Implementing an Integrated Activity-Based Costing and Economic Value Added System: A Case Study

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Abstract

This paper presents a systematic methodology for implementing an integrated Activity-Based Costing and Economic Value Added system in small manufacturing companies. In this case study, the actual implementation of this system in a small manufacturing company is presented in a step-by-step manner. This methodology begins by analyzing the company's income and balance sheet statements. Supporting tools to estimate and trace capital cost are illustrated with the company's actual data. Changes in product cost resulting from the inclusion of capital cost are then demonstrated. Finally, the impact of this complete, and therefore, reliable cost information on the company's decision-making and long-term business performance is discussed.

Keywords
Activity-Based Costing, Economic Value Added, Costing System, Small Manufacturers, Small Business

1. Introduction
Many manufacturing companies get into financial trouble not because of bad products or services, but because they lack the appropriate financial and managerial tools necessary for controlling business and establishing strategic corporate goals. For many small manufacturers, one of the major obstacles preventing better business performance, according to the literature, is their cost accounting system [1].

In the 1980s, a movement from Traditional Cost Accounting (TCA) methods to Activity-Based Costing (ABC) was seen as a great advancement for companies which were striving to gain control and better manage indirect cost (overhead) [2]. Unfortunately, in today's highly competitive environment, ABC cost information alone is no longer able to lead companies toward long-term competitiveness and profitability [2,3]. Despite its advantages over TCA methods, ABC fails to account for capital cost, investment risk, and cash flow factors. ABC cost calculation traces only the operating cost and expenses given in the company's income statement[4,5]. The financial data given in the company's balance sheet are not taken into account [4]. For this reason, the ABC calculated product costs still tend to underestimate the total product [5]. Many authors end the ABC cost analysis by subtracting direct and overhead costs from revenues generated from sales [6,7]. The results, called "operating profits"[6] or "profits before interest and taxes"[7] are calculated for each cost object and then used for decision-making. Expenditures, such as interest expenses (capital cost) and taxes, are not taken into account [5].

In addition, companies using ABC cost information alone tend to focus their attention on cost reduction for its own sake. Frequently to achieve cost reduction targets, they put costs before employees' interests, customers' expectations, and continuous improvement [8]. During their cost reduction efforts, managers tend to use accurate cost information only in order to identify and drop products requiring a lot of overhead and generating only marginal revenues [2,8]. Because of this deficiency, even proper long-term implementation of an ABC system in an organization is not enough to fully account for capital usage. Since the capital factor is not considered in the calculation and product costs are underestimated, the pure ABC system may allow a small company's value to be reduced. In order to improve cost information obtained by ABC, some researchers have proposed that ABC should be combined with Economic Value Added, so that the cost of capital can be considered [4,5,9,10,11].

The costing and financial performance measurement system which is being described in this paper, referred to from this point on as the Integrated ABC-and-EVA System, has the potential to help manufacturing companies maintain an effective long-term business policy focusing on both cost and capital. It integrates the ABC method with the Economic Value Added performance measure. The ABC component of this system focuses on operating costs while the Economic Value Added component focuses on capital costs.

2. Methodology

2.1 Implementing an Integrated ABC-and-EVA System

The Integrated ABC-and-EVA System is especially valuable for organizations having high capital costs. In order, to help companies decide if the Integrated ABC-and-EVA System has the potential to improve the quality of their cost information, the ratio of capital cost (capital charges) to total cost should be examined. The *CT* (Capital to Total) ratio can be shown mathematically as follows:

$$CT\text{-}ratio = Capital\ Cost\ /\ Total\ Cost \qquad (1)$$

If this ratio is high, higher than 0.05, the management should consider implementing the Integrated ABC-and-EVA System. The value of 0.05 was derived upon the author's experience working with several small manufacturing firms. This value is expected to be refined over time, as more data will be collected.

2.2 Implementation Methodology

The next described implementation methodology has been developed by researchers from the University of Pittsburgh [11]. While some authors propose that capital charges should be first added to activities and then traced to the cost objects [4,5,9], the method proposed by researchers at the University of Pittsburgh traces capital charges directly to cost objects using Product-Capital-Dependence (PCD) analysis [11]. Estimating the capital cost which is applicable for a particular company is, however, a major challenge in determining capital charges. Therefore, this paper proposes a substantial refinement in estimating capital cost for small companies.

