

## CHANGES IN THE PRODUCT COSTING PROCESS DRIVEN BY IMPLEMENTATION OF AN INTEGRATED INFORMATION SYSTEM IN A PRODUCTION COMPANY

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### Abstract

The article deals with product costing in a manufacturing company and change of costing methodology from normal to standard costing caused by a new integrated information system implementation. The aim of the article is to show the impact of a new integrated information system on product costing. In order to show the consequences of changing the methodology of product costing from normal to standard costing variances between standard costing and normal costing in an international production company were analyzed. For this research comparative analysis was used of unit costs before and after the new system implementation for finished goods. Ten percent of the items had a variance of more than 30% which was caused by errors in the new system settings and mistakes in the normal costs in the old system. The impact of the change of the costing methodology was shown by calculation of the difference between normal cost values and standard cost values ten months after the new integrated information system implementation. To verify the accuracy of standard costs settings, standard costs were compared to actual costs for finished goods and semi-finished goods. In the tenth period only 30% of finished goods and 42% of semi-finished goods showed a variance between standard costs and actual costs lower than 20%. It means that for the rest of the items standard cost assumptions should be checked and corrected. The results of the study indicate that a change in product costing methodology driven by new integrated information system implementation has an impact on company revenues. The direction of the change depends on the accuracy of previous system settings. It is impossible to implement a new system without increase or decrease of sales. The most important limitation of the research is that only one manufacturing company was studied. This was connected with data availability. The research methodology can be used by manufacturing companies to assess the impact of new integrated system implementation on their revenues. Literature concerning integrated information system implementation focuses on its advantages and disadvantages therefore the author of the article wants to concentrate on its impact on the profit and loss account, specifically on revenues.

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## INTRODUCTION

In economic reality there are three types of information system implementations. The first type is a system launch in a new company. During this project the team has a big challenge to set up everything from scratch. All requirements have to be defined from the base point. The project team has to define all scenarios which may occur in the company. The second type is when one system is replaced by another. The reason could be a merger or acquisition. After that the company becomes part of a corporation and the corporate information system is implemented in the new partnership. Sometimes replacement of one system by another is also caused by weak functionality of the current system which cannot meet the company's expectations. The most difficult and complicated situation is replacement of many systems by one integrated system. In this case the data from different systems has to be unified. The aim of the article is to focus on changes in the product costing process driven by integrated information system implementation in a production company when many systems are combined into one SAP system. The author wants to indicate problems that appear when a company changes its methodology of product costing from normal costing to standard costing and replaces a few systems with one integrated system. The second intent is to verify whether change of product costing methodology has an impact on company revenues.

Comparative analysis was used as the research methodology. The comparison was done for the ten first months after SAP implementation. The research sample consisted of an international wholesaler's portfolio which includes 856 customized finished goods and 1302 semi-finished goods. In order to show consequences of changing the methodology of product costing from normal to standard the author analyzed variances between standard costs and normal costs. For this purpose, comparative analysis between unit costs before and after new system implementation was used. Furthermore, variances were calculated between standard cost values and normal cost values, actual costs and standard costs, standard cost values and actual cost values.

Literature concerning integrated information systems implementation focuses on its advantages and disadvantages therefore the author of the article wants to concentrate on its impact on the profit and loss

account, especially revenues. This paper first reviews the literature and then the methodology section describes the calculation formulas used for analysis. The research results section presents results of the comparative analysis for the ten first months after SAP implementation. In the summary are included conclusions of the research.

## LITERATURE OVERVIEW

In order to set the price of a product the company has to know its unit cost which tells us how much production of a finished good will cost. There are different methods of unit costing: actual costing, normal costing and standard costing. Each company can use the methodology which is the most appropriate for its type of production. Sometimes changing the system causes the necessity of changing the product costing methodology. By G. K. Świdarska in actual costing the company bases its calculation on actual usages for direct and indirect cost calculation, in standard costing planned usages are taken into consideration. In normal costing actual usages are used for direct cost calculation and planned usages for indirect cost calculation (Świdarska, 2010, p. 102). Direct costs are labor costs from production departments and material costs (Czubakowska, Gabrusewicz & Nowak, 2014, p. 157). Indirect costs are depreciation, materials which are not in a bill of materials, supplies, external services, utilities, and salaries from non-production departments.

