Better Information through the *Marriage* of ABC and Traditional Standard Costing Techniques

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Traditional standard costing and variance analyses have been subject to a great deal of criticism within academic circles, although they are used in industry. The purpose of this article is to introduce a set of improved standard costing techniques that provide additional relevant information for decision making within the contemporary manufacturing environment that is not provided by traditional standard overhead cost analysis.

Standard costing has been criticized for being inflexible, motivating excess production, and failing to provide meaningful information on a timely basis. Although many academics see standard costing as an outdated technique designed for smokestack industries, a marriage of activity-based costing (ABC) and traditional standard costing techniques can provide relevant information within the contemporary, overhead-intensive manufacturing environment.

Few would argue that traditional standard costing and variance analyses fail to provide relevant information on costs that truly change with the number of units produced, such as direct materials and variable direct labor cost. Traditional standard costing and variance analyses, however, have severe limitations when used to analyze overhead costs. Given the increasing importance of overhead cost and the fact that the limitations of traditional standard costing arise primarily in the calculations and interpretations of the overhead variances, this discussion will be restricted to the analysis of overhead.

The most detailed overhead information provided by traditional standard costing techniques, as outlined in popular cost accounting texts, can be summarized as follows:

Variable Overhead Efficiency Variance—The variable overhead efficiency variance is calculated as the difference between the actual usage and the allowed usage of the assigned cost driver, given actual output levels, multiplied by a standard rate per cost driver unit. Unfavorable variances arise when more units of the cost driver are used than would be expected, given actual output level.

Variable Overhead Spending Variance—The variable overhead spending variance is calculated as the difference between the actual cost and the expected cost of variable overhead, given the actual usage of an assigned cost driver, such as production hours, labor hours, or labor dollars. Unfavorable variances arise when overhead spending exceeds expectations after controlling for the actual cost driver level.

Production Volume Variance—The production volume variance is the difference between applied fixed overhead and budgeted fixed overhead. This variance arises when actual output volume differs from the expected output volume. Unfavorable variances arise when actual output volume is less than budgeted output volume.

Fixed Overhead Spending Variance—The fixed overhead spending variance is the difference between actual fixed overhead and budgeted fixed overhead. Unfavorable variances arise when actual fixed overhead cost is greater than budgeted fixed overhead cost.[1]

ABC Molding Company

The ABC Molding Company is an example of both the limitations of traditional standard overhead variance information and the improvements that can be gained by incorporating ABC techniques into the calculations. For the purposes of simplicity and clarity, consider a single injection molding machine and a single operator. The machine and operator are capable of producing 125 parts per hour, or 1,000 parts per eight-hour shift, when operating at full capacity. Although theoretical production over 20 eight-hour shifts should yield 20,000 parts per month, the expected production for the test month was 18,000 parts—after allowing the operator to perform two setups expected to require eight hours each.

There are three components of overhead costs: the cost of the operator, the cost of indirect materials (cleaning solvent), and the cost of utilities (electricity). The operator sets up the machine to produce various parts and then monitors the machine during production runs. Cleaning solvent is used as part of each setup, and electricity is consumed primarily during production runs.

The actual production in the test month was 16,000 parts. The operator performed four setups and worked a total of 160 regular hours and 10 overtime hours. The operator monitored the machine for 120 production hours and spent the remaining 50 hours performing the four setups. See Table 1 for comparisons.

The Limitations of Traditional Standard Overhead Costing Variance Analysis

If all three overhead items were treated as unit-level variable costs, traditional standard overhead cost variance analysis would allow 128 production hours (16,000 parts / 125 parts per production hour) and 14.2 setup hours (16,000 parts @ one setup for each 9,000 parts = 1.78 setups @ eight hours per setup).

The variances based on traditional standard variable overhead analysis are presented in Table 2. The flexible budget amounts are presented in the far right-hand column. The actual costs are presented in the far left-hand column. The expected overhead costs based on the actual cost driver levels are presented in the middle column. In this example, assume that the information system is capable of tracking the number of setup hours and production hours separately. If this were not the case, the resulting information would be even more distorted than what is presented because the operator cost efficiencies, including both setups and production, would be combined in a single number.

These results illustrate how treating batch-level costs (setup costs) as unit-level variable costs can distort and conceal information within the tradition-

Table 1

ABC Molding Company Budgeted Information for Test Month

Operator:	(20 shifts @ 8 hours per shift @ $20 per hour)	$ 3,200
Cleaning Solvent:	(2 setups @ 6 gallons per setup @ $48 per gallon)	576
Electricity:	(100 kilowatts hours per production hour	
	@ $0.06 per kilowatt hour = $6 per production hour)	
	(144 production hours @ $6 per production hour)	864

ABC Molding Company Actual Information for Test Month

Operator:	(170 hours @ $21 per hour)	$ 3,570
Cleaning Solvent:	(16 gallons @ $60 per gallon)	960
Electricity:	(16,800 kilowatts hours @ $0.07 per kilowatt hour)	1,176

Table 2: Variances Based on Traditional Standard Variable Overhead Cost Analysis

(Flexible budget amounts are based on the actual production level: 16,000 parts.)

