

## THE CONCEPT OF IMPLEMENTING THE ACTIVITY-BASED COSTING IN MULTI- ASSORTMENT MANUFACTURING ENTERPRISE – CASE STUDY (PART 2)

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**Purpose:** As mentioned in the first part of the article, its main objective is to develop and present a concept for the implementation of activity-based costing in a company dealing with multi-assortment production of bookbinding machinery.

**Design/methodology/approach:** The main research method used is a case study of the implementation of activity-based costing in a selected multi-assortment production company. The concept of an original model of implementation of activity-based costing in the analyzed company as well as the benefits resulting from this implementation are presented in this article.

**Findings:** The carried-out research indicates that the calculation of cost according to the concept of activity-based costing is more useful for effective cost management than traditional methods. After the development and presentation of the model of the analyzed costing method, the board of directors of the examined company began seriously considering the implementation of this method within their business unit.

**Research limitations/implications:** The main barrier in the conducted research was the lack of conviction on the part of the company about the advantages of the presented unit cost calculation method and its usefulness for effective cost management within the company.

**Originality/value:** The article is an example of the practical application of activity-based costing in multi-assortment production. Its content is directed both to persons dealing with these matters from the theoretical perspective, as well as company owners and heads of controlling or production departments.

**Keywords:** activity-based costing, implementation of, multi-assortment production.

**Category of the paper:** research paper, case study.

### 1. Introduction

According to the considerations presented in the article entitled *The concept of implementing the activity-based costing in multi-assortment manufacturing enterprise — case study*, traditional costing methods, including above all full costing, do not meet the information

requirements of their users with regards to costs. Therefore, some companies decide to change their existing costing systems to other, more advanced systems. One such tool is activity-based costing, whose conceptual assumptions as well as calculation procedures are presented in the above-mentioned article.

This article presents an original model of implementation of activity-based costing in a multi-assortment production company. Therefore, the aim here is to present the necessary assumptions and calculation procedures for its implementation. All theoretical considerations were supported using numerical examples. To maintain the confidentiality of the examined company, for the purposes of this case study, it shall hereinafter be referred to as company X.

## 2. Implementation of activity-based costing in a company — case study

The subject of the study is a production company from Świętokrzyskie voivodeship, which deals with the production of bookbinding and printing machinery. The company is characterized by a multi-assortment production, with 17 assortment groups in its offer portfolio, almost all of which additionally feature various models of a given product. In total, the company distributes around 130 models of machinery and equipment, including 8 models produced in-house. Paper cutters are the company's core products. Nearly 80% of the products are exported abroad, mainly to Western Europe, the Middle East and North America. Moreover, the company has its own warranty and post-warranty service for machines and a warehouse for spare parts for the offered products. The examined company has a total of 34 employees. Table 1 shows the detailed employment structure in the company.

**Table 1.**  
*Employment structure in Company X*

No.	Organizational unit	Number of employees
1.	Management Board	2
2.	Accounting Department	2
3.	Sales Department	3
4.	Production Department	22
5.	Quality Control Department	1
6.	Machine Service and Installation Department	3
7.	Warehouse	1

Source: Own elaboration.

Accounting at Company X is carried out on the basis of the provisions of the Polish *Accounting Act* of 29 September 1994 and as the net revenues from the sale of products for the previous financial years amounted to more than EUR 2 million, the company employs so-called comprehensive bookkeeping (Act, 1994). The company's costs and revenues are recorded both

by type and by function, i.e. on accounts of group 4 and 5<sup>1</sup>. Cost recording occurs on a number of analytical levels. The production cost of a single machine is calculated in accordance with the rules specified in the Act, i.e. as a full cost of manufacturing, which means that the company keeps cost records divided into direct and indirect costs. The latter represents nearly 70% of all costs incurred within the company.

The main problem of the company in question is finding such a method of unit cost calculation, which will allow detailed presentation of the level and structure of costs of the manufacturing process. For this reason, the company decided to implement a method of unit cost calculation that would make the calculations carried out thus far credible.

Further considerations will feature the calculations of manufacturing costs of three core products of Company X, namely: paper cutter G73, paper cutter G52 and paper cutter G52H, so-called cost calculation objects, which shall be carried out using cost calculation procedures according to the concept of activity-based costing. In the example, the products are defined as Product X, Product Y and Product Z, respectively. The calculation of unit costs of these products will be carried out according to the individual stages of the activity-based costing implementation procedure, i.e.:

1. identifying the relevant processes and activities taking place within the company,
2. determining the resource structure type of the company and the value of resource consumption,
3. defining resource cost drivers,
4. determining costs of the distinguished activities,
5. defining activity cost drivers,
6. settlement of indirect costs of individual activities into cost objects.