The most difficult costing method is standard costing because it is based on planned data, it is done a priori. It means that all cost components have to be estimated. The project team has to project a bill of materials, waste of material, labor tariffs, machine tariffs, efficiencies, indirect costs from non-production departments, laboratory, engineering, administration costs (LEA). In order to project the labor tariff labor costs and labor hours have to be estimated because it is a quotient of these two values. Production volume has to be known to estimate labor costs, labor hours and machine hours. The planning department gives forecasts of demand. For each product operation staff have to be defined. If the company possesses more than one production department each production department has to have calculated labor and machine tariffs. For cost planning usually data is taken from the operating plan or historical data. This data is adjusted with new information. It is easier to plan direct costs than indirect costs because indirect costs can appear

disproportionately throughout the year (Świdarska, 2010, p.103). For this reason, indirect cost calculation takes into consideration normal equipment utilization. Standards are also set for quantities and prices (Nowak & Wierziński, 2010, p. 92). Quantitative standards are based on norms of the production process, labor and machine efficiency. Price standards usually are current prices or if there is information about planned price increases the price includes the increase.

Usually there appear differences between standard costs and actual costs. A situation in which unit cost is equal to actual cost is very rare. When actual cost is lower than standard cost it is good situation for the company; it is a favorable variance because then the company makes a profit. When actual cost is higher than standard cost there appears an unfavorable variance and the company takes a loss. Management directs its attention to explain negative unit cost variances. Each component of unit cost can have a variance. Charles T. Horngren in the book *Cost accounting a managerial emphasis* suggests three types of variances: material costs variances, labor costs variances and indirect costs variances. Material costs are multiplication of planned usage of raw material and its prices. Planned usage can be different from real usage due to poor quality of material, change of supplier or worse machine performance. Sometimes when standard cost is set for a new product at the beginning of production planned usage can vary from actual data. Material price can change due to its price increase. Variance can also appear when another material is used in production which was not included in the bill of materials. It can be made when original material cannot be delivered in time, but the production order must be produced on time according to customer requirements. The next cost component which can have a variance is labor cost. Influence on this cost are the efficiency obtained by operators and the labor tariff. Variance on labor costs occurs because sometimes it is difficult to achieve assumed efficiency or in the process staff was replaced. Usually an experienced operator is more efficient than a new person who is learning a process. The planned labor tariff can be too low because there was a salary increase not included in calculation of the labor tariff. Moreover, there can be a change in quantity of labor hours due to lower demand than was assumed. Machine tariff can vary due to planned machine costs change. There appear unexpected expenses which have to be paid to continue production for example machine repair costs. Without them production will not proceed because

the machines are crucial. The next cost components are indirect costs such as costs of non-BOM materials, salaries and external services from non-production departments, building maintenance, etc. Non-production departments are quality, warehouse, planning, and maintenance departments. Some unexpected costs which were not included in standard cost calculation cause a variance. Production order volume has an influence on routings and waste in the production process. Routings are set up on the most frequently ordered quantity. If production order quantity is lower than the volume used for setting up routing, there will be a bigger variance on labor and machine costs which is negative for the enterprise. Moreover, it will also have an influence on raw material waste. The material used and time spent for setting up machines for each process is the same for different order quantities. If we set up a machine for production of 100 pieces of a finished good instead of 10 pieces we will save time and material. If there are small volume orders, usually they should be consolidated to bigger volume orders. The operations group is responsible for cost efficiency. This group performs a monthly variance analysis to evaluate actual resource consumption vs. standard expectations (Dosch & Wilson, 2010, p. 41). These variances are then communicated throughout the organization.