The implementation methodology can be broken into seven steps. Steps 1 through 5 are identical to those proposed before [11]. The refinement in estimating company's capital cost lies in Step 6 of the methodology. Therefore, Steps 1 through 5 (as well as Step 7) will be just overviewed briefly, while Step 6 will be discussed in greater detail.

Step 1: Review the company's financial information
Almost all of the information needed to perform the analysis can be obtained from the company's profit/loss (P&L) statement and balance sheet. The P&L statement is mainly needed for estimating the operating cost, while the balance sheet is needed to perform the capital charges calculation.
Step 2: Identify main activities
The main activities that consume operating resources are identified.
Step 3: Determinate the operating cost for each activity
Operating costs are calculated for each activity.
Step 4: Select operating cost drivers
Selection of operating cost drivers is performed in a manner similar to the implementation of a traditional ABC system.
Step 5: Calculate operating costs for cost objects
Once the cost drivers have been selected, operating costs are traced to the cost objects.
Step 6: Calculate capital charges for cost objects
The main objective of this step is to trace the capital charges to the appropriate cost objects.

Estimating the cost of capital for a small company represents a challenge. The common method to identify the cost of capital, Weighted Average Cost of Capital (WACC), although useful for large companies, is less so for small companies. For example, many small companies would have difficulty estimating their cost of debt because neither their debt is traded publicly nor are they rated in Moody's Bond Record [12].

Estimating the cost of equity for a small company is even more challenging [12]. The Capital Asset Pricing Model (CAPM), a common method to estimate cost of equity, postulates that the cost of equity is equal to the return on risk-free security plus the company's systematic risk (called beta) multiplied by the market risk premium [13]. For

large companies the betas are published periodically by services such as Value Line [14]. For small companies, the betas are not published. The next impediment to capital cost estimation is determining the valid market risk premium. For large publicly-traded companies, the recommended market risk premium is five to six percent [13]. For publicly-traded small companies, the applicable market risk premium is substantially higher or approximately 14 percent [15]. As of today, a market risk premium for privately-held companies with fewer than 100 employees has not been published [12]. In general, it can be expected that the value for a small privately-held firm would be higher because of the inherent risk and their specific conditions which are frequently characterized by a lack of resources often referred to as *resource poverty* [16].

Taking into account the previously described obstacles, some researchers have proposed a method derived from the WACC estimation and the CAPM model, adjusted to the unique needs of small companies [12]. In this method, the estimated cost of capital rate is called *CCR* to distinguish it from the WACC method used for large companies. The methodology presented in this paper, however, estimates *CCR* before tax. The main reason for estimating *CCR* before tax is that other expenses (for example, direct labor cost, direct material cost, and operating expenses) are also handled before tax. In this context, it is necessary to remember that following method was developed for small companies. For most large companies, the well-documented WACC and CAPM methods will usually result in a more accurate capital cost estimation.

The *CCR* for a particular small company can be estimated as follows [12]:

$$CCR = CCR_{Debt} \acute{}\ (Debt/(Debt + Equity)) + CCR_{Equity} \acute{}\ (Equity/(Debt + Equity)) / (1-t) \quad (2)$$

In this equation, *t* represents the company's tax rate.

CCR_{Debt} for a small manufacturing company can be estimated as follows [12]:

$$CCR_{Debt} = Prime\ Rate + Bank\ Charges \quad (3)$$

For many small manufacturing companies, the average bank charges were one to two percent per year [12].

For a small manufacturing company, CCR_{Equity} can be estimated as follows [12]:

$$CCR_{Equity} = RF + RP \quad (4)$$

RF represents the risk-free investment rate, and *RP* represents the risk premium rate. *RF* can be estimated using the yield-to-maturity rate for 10-year government bonds, while *RP* reflects the risk resulting from investment in a company. In general, the riskier the investment the higher the *RP*. Table 1 suggests various *RP* ranges depending upon the investment. These values were derived from information gathered during the literature search as well as through working with several small manufacturing companies [12].