### **2.1. Stage 1. Identifying the relevant processes and activities taking place within Company X**

The core element of the implementation of the analyzed costing method in each company is the identification of processes and activities. It is repeatedly stressed in the literature on the subject that this is the most important and, at the same time, the most difficult stage of implementation of activity-based costing. As mentioned, it is the processes and activities that are the direct cause of cost generation, so their precise identification determines the success of the entire calculation procedure. The level of costs in a company is therefore directly influenced by the number of activities and their scope. The implementation team should therefore select the level of specificity in the definition of activities in such a manner that, on the one hand, all activities that have an impact on the level of costs are taken into account and, on the other hand, that their number is not too large so as not to make the functioning of the costing of activities overly complex and costly. The Pareto rule should be followed here, which assumes that 20% of all activities generate as much as 80% of costs incurred within the company.

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<sup>1</sup> Given the objective of this article, only information concerning the costs incurred in this company will be presented.

In Company X, no detailed identification of the implemented processes and activities was carried out. The Management Board of the examined company was not fully convinced of the validity of the implementation of the presented method and did not want to undertake time-consuming implementation work without knowing the advantages of this costing method beforehand. Therefore, an example — partly taken from the literature on the subject — of a glossary of activities performed in a production company, adapted for the purpose of this calculation, was used. Table 2 presents a list of exemplary actions implemented in Company X.

**Table 2.**  
*Glossary of activities of Company X*

<b>Name of activity</b>	<b>Activity cost driver</b>
Technical preparation of production	Time of technical preparation of production
Production planning	Number of production orders
Machinery setup	Number of production batches
Production operation	Operation time in working hours
Warehouse management	Number of components
In-house transport	Number of material transfers
Quality control	Number of tests
Change in technical conditions of production	Number of changes
Computerized production control	Number of production runs
Service and consulting	Number of services provided
Installation of machines at customers' premises	Number of installations at customer's premises

Source: Own elaboration.

According to the information presented in the table above, apart from the identified activities, the second-degree statistical key figures were immediately defined, which are referred to as activity cost drivers in activity-based costing. It makes it possible to settle the costs of particular activities into cost objects. Although in the procedure of implementation of this costing method it is the subject of Stage 5, when identifying individual activities carried out in Company X, the corresponding drivers were immediately defined.

## **2.2. Stage 2. Determining the resource structure type of the company and the value of resource consumption. Stage 3. Definition of resource cost drivers**

In Stage 2 of the implementation of the activity-based costing it is necessary to identify the resource structure type used in the implementation of individual activities and to determine the value of their consumption. Cost accounting records and all other documents, such as depreciation plans or evidence of material consumption, are extremely helpful in this case. In the examined company, the direct cost accounting records are kept in quite a detailed manner, the chart of accounts of group 4 is kept on a number of analytical levels. Indirect costs, on the other hand, are treated as a single category and settled to object costs in an appropriate proportion. And it is the structure type of indirect costs that is crucial for the valuation of manufactured products and services offered. In activity-based costing, the level of generic cost is the actual level of consumption of a given type of resource assigned to an adequate activity.

The main resources of the analyzed company include: employees, buildings, machinery and equipment used in production, materials and components, means of transport, office equipment and utilities. Their identification allows moving to the subsequent stage of the procedure of implementing the concept of activity-based costing. In Stage 3, the value of resources consumed for activities should be accounted for, for this purpose it is necessary to define the so-called resource cost driver for each resource. In the literature these are defined as measures of the amount of resources used or consumed in the performance of individual activities. Table 3 presents the proposed cost drivers for the identified resources.

**Table 3.**  
*Resource cost drivers in Company X*

Name of resource	Resource cost driver
Employees	Number of employees
Buildings	Area in m <sup>2</sup>
Machinery and equipment	Machine-hours
Materials and components	Amount of materials used
Modes of transportation	Number of km driven
Office equipment	Machine-hours
Utilities	Volume of consumption

Source: Own elaboration.

The next stage is to settle — by means of defined drivers — the value of resources used for activities. This settlement in schematic terms is significantly facilitated by the resources–activities matrix, however, due to the limitation regarding the size of this article it will not be presented here.

The final result of the above-mentioned settlement stages are the so-called activity cost pools, which correspond to the amount of costs generated by individual activities.