E. Nowak in *Rachunek kosztów w jednostkach gospodarczych* reports advantages of standard costing. The biggest advantage is control of a production process. First, there are made assumptions that are then compared with actual data reported in the production process. It enables us to identify ineffective operations in the production process. Standards provide motivation to better performance. Standard costing allows us to determine variances between actual costs and planned costs. Thanks to standard costing calculation of new product prices is easier. It is a very good basis for managerial decisions concerning production and product portfolio. Furthermore, standard costing enables quick communication of results and the immediate investigation of significant variances. Communicating results using predetermined standards is much faster than waiting to accumulate actual cost data. Moreover, standards provide consistency across reporting periods that may fluctuate month to month. Most importantly, standards allow departments to work together using the same performance measures across the company (Dosch & Wilson, 2010, p. 39). The standard cost method is considered a method of determining the cost of production, of forecasting and tracking the

operative production process. This method can perform the function of an investigation and forecasting tool. Use of the standard costing in manufacturing companies leads to increasing utility of information on activities contributing to the development of new international management concepts (Ocneanu & Cojocaru, 2013, p. 50).

When a new integrated information system is implemented it can change the way of setting finished goods standard costs. In SAP standard cost is not a price which is filled in manually by controllers, but it is calculated by the system when all functions e.g. process engineers, R&D department set up a product. The responsibility for developing cost estimates for raw materials, labor and overhead rests with the operations group. Bills of materials and routings for each production step have to be filled in by process engineers and product engineers in order to calculate standard costs. It is a very good solution when a new product is introduced to production. This way of finished good settings forces a second verification of the process assumptions. At this stage process engineers can check previous assumptions given for standard cost calculation. In some companies, unit costs are calculated in a spreadsheet, all assumptions are done there. The result of this calculation is manually entered to the system. There is no possibility for a second verification. Sometimes numbers which were originally calculated can differ from numbers calculated in SAP. The reason can be wrong units of measure in the bill of materials in SAP and in previous calculations. For example, the same usage quantity was put in the bill of materials in square meters but in a previous calculation the same usage quantity was entered in square yards. Without a second verification an incorrect figure with the error in unit of measure will be used.

When a company changes several information systems into one integrated system there is a big challenge to set up semi-finished and finished goods standard costs. In SAP all routings and bills of materials have to be set up. The price list for raw materials has to be revised and adjusted according to new system requirements. If a company has many units of measure it can be difficult to find all of them in the new system. For this reason, mistakes appear in units of measure caused by incorrect conversion factors. Some units are not available in the new system. All settings have to be revised. For example, material price can be used for yards without conversion to square meter, which is the unit used in the bill of materials. Transformation of many systems into one is a complex project in which many errors

in routings and bills of materials can occur. In the previous multiple systems, there can be various units of measure and settings for the same item. The project team has to verify the data and put the correct settings into the new system. Furthermore, during system change old errors in bills of materials and routings can be discovered.

The situation is more difficult when a company changes the system and methodology of costing. If the company changes normal costing to standard costing for direct costs actual usages are moved to planned usages. Nothing changes for indirect costs as they still are based on planned usages. Labor tariff has to be planned. Salaries and number of operators have to be estimated. The company cannot treat unit costs from the old system as a comparison to unit costs from the new system because of the change of costing methodology. For this reason, historical data is useless. The difference between old unit costs calculated by normal costing methodology and standard costing appears. It is important for the marketing department and final prices for customers. There is a variance coming from costing methodology change and system change.

## **METHODOLOGY AND RESULTS SAMPLE**

The research sample consists of an international company's portfolio which has 856 finished goods and 1302 semi-finished goods. The production process is complex, and it has at least four production levels. This firm is a big wholesaler of customized products sold throughout the world. The entire product range was taken into consideration. The analyzed time period amounts to the first ten months after SAP implementation.

In order to show the consequences of changing methodology of product costing from normal to standard costing the author wants to analyze variances between standard costing and normal costing in the production company. The change of methodology was caused by replacement of a few systems with one integrated information system called SAP. It was not a management decision.

Comparative analysis between unit costs before and after new system implementation was done, therefore variances between standard costs and normal costs were calculated (calculating formula (1)). Variances were calculated in absolute values in order to show strength of change not direction. The analysis was done for finished

goods.

$$\text{Variance SC vs NC} = | \text{SC/NC} - 1 |, \tag{1}$$

where SC = standard cost  
NC = normal cost

In order to check the direction of unit cost change methodology differences between standard costs value and normal costs value were calculated (calculating formula (2)).

$$\text{SC value} - \text{NC value} = \text{SC} \times \text{Q} - \text{NC} \times \text{Q}, \tag{2}$$

where SC = standard cost  
NC = normal cost  
Q = produced quantity

To analyze the correctness of standard costs settings variances between actual costs and standard costs were calculated (calculating formula (3)). Variances were calculated in absolute values in order to show strength of change not direction. The analysis was done for semi-finished goods and finished goods.