Table 1. Suggested Ranges for Risk Premium (RP)

RP Ranges	Investment Risk
6 % and less	Extremely low risk, established profitable company with extremely stable cash flow
6 % - 12 %	Low risk, established profitable company with relatively low fluctuation in cash flow
12 % - 18 %	Moderate risk, established profitable company with moderate fluctuation in cash flow
18 % and more	High business risk

After establishing an appropriate *CCR* for each accounting category, in most cases uniform across each category, capital charges can be traced to cost objects [11].

Step 7: Calculate product cost for cost objects

Finally, the total costs (direct, operating, and capital cost) are traced to the cost objects.

3. Applications Example

3.1 Company Z

Company Z (the managers of the company wished for their company name to remain anonymous) is owned and managed by three owner-managers who bought the company from a large corporation several years ago. Company Z employs more than 40 people. The majority of this company's business is in the area of manufacturing electrical devices such as motors, generators and electrical industrial equipment. Company Z sells its products in the domestic market as well as abroad. Most customers are manufacturers or electrical companies looking to replace their old equipment. A portion of the company's output is sold directly to end-users, while the remainder is sold with the help of independent distributors.

Before the field study Company Z was using a traditional cost system. Company Z's overhead was allocated to products based on direct labor hours. This cost information was then used mainly for cost controlling and profit planning. Management at Company Z was interested in determining reliable cost information for their major product lines: Motors and Motor Parts, Breakers, Control Products, and Miscellaneous Parts.

All three costing systems (TCA, ABC and the Integrated ABC-and-EVA System) were used to obtain cost information for Company Z. The objective of these calculations was to obtain and compare cost information from all three systems. These results are presented in the following sections.

3.2 Implementing an Integrated ABC-and-EVA System

Most of the financial information needed for the analysis was obtained from Company Z's income statement and balance sheet. Table 2 and Table 3 present Company Z's income statement and balance sheet respectively.

Table 2. Company Z's Income Statement in Thousands of Dollars

Net sales	5,452
Cost of goods sold	-2,986
SG&A expenses	-2,214
Earnings before interest and taxes	**252**
Interest expenses	-87
Income before tax	**165**
Income tax (42%)	-69
Net Income	**96**

Table 3. Company Z's Balance Sheet in Thousands of Dollars

ASSETS		**LIABILITIES**	
Current assets		**Current liabilities**	
Cash	30	Accounts payable	814
Receivables	833	Accrued expenses	38
Inventory	1,014	Short-term debt	404
Other current assets	0	**Total current liabilities**	**1,256**
Total current assets	**1,877**		
		Long-term liabilities	
Fixed assets		Long-term debt	968
Property, land	0	**Total long-term liabilities**	**968**
Equipment	1,704		
Other fixed assets	100	**Owners' Equity**	
Total fixed assets	**1,804**	Common stock	300
		Retained earnings	1,157
		Total owner's equity	**1,457**
TOTAL ASSETS	**3,681**	**TOTAL LIABILITIES**	**3,681**

Company Z's operating expenses included selling expenses, administrative costs, and outlays such as transportation, rent, utilities, and maintenance. The largest portion of operating expenses was included in the SG&A expense category on the income statement. In addition, a part of the operating expenses was included in the cost category cost of goods sold ($120,000.00). Company's capital consists of all money invested in the enterprise [12]. Company Z's *Capital*, assuming all book values are good estimators of market values, was estimated by subtracting all non-interest-bearing liabilities (Accounts payable and Accrued expenses) from total assets. The complete calculation is shown in Table 4.

Table 4. Company Z's Capital in Thousands of Dollars

Total assets	3,681
Accounts payable	-814
Accrued expenses	-38
Capital	**2,829**

The implementation of the Integrated ABC-and-EVA System by Company Z began with the identification of its major activities. Operating costs for each activity were determined by their consumption of overhead resources. These operating expenses were then traced to product lines using cost drivers. After selecting operating cost drivers, driver volume information (such as material cost and number of inspections) was collected. Using the previously selected operating cost drivers and driver volume data, Company Z's overhead was traced to its four product lines.

