VOLUME ADJUSTED COSTING: A QUICK AND IMPLEMENTABLE SOLUTION

Bala V. Balachandran and Glen Navis

When the watch-words of competitiveness, profit erosion, and pricing decisions are pondered in the board rooms, great attention is paid to the internally-generated cost numbers of the organization's products and customers. Invariably, the cost system is blamed for most problems associated with these watch-words, because costs of goods sold (CGS) and costs to serve (CTS) are completely under the control and scrutiny of the company. Because of this, greater attention is being paid today to the cost system and its poor performance of the measurement process than ever before.

BALA V. BALACHANDRAN is the Kellogg Distinguished Professor of Accounting and Information Systems at J.L. Kellogg Graduate School of Management, Northwestern University and Director of the Accounting Research Center. Professor Balachandran has authored two books and over sixty-five articles, including a special "executive supplement" on "Strategic Activity Based Accounting" in Business Week *in 1994. Glen Navis is a Management Consultant. His work experience includes ten years as the Senior Cost Accountant at John Deere Horicon and twelve years as an Industrial Engineer and Plant Controller for Mercury Marine. He has a Bachelor's Degree in Business Administration from Marian College and a Liberal Arts Degree from the University of Wisconsin.*

TWO LEVERS

To enhance bottom-line performance, an organization may only impact two levers: (1) the "top-line" lever operated by "revenue/yield" management and (2) the "middle-line" lever influenced by "cost/productivity" management. Because it is so difficult to control the top line of revenue, the corporate world has chosen to try to control the middle line and focus more on cost management.

EXECUTIVE SUMMARY

- *Despite the need for a good cost accounting system, ABC and ABM systems suffer from too many cost drivers.*
- *Volume Adjusted Costing is easy to understand, and based on a very believable premise that annual volume is the most valuable cost driver.*
- *The purpose of variable adjusted costing is to provide direction for decision making.*
- *"Buy in" among users of cost data is one of the biggest benefits derived by variable adjusted costing.*

In recent years, as revenue per unit has continued to decrease due to forces that include increased competitiveness, declining lifetimes of products, and demanding customers, a more accurate cost measurement system has become a necessity. This is due to the fact that existing cost measurement systems could not categorically state whether a product or service was making or losing money.

To further complicate the problem, the support and indirect costs traditionally viewed as fixed costs have skyrocketed compared to variable costs, such as those associated with materials or sales commissions. This has, in some ways, turned the entire standard costing model upside-down. Thus, maximizing the total contribution margin has sometimes resulted in a decrease in profitability due to unforeseen increases in fixed costs. This has caused some to call the go with low volume parts in a high volume environment.

Although cost adjustments can not be defended out to the fifth decimal place, the results are a lot more believable and understandable. Our philosophy is, "it is better to be approximately right than precisely wrong." A cost system should not just report after the fact what the costs are; a good cost system should help steer the everyday decision makers into making decisions that are consistent with the overall business strategy. Is it the business strategy to be high volume or low volume? Is it the strategy to design new products that use common parts or create all new unique parts? Does your cost system support the chosen strategy?

CAUTIONARY NOTES

However, there are a few cautionary notes to be made regarding volume adjusting. Because volume adjusting is basically a mathematical formula, it can result in certain illogical excesses. These can be avoided by choosing some limitations in advance. For example, to avoid the problem of a very low volume service part being adjusted beyond a believable cost amount, a low-end annual volume limit may be chosen (which is not a bad business decision in itself). Or maybe labor standards have to be revised for final assembly to isolate the common parts from the unique parts so that the common part assembly can enjoy the reward for high volume and only the unique parts are penalized for low volume.

These are the kind of common sense decisions that must be made to avoid problems. A cross-functional team could arrive at a consensus for these guidelines providing profitability and productivity to the organization as a whole.

PROVIDING DIRECTION

Volume adjusting is not a magic potion. VAC can only be an enhancement to a well-maintained cost system. There is no substitute for well-documented bills of material, accurate material costs, and realistic industrial engineering labor standards. VAC cannot make a bad cost system into a good cost system.

However, VAC can change an average cost system from being passive to active; from being reactive to proactive; from looking backward to being a powerful tool used to help chart the forward course of the company. Average cost systems can only tell you what kind of company you are today. A volume adjusted cost system can help determine the future of the company by rewarding good decisions and penalizing decisions that do not support the goals of the company.

The purpose of volume adjusting is not just to provide more accurate costs. It is to provide a direction for decision making. It becomes an integral part of the entire business strategy. If management intuitively believes high volume parts cost less than similar low volume parts, they need a cost system that pushes their everyday decision makers in that direction. ■

Notes

1. Artemis March and R.S. Kaplan, *John Deere Component Works (A) and (B)*. (Boston, Mass.: Harvard Business School, 1987).
2. *Id.* In John Deere (A), they had three drivers, then moved to eight drivers, and Keith Williams mentioned they later moved to sixty-four drivers.

traditional fixed costs the Super-Variable Costs.

ABC AND ABM

During the late 1980s, academics, practitioners, and consultants tried to react to these changes by proposing a better measurement of fixed costs using Activity Based Costing (ABC). Theoretically, this system enabled them to manage better by identifying "non-value added activities" and, fathered the appropriately entitled Activity Based Management (ABM). Pioneering efforts of Professors Robert S. Kaplan and Robin Cooper created a whole new methodology of ABC and ABM that grew into Activity Based Budgeting, Activity Based Business Intelligence, and other disciplines.

Through the use of ABM, practitioners strove to reveal the links between performing activities (indirect functions labeled as *cost drivers*) and the demands these activities make on the organization's resources (i.e., fixed or indirect costs). It was designed to provide managers with a picture of how products generate revenues (top-line) and consume resources (middle-line) through cost drivers. Several case studies were conducted on product profitability distortions (e.g., John Deere A&B, Schroeder Bellows), focusing on cost of sales with special attention to fixed manufacturing costs. Others were written on customer profitability distortions (e.g., Kenthal A&B, Winchester Lighting), focusing primarily on cost to serve a specific customer with special attention to fixed (indirect) selling and administrative costs. These cases have been used in classrooms and shown by consultants to practitioners.

With the implementation of ABC/ABM becoming so complex and costly, the viability of the concept was questioned.

TOO MANY DRIVERS

In the resulting exuberance over the ABC theory, however, "paralysis by analysis" was encountered. Cost managers started creating a host of activities and hundreds of associated cost drivers, thus escalating the cost to administer the ABC system and compounding the "fog factor" of the average user who was attempting to use this system to make everyday decisions. In too many cases, the answer from a complicated ABC system to the questions, "Should I make?" and "Should I buy?," was "It all depends." Although this may be the technically correct answer in a given situation, it is not very useful to the everyday user.

In the early nineties, many people became fed up with sorting through the hundreds of cost drivers, which in itself became the biggest non-value added activity. With the implementation of ABC/ABM becoming so complex and costly, the viability of the concept was questioned.

A NEW SOLUTION

In this article, a compromise solution is proposed which circumvents both pitfalls. It avoids the mistake of using *only* the "peanut butter" approach of allocating all indirect fixed costs by a single cost driver (e.g., direct labor or machine hours). Moreover, it avoids the mistake of identifying hundreds of cost drivers and activities, which becomes too costly, complex, and difficult to maintain.

This approach is called volume adjusted costing (VAC), which, in a nutshell, has only two components: a well maintained standard cost system coupled with a mathematical adjustment to each part's overhead cost based on annual volume. High volume parts are rewarded, low volume parts are penalized. VAC is easy to understand and implement, inexpensive to maintain, and yet provides a powerful tool for strategic business decisions.

AN ILLUSTRATIVE CASE

One of the authors of this paper was the cost accountant at John Deere Horicon (JDH) from 1976 to 1986. From 1979 to 1980, VAC was the cost procedure introduced at JDH by Deere and Co. Corporate Accounting. In the following years of historic growth and profits at Horicon, the author believes VAC was the single most important change that occurred at JDH. For example, one year after VAC was accepted as the "official" standard, low volume snowmobiles were moved out of Horicon because it became painfully evident that the real cost of some of the snowmobiles was higher than the retail list price. A year later, the low volume "Tiller" and "Blade" attachment product lines were cut, along with many other low volume service parts.

As a result of moving out these low volume products, room was made for the high volume lawn tractor and rider family lines. The VAC system helped maintain the decision focus on this high volume strategy, which in turn helped Horicon become the leader in the lawn and garden industry.

Changing Systems

If VAC worked so well, why did Deere introduce ABC costing in

1987 as stated in the most used ABC costing case at Harvard?[1] There are at least two major reasons.

First, the official reason would probably be a desire for improved information for low volume decision making. The rationale was likely that volume adjusting had been a good beginning and worked well for high volume production, but if volumes were lower (such as in the Waterloo Tractor Works), there is a need for multiple cost drivers to help make decisions between low volume alternatives. (However, as will be shown in more detail below, a well-maintained standard cost system with volume adjusting will still provide the correct strategic answer even in low volume situations. High volume and low volume are relative within a cost center.)

A possible second, and unofficial, reason was the age-old lure of "more must be better" thinking. In other words, if adjusting by one cost driver (such as volume) works well, then adjusting by twenty cost drivers must be twenty times better.[2]

BELIEVABILITY AND UNDERSTANDABILITY

This "more must be better" logic behind proliferating cost drivers ignores two critical issues: believability and understandability. Users must both believe and understand the results provided by the system. As explained later, the great numbers of cost drivers used in an ABC system reduce both the believability and understandability of the data it delivers. However, VAC results are both believable and understandable:

Believability. On its own, VAC is a very down-to-earth, commonsense adjustment to standard costing. Most people intuitively believe that high volume parts must cost less per part to produce than similar low volume parts.

When there are twenty different cost drivers, all the explanations just start to sound like excuses.

Understandability. The cost adjustment process used in VAC is very logical, predictable, and easy to understand. It is a mathematical equation. One may not like the results, and may even disagree with them, but at least the calculation of the costs was understandable, and thus, affords an opportunity to fix these results next time (e.g., use more common high volume parts in the design). In other words, the end user—the decision maker—can understand the rules of the cost system and can plan accordingly.

PROBLEM COST DRIVERS

The stated problem with ABC costing is its complexity and inexactness. Most of the cost drivers used in ABC costing are based on opinion, and there are wildly divergent opinions on how almost every cost driver is calculated and allocated. This is especially evident when trying to explain to a hostile audience (whose latest design just went way over budget), why two similar parts have radically different costs. When there are twenty different cost drivers, all the explanations just start to sound like excuses.

The following is a partial list of cost drivers commonly used in ABC systems and the questions or problems that surround each one:

Part Number. What is the cost of a part number? Is it internal to manufacturing? Is it for Service? Or is it only needed for internal inventory tracking? Does this part number result in a new physical part or just an additional level? What is the cost of a new assembly made up entirely of current production parts? How much will it add to the bottom line if this part number is not added?

Process a Purchase Order. How much does it cost to process a purchase order? Is it different for a low volume service part versus a high volume current production part?

Supervisor Time. Where do your supervisors or expeditors spend most of their time? With everyday high volume parts or with low volume parts that run infrequently? Is that time spent disproportionately to the quantities produced? Does your cost system reflect this disproportionate time spent?

Service Run. How much does it cost to break into a production run for a quick service run? How do you assign this cost? Does the Service part get charged for both the Setup IN and OUT? Should it? Do you have accurate setup costs? Do you run consistent batch sizes? Where do you charge down time?

Common Parts. Why should one use common parts? Where is the cost reward if this is such a good idea?

Material Handling. What is the cost of material handling per part? Does it really make a discernable cost difference if a part is moved ten feet or twenty feet or fifty feet? Is it worth the effort to define? Do you always move the same quantities? If so, are there any exceptions? Even on low volume service orders? Do low volumes cause a problem in the warehouse where one part occupies a bin that could hold 1,000 parts? Can ABC define this cost? Is it worth the effort with volumes always changing?

Service Order. What is the fixed cost to process a service order? What is the variable cost? Are there consistent service order quantities? Is the high volume manufacturing facility processing low volume service parts? When is it appropriate to say "No?" Define low volume.

An End Model. What is the cost of an end model? What engineering cost gets assigned to the end model and what gets assigned to the parts used on the end model? Does it make a difference if it is totally new or just "new and improved"?

A New Model. How much does it cost to introduce a new model? How much does it cost not to introduce a new model? Can the business continue if new products are not introduced?

Engineering. What is the cost of Engineering per part? Is it a brand new, "clean-sheet-of-paper" design? Or is it a slight variation of a current production part? Should you charge Engineering cost for each level of the part? What if it has a casting part number, a machining part number, or a separate part number for paint? Is that not charging the part three times for engineering compared to if one buys it complete from a supplier? Does it "backfit?" Does it cover old service requirements? Is credit given for service parts eliminated?

If ten different accountants were asked these questions, one would get ten different cost numbers for every one of these cost drivers and probably ten different methods on how each one should be allocated.

anything unless they believe and understand the system and its rationale.

ANNUAL VOLUME AND BUY IN

There is only one cost driver that does not generate an argument: Annual Volume. That is because Annual Volume is not an opinion; it is a fact.

The problem with all the other cost drivers is that each really does depend on the circumstances, but a hostile audience does not want to hear how difficult it is to allocate costs. They just want to know why their pet project just got cancelled. After listening to a long, complex explanation about the effect of all these cost drivers on the cost of their parts, most hostile listeners simply say "Bean counters! Whatever!" and go ahead and do what they believe is correct despite what an ABC cost system may tell them.

They are not just stubborn. Rather, they do not understand how to win at this game because the rules seem to keep changing. They will not alter their future behavior because they do not believe or understand the costs calculated by an ABC cost system. People do not "buy in" to anything unless they believe and understand the system and its rationale. Buy in among users is the biggest benefit to be gained by VAC.

Once the decision-makers believe and understand the logic behind volume adjusting, they do change their behavior. The results of their attitude change are a top ten list of best business practices:

1. Part commonality
2. Fewer service parts, lower service inventory
3. Lower WIP inventory
4. Outsourcing the manufacture of low volume parts
5. Better utilization of existing equipment and less downtime
6. Fewer setups and longer production runs
7. Emphasizing core competencies
8. Natural focus on the 80/20 Rule (i.e., 80 percent of the profits are from 20 percent of the products)
9. Less complexity on the manufacturing floor
10. Simplification

STEPS TO VAC

As discussed earlier, VAC differs from traditional standard costing by an additional calculation that credits high volume parts and debits low volume parts in such a way that the total budgeted overhead assigned is still the same. The following are the steps required in the volume adjusting process:

Step One. The standard cost calculation process remains the same. The budgeting process and the standard overhead rate calculation is unchanged. The standard cost per part is calculated using the normal overhead allocation methods.

Step Two. An experience curve must be determined for each process. A 90 percent experience curve is suggested for an average manufacturing process. Thus, there would be a 10 percent decrease in overhead cost for any part that has an annual volume that is double the average volume for that process.

A different experience curve can be chosen for each process;

EXHIBIT 1
VA Proration Adjustment Example

Similar Brackets In the Same Cost Center	Vol. Adj. % Annual Volume	Standard Overhead	Vol. Adj. %Change to Overhead Cost	Primary Vol. Adj.% Overhead Cost	Final Vol. Adj. OH Cost after Cost Diff. Proration
A	5,000	$ 1.00	- 10%	$ .90	$ .936
B	3,750	$ 1.00	- 5%	$ .95	$ .988
C	2,000	$ 1.00	+ 4%	$ 1.04	$1.082
D	1,725	$ 1.00	+ 6%	$ 1.06	$1.102
E	25	$ 1.00	+ 86%	$ 1.86	$1.934
Total OH Absorbed	$12,500	$12,018		$12,498	
Total Volume =	12,500				
Average =	2,500				

perhaps 75 percent or 80 percent for a process requiring long, expensive setups or perhaps only 95 percent for a process requiring very little extra setup, such as a cleaning process. With experience, each cost center, with the help of a cross functional team, can develop the correct formula for volume adjustment based on the center's experience, the complexity of the process, and the variances in the volume of products.

Step Three. The standard overhead cost by operation for each part is adjusted based on a comparison of the individual part's annual volume with the average part volume in each manufacturing process. This is the Primary Volume Adjusting calculation.

For example, using a 90 percent experience curve, if an individual part's volume is half the average for that cost center, the computer will add 10 percent to the part's standard overhead cost for that operation. An additional 10 percent will be added for each halving of volume.

Of course, the opposite is true if the part's volume is higher than the average for that process. In that case, there will be a 10 percent decrease in overhead cost for any part that has an annual volume that is double the average volume for that process. Another 10 percent will be subtracted for each additional doubling of volume.

Step Four. Total Overhead Proration Adjustment. The total overhead assigned before the volume adjusting and after the Primary Volume Adjusting will not be exactly the same In fact, using the basic VAC formula described above, it would be mathematically impossible—especially if one has volume extremes—to have the same assigned overhead.

For example, in a cost center of only two parts, "X" with a volume of 4,900 and "Z" with a volume of 100, if the VAC formula is applied as described above, 10 percent would be deducted from all 4,900 of the "X" parts and 61 percent would be added to the 100 "Z" parts. Obviously, this will not absorb all the original overhead assigned.

This difference is corrected by an adjusting calculation made during the budgeting process to prorate this difference equally to all parts in the cost center. Exhibit 1 is a simplified example of the VA proration adjustment.

In Exhibit 1, the Proration adjustment required was 4.0 percent, the results of which are shown in the final column. This is simply a mathematical adjustment that must be made separately for each cost center to assure complete overhead absorption.

AFTER THE ANALYSIS

Just a few comments about the final Volume Adjusted costs in Exhibit 1. The high volume part (A) was rewarded with a nice ($ .06) cost decrease. Depending on the retail markup, this could end up with a ($ .10) to ($ .20) retail cost decrease. The Sales Department could certainly sell a few more with a ($ .20) price decrease on their best seller. This, of course, would increase overall volume, which should result in lower fixed overhead next year for every part in the cost center; a nice positive upward spiral.

For the low volume part (E), perhaps before volume adjusting, purchasing could not find any outside job shop to work on this because the accounting department did a "Make versus Buy" analysis and would not let it go out for a cost increase, because no one could beat the Standard Cost of $1.00. Now, with VAC analysis, purchasing should be able to find an outside supplier at $1.93. Manufacturing can then avoid all the problems (and hidden costs) that