$$\text{Variance AC vs SC} = | \text{AC/SC} - 1 |, \tag{3}$$

where AC = actual cost  
SC = standard cost

In order to check the direction of unit cost change methodology differences between standard costs value and actual costs value were calculated (calculating formula (4)). Q means produced quantity.

$$\text{SC value} - \text{AC value} = \text{SC} \times \text{Q} - \text{AC} \times \text{Q}, \tag{4}$$

where SC = standard cost

AC = actual cost

Q = produced quantity

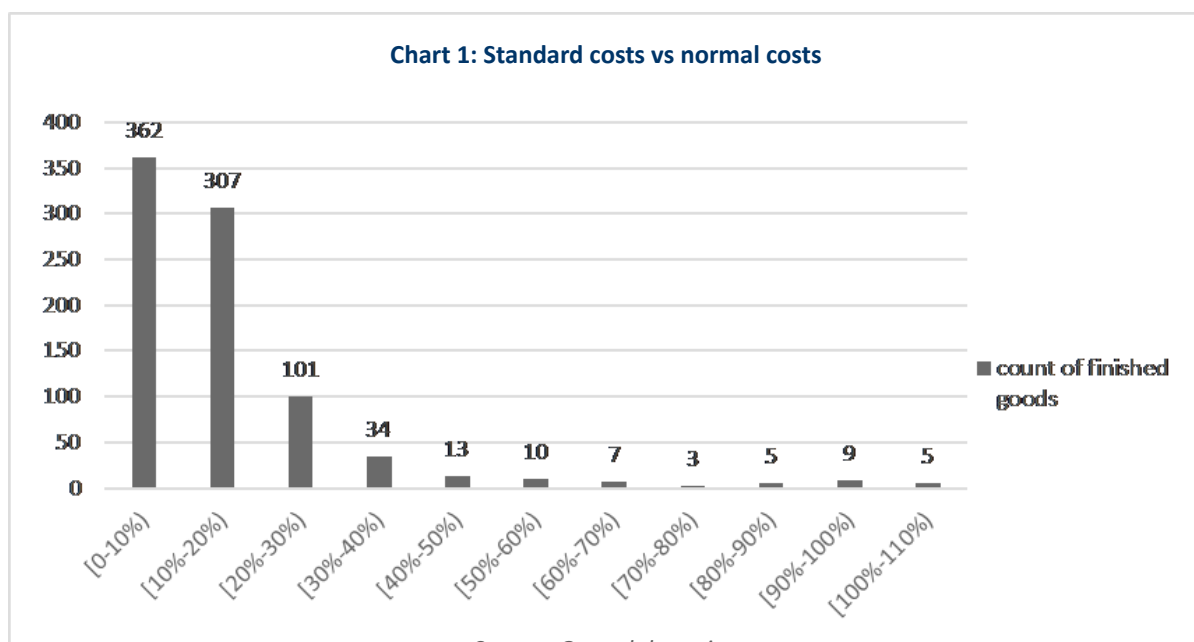
The results were split into ranges of variance. To each range was calculated the number of items having a variance from the range. After that the number of items was divided by the number of all analyzed items to show the percentage of sample which has a variance from the range.

### RESEARCH RESULTS

To calculate variances between standard costs and normal costs data for 856 finished goods were analyzed. Comparative analysis was done in Excel after new system implementation. The results were split into ranges which amount to 10 percentage points. Chart 1 shows results of this calculation.

Variances between standard costs and normal costs are as follows: for 42% of items variance amounts to [0-10%), 36% have [10%-20%), 12% have [20%-30%), 10% of items have a bigger variance than 30%. This structure shows that standard costs from SAP are very similar to normal costs before new system implementation. 5% of the part with the biggest deviation was a unit of measure error caused by incorrect settings of routings and bill of materials. The next 5% came from an error in normal costing calculation before new system implementation.

