Case 14-1: Pet Groom & Clean (PG&C)

David Green is considering his operating statement for 2013, which is displayed in the table below. David is the manager of store number 88, where he began as one of the staff 6 years ago, and through hard work has risen to become manager of the store. The operating report shows his budgeted performance for the year and the actual results, showing a net improvement of 9% over budget--$405. While his results are positive, the small improvement over the budget does not qualify David for the bonus program which awards a $3,000 bonus for store managers who improve their performance over that of the budget by 20% or more.

David manages one store in a 110 store chain of pet grooming stores owned by Pet Groom & Clean Company (PG&C). As for other PG&C stores, his store is open Monday through Saturday each week; the only service provided at the store is a service in which a pet, dog or cat, is groomed and cleaned, typically while the customer waits. The budgeted price for the service at the beginning of 2013 was $25. Budgeted variable costs were $2 for materials and $9 labor cost per service, as well as other variable costs of $1.50 per service. Materials are purchased by local store managers, and all staff are hired and supervised by the local store managers. Other budgeted and actual information for 2013 are shown in the table below.

David is an ambitious and hardworking manager, who has applied himself to the job and has looked for different ways to attract customers and to reduce costs. For example, he noticed that most of the company's customers brought their pets in on Friday, Saturday, and Monday, and the number of customers was significantly lower on Tuesday through Thursday. In fact, David budgeted that 80% of total demand for 2013 would be in the Friday-Monday period, and only 20% would be in the Tuesday-Thursday period. So at the start of 2013 David began a promotion that reduced prices on Tuesday through Wednesday to $18 in an effort to draw in more business during these three days. Also, noting the strong demand in the Friday-Monday period, David decided to increase the price during those days from $25 to $30. An experienced manager, David was able to manage labor costs so that staff were not idle, even on slow days; David scheduled the number of staff to meet the expected demand on each day, and because of his experience (and because his store encouraged appointments), his forecast of demand was usually quite accurate. Thus, labor cost is fairly treated as a variable cost for David's store. Labor costs consists of 3 staff who are budgeted to work 2,500 hours per year at a budgeted pay rate of $12 per hour, thus the total budgeted labor costs of $90,000 (= 3 × $12 × 2,500). Through his careful scheduling of staff, and his effective management style, Dave was able to save labor time so that each of the three employees worked only 2,250 hours in 2013.

Other expenses include training expenses -- each staff employee is expected to have at least 6 hours of training at the PG&C headquarters during the year; the local store is charged $250 per hour for this training. The local store manager determines the amount of training time for each staff. Other expense also includes advertising expense, which is controlled by the local managers; PG&C recommends that advertising should be about 1% of total sales. Service development is the cost of studying new products for use in the stores and for the study of potential new ways to improve the services provided at PG&C stores. Service development is charged to each store based on the allocation rule of 10% of store sales. Accounting, insurance costs, taxes, and management overhead (which includes store rent and manager's pay) are paid at the home office of PG&C and are allocated based upon a formula which combines store size, store sales, and the age of the store. Employee benefits accrue to staff at the rate of 20% of total pay. These benefit payments are contributed to a 401(k)-type retirement plan for each employee.

The result of David's promotional price for the Tuesday-Thursday period was successful, as total sales increased from 10,000 to 10,500 and the Tuesday-Thursday sales increased from 20% to 30% of total sales.

REQUIRED: From David Green's perspective, develop an analysis which explains your performance for the year ended December 31, 2013.

Pet Groom and Clean: Store Number 88		
Operating Statement	**Year Ended December 31, 2013**	
	Actual	**Budget**
Gross Sales	$ 277,200	$ 250,000
Less Variable Expenses		
Food	23,100	20,000
Labor	91,125	90,000
Operating Expenses	19,425	15,000
Total Variable Expenses	133,650	125,000
Net contribution	$ 143,550	$ 125,000
Other Expenses		
Training Expenses	2,750	4,500
Advertising	3,200	2,000
Service Development	27,