i>Przygotowanie podstaw do otrzymania pozwoleń na pracę</i>	Kit of bases <i>Zestawy</i>	1 466	79 157	1 466	17 590	1,00
6	Coordination activity in the time of order realisation <i>Koordinacja działań w trakcie realizacji zleceń</i>	Contact number <i>Liczba kontaktów</i>	6 871	371 048	6 871	82 455	1,00
7	Trucks clearance <i>Odprawa ciężarówek</i>	Truck number <i>Liczba ciężarówek</i>	2 749	148 419	4 581	54 970	1,67
8	Other comm. activities <i>Inne ogólne działania</i>	Panel flat <i>Ryczałt na powierzchnię</i>	14 715	794 614	29 430	353 162	2,00
9	Other undefined activities <i>Inne działania</i>	Panelsflat <i>Ryczałt na powierzchnię</i>	5 271	284 661	10 543	126 516	2,00
	Total <i>Razem</i>		124 155	6 704 369	145 974	1 751 687	1,18

The computation accuracy in the framework of the procedure used is verified by the following control computation that reflects periodical overhead cost calculation (table 6):

Table 6. Definition of financial performance deviation – control computation*Tabela 6. Określenie odchylenia wyników finansowych – obliczenia kontrolne*

Size category <i>Kategoria wielkości</i>	Costs of planned performance (Planned costs – C_p) <i>Koszty planowanych działań (Koszty planowane – C_p)</i>	Costs of real performance (Costs re-counted – C_{rec}) <i>Koszty faktycznych działań (Koszty przeliczone ponownie – C_{rec})</i>	Performance deviation (D_p) <i>Odcylenie wyników (D_p)</i>
Small houses <i>Małe domy</i>	8.194.229	6.704.369	+ 1.489.860
Large houses <i>Duże domy</i>	875.843	1.751.687	– 875.844
Total: <i>Razem:</i>	9.070.072	8.456.056	614.016

On the basis of the above-identified performance deviation of the overhead costs of the trade departments, the coefficient of overhead costs potential utilisation, calculated acc. to the following mathematical formulas, was defined:

$$c_{OC} = \frac{C_{rec}}{C_p}$$

$$c_{OC} = \frac{8.456.056}{9.070.072} = 0.932 \times 100 = 93.2\%.$$

The results achieved in the trade department section confirm that process-oriented calculation model radically constraints proportional attribution of overhead costs ($p = 1.18$). The performance deviation by the changes of performance size structure is enabled as well as identification of coefficient of useful potential of overhead costs ($c_{OC} = 93.2\%$) in this way. Similar results were obtained by other departments in the following enterprise. These results, for the enterprise as a whole, obtained from particular results achieved by application of process-oriented calculation model in the framework of single intra-departmental departments and units are summarised in tables 7–9. Aggregate results of the study are presented in fig. 1–3 as well.

In order to quantify economic efficiency of the proposed solution we compared its costs and potential economic effects.

Economic effects – economic effects of implementation of alternative economic costing model are presented in the form of gross margin on the average sale price and average direct costs per m^2 of house useful area. Validity of both examined values for all house size categories was verified by method of variance analysis, whereby:

- Average sale price – from total achieved results it stems that no statistically important differences in average sale price per m^2 house useful area exist between different house size categories. This effect was verified ex post facto by variance analysis of sale prices of walled family houses as substitution products. The conducted verification confirmed the results achieved in the following wood-processing enterprise.
- Average direct costs – the results of variance analysis were not as clear as in the case of sale prices. In spite of this fact, the alternatives of size categorization A, C cannot give a statistically important difference in the area of direct costs as regards dependence of house size categorisation.

Table 7. Calculation of overhead costs and their values obtained by application of alternative model – enterprise total**Tabela 7. Kalkulacja kosztów ogólnych i ich wielkości otrzymane poprzez zastosowanie modelu alternatywnego – przedsiębiorstwo ogółem**

Department <i>Dział</i>	Small houses (120 m ²) <i>Małe domy (120 m²)</i>		Large houses (240 m ²) <i>Duże domy (240 m²)</i>		Proportionality coefficient <i>p</i> <i>Współczynnik proporcjonalności p</i>
	Production unit calculation <i>Kalkulacja na jednostkę produkcji</i>	Periodical calculation <i>Kalkulacja okresowa</i>	Production unit calculation <i>Kalkulacja na jednostkę produkcji</i>	Periodical calculation <i>Kalkulacja okresowa</i>	
Trade department <i>Dział handlowy</i>	124 155	8 194 229	145 974	875 843	1,18
Economic department <i>Dział ekonomiczny</i>	43 608	2 878 098	58 767	352 602	1,35
PPP department <i>Dział PPP</i>	56 367	3 720 213	111 035	666 212	1,97
MPP department <i>Dział MPP</i>	33 173	2 189 408	47 173	283 038	1,42
Production department <i>Dział produkcji</i>	334 856	22 100 501	611 716	3 670 294	1,83
Fabrication department <i>Dział fabrykacji</i>	158 040	10 430 634	241 821	1 450 927	1,53
Enterprise total <i>Przedsiębiorstwo ogółem</i>	750 198	49 513 084	1 216 486	7 298 916	1,62

Table 8. Calculation of overhead costs per production unit and periodical calculation – results achieved by the change of size structure – enterprise total**Tabela 8. Kalkulacja kosztów ogólnych na jednostkę produkcji oraz kalkulacja okresowa – wyniki otrzymane poprzez zmianę struktury wielkości – przedsiębiorstwo ogółem**

Department <i>Dział</i>	Small houses (120 m ²) <i>Małe domy (120 m²)</i>		Large houses (240 m ²) <i>Duże domy (240 m²)</i>		Proportionality coefficient <i>p</i> <i>Współczynnik proporcjonalności p</i>
	Production unit calculation <i>Kalkulacja na jednostkę produkcji</i>	Periodical calculation <i>Kalkulacja okresowa</i>	Production unit calculation <i>Kalkulacja na jednostkę produkcji</i>	Periodical calculation <i>Kalkulacja okresowa</i>	
1	2	3	4	5	6
Trade department <i>Dział handlowy</i>	124 155	6 704 369	145 974	1 751 687	1,18
Economic department <i>Dział ekonomiczny</i>	43 608	2 354 808	58 767	705 204	1,35

Table 8. Continued**Tabela 8. c.d.**

1	2	3	4	5	6
PPP department <i>Dział PPP</i>	56 367	3 043 811	111 035	1 332 424	1,97
MPP department <i>Dział MPP</i>	33 173	1 791 334	47 173	566 076	1,42
Production department <i>Dział produkcji</i>	334 856	18 082 228	611 716	7 340 588	1,83
Fabrication department <i>Dział fabrykacji</i>	158 040	8 534 155	241 821	2 901 854	1,53
Enterprise total <i>Przedsiębiorstwo ogółem</i>	750 198	40 510 705	1 216 486	14 597 832	1,62

Table 9. Definition of performance deviation and utilisation of the potential of overhead costs by the change of size structure – enterprise total**Tabela 9. Określenie odchylenia wyników oraz wykorzystanie potencjału kosztów ogólnych poprzez zmianę struktury wielkości – przedsiębiorstwo ogółem**

Department <i>Dział</i>	Planned costs – C_p <i>Koszty planowane – C_p</i>	Costs re-counted – C_{rec} <i>Koszty przeliczone ponownie – C_{rec}</i>	Performance deviation – D_p <i>Odchylenie wyników – D_p</i>	Potential of overhead costs utilisation <i>Potencjał wykorzystania kosztów ogólnych</i>
Trade department <i>Dział handlowy</i>	9 070 072	8 456 056	614 016	93,2%
Economic department <i>Dział ekonomiczny</i>	3 230 700	3 060 012	170 689	94,7%
PPP department <i>Dział PPP</i>	4 386 425	4 376 235	10 191	99,8%
MPP department <i>Dział MPP</i>	2 472 446	2 357 410	115 036	95,3%
Production department <i>Dział produkcji</i>	25 770 795	25 422 816	347 979	98,6%
Fabrication department <i>Dział fabrykacji</i>	11 881 561	11 436 009	445 552	96,3%
Enterprise total <i>Przedsiębiorstwo ogółem</i>	56 812 000	55 108 537	1 703 463	97,0%