In order to show the impact of costing methodology change for the profit and loss account, revenues in



Source: Own elaboration

**Table 1: Standard costs value vs. normal costs value in USD**

Period	Standard costs value	Normal costs value	Change	%
1	1,490.46	1,643.99	-153.54	-9.34%
2	961.20	1,028.90	-67.70	-6.58%
3	2,245.95	2,168.21	-189.21	-8.73%
4	2,595.68	2,847.66	-251.99	-8.85%
5	1,799.32	1,962.54	-163.21	-8.32%
6	2,446.68	2,689.74	-243.06	-9.04%
7	2,672.70	2,932.85	-260.15	-8.87%
8	2,961.09	3,254.60	-293.50	-9.02%
9	2,869.81	3,100.15	-230.35	-7.43%
10	2,804.29	3,028.15	-223.86	-7.39%
<b>TOTAL</b>	<b>22,847.18</b>	<b>24,656.78</b>	<b>-2,076.57</b>	<b>-8.42%</b>

Source: Own elaboration

standard costs were compared to revenues in normal costs which is shown in Table 1.

In these ten months costing methodology change caused reduction of revenues by 8.42% which amounts to 2076,57 USD. In each period the variance is different because it depends on the product mix of what was produced. On the basis of Table 1 we can say that costing methodology change caused a drop in sales. It means that previous normal unit costs which were set up in the system manually were overestimated. Although in some cases new standard costs assumptions were too optimistic.

The next part of the research was analysis of variances between actual costs and standard costs. The aim of this analysis was to determine whether standard costs are achievable. Into comparison were taken actual costs from 10 months of regular production. Analyzed were items

which were produced at least 6 times in the period. The research sample consists of 856 finished goods and 1302 semi-finished goods. The results were split into ranges which amount to 20 percentage points.

Table 2 shows variances between actual costs and standard costs for finished goods. In the analyzed period on average 39% of items have a range of 0-20% variance between actual costs and standard costs. It means that for these items standard costs are close to actual costs. The settings of these finished goods were correct. Assumptions for machine tariffs and labor tariffs were as in reality. It means that volume was as forecast, waste in the production process was as planned. On average 59% of finished goods have a range of 0-40%. On average 41% of items have a range higher than 40%. Some items have a range higher than 80%. These results were caused by

**Table 2: Finished goods actual costs vs. standard costs**

Range/Period	1	2	3	4	5	6	7	8	9	10
0-20%	41%	37%	50%	53%	42%	43%	32%	33%	31%	32%
20%-40%	17%	14%	14%	15%	20%	18%	25%	24%	23%	22%
40%-60%	6%	6%	7%	11%	18%	25%	19%	24%	26%	25%
60%-80%	5%	6%	12%	13%	13%	9%	14%	14%	16%	14%
80%-100%	7%	8%	13%	6%	4%	2%	4%	2%	2%	4%
100%-120%	8%	7%	2%	1%	1%	1%	1%	1%	1%	1%
120%-140%	7%	8%	1%	0%	0%	1%	2%	1%	0%	0%
140%-160%	3%	6%	0%	0%	0%	0%	1%	0%	0%	0%
160%-180%	1%	2%	0%	0%	0%	0%	1%	0%	0%	0%
180%-200%	1%	2%	0%	0%	0%	0%	0%	0%	0%	0%
>200%	3%	5%	1%	1%	1%	1%	1%	1%	1%	1%

Source: Own elaboration

**Table 3: Semi-finished goods actual costs vs. standard costs**

Range/Period	1	2	3	4	5	6	7	8	9	10
0-20%	22%	18%	30%	35%	25%	27%	38%	31%	33%	42%
20%-40%	19%	7%	10%	9%	14%	13%	16%	25%	16%	18%
40%-60%	8%	6%	6%	4%	8%	7%	10%	20%	8%	20%
60%-80%	6%	6%	11%	4%	8%	28%	27%	13%	9%	16%
80%-100%	4%	10%	36%	9%	36%	11%	7%	7%	22%	2%
100%-120%	3%	29%	2%	26%	4%	6%	1%	2%	5%	1%
120%-140%	11%	6%	2%	6%	1%	5%	1%	1%	8%	1%
140%-160%	17%	4%	0%	1%	1%	2%	0%	1%	0%	0%
160%-180%	4%	3%	0%	3%	1%	0%	0%	0%	0%	0%
180%-200%	0%	3%	1%	1%	1%	0%	0%	0%	1%	0%
>200%	5%	8%	2%	3%	1%	1%	1%	1%	0%	1%

Source: Own elaboration

mistakes in item system settings. Some of the items were new products which were produced on new machines. They were not produced before in the old system. Comparing outstanding observations with a range higher than 80% in the first period to the tenth period a big reduction of variance is visible between actual costs and standard costs from 31% to 7%. It means that mistakes in settings were corrected.