	Actual Cost	Traditional Spending Variance	Expected VMOH@ Actual Cost Driver Level[a]	Traditional Efficiency Variance	Flexible Budget[b]
Operator Cost Production Hours	$2,520	$120 U	$2,400	$160 F	$2,560
Operator Cost Setup Hours	$1,050	$50 U	$1,000	$716 U	$284
Solvent	$960	$192 U	$768	$256 U	$512
Electricity	$1,176	$456 U	$720	$48 F	$768

Notes: VMOH—Variable Manufacturing Overhead

[a]**Expected VMOH @ Actual Cost Driver Level Calculations:**

120 production hours @ $20 per hour = $2,400

50 setup hours @ $20 per hour = $1,000

16 gallons @ $48 per gallon = $768

120 production hours @ 100 kilowatts hours per production hour @ $0.06 per kilowatt hour = $720

[b]**Flexible Budget Calculations:**

16,000 parts @ 125 parts per production hour @ $20 per hour = $2,560

16,000 parts @ 1 setup per 9,000 parts @ 8 hours per setup @ $20 per hour = $284

16,000 parts @ 1 setup per 9,000 parts @ 6 gallons per setup @ $48 per gallon = $512

16,000 parts @ 125 parts per production hour @ 100 kilowatts hours per production hour @ $0.06 per kilowatt hour = $768

Table 3: Variances Based on Traditional Standard Fixed Overhead Cost Analysis

(Applied fixed overhead amounts are based on the actual production level: 16,000 parts.)

	Actual Cost	Traditional Spending Variance	Budgeted FMOH[a]	Production Volume Variance	Applied FMOH[b]
Operator Cost Setup Hours	$1,050	$730 U	$320	$36 U	$284
Solvent	$960	$384 U	$576	$64 U	$512

Notes: FMOH—Fixed Manufacturing Overhead

[a]Budgeted FMOH Calculations:

2 setups @ 8 hours per setup @ $20 per hour = $320

2 setups @ 6 gallons per setup @ $48 per gallon = $576

[b]Applied FMOH Calculations:

16,000 parts @ $0.0178 per part ($320/18,000 expected output) = $284

16,000 parts @ $0.0320 per part ($576/18,000 expected output) = $512

al efficiency variances. While the favorable efficiency variances correctly reflect the efficiencies obtained by producing 16,000 parts in eight fewer hours than expected (120 hours versus 128 hours), the efficiency variances associated with the two batch-level costs are highly distorted. The $768 unfavorable operator efficiency variance results from performing 2.22 extra setups (four setups versus the allowed 1.78 setups, given actual production) and from using more hours than expected to perform the four setups (50 hours versus 32 hours, four setups @ eight hours per setup). The $256 unfavorable efficiency variance associated with the solvent results from performing the 2.22 extra setups, and it hides the fact that each setup was performed with less solvent than expected (16 gallons versus 24 gallons, four setups @ six gallons per setup). These efficiency variances conceal the true efficiencies/inefficiencies. Treating batch-level costs as unit-level costs results in an unrealistic expectation of partial setups, and it unrealistically treats extra setups, which may have had legitimate business motivation, as inefficiencies. The unfavorable solvent efficiency variance and unfavorable solvent spending variance conceal the fact that solvent cost per setup was actually less than expected. These limitations may prevent management from investigating an important factor: whether the more expensive solvent ($60 per gallon versus $48 per gallon) led to the $48 per setup savings because less solvent was needed to perform each setup than had been expected (four gallons per setup versus six gallons per setup).

The second source of concealed information resulting from the traditional variances presented in Table 2 lies within the spending variance associated with electricity cost. Although this cost is a true unit-level variable cost, the $456 unfavorable electricity spending variance conceals the fact that this variance is caused by two separate factors. It arises from an increase in the price of electricity ($0.07 per kilowatt hour versus $0.06 per kilowatt hour) and by the fact that the machine consumed 4,800 more kilowatt hours than would be expected, given the hours of operation (16,800 kilowatt hours versus 12,000 kilowatt hours, 120 hours @ 100 kilowatt hours per production hour). Failing to separate these two factors may preclude management from addressing a problem that could be corrected easily (the electrical efficiency of the molding machine) because it is hidden behind a problem that may be outside management control (utility prices).

A separate set of limitations that arises when batch-level costs (operator setup cost and solvent setup cost) are treated as fixed-overhead cost is presented in Table 3. The amount of each fixed-overhead item that would be applied to production based on actual output level is presented in the far

Table 4: Variances Based on ABC Standard Overhead Cost Analysis—Unit-Level Overhead Cost

(Flexible budget amounts are based on the actual production level: 16,000 parts.)