### 2.3. Stage 4. Determining costs of the distinguished activities

Stage 4 is aimed at determining the cost of all activities identified in the company. The relevant values for Company X are presented in Table 4.

**Table 4.**  
*Activity cost pools in Company X*

Name of activity	Activity cost pools
Technical preparation of production	1,200.00
Production planning	3,000.00
Machinery setup	1,000.00
Production operation	34,600.00
Warehouse management	1,000.00
In-house transport	762.00
Quality control	2,500.00
Change in technical conditions of production	1,800.00
Computerized production control	3,000.00
Service and consulting	1,200.00
Installation of machines at customers' premises	2,350.00
<b>Total indirect costs</b>	<b>52,412.00</b>

Source: Own elaboration.

## 2.4. Stage 5. Defining activity cost drivers

As mentioned, Stage 5 was carried out as one of the first, which had no impact on the unit cost calculation procedure. Once the activity cost drivers have been defined, the individual cost objects required for specific activities should be determined. For this purpose — as in Stage 3 — the activities–cost objects matrix is created, but due to the limitation regarding the size of this article it will not be presented here, as with the previous one. The result of the performed calculation stage is an answer to the question about the value of costs per unit of activity — the results obtained are presented in Table 5.

**Table 5.**  
*Unit costs of activities implemented in Company X*

Name of activity	Activity costs driver	Total activity costs	Size of activity	Unit cost of activity
Technical preparation of production	Time of technical preparation of production	1,200.00	5	240.00
Production planning	Number of production orders	3,000.00	5	600.00
Machinery setup	Number of production batches	1,000.00	5	200.00
Production operation	Operation time in working hours	34,600.00	40	865.00
Warehouse management	Number of components	1,000.00	20	50.00
In-house transport	Number of material transfers	762.00	3	254.00
Quality control	Number of tests	2,500.00	5	500.00
Change in technical conditions of production	Number of changes	1,800.00	3	600.00
Computerized production control	Number of production runs	3,000.00	5	600.00
Service and consulting	Number of services provided	1,200.00	10	120.00
Installation of machines at customers' premises	Number of installations at customer's premises	2,350.00	5	470.00
<b>Total indirect costs</b>		<b>52,412.00</b>	X	X

Source: Own elaboration.

## 2.5. Stage 6. Settlement of indirect costs of individual activities into cost objects

The last stage of the implementation of the activity-based costing in Company X is the settlement of activity costs — listed in Table 4 — into established cost objects, i.e. products X, Y and Z. The relevant calculations are presented in Tables 6, 7 and 8.

**Table 6.**  
*Indirect costs for Product X*

Name of activity	Activity size for Product X	Unit cost of activity	Total activity costs for Product X	Production volume	Unit indirect costs
Technical preparation of production	3	240.00	720.00	10	72.00
Production planning	3	600.00	1,800.00	10	180.00
Machinery setup	2	200.00	400.00	10	40.00
Production operation	20	865.00	17,300.00	10	1,730.00
Warehouse management	7	50.00	350.00	10	35.00
In-house transport	1	254.00	254.00	10	25.40
Quality control	2	500.00	1,000.00	10	100.00
Change in technical conditions of production	1	600.00	600.00	10	60.00
Computerized production control	2	600.00	1,200.00	10	120.00

Cont. table 6.

Service and consulting	6	120.00	720.00	10	72.00
Installation of machines at customers' premises	3	470.00	1,410.00	10	141.10
<b>Unit indirect costs</b>					<b>2,575.50</b>

Source: Own elaboration.

**Table 7.***Indirect costs for Product Y*

Name of activity	Activity size for Product Y	Unit cost of activity	Total activity costs for Product Y	Production volume	Unit indirect costs
Technical preparation of production	1	240.00	240.00	15	16.00
Production planning	1	600.00	600.00	15	40.00
Machinery setup	2	200.00	400.00	15	26.67
Production operation	15	865.00	12,975.00	15	865.00
Warehouse management	7	50.00	350.00	15	23.33
In-house transport	1	254.00	254.00	15	16.93
Quality control	2	500.00	1,000.00	15	66.67
Change in technical conditions of production	1	600.00	600.00	15	40.00
Computerized production control	2	600.00	1,200.00	15	80.00
Service and consulting	2	120.00	240.00	15	16.00
Installation of machines at customers' premises	1	470.00	470.00	15	31.33
<b>Unit indirect costs</b>					<b>1,221.93</b>

Source: Own elaboration.