Calculating Capital Charges for Company Z's product lines began with estimating its *CCR*. According to the owner-managers, a bank interest rate for debt was 9 percent. Based on this information, the CCR_{Debt} was chosen to be 9 percent. Because the owner-managers stated that they expected a return of 11 percent before tax for their investment in the company, the CCR_{Equity} was chosen to be 11 percent. The company's overall tax rate *t* was obtained from its income statement and (long and short-term) debt as well as owners' equity from the balance sheet.

Using this information and Equation 2, the *CCR* for Company Z can be estimated as follows:

$$CCR = CCR_{Debt} \times (Debt/(Debt + Equity)) + CCR_{Equity} \times (Equity/(Debt + Equity)) / (1-t)$$
$$= 9\ \% \times (1{,}372/(1{,}372 + 1{,}457)) + 11\ \% \times (1{,}457/(1{,}372 + 1{,}457)) / (1 - 0.42)$$
$$= 4.32\ \% + 9.79\ \% = 14.11\ \%$$

A *CCR* of 14 percent was chosen for all of Company Z's accounting categories and product lines. Once the *CCR* and *Capital* were determined, the total capital cost can be calculated. This calculation returns total capital charges to be $ 396,000.00. Using Equation 1, *CT-ratio* can be calculated as follows:

$$CT\text{-}ratio = Capital\ Cost / Total\ Cost = (396{,}000 / 5{,}596{,}000) = 0.071$$

A relatively high CT-ratio (>0.05) suggest that implementing the Integrated ABC-and-EVA System will have potential to increase the reliability of Company Z's cost information.

Next, the Product-Capital-Dependence (PCD) Analysis [11] was used to trace capital charges to product lines. The relatively high capital charges in the product lines Motors and Motor Parts as well as Breakers could be explained by the relatively high capital investments in inventory and manufacturing equipment. Finally, Integrated ABC-and-EVA cost information was obtained by adding the operating and capital costs to the direct cost. Table 5 shows these results.

Table 5. ABC-and-EVA Product Cost Information for Company Z in Thousands of Dollars

Product line	Direct Cost	Operating Cost	Capital Charges	ABC-and-EVA
Motors and Motor Parts	1,255	1,093	180	2,528
Breakers	677	647	113	1,437
Control Parts	318	236	36	590
Miscellaneous Parts	616	358	67	1,041
Total	**2,866**	**2,334**	**396**	**5,596**

4. Results

The three costing systems' product cost information for the product lines shows notable differences. In this analysis, capital cost was only taken into account by the Integrated ABC-and-EVA System. Table 6 and Table 7 summarize the product cost information and profitability figures respectively.

Table 6. Comparison of Product Cost Information for Company Z in Thousands of Dollars

Product line	TCA	ABC	ABC-and-EVA
Motors and Motor Parts	1,839	2,348	2,528
Breakers	1,261	1,324	1,437
Control Parts	655	554	590
Miscellaneous Parts	1,445	974	1,041
Total	**5,200**	**5,200**	**5,596**

Table 7. Comparison of Profitability and Value Creation for Company Z in Thousands of Dollars

Product line	TCA	ABC	ABC-and-EVA
Motors and Motor Parts	661	152	-28
Breakers	310	247	134
Control Parts	-154	-53	-89
Miscellaneous Parts	-565	-94	-161
Total	**252**	**252**	**-144**

Company Z's management, when presented with the results provided by the Integrated ABC-and-EVA System, shown a tendency to change its business and decision-making policies. They were especially surprised by the fact that the product line Motors and Motor Parts, which was believed to be highly profitable under the TCA calculation, was not able to create economic value. Because the Economic Value Added in this product line was only slightly negative, they believed a marginal increase in price would make Motors and Motor Parts a value creator. In their opinion, this price increase was feasible since Company Z has an especially strong market position in this particular product line. This was also different from ABC profitability which showed a positive profit and, therefore, encouraged managers to reduce prices in hope of increasing sales.

5. Conclusions

The Integrated ABC-and-EVA System is a very promising managerial tool for several reasons. First, this system is able to provide decision makers with reliable and complete cost information. Second, after implementing the system managers become more sensitive to value creation as opposed to accounting profits alone. Third, decision makers who recognize that capital is a precious and limited resource which must be carefully accounted for, will tend to use it more efficiently. In other words, the Integrated ABC-and-EVA System allows managers in small companies to run their companies more effectively.

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Bibliographical Sketch

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