Activity Based Costing Application in Turkish Hardcoal Authority[1]

Halim Akbulut[1], Mehmet Pekkaya[1], Hakan Vargün[2], Cumhur Açıkgöz[3]

[1]Bülent Ecevit University, F.E.A.S., Zonguldak, Turkey
[2]Bülent Ecevit University, D.V.S. , Zonguldak, Turkey
[3]Bülent Ecevit University I.S.S. , Zonguldak, Turkey

Email: akbulut.halim@gmail.com

Abstract: As result of the growing competition and changing production structure, traditional cost systems are not adequate any more. In this study, it is aimed to review the feasibility of activity based costing (ABC) system - one of the modern costing systems - for a coal enterprise. In this context, case study was conducted via the selected enterprise. Results obtained from the research are as follows: First of all, due to not including the cost proportion of sales /marketing and general administrative expenses to inventoriable costs calculated in the enterprise of application, inventoriable costs were lower in traditional costing system compared to ABC system. The most important reason for that is, in the accounting system of Turkey, even if operating expenses belong to that production period, it is considered as a non-production expense and added to operating accounts instead of stock accounts.

Key Words: Activity Based Costing System, Cost Management, Hardcoal Enterprises

Introduction

Rapid developments that took place in technology in recent years appear also in production technologies, and create new production systems. These new production systems specifically depend on automation. It is considered that traditional costing systems are not suitable for such new production environments. Main reasons for that are rapid increase in product range and therefore considerable increase in design expenses and after sales service expenses, increase in ratio of general production expenses in total costs but decrease in proportion of direct workmanship costs instead.

Two basic factors which are significant to reach the profit - purpose of the enterprises - are cost and sales price.

Sales prices are determined by companies offering goods or services in a competitive environment.

Besides that, costs are partially under the control of the related enterprise. It is regarded that traditional cost systems are not very succesfull in fulfilling this control in a healthy way. For this case, Activity Based Costing (ABC) system is recommended, which is regarded as one of the modern cost systems and usage of which becomes more common day by day.

ABC method was developed which yields more accurate results compared to traditional cost methods in product costing as well as produces broader and more rational information which executives can use during their decision processes. Purpose of this study is to review the feasibility of ABC system in a coal enterprise, with a case study approach. In this sense, case study was performed in a mine enterprise operating in Turkey.

Activity Based Cost (ABC) System

As result of the changes taken place for years in the environment which the enterprises were active; the competition has increased, new demands of customers such as quality, efficiency, elasticity, innovation and continous development came to the fore and thus, the basic assumption that a product can be manufactured for a long term phenomenon, which traditional costing systems have based on, have dissappeared (Durer etc., 2009). ABC system calculates the cost of resources, which the enterprise uses during production process (Cooper & Kaplan, 1992). ABC is a total quality instrument used for measuring the costs and performances of activities, resources and cost objects (Ashford, 2011). ABC System is the measurement method for measuring costs and performances of activities, resources and cost drivers. ABC is a system that charges resource costs to activities by grounding on sourcing of activities, and that charges activity costs to cost objects by grounding on use of activities of cost drivers (Bengü, 2005).

[1] This study was supported by BAP of Bülent Ecevit University.

ABC System can be defined as a sense of cost and management which the products consume the enterprise resources on the basis of activity, thus acts in a sense that indirect expenses should be classified on the basis of activity and builds a linear relationship at various levels between the product and indirect expenses regardless of only being based on the production volume (Dumanoğlu, 2005).

Basic purposes of ABC system are as follows (Alkan, 2005):
- To eliminate or minimize the costs of activities which do not create added value,
- To provide active information flow in simplifying the activities with high added value,
- To provide identification of main reasons for the problems and remedy those factors,
- To eliminate the mistakes arising from the cost distribution,
- To provide correct cost information in decisions to be taken by executives.