	Actual Cost	ABC Spending Variance	Expected Overhead @ Actual SCD Level[a]	Second-Level Cost Driver Efficiency Variance	Expected Overhead @ Actual BCD Level[b]	Basic Cost Driver Efficiency Variance	Flexible Budget[c]
Operator Production Hours	$2,520	$120 U	NA	NA	$2,400	$160F	$2,560
Electricity	$1,176	$168 U	$1,008	$288 U	$720	$48 F	$768

Notes: BCD—Basic Cost Driver—The basic cost drivers are the level of basic input allowed given the actual output level. An example of a basic cost driver level is production hours.

SDC—Second-Level Cost Driver—The second-level cost drivers are the second level of input, given the basic cost driver level. An example of a second-level cost driver is the amount of electricity consumed by each production hour.

[a]Expected Overhead @ Actual SDC Level Calculations:

16,800 kilowatt hours @ $0.06 per kilowatt hour = $1,008

[b]Expected Overhead @ Actual BCD Level Calculations:

120 production hours @ $20 per hour = $2,400

120 production hours @ 100 kilowatt hours per production hour @ $0.06 per kilowatt hour = $720

[c]Flexible Budget Calculations:

16,000 parts @ 125 parts per production hour @ $20 per hour = $2,560

16,000 parts @ 125 parts per production hour @ 100 kilowatt hours per production hour @ $0.06 per kilowatt hour = $768

right-hand column. The actual overhead costs are presented in the far left-hand column, and the fixed-overhead budget amounts are presented in the middle column.

Both unfavorable production volume variances arise from producing 2,000 fewer parts than expected. The limitations arise from combining the results of legitimate business decisions (number of setups), true efficiency information (number of hours and gallons per setup), and price information (cost per operator hour and cost per gallon) into the traditional spending variances. While treating these as fixed costs no longer results in an unrealistic expectation of partial setups, the resulting spending variances do not produce useful information for decision making because several, possibly opposing, factors are reported as a single number. The $730 unfavorable spending variance associated with the cost of the operator performing setups arises from performing two extra setups, using excess hours to perform each setup (50 hours versus 32 hours, four setups @ eight hours per setup), and operator costs that are one dollar per hour above expectations ($21 per hour versus $20). The $384 unfavorable spending variance associated with the solvent cost arises from performing two extra setups, using less solvent than expected (16 gallons versus 24 gallons, four setups @ six gallons per setup), and from paying more than expected for each gallon of solvent ($60 per gallon versus $48 per gallon).

ABC Standard Overhead Analysis

The variances produced by combining ABC and traditional standard costing techniques are presented in Tables 4 and 5. The analysis of the two unit-level variable costs are presented in Table 4, and the analysis of the two batch-level costs are presented in Table 5. These results illustrate the ability of these more refined variances to overcome the limitations we have discussed and demonstrate the ability of these variances to produce valuable information for decision making.

The analysis of the operator cost associated with production demonstrates that limitations of the traditional techniques do not extend to the unit-level variable cost that is driven by a single, basic cost

Table 5: Variances Based on ABC Standard Overhead Cost Analysis—Batch-Level Overhead Cost

(Flexible budget amounts are based on the actual production and setup levels: 16,000 parts and 4 setups.)

	Actual Cost	ABC Spending Variance	Expected Overhead @ Actual BCD Level[a]	Basic Cost Driver Efficiency Variance	Batch-Level Flexible Budget[b]	Batch Size Variance	Unit-Level Flexible Budget[c]
Operator Setup Hours	$1,050	$50 U	$1,000	$360 U	$640	$356 U	$284
Solvent	$960	$192 U	$768	$384 F	$1,152	$640 F	$512

Notes: BCD—Basic Cost Driver—The basic cost drivers are the level of basic input allowed given the actual output level. An example of a basic cost driver level is production hours.

[a]Expected Overhead @ Actual BCD Level Calculations:

50 hours @ $20 per hour = $1,000

16 gallons @ $48 per gallon = $768

[b]Batch-Level Flexible Budget Calculations:

4 setups @ 8 hours per setup @ $20 per hour = $640

4 setups @ 6 gallons per setup @ $48 per gallon = $1,152

[c]Unit-Level Flexible Budget Calculations:

16,000 parts @ 1 setup per 9,000 parts @ 8 hours per set up @ $20 per hour = $284

16,000 parts @ 1 setup per 9,000 parts @ 6 gallons per setup @ $48 per gallon = $512

driver (production hours). Both the traditional and ABC analysis result in a $160 favorable efficiency variance due to spending fewer hours on production than expected and a $120 unfavorable spending variance because the operator cost exceeded expectations by one dollar per hour.

In contrast, the other unit variable cost—electricity—demonstrates the advantage of the more refined analysis when a single variable overhead cost is driven by both a basic cost driver (production hours) and a second-level cost driver (hourly electrical consumption). By monitoring the number of production hours and the consumption of electricity, this analysis separates the cost reduction gained by producing 16,000 parts in fewer hours than expected ($48 favorable basic cost driver efficiency variance) from the cost resulting from consuming more electricity than expected for 120 production hours ($288 unfavorable second-level cost driver efficiency variance) and from the cost of paying more for each kilowatt hour than expected ($168 ABC unfavorable spending variance). These variances provide information that allows management to concentrate their efforts on factors that could improve company performance. They can explore the reasons behind the basic cost driver efficiency, such as why the operator was able to produce more than 125 units per production hour during the test month, and determine if these efficiencies could be repeated in subsequent months and/or carried over to other operators and shifts. They could also determine the reason for the inefficiency of the second-level cost driver, electrical consumption, and determine if this could be corrected.

Analysis of the two batch-level costs presented in Table 5 reveals the importance of calculating variances based on flexible budgets based on the number of parts produced and on the number of batches produced. The batch size variances ($356 unfavorable and $640 unfavorable) highlight the fact that the setup cost per part increases when parts are produced in smaller batches (4,000 parts per batch versus an expected 9,000 parts per batch). These variances could result from inefficiencies (inefficient scheduling) or from legitimate business considerations (meeting specific customer demands). Having these separate dollar amounts allows management to either address the inefficiency or calculate the true cost of meeting customer demands.

True efficiency variances result from calculating a basic cost driver variance as the differences between the number of hours consumed by the four setups versus the number of hours expected to perform four setups, and between the number of gallons of solvent consumed by the four setups versus the number of gallons expected to be consumed by four setups. The $360 unfavorable operator cost variance arises because 18 more hours than expected were used to perform the four setups (50 hours versus 32 hours, four setups @ eight hours per setup). The $384 favorable second-level solvent cost efficiency variance arises because eight fewer gallons of solvent than expected were used to perform the four setups (16 gallons versus 24 gallons, four setups @ six gallons per setup). This analysis also results in spending variances that are strictly related to prices. It reveals a potential savings to the company if management can determine that the more expensive solvent was responsible for the decreased consumption. Although the actual cost per gallon of solvent was higher than expected, the solvent cost was $48 per setup less than expected ($240 per setup versus $288 per setup, four gallons @ $60 per gallon versus six gallons @ $48 per gallon).

System Building Blocks

The simple examples described in this article lay the groundwork for marrying ABC and traditional standard-costing techniques to produce more useful information for managing contemporary manufacturing processes. The examples demonstrate that as manufacturing becomes more overhead intensive, the information limitations of variances produced by traditional analysis become more severe, and, therefore, the techniques described become more valuable.

This marriage of techniques does not represent the ultimate sophistication in overhead analysis, but it does represent the basic building blocks of a system capable of producing more relevant, more sophisticated information. One obvious extension would be to calculate both basic and second-level cost drivers for batch-level overhead costs. A second extension could include situations where efficiency variances based on a third-level cost driver might be applicable. And a third extension could include flexible budgets based on the number of products produced to provide relevant information on product-level costs.

Finally, to take full advantage of these techniques, it will be necessary for companies to continually update the standard quantities and the standard prices of inputs. The standard production hours, standard setup hours, and standard prices for labor, indirect materials, and utilities must be reviewed constantly because of continual improvement, learning curves, and business environment changes. Variances contain relevant information only when the standards are reasonable and current. Similar to other activity-based costing (ABC) and activity-based management (ABM) analyses, the information produced by these techniques should help management focus on potential areas for significant cost reduction. After truly understanding the full cost of performing setups, the company may not only focus on correcting the current inefficiency but may be motivated to find ways to reduce the number of setups or the cost of each setup.

Like many other management accounting techniques, these refined variances require information. While traditional standard overhead costing variances could be generated with information on the number of parts produced, the number of hours worked, the operator cost, the indirect materials cost, and the utility cost, these techniques require additional information. While tracking additional information—such as monitoring utility consumption for each machine—may require improvements to existing information systems, we may find, in many cases, that this type of information is already being captured by contemporary, sophisticated information systems.

The true benefits of the techniques described are that, like traditional standard costing techniques, they have the potential to effectively and efficiently provide useful information for decision making. Once these techniques are put in place, they can provide low-cost monitoring and a low-cost means of identifying potential profit-increasing improvements. ■

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1 Charles T. Horngren, George Foster, and Srikant M. Datar, *Cost Accounting: A Managerial Focus*, Tenth Edition, Prentice Hall, Upper Saddle River, N.J., 2000, pp. 253-276.