Table 3 shows variances between actual costs and standard costs for semi-finished goods. In the first month 22% of items have a range of 0-20% variance between actual costs and standard costs but in the tenth month 42% of items have this range. There was big progress in variance. It means that for these items standard costs are close to actual costs. The settings of these semi-finished goods were corrected. Comparing outstanding

observations with a range higher than 80% in the first period to the tenth period a big reduction from 45% to 5% is visible. It means that mistakes in settings were corrected and assumptions were analyzed once again.

Variance standard costs value to actual costs value is shown in Table 4. On the basis of the table we can see that actual costs were 12 247 USD higher than standard costs in the analyzed period. The biggest difference appeared in the second month when it amounted to 2 896 USD. It was the time when full production and reporting in the new integrated information system started. Some mistakes during this time were corrected regarding unit of measure mistakes. As result of this analysis we can say that standard costs were set too optimistically. They were underestimated. Actual costs were 22.74% higher than standard costs. It also means that some of the factory

**Table 4: Standard costs value vs. actual costs value in USD**

Period	Standard costs value	Actual costs value	Change	%
1	2,672.02	3,538.92	-866.89	-24.50%
2	2,251.84	5,148.15	-2,896.31	-56.26%
3	4,232.85	5,271.68	-189.21	-3.59%
4	4,498.77	5,103.31	-604.54	-11.85%
5	3,590.16	4,278.27	-688.11	-16.08%
6	4,589.01	5,783.21	-1,194.20	-20.65%
7	4,314.81	5,771.89	-1,457.08	-25.24%
8	4,841.92	6,250.19	-1,408.27	-22.53%
9	4,974.26	6,455.03	-1,480.77	-22.94%
10	4,789.69	6,251.99	-1,462.29	-23.39%
TOTAL	40,755.34	53,852.63	-12,247.68	-22.74%

Source: Own elaboration

costs were unabsorbed and the company equipment was underutilized, so the costs were not completely covered by volume.

The most important limitation of the research is that only one manufacturing company was studied. This is connected with data availability. New integrated information system implementation is not a common situation in economic reality. Furthermore, the research only shows that it is impossible to predict in which direction the change of revenues caused by new integrated information system implementation will flow because it depends on whether the old prices were overestimated or underestimated.

## CONCLUSION

Changing product costing methodology is a complex and difficult process especially when the change is caused by new integrated information system implementation. Unit costs changes appear. Variances between normal costing and standard costing have different directions on various finished goods. This is connected with new cost allocation. Normal costing is based on actual usages for direct costs and planned indirect costs, but standard costing is based on planned usages for direct and indirect costs. It is difficult to plan all the data especially when new products appear. In the analyzed business transformation, 42% of items had a variance between standard costs and

normal costs +/-10% after the system change which is a good achievement. The total revenues of normal costs were bigger than the total value of revenues in standard costs. The change amounts to an 8.42% decrease. There appear higher than 30% variances on finished goods. The reasons were originally incorrect settings for the items in the old system even for normal costing and bad conversion factors of units of measure for materials during the system change. To check whether new finished goods prices are achievable the author compared standard costs to actual costs during ten months after the new integrated information system implementation. On average 39% of the analyzed items had a variance in the range of 0-20% between actual costs and standard costs. It means that for these items standard costs are close to actual costs. There appeared outstanding observations with a range higher than 80% but they were reduced from 31% in the first month after transformation to 7% in the tenth month. Mistakes on these items were corrected. On the basis of the analyzed system change we can say that it is impossible to change costing method without price change of finished goods. Each company has to be prepared for product prices to change when the enterprise decides to change its system and costing methodology. There can be sales decrease or increase. Everything depends on the previous settings of items. It is impossible to change costing methodology without revenue change. A variance will always appear.

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