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Title: Variable Activity-Based Costing and Decision Making

Authors: Geiszler, Matthew
Baker, Kelsey
Lippitt, Jeffrey

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Description: Byline: Matthew Geiszler, Kelsey Baker, Jeffrey Lippitt Much of managerial decision making regarding product pricing and output depends on a careful separation of the fixed and variable components of costs. Without this separation, the decision maker will be unable to assess the impact of their decisions on profitability. This distinction is particularly relevant in allocating overhead. Both traditional and activity-based costing (ABC) systems are full absorption systems in the sense that they include both fixed and variable production costs in product cost. This mixing of fixed and variable overhead costs results in product costs that are difficult to use in decision making. This article uses a numeric example to compare several alternate approaches to overhead allocation. It highlights variable activity-based costing (VABC), which utilizes regression analysis to estimate the fixed and variable portions of each cost pool. The results show that VABC can produce information that is more useful in decision making and that the resulting cost allocations are superior to traditional costing approaches for decision-making purposes. [c] 2017 Wiley Periodicals, Inc.

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Variable Activity-Based Costing and Decision Making.

Much of managerial decision making regarding product pricing and output depends on a careful separation of the fixed and variable components of costs. Without this separation, the decision maker will be unable to assess the impact of their decisions on profitability. This distinction is particularly relevant in allocating overhead. Both traditional and activity-based costing (ABC) systems are full absorption systems in the sense that they include both fixed and variable production costs in product cost. This mixing of fixed and variable overhead costs results in product costs that are difficult to use in decision making. This article uses a numeric

example to compare several alternate approaches to overhead allocation. It highlights variable activity-based costing (VABC), which utilizes regression analysis to estimate the fixed and variable portions of each cost pool. The results show that VABC can produce information that is more useful in decision making and that the resulting cost allocations are superior to traditional costing approaches for decision-making purposes.

This article illustrates several modifications to activity-based costing (ABC) and shows how these approaches will improve the relevance of the resulting product costs to both long-term and short-term decision making. ABC was developed to improve the allocation of indirect production costs to products and to aid in the management of these costs. Many managers felt that a single cost pool allocation of overhead resulted in product costs that do not reflect the combination of resources that go into the production of each product (Cardinaels, Roodhooft, & Warlop, [2]). The resulting "peanut butter" costing overcosted some products and undercosted others (Horngren, Datar, & Rajan, [5]). ABC refines the overhead allocation process by allocating overhead costs to several cost pools, based on the activities involved in the production process. The costs of an activity are then allocated only to those products that utilize that activity. Many would argue that the resulting product costs are superior to traditional costing because the resulting product costs do reflect the resources that went into the production of the product more accurately than traditional cost systems (Balakrishnan & Sivaramakrishnan, [1] ; Homburg, [4] ; Schneeweiss, [6]).

In some ways, the ABC approach may present some dangers that were not as pronounced under traditional costing systems. Managers are well aware that traditional cost systems that mix together fixed and variable components of overhead costs, are inappropriate for use in decision making. Because full absorption costing is required under generally accepted accounting principles (GAAP), these product costs are regularly produced for financial reporting purposes, but managers are aware that these costs are not useful in decision making (Datar & Gupta, [3]). Decision making depends on a careful separation of the fixed and variable portions of product cost. ABC costing is a significant refinement of traditional cost systems because it does a better job of having product costs represent the resources that went into the production of a product; however, these costs are still full absorption costs and blend together fixed and variable costs. An ABC costing system produces cost information that is also inappropriate for decision making, but the apparent refinement of cost allocation in ABC may easily mislead decision makers into using these costs in pricing and output decision making (Homburg, [4]). In some situations, ABC may avoid some of the problems inherent in absorption costing. If an activity supports a single product, the fixed costs of that activity must be included in some decisions regarding the profitability of that product, provided the fixed costs associated with that activity are fully avoidable should the product be discontinued.

This article uses a numeric example to compare several alternate approaches to overhead allocation. It will highlight variable activity-based costing (VABC) and show how these systems can produce information that is useful in decision making and show that the resulting costs are superior to traditional variable costing for decision-making purposes. Both VABC models utilize regression analysis to estimate the fixed and variable portions of each cost pool. Utilizing the ABC approach, these variable costs are allocated only to those products that utilize that activity.

When a job utilizes several different types of materials, the amount, cost, and cost per unit of each input is separately charged to the job. Under VABC, there are several different kinds of overhead involved in production, and each of these types has a different cost that is individually charged to the job.

The analysis presented is based on a hypothetical job shop setting that has three jobs. The same data are used in each model, allowing comparison of allocated costs between each model.

TRADITIONAL COSTING

Traditional analysis applies total overhead costs ($157,835) on the basis of direct labor hours (DLH; 682 total hours), resulting in an overhead application rate of $231.43 per direct labor hour. Exhibit [NaN] , Panel A demonstrates that application of overhead to each job, based on DLH.

ExhibitTraditional and Activity-Based Costing Manufacturing Overhead Allocations

ACTIVITY-BASED COSTING

For ABC, the total overhead costs are separated into three cost pools based on the three activities involved in the production process: machining, assembly, and inspection. A cost driver is identified for each cost pool: machine hours (MH) for machining, labor hours (DLH) for assembly, and inspection hours (IH) for inspection.

The assembly cost pool consists of $62,345 of overhead; the machining cost pool is $24,294; and the inspection cost pool is $71,196. Each cost pool is divided by its respective cost driver (682 DLH, 244 MH, and 66 IH) to determine the application rates: $91.41 per DLH used, $99.57 per MH used, and $1,078.73 per IH used. This process results in allocating the average total cost of each cost pool. Exhibit [NaN] , Panel B illustrates the application of these cost pools to each of the three jobs. After multiplying each rate by the given driver for each job, new overhead allocation totals are calculated for each job. Based on ABC, total overhead allocated to each job is: Product 1, $57,476.56; Product 2, $27,366.75; and Product 3, $72,991.69.

The total amount of overhead allocated to the three products is the same, but the breakdown between products varies greatly from that of traditional costing. The difference is representative of the fact that traditional costing, while a simpler approach, takes less care to be sure that the allocated cost reflects the activities that went into the production of each product. ABC does a better job of this; however, there is a common misconception that since ABC provides a better allocation than traditional costing, it is more useful for decision making. This assumption is wrong due to the fact that ABC is still a full absorption costing approach to product costing. Both traditional costing and ABC mix together fixed and variable costs, rendering the result of little or no value in decision making. Decision making requires the careful separation of fixed and variable components of production costs for cost-benefit analysis. This distinction is also necessary for planning and controlling costs.

VARIABLE COSTING

Next, we consider a traditional variable costing approach to the allocation of overhead. As seen in Exhibit [NaN] , Panel A, a regression based on DLH is run to determine fixed costs (y-intercept), variable cost (DLH coefficient), and residual error. The coefficient of $41.48 per DLH is then used to apply overhead to each job based on the direct labor hours used for that job. The allocations to each job using variable costing are: Product 1, $16,592.00; Product 2, $7,673.8; and Product 3, $4,023.56 (Exhibit [NaN] , Panel B).

Under variable costing, a total of $28,289.36 is allocated to the three jobs, significantly less than $157,832.88 under absorption costing. This is because $126,946.80 of fixed overhead cost is not allocated to the respective jobs.[1]

ExhibitVariable Traditional Manufacturing Overhead Allocation

While this variable costing approach does separate overhead costs into fixed and variable portions based on direct labor hours, it may also produce results that are of limited usefulness in decision making. The use of a single cost driver assumes that all overhead costs either vary with direct labor hours, or are fixed. One of the main contributions of ABC is that overhead costs vary based upon the levels of several different cost drivers. Many short-term decisions could potentially affect the levels of each of these cost drivers. To make sound decisions, managers must understand how their decisions will affect each of these cost drivers and how the cost drivers will in turn affect overhead costs. Each activity within the manufacturing process will have its own variable cost. The total variable overhead cost of a product will, therefore, be determined by multiplying the amount of each activity used to manufacture that product, by the variable cost of each activity and summing these costs. The resulting variable cost for that product will reflect the likely impact on total overhead of changing the production level of that product.

Our next analysis builds on the ABC approach of separating overhead costs into the cost pools relevant to each activity. Then, using the cost driver for each pool, the cost pool is separated into fixed and variable components.

VARIABLE ABC

In essence, variable costing and ABC are combined by running a regression for each of the cost drivers used in ABC. Each regression calculates a fixed cost and a variable cost, shown in Exhibit [NaN] , Panel A. The regression analysis shows that DLH and MH have a significant impact on their respective cost pools. Inspection hours, however, have a variable cost that is not statistically significantly different from zero at a 90% confidence level.[2] The lack of a relationship between inspection hours and the inspection cost pool could indicate one of several problems. First, it could mean that we have chosen the wrong cost driver. Second, it could mean that the inspection costs are not well controlled and the variations in the inspection cost due to other causes is masking the relationship between inspection hours and inspection costs. Third, it could indicate that the inspection activity is primarily a fixed cost. When implementing this methodology, it is important to consider these issues before moving forward with the overhead allocations.

Overhead is applied to each job by multiplying the level of each of the cost drivers used in that job by its respective variable cost. DLH is applied at $39.49 per direct labor hour, MH at $60.23 per machine hour, and inspection costs at $10.34 per inspection hour. The total costs of each of the jobs are: Product 1, $16,885.57; Product 2, $9,776.89; and Product 3, $15,648.28 (Exhibit [NaN] , Panel B). Compared to the variable costing total allocation of $28,289 of variable overhead cost, variable ABC allocates $42,311 of variable overhead cost. As a result, the total allocated cost to each product reflects the likely change in overhead cost that would result from changing the amount of the product that is produced.

ExhibitVariable Activity-Based Costing Manufacturing Overhead Allocations—Panel A and Panel B

One of the more challenging aspects of implementing ABC is assigning the total overhead cost to the various cost pools. Errors in this assignment will result in errors in the coefficients of the cost drivers for that cost pool and, therefore, a misstatement of the variable costs of the products. Fortunately, the variable ABC approach does not require this assignment of total cost to individual cost pools. In most cases, the analysis can be completed by analysis of the total overhead cost pool.

MULTIPLE REGRESSION

The variable ABC approach can be implemented by including all the cost drivers in one multiple regression analysis, eliminating the need to separate cost pools. The multiple regression will still provide a coefficient (variable cost) for each driver, but one fixed cost. Exhibit [NaN] , Panel A shows this calculation. In our

example, DLH and MH are significant with coefficients of $37.78 and $69.80, respectively. Inspection hours, on the other hand, are insignificant and negative. As a negative coefficient, inspection hours appear to be a cost absorber as opposed to a cost driver.[3] Combining both the lack of statistical significance and the counter factual suggestion of a negative variable cost, the inspection hour cost driver is eliminated from the multiple regression and recalculated as shown in Exhibit [NaN] , Panel B.

The reduced multiple regression results in a coefficient of $37.84 per DLH and $69.41 per MH, respectively. The allocation of overhead to each job using reduced multiple regression results in: Product 1, $16,177.15; Product 2, $9,776.80; and Product 3, $16,788.97. Altogether a total of $42,742.92 is allocated using multiple regression overhead allocations (Exhibit [NaN] , Panel C). Once again, this amount is more than variable costing. Comparing these results to the results of the traditional allocations in Exhibit [NaN] , demonstrates how absorption costing can lead to overpricing of products due to over costing. In addition, comparing Exhibit [NaN] to Exhibit [NaN] and Exhibit [NaN] demonstrates how traditional variable costing, although it separates costs into fixed and variable components, is of only limited usefulness in decision making.

ExhibitMultiple Regression Overhead Allocation—Panel A, Panel B, and Panel C

CONCLUSION

As noted earlier, traditional costing systems and ABC systems suffer from the problem of being "full absorption" systems, limiting their usefulness in decision making. Managers and decision makers should be acutely aware of this limitation. This study highlights this deficiency and demonstrates that VABC can produce information that is useful in decision making and that the resulting cost allocations are superior to traditional variable costing for decision-making purposes.

LIMITATIONS

Although multiple regression provides a better way to allocate overhead costs per activity driver to each job, there remain fundamental limitations. Cost drivers must be accurately selected by management and costs must be controlled. While multiple regression does not require the separation of total overhead cost into cost pools, this is often an essential step in the control of these costs. The recognition of the variable nature of the cost pools may also help in planning and controlling these costs.

Regression analysis is a mathematical tool that lacks any respect for economic reality. Management must carefully assess the results of this analysis to be certain that the results are not driven by anomalies that do not reflect the true underlying relationships.

Footnotes

1 Together, only $155,263.16 of the total overhead ($157,835) was allocated during the year. The difference is a result of the residual error calculated in the regression. Similar to absorption costing, variable costing can lead to misvalued, specifically undervalued, unit cost pricing.

2 The coefficient is significant at the 85% confidence level. This highlights an important judgment call that must be made with respect to what is an acceptable cutoff threshold for use in the overhead allocations.

3 It is important to note that due to the lack of statistical significance of the coefficient, interpretation of the direction of the sign on the coefficient becomes inconclusive.

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By Matthew Geiszler; Kelsey Baker and Jeffrey Lippitt

Matthew Geiszler, PhD, is an Assistant Professor of Accounting at Ithaca College.

Kelsey Baker is an Assurance Associate with PricewaterhouseCoopers. She received both her BS in accounting and MBA in professional accountancy from Ithaca College.

Jeffrey Lippitt, PhD, is an Associate Professor of Accounting at Ithaca College.

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