Basic concepts used in ABC system can be listed as resource, activity, center of activities, cost pool and cost factor (Unutkan, 2010). Explaining the said concepts can be useful. The resource concept is the expenditures required to perform the activities. The activity concept refers to some procedures which are performed in order to manufacture and sell the products or services. Center of activities concept refers to centres where activities having similar processes or sense of the same cost distribution in resource consumption come together. Cost pool concept is used in order to follow the total amount of resources consumed by activities on the basis of activities (Unutkan, 2010). Since cost pools contain the costs of similar activities, those cost pools are have homogeneous characteristics. Thus, one single cost factor becomes sufficient in transferring the costs accumulated in the cost pool for each activity to products or services (Bekçi & Negiz, 2011). The cost factor concept refers to distribution keys in charging the resource costs to activities and charging the costs accumulated in the cost pools to products or services.

2.1. Properties Which Distinguish ABC System From Traditional Costing System

The most important difference between ABC system and traditional costing systems does not only appear at production costs, but also in dealing with other activity costs (Karacan & Aslanoğlu, 2005). In traitional costing system, only costs associated with production are classified as direct and indirect. While direct costs can be charged to manufactured products or services directly, indirect expenses are charged to products or services through some distributive criteria. In this respect, the costs which arise generally in production environment in traditional costing system are first distributed to production centers, then the costs accumulated in production centers are charged to productions or services through volume based criteria.

Another property of traditional costing system is that it only takes into consideration the costs resulted in production environment in calculating the manufactured product or service costs. In other words, while general administrative expenses and activity expenses such as marketing, sales and distributive expenses are calculated in traditional costing system as production costs, they are not considered as a cost element and are regarded directly as period cost instead.

The most important deficits of traditional costing system are that it falls behind to meet the needs of management with the information it produces, can not accurately and correctly reflect the production process, does not allow to make an effective performance evaluation, that the information it provides are very general, can not measure the resource consumption correctly, is late in providing information, that the information it provides are not reliable, encourages overstock, makes unrealistic cost distributions and is unable to provide necessary information for the future production (Edward & Heard, 1984, cited by:Çabuk, 2003).

ABC system is the one that is underlying for removing the deficits or mistakes arising from traditional costing system in terms of resource consumption of activities. Basic contribution of ABC system in calculating the costs related to production outputs is to provide the connection between the activity or series of activities causing the formation of production costs, and production outputs which causes the appearance of such activity or series of activities (Karacan & Aslanoğlu, 2005).

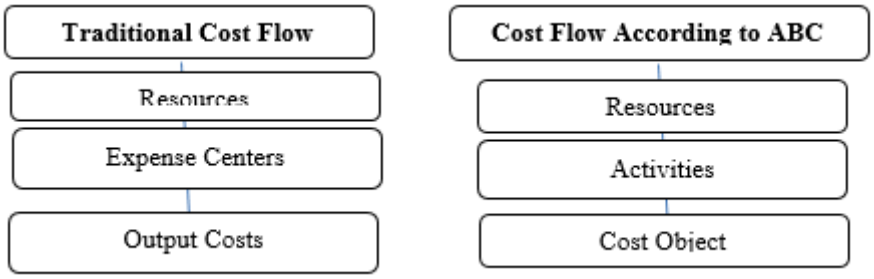

Figure 1: Cost Flow Chart

Source: Öker, F. (2003). Faaliyet Tabanlı Maliyetleme Üretim ve Hizmet İşletmelerinde Uygulamalar. İstanbul: Literatür Yayınları, p.33.

Unlike traditional costing system, the ABC system focuses on activities in calculating the costs of products or services. In this advanced costing system, in identifying the costs of production and service; not only the costs arising during the production process are considered, but also non-operational expenses are taken into consideration. In this respect, operational expenses are taken into operating accounts as a cost element relating to production. Since the costs can be followed up according to activity or series of activities in ABC system, it is possible to analyse how much cost an activity has created. It is possible to present the cost flow process of traditional costing and ABC system in Figure 1.

As can be seen in Figure 1, cost flow in traditional costing system is first transferred from resources to essential and auxiliary production centers, and costs accumulated in such centers transform to output costs. However in ABC system, resource costs are first charged to activities that consume those resources, and expenses accumulated in activities are transferred to cost objects through various cost factors.

2.2. Structure of ABC System

In an enterprise, ABC system shoud be established expediently, with minimum cost, simple and in a perceptible manner. In this sense, there should be harmony between the determined activities. Rather than the specific activities, choosing more macro size activities should be considered. By gathering the activities that seem unimportant, unnecessary works should be prevented. In addition, it is very important to provide correct data flow in order to get successful results from the system (Bengü & Arslan, 2009).