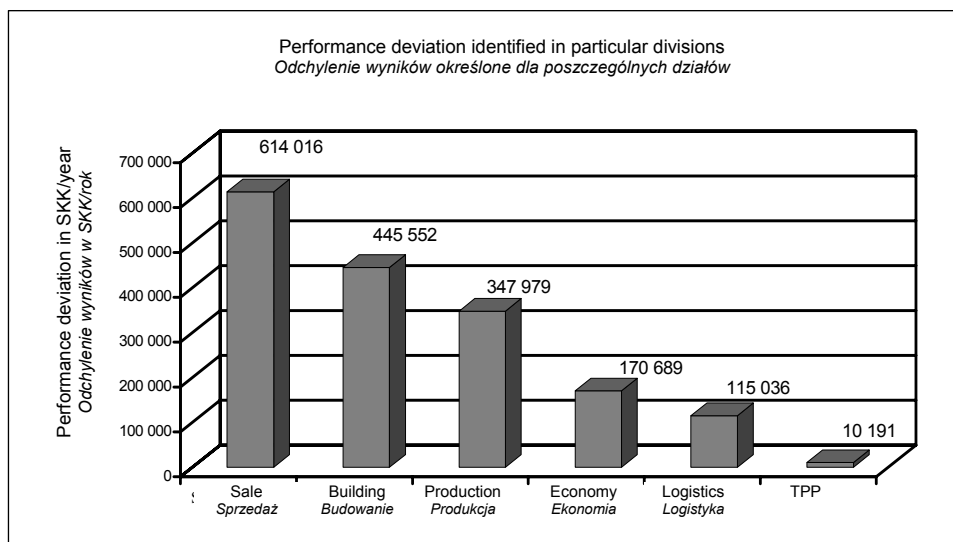


Fig. 1. Performance volume deviation identified in particular divisions after application of alternative calculation approach

Rys. 1. Odchylenie wielkości wyników określone dla poszczególnych działów przy zastosowaniu alternatywnej kalkulacji kosztów

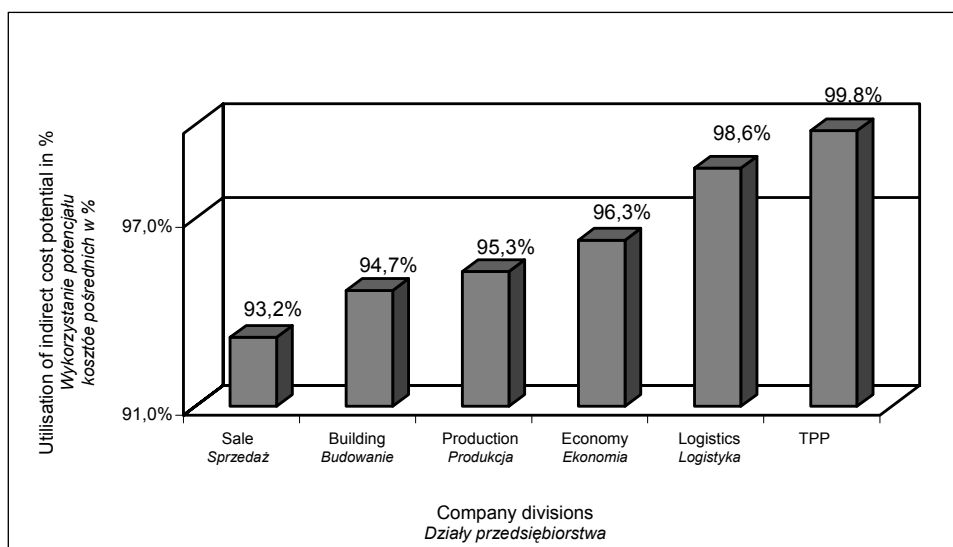


Fig. 2. Utilisation of indirect costs potential in particular company divisions

Rys. 2. Wykorzystanie potencjału kosztów pośrednich w poszczególnych działach przedsiębiorstwa

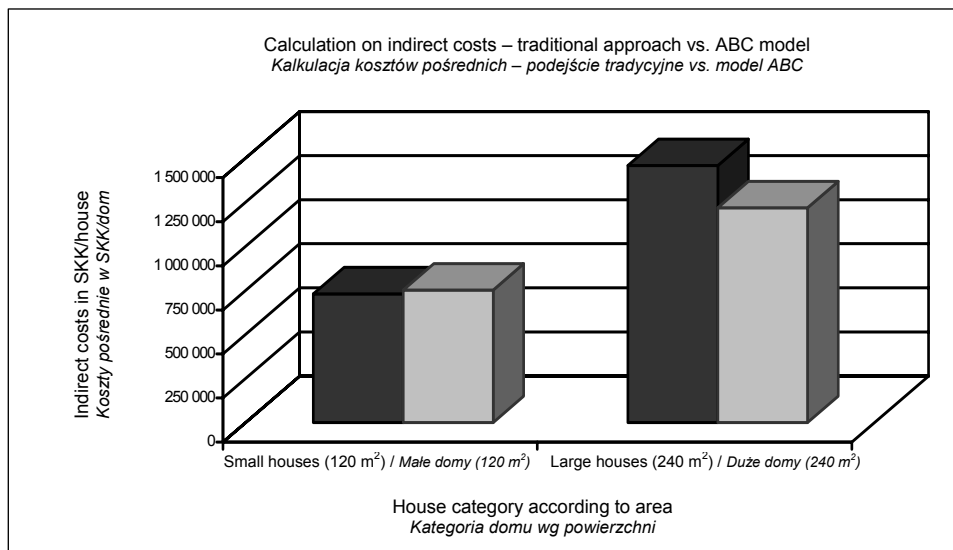


Fig. 3. Calculation of indirect costs per one unit of production – comparison of the results obtained by application of traditional and alternative calculation approach
Rys. 3. Kalkulacja kosztów pośrednich na jednostkę produkcji – porównanie wyników otrzymanych przy zastosowaniu podejścia tradycyjnego i alternatywnej kalkulacji kosztów

By the application of specific methodology we assessed chosen economic benefits and costs stemming from implementation of alternative calculation model:

Benefits

- Earnings by particular company's performance:

Average structure of performances 6 070 668,- SKK/ year,

Small houses 5 717 218,- SKK/ year,

Large houses 7 051 535,- SKK/ year,

- Gross margin by particular company's performance:

Average structure of performances 2 066 087,- SKK/ year,

Small houses 1 945 794,- SKK/ year,

Large houses 2 399 915,- SKK/ year.

Costs – Total average yearly costs (TAC) of implementation of alternative solution were calculated as follows:

$$\text{TAC} = 1.500.000 \times 0,229607 + 330.000 = 674.410,- \text{SKK/ year.}$$

From the above-mentioned we could see that economic benefits stem from the alternative solution's multiply cost overrun needed for implementation and regular use of this solution, and therefore we recommend its application in the company.

Conclusions

Nowadays, many consultant companies dealing with implementation of costing and calculation systems offer alternative calculation systems based on performed activities and processes – so-called Activity Based Costing systems. Managers must decide which conception they would apply in their companies. The system of Activity Based Costing brings economical effects, but it has higher demands on information database based on special software and therefore it results in higher investment expenditure on its purchase and application. On the basis of our methodology and obtained results we can recommend implementation of alternative calculation system based on performed processes and activities in the chosen wood-processing company. From the about given study results, realised in the selected wood-processing enterprise, it follows that selected economic effects of implementation of alternative multi-overstepping solution justify costs of its implementation and regular use. On that basis we recommend its implementation in the enterprise.

Additionally, implementation of calculation based on processes and activities brings about also non-quantified effects such as:

- transparency and rationalisation of performed activities and processes,
- more responsible proceeding of enterprise work,
- identification of enterprise's competitive advantages or disadvantages,
- information support for strategic management and goal oriented management,
- assignment of overhead costs to performance on case-by-case basis,
- support of price policy and production-sales program optimisation.

ABC calculation method improved traditional calculation methods through the fixed and variable performance calculation. It distinguishes among:

- direct costs that are the performance basis and are normalised by the unit,
- short-time variable costs that are dependent on the production volume,
- long-term variable costs that are used by calculation cost drivers; and
- fixed costs (stable from the activity indicator).

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KOSZTORYSOWANIE OPARTE NA DZIAŁANIACH ORAZ WYDAJNOŚĆ JEGO ZATOSOWANIA W PRODUKCJI DOMÓW DREWNIANYCH

Streszczenie

Wraz z rosnącą dynamiką otoczenia przedsiębiorstwa pojawiły się nowe potrzeby w zakresie kosztorysowania i kalkulowania. Jednocześnie, w wyniku znacznego zróżnicowania produktów oraz wdrożenia zintegrowanych systemów zarządzania, zdecydowanie zmieniła się struktura kosztów przedsiębiorstwa. Upowszechniająca się automatyzacja powoduje zmniejszenie liczby pracowników produkcyjnych, ale także wiąże się z wyższymi kosztami amortyzacji

i wynagrodzeń niezwiązanych bezpośrednio z produkcją. Oznacza to niższe koszty bezpośrednie i wyższe pośrednie, stanowiące najważniejszą sferę zarządzania kosztami. Tradycyjne metody kosztorysowania i kalkulacji kosztów nie są w stanie sprostać nowym oczekiwaniom.

Zaprezentowano możliwości zastosowania nowoczesnej koncepcji kosztorysowania kalkulacji kosztów na przykładzie wybranych przedsiębiorstw przerobu drewna. Skuteczne zarządzanie kosztami w warunkach gospodarki rynkowej, charakteryzującej się silną konkurencją, opiera się głównie na systemie kosztorysowania i kalkulacji kosztów, który wspiera kierownictwo przedsiębiorstwa, dostarczając mu istotnych informacji niezbędnych w planowaniu i kontroli kosztów.

Skoncentrowano się na wynikach osiągniętych w trakcie porównywania efektywności ekonomicznej tradycyjnych systemów kalkulacji kosztów z nowoczesną kalkulacją kosztów opartą na procesach i działaniach poprzez wdrożenie specyficznych metodologii w wybranym przedsiębiorstwie przerobu drewna.

Obecnie coraz więcej komercyjnych firm konsultingowych zorientowanych na wprowadzanie do praktyki przedsiębiorstw systemów księgowania i kalkulacji kosztów oferuje alternatywne systemy kalkulacji kosztów oparte na wykonywanych działaniach i realizowanych procesach. Menedżerowie stoją przed podjęciem ważnej decyzji, którą koncepcję księgowania i kalkulacji kosztów wdrożyć w przedsiębiorstwie. System księgowania kosztów oparty na procesach i działaniach przynosi firmie korzyści ekonomiczne, ale z drugiej strony wymaga zapewnienia bazy informacyjnej opartej na specjalistycznym oprogramowaniu, a to pociąga za sobą większe wydatki inwestycyjne związane z zakupem i użytkowaniem takiego oprogramowania. W zasadzie, wdrożenie zaproponowanej przez autorów specyficznej metodologii oraz uzyskane dzięki niej wyniki sugerują zastosowanie w wybranym przedsiębiorstwie przerobu drewna alternatywnego systemu kalkulacji kosztów opartego na realizowanych procesach i działaniach.

Słowa kluczowe: przemysł drzewny, produkcja domów drewnianych, zarządzanie procesami, planowanie, budżetowanie, kosztorysowanie, controlling