**Table 8.***Indirect costs for Product Z*

Name of activity	Activity size for Product Z	Unit cost of activity	Total activity costs for Product Z	Production volume	Unit indirect costs
Technical preparation of production	1	240	240	5	48.00
Production planning	1	600	600	5	120.00
Machinery setup	1	200	200	5	40.00
Production operation	5	865	4325	5	865.00
Warehouse management	6	50	300	5	60.00
In-house transport	1	254	254	5	508.00
Quality control	1	500	500	5	100.00
Change in technical conditions of production	1	600	600	5	120.00
Computerized production control	1	600	600	5	120.00
Service and consulting	2	120	240	5	48.00
Installation of machines at customers' premises	1	470	470	5	94.00
<b>Unit indirect costs</b>					<b>1,665.80</b>

Source: Own elaboration.

Tables 6, 7 and 8 present the calculation of the unit indirect costs for paper cutters manufactured by the examined company. In order to determine the total unit costs of products, it is also necessary to establish the unit direct costs, including the costs of consumption of material and remuneration of the production personnel. The examined company, as already mentioned, keeps detailed records of direct costs in the accounts of group 4. The data concerning these costs are shown in Table 9.

**Table 9.**  
*Unit direct costs of products X, Y, Z*

Item	Finished products		
	X	Y	Z
Direct materials	35,000.00	28,000.00	25,000.00
Direct wages	50,000.00	20,000.00	11,000.00
<b>TOTAL</b>	<b>85,000.00</b>	<b>48,000.00</b>	<b>36,000.00</b>
Production volume	10	15	5
<b>Unit direct costs</b>	<b>8,500.00</b>	<b>3,200.00</b>	<b>7,200.00</b>

Source: Own elaboration.

Having determined both unit direct costs (see table 9) and unit indirect costs (see tables 6, 7 and 8), it is possible to determine unit manufacturing costs of the analyzed finished products. The results of the performed calculations are presented in Table 10.

**Table 10.**  
*Unit manufacturing costs of products X, Y and Z*

Item	Finished products		
	X	Y	Z
Unit direct costs	8,500.00	3,200.00	7,200.00
Unit indirect costs	2,575.50	1,221.93	1,665.80
<b>TOTAL</b>	<b>11,075.50</b>	<b>4,421.93</b>	<b>8,865.80</b>

Source: Own elaboration.

The data in Table 10 shows that the unit manufacturing costs of paper cutters determined according to the activity-based costing concept amounted to 11,075.50 for the G73 model (Product X), 4,421.93 for the G52 model (Product Y) and 8,865.80 for the G52H model (Product Z).

The results obtained differ significantly from the value of these costs determined using the traditional costing method<sup>2</sup>, however, from the point of view of the analyzed company it was not the value of manufacturing costs that mattered but their scope and structure. It was important for the board of directors of Company X to obtain reliable information on costs from the costing system, in particular with regard to the level and structure of indirect costs. Recognizing the advantages of this concept, Company X also began to consider the possibility of extending the cost analysis to direct costs. Furthermore, it was clearly stated that activity-based costing is an excellent cost management tool, providing multifaceted opportunities for analysis and evaluation. According to the company, the costing method will no longer be considered as a mere management accounting tool and the information derived from it will cease to be used mainly for drawing up obligatory financial statements. Company X will finally gain an advanced cost management tool functioning in the area of operational and strategic management. In their opinion, the benefits from the implementation of activity-based costing are so great that the costs and the amount of work associated with the elaboration and implementation of this concept within the company become irrelevant.

<sup>2</sup> In view of the purpose of this article, which is to develop a concept for the implementation of activity-based costing in the analyzed company, as well as the size limitations of this article, the calculation of unit costs according to the traditional full costing will not be presented here.



### 3. Final thoughts

Activity-based costing is an advanced method of unit cost calculation. Its implementation within a company enables conducting a broader analysis of the level and structure of the costs of manufacturing products, which makes the determination of their amount more reliable. In contrast to the traditional full costing method, numerous different statistical key figures can be used in activity-based costing, which makes the level of the calculated cost even more reliable. The presented advantages of the analyzed concept of cost calculation — for the analyzed company — at the same time became the main arguments for switching from the costing system employed so far to activity-based costing. The new approach to the allocation of indirect costs in defined cost objects was of great significance here. The analyzed company, after having presented the results of the unit cost calculation for the manufacturing of their core products, began to seriously consider the implementation of activity-based costing at their plant.

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