It is possible to list the stages of ABC system as follows (Bekçi & Negiz, 2011).

A1. Determination of activities: Activities occur throughout the process ranging from the beginning of manufacture of a product or service to presentation of the said product or service to customers in a producion environment. It is quite important to determine, define and categorize all the activities involved in that process. In the process of determination of the activities, some important points should be taken into consideration. It is possible to summarize the said points as follows (Doğan, 1996, cited by: Alkan, 2005).

1. The determined activities should be detailed relevant to the system's purpose,
2. Macro activities should be chosen,
3. Less important activities should be collected in an activitiy group,
4. Activities should be defined explicitly.

A2. Determination of the activity centers: After the activities are determined, second stage of the system design is determination of activity centers. It is possible to explain activity centers in four basic category as follows (Erdoğan & Saban, 2014):

1. Activities at product unit level: These kind of activities are the ones which always appear when manufacturing of products or services are performed. When those activities are performed, resource costs are directly associated with the number of produced units.

2. Lot level activities: These kind of activities appear according to the number of produced lots. The costs related to such activities vary for each lot, but constant for products or services provided in the lots.

3. Product level activities: These kind of activities appear as the activities required for manufacturing of multi-feature products or services.

4. Factory level activities: These are the activities performed in order to make the production at desired level. The costs related to such activities are asscociated with products or services according to various distribution criteria.

A3. Determination of Cost Factors: Cost factors are validation instruments in terms of amount of resources consumed by activities and its monetary amount. In other words, cost factors build causality relationship in charging resource costs to activities and costs accumulated in activities to products and services (Alkan, 2005).

A4. Transfering the costs to activity centers: In charging resource costs to activities, it is required to determine several cost factors. In choosing such cost factors, cause and effect relationship between resource and activity should be considered. In result of transfering resource costs to each activity, the cost of each activity center is calculated correctly.

A5. Charging the costs to products: After determining the suitable cost fctors for activity centers, it is required to determine several cost factors for each manufactured product or service group and transfer such costs to product or service groups (Öker, 2003).

An application On a Coal Enterprise

The application is on only one establishment of TTK *(Turkish Hardcoal Authority)* that continues its activities in field of hardcoal mining. Hardcoal production is considerably performed in a labour-intense manner that depends on manpower. Under these circumstances, number of saleable coals carried out by the Coal Enterprise in 2014 is 325 953 tons. The produced coking coals are washed in washery, and the A, B and C type coals obtained after the coal is washed are supplied to the market and sold. In the said enterprise, 316 258 tons of coals out of 325 953 tons produced in the year of 2014 were sold. The enterprise carried out such activities with its 2159 employees consisting of workers and officials. Operating expenses of the coal enterprise for 2014 operating cycle can be shown in Table 1.

Table 1: Operating Expenses of the Coal Enterprise For 31.12.2014 Operating Cycle

Indirect Expenses	Total (Turkish Lira - ₺)
Indirect raw materials and consumables	10 579 544.50
Indirect labour expenses	95 241 972.23
Civil servants wages and expenses	2 730 167.52
Electricity costs	8 283 665.10
Depreciation	12 939 254.15
Outsourced benefits and services	6 773 255.79
Marketing and sales expenses	3 601 849.02
Administrative expenses	23 242 952.58
TOTAL	163 392 660.89

3.1. The First Stage: Determination of Activities

In this stage, activities shall be determined for the enterprise under application. In the enterprise under application, many activities are being fulfilled and adequate number of activities has been determined in terms of study frame. In determining the said activities, a negotiation was made with the enterprise management and activities were classified in line with the obtained information. The said activities can be seen in Table 2.

As seen in Table 2, eight activities were determined in the coal product enterprise. Pit 1-6 activities include production activities related with reaching the coal mine, shattering and extracting the coal. Sales and marketing activity includes the activities related with sales and distribution of the coal mine which was made usable. And lastly, the enterprise management activity includes all the activities which are administratively necessary for the enterprise in order to continue its activities in line with its mission.

Table 2: Determined Activities in the Coal Enterprise

Activitiy No	Activitiy Name
1	Quarry Area 1 Activitiy
2	Quarry Area 2 Activitiy
3	Quarry Area 3 Activitiy
4	Quarry Area 4 Activitiy

Activitiy No	Activitiy Name
5	Quarry Area 5 Activitiy
6	Quarry Area 6 Activitiy
7	Marketing and Sales Activity
8	Business Management Activity

4.2. Second Stage: Determination of Cost Factors

At this stage, it is required to determine various cost factors in order to charge all activity expenses of 2014 production period to the activities determined for the enterprise in the previous stage. With that purpose, in order to charge the activity expenses to activities about which we gave information before, it is possible to present the information in Table 3 concerning the optimum cost factors determined in enterprise environment.

Table 3: Determination of Cost Factors:

Indirect Expenses	Cost Driver
Indirect raw materials and consumables	Number of mine timber(number)
Indirect labour expenses	Number of employee (worker)
Civil servants wages and expenses	Number of employee (officer)
Electricity costs	Use of elektricity (kWh)
Depreciation	Rate of machine utilisation (%)
Outsourced benefits and services	Usage rate (%)
Marketing and sales expenses	Usage rate (%)
Administrative expenses	Usage rate (%)

Table 4: Data For Cost Facors On the Basis Of Activities

Activities	Use of mine timber (Number)	Number of employee (Person)	Number of officer (Person)	Use of elektricity (kWh)	Rate of machine utilisation (%)	Equal rating (%)
Quarry Area 1	34 495	345	2	8 694 338.62	16.50	16.66
Quarry Area 2	30 020	317	2	7 579 854.72	16.50	16.66
Quarry Area 3	21 813	322	0	7 977 192.58	16.50	16.66
Quarry Area 4	28 287	290	0	8 839 706.42	16.50	16.66
Quarry Area 5	33 462	307	1	7 638 001.83	16.50	16.66
Quarry Area 6	41 382	327	3	6 533 208.66	16.50	16.70
Marketing and Sales	0	0	0	0.00	0.00	0.00
Business Management	0	32	213	1 593 429.17	1.00	0.00
Total	189 909	1 939	220	45 855 732.00	100.00	100.00

In Table 3; Number of mine timbers were considered as the cost factor in charging the indirect raw materials and consumables' expenses to the activities while number of employees in charging workmen and officials' wage expenses, electricity utilization in charging electricity expenses, machine using rates in charging depreciation expenses, using rate in charging sales and marketing expenses, using rate in charging outsources and using rate in charging general administrative expenses. After the necessary definition was made for the cost factors, it will be useful to present numerical information for such factors in details. Using of cost factors with respect to activities are shown in Table 4.

3.3. Third Stage: Determination of Activity Costs

In this stage of the application, indirect costs shall be provided to be added to activities through the cost factors determined in the previous stage.

In Table 5, number of mine timbers were considered as the cost factor in charging of indirect raw materials and consumables' expenses to the activities. Total cost in activity centers is 10 579 544.50 ₺. Total number of mine timbers used for ongoing activities is 189 909. Relevant expenses were distributed by considering the number of mine timbers used in activity centers.

Table 5: Distribution of Indirect Equipment and Material Expenses to Actvities

Activities	Use of Mine Timber	Unit Expense Criterion	Total(₺)
Quarry Area 1	34 495	55.71	1 921 664.52
Quarry Area 2	30 020	55.71	1 672 369.01
Quarry Area 3	21 813	55.71	1 215 169.39
Quarry Area 4	28 287	55.71	1 575 826.19
Quarry Area 5	33 462	55.71	1 864 117.65
Quarry Area 6	41 832	55.71	2 330 397.75
Marketing and Sales	0	55.71	0.00
Business Management	0	55.71	0.00
Total	189 909		10 579 544.50

Not: Unit Expense Criterion = 10 579 544,50 / 189 909,00 = 55,71

In Table 6, number of workmen were considered as the cost factor in charging the indirect labour expenses to activities. Total cost in activity centers is 95 241 972.23 ₺. Total number of workmen for the ongoing activities is 1939. Relevant expenses were distributed by considering the number of workmen in activity centers.

Table 6: Distribution of Indirect Labour Costs to Activities

Activities	Number of Employee	Unit Expense Criterion	Total (₺)
Quarry Area 1	345	49 119.12	16 957 618.79
Quarry Area 2	317	49 119.12	15 553 903.35
Quarry Area 3	322	49 119.12	15 798 467.53
Quarry Area 4	290	49 119.12	14 253 577.56
Quarry Area 5	307	49 119.12	15 070 700.55
Quarry Area 6	327	49 119.12	16 051 543.70
Marketing and Sales	0	49 119.12	0.00
Business Management	32	49 119.12	1 556 160.75
Total	1 939		95 241 972.23

Not: Unit Expense Criterion = 95 241 972,23 / 1 939,00 = 49 119,12

In Table 7, number of officials was considered as the cost factor in charging the officials' wage bills to activities. Total cost in activity centers is 2 730 167.52 ₺. Total number of officials for the ongoing activities is 220. Relevant expenses were distributed by considering the number of officials in activity centers.

Table 7: Distribution of Officials' Wage Bills to Activities

Activities	Number of Officer	Unit Expense Criterion	Total (₺)
Quarry Area 1	2	12 409.83	19 257.17
Quarry Area 2	2	12 409.83	19 034.78
Quarry Area 3	0	12 409.83	0.00
Quarry Area 4	0	12 409.83	0.00
Quarry Area 5	1	12 409.83	12 409.83
Quarry Area 6	3	12 409.83	35 798.87
Marketing and Sales	0	12 409.83	0.00
Business Management	213	12 409.83	2 643 666.86
Total	220		2 730 167.52

Not: Unit Expense Criterion = 2 730 167.52 / 220.00 = 12 409.83

When Table 8 is observed, the electricity consumed (kWh) was considered as the cost factor in charging the electricity expenses to activities. Total cost in activity centers is 8 283 665.10 ₺. Amount of consumed electricity for ongoing activities is 45 855 732.00 kWh. Relevant expenses were distributed by considering the amount of electricity consumed in activity centers.

Table 8: Distribution of Electricity Expenses to Activities

Activities	Use of Elektricity (kWh)	Unit Expense Criterion	Total (₺)
Quarry Area 1	8 694 338.62	0.17	1 474 156.39
Quarry Area 2	7 579 854.72	0.17	1 285 191.63
Quarry Area 3	7 977 192.58	0.17	1 352 561.70
Quarry Area 4	8 839 706.42	0.17	1 498 804.02
Quarry Area 5	7 638 001.83	0.17	1 295 050.68
Quarry Area 6	6 533 208.66	0.17	1 107 729.03
Marketing and Sales	0.00	0.17	0.00
Business Management	1 593 429.17	0.17	270 171.65
Total	45 855 732.00		8 283 665.10

Not: Unit Expense Criterion = 8 283 665.10 / 45 855 732.00 = 0.17

When we look at table 9, we see that using rates (%) were used as the cost effect in charging outsource expenses. Total cost in activity centers is 6 773 255.79 ₺. Relevant expenses were distributed by considering the using rates in activity centers.

When we look at Table 10, we see that machine using rates (%) were considered as the cost factor in charging depreciation expenses to activities. Total cost in activity centers is 12 939 254.15 ₺. Relevant expenses were distributed by considering the machine using rates in activity centers.

Table 9: Distribution of Outsource Expenses to Activities

Activities	Usage Rates (%)	Unit Expense Criterion	Total (₺)
Quarry Area 1	16.66	67 732.56	1 128 424.41
Quarry Area 1	16.66	67 732.56	1 128 424.41
Quarry Area 1	16.66	67 732.56	1 128 424.41
Quarry Area 1	16.66	67 732.56	1 128 424.41
Quarry Area 1	16.66	67 732.56	1 128 424.41
Quarry Area 1	16.70	67 732.56	1 131 133.72
Marketing and Sales	0.00	67 732.56	0.00
Business Management	0.00	67 732.56	0.00
Total	100.00		6 773 255.79

Not: Unit Expense Criterion = 6 773 255.79 / 100.00 = 67 732.56

Table 10: Distribution of Depreciation Expenses to Activities

Activities	Rate of Machine Utilisation (%)	Unit Expense Criterion	Total (₺)
Quarry Area 1	16.50	129 392.54	2 134 976.93
Quarry Area 2	16.50	129 392.54	2 134 976.93
Quarry Area 3	16.50	129 392.54	2 134 976.93
Quarry Area 4	16.50	129 392.54	2 134 976.93
Quarry Area 5	16.50	129 392.54	2 134 976.93
Quarry Area 6	16.50	129 392.54	2 134 976.93
Marketing and Sales	0.00	129 392.54	0.00
Business Management	0.00	129 392.54	129 392.54
Total	100.00		12 939 254.15

Not: Unit Expense Criterion = 12 939 254.15 / 100.00 = 129 392.54

In Table 11, the first stage cost charging was made at a rate consumed by activities, and total costs of activity centers were presented in the table.

3.4. Fourth Stage: Determination of Cost Factors

After activity costs are determined, several cost factors are needed at this stage of the application in order to charge activity costs to products. In this respect, it is possible to present cost factors as in Table 12 for the ongoing activities in the coal enterprise.

When we look at Table 12, the amount of tons produced will be considered as the cost factor in distribution of total activity costs to products for Pit 1-6 activities, and the amount of tons sold will be considered as the cost factor in distribution of total costs accumulated in sales, marketing and business administration to activities. With this point of view, it is possible to present numerical data as in Table 13 for activity factors on the basis of products.

3.5. Fifth stage: Determination of Product Costs

As the last stage of the application, total activity costs can be distributed to manufactured products in this stage by using the activity factors determined at the fourth stage.

Table 11: Determination of Total Activity Costs (₺)

Activities	Material Costs	Labour Expenses	Officer Wages	Electricity Costs	Outsourced Benefits and Services	Depreciation	Marketing and Sales Expenses	Administrative Expenses	Total
Quarry Area 1	1 921 664.52	16 957 618.79	19 257.17	1 474 156.39	1 128 424.41	2 134 976.93	0.00	0.00	23 636 098.21
Quarry Area 1	1 672 369.01	15 553 903.35	19 034.78	1 285 191.63	1 128 424.41	2 134 976.93	0.00	0.00	21 793 900.12
Quarry Area 1	1 215 169.39	15 798 467.53	0.00	1 352 561.70	1 128 424.41	2 134 976.93	0.00	0.00	21 629 599.97
Quarry Area 1	1 575 826.19	14 253 577.56	0.00	1 498 804.02	1 128 424.41	2 134 976.93	0.00	0.00	20 591 609.12
Quarry Area 1	1 864 117.65	15 070 700.55	12 409.83	1 295 050.68	1 128 424.41	2 134 976.93	0.00	0.00	21 505 680.07
Quarry Area 1	2 330 397.75	16 051 543.70	35 798.87	1 107 729.03	1 131 133.72	2 134 976.93	0.00	0.00	22 791 580.00
Marketing and Sales	0.00	0.00	0.00	0.00	0.00	0.00	3 601 849.02	0.00	3 601 849.02
Business Management	0.00	1 556 160.75	2 643 666.86	270 171.65	0.00	129 392.54	0.00	23 242 952.58	27 842 344.38
Total	10 579 544.50	95 241 972.23	2 730 167.52	8 283 665.10	6 773 255.79	12 939 254.15	3 601 849.02	23 242 952.58	163 392 660.89

Table 12: Factors For Activities of the Coal Enterprise

Activities	Activity Factors
Quarry Area 1	Produced Ton
Quarry Area 1	Produced Ton
Quarry Area 1	Produced Ton
Quarry Area 1	Produced Ton
Quarry Area 1	Produced Ton
Quarry Area 1	Produced Ton
Marketing and Sales	Sold Ton
Business Management	Sold Ton

Table 13: Data For Activity Factors On the Basis Of Products

Activities	Product A	Product B	Product C	Total Productin	Total Sold
Quarry Area 1	92 810	19 742	213 401	325 953	-
Quarry Area 2	92 810	19 742	213 401	325 953	-
Quarry Area 3	92 810	19 742	213 401	325 953	-
Quarry Area 4	92 810	19 742	213 401	325 953	-
Quarry Area 5	92 810	19 742	213 401	325 953	-
Quarry Area 6	92 810	19 742	213 401	325 953	-
Marketing and Sales	92 810	19 742	213 401	-	316 258
Business Management	92 810	19 742	213 401	-	316 258

When we look at Table 14, total of costs at Pit 1 activity center is 23 636 098.21 ₺, and the cost factor to be used in distribution is the produced ton. Total amount of production for the manufactured A, B and C products is 325 923 tons. Total of costs at Pit 2 activity center is 21 793 900.12 ₺, and the cost factor to be used in distribution is the produced ton. Total amount of production for the manufactured A, B and C products is 325 923 tons. Total of costs at Pit 3 activity center is 21 629 599.97 ₺, and the cost factor to be used in distribution is the produced ton. Total amount of production for the manufactured A, B and C products is 325 923 tons. Total of costs at Pit 4 activity center is 20 591 609.12, and the cost factor to be used in distribution is the produced ton. Total amount of production for the manufactured A, B and C products is 325 923 tons. Total of costs at Pit 5 activity center is 21 505 680.07 ₺, and the cost factor to be used in distribution is the produced ton. Total amount of production for the manufactured A, B and C products is 325 923 tons. Total of costs at Pit 6 activity center is 22 791 580.00 ₺, and the cost factor to be used in distribution is the produced ton. Total amount of production for the manufactured A, B and C products is 325 923 tons. Cost factor calculation for this activity center is as follows.

Table 14: Distribution of Activity Expenses to Products

Unit	Products	Produced Ton	Unit Expense Criterion (UEC)	Total (₺)	Measuring UEC
Quarry Area 1	Product A	92 810.00	72.51	6 730 007.93	23 636 098.21 / 325 953 = 72.51
	Product B	19 742.00	72.51	1 431 567.90	
	Product C	213 401.00	72.51	15 474 522.39	
	Total	325 953.00		23 636 098.21	
Quarry Area 2	Product A	92 810.00	66.86	6 205 470.94	21 793 900.12 / 325 953 = 66.86
	Product B	19 742.00	66.86	1 319 991.46	
	Product C	213 401.00	66.86	14 268 437.72	
	Total	325 953.00		21 793 900.12	
Quarry Area 3	Product A	92 810.00	66.36	6 158 689.05	21 629 599.97 / 325 953 = 66.36
	Product B	19 742.00	66.36	1 310 040.29	
	Product C	213 401.00	66.36	14 160 870.63	
	Total	325 953.00		21 629 599.97	
Quarry Area 4	Product A	92 810.00	63.17	5 863 137.45	20 591 609.12 / 325 953 = 63.17
	Product B	19 742.00	63.17	1 247 172.28	
	Product C	213 401.00	63.17	13 481 299.38	
	Total	325 953.00		20 591 609.12	
Quarry Area 5	Product A	92 810.00	65.98	6 123 404.81	21 505 680.07 / 325 953 = 65.98
	Product B	19 742.00	65.98	1 302 534.83	
	Product C	213 401.00	65.98	14 079 740.43	
	Total	325 953.00		21 505 680.07	
Quarry Area 6	Product A	92 810.00	69.92	6 489 544.63	22 791 580.00 / 325 953 = 69.92
	Product B	19 742.00	69.92	1 380 417.95	
	Product C	213 401.00	69.92	14 921 580.00	
	Total	325 953.00		22 791 580.00	

When we look at Table 15, we see that total costs at Sales and Marketing activity center is 3 601 849.02 ₺, and the cost factor to be used in distribution is the sold ton. Total amount of sales for the manufactured A, B and C products is 316258 tons. Total cost at Business Administration activity center is 27 842 344.38 ₺, and the cost factor to be used in distribution is the sold ton. Total amount of sales for the manufactured A, B and C products is 316 258 tons.

Table 15: Distribution of Activity Expenses in Sales-Marketing and Management Units to Products

Unit	Products	Sold Ton	Unit Expense Criterion (UEC)	Total (₺)	Measuring UEC
Marketing and Sales	Product A	92 810.00	11.39	1 057 009.17	3 601 849.02 / 316 258 = 11.39
	Product B	14 118.00	11.39	160 789.31	
	Product C	209 330.00	11.39	2 384 050.54	
	Total	316 258.00		3 601 849.02	
Business Management	Product A	92 810.00	88.04	8 170 696.02	27 842 344.38 / 316 258 = 88.04
	Product B	14 118.00	88.04	1 242 903.64	
	Product C	209 330.00	88.04	18 428 744.73	
	Total	316 258.00		27 842 344.38	

When we look at Table 16, we see that the second stage cost charging was made and total costs of product costs are presented.

Table 16: Total Presentation of Product Costs (₺)

Collective Display of Product Cost				
Activities	Product A	Product B	Product C	Total
Quarry Area 1	6 730 007.93	1 431 567.90	15 474 522.39	23 636 098.21
Quarry Area 2	6 205 470.94	1 319 991.46	14 268 437.72	21 793 900.12
Quarry Area 3	6 158 689.05	1 310 040.29	14 160 870.63	21 629 599.27
Quarry Area 4	5 863 137.45	1 247 172.28	13 481 299.38	20 591 609.12
Quarry Area 5	6 123 404.81	1 302 534.83	14 079 740.43	21 505 680.07
Quarry Area 6	6 489 544.63	1 380 417.95	14 921 617.42	22 791 580.00
Marketing and Sales	1 057 009.17	160 789.31	2 384 050.54	3 601 849.02
Business Management	8 170 696.02	1 242 903.64	18 428 744.73	27 842 344.38
Total	46 797 960.01	9 395 417.65	107 199 283.23	163 392 660.89

- Presentation of Total Costs For Products Calculated According to ABCS

It is possible to show the total presentation of product costs as in Table 17, which are calculated according to ABCS. As seen in Table 17, it can be observed that product C has the most share of cost among the product costs calculated according to ABC system while product B has the least. Accordingly, it is possible to sort the products as C, A and B from having the most share of cost to the least one. In terms of their share of costs, product A has 29% of the total cost while product B has 6% thereof and product C has 65%.

Table 17: Total costs For Products Calculated According To ABCS (₺)

Costs	Product A	Product B	Product C	Total
Direct	3 365 814.89	715 956.44	7 739 125.78	11 820 897.11
Indirect	46 797 960.01	9 395 417.65	107 199 283.23	163 392 660.89
Total	50 163 774.90	10 111 374.10	114 938 409.01	175 213 558.00

- Presentation of Total Costs For Products Calculated According to Traditional Costing System

Product costs which are calculated according to traditional costing system shall provide convenience in analyzing product costs in both costing systems. In this direction, according to information obtained from the coal enterprise, it is possible to present product costs which the enterprise calculated according to traditional costing system as in Table 18.

Table 18: Total Costs of the Products Calculated According to Traditional Costing System (₺)

Costs	Product A	Product B	Product C	Total
Direct	3 365 814.89	715 956.44	7 739 125.78	11 820 897.11
Indirect	38 351 544.55	8 157 916.09	88 182 932.43	134 692 393.07
Total	41 717 359.44	8 873 872.53	95 922 058.21	146 513 290.18

As can be seen in Table 18, it can be observed that product C has the most share of cost among the product costs calculated according to traditional costing system while product B has the least. Accordingly, it is possible to sort the products as C, A and B from having the most share of cost to the least one.

Conclusion

Changes experienced in today's business management sense have increased the efforts to calculate the costs more accurately and provide more cost control. Utilization of cost focused production techniques in enterprises and focusing on the quality of process in the context of continuous improvement has lead the costs to be discussed within a system. Since costs can be calculated more accurately with ABC system and it provides an insight to executives in their decisions, this system has come into prominence today. ABC system allows activities and thus activity costs to be made out better in production enterprises. With this purpose, the ABC system was applied in a coal enterprise and within the frame of obtained results, it was determined that there were differences between in two costing systems. Due to not including the cost share of sales, marketing and general administrative expenses into the product costs calculated in the enterprise of application, product costs were lower in traditional costing system compared to ABC system. The most important reason for that is in the accounting system applied in our country, operating expenses are considered as a non-production expense even if included in that production period and transferred to nominal account instead of stock account. In fact, amount of product costs calculated according to ABC cystem should be included in stock account and then the cost expenses of sold products should be transferred to nominal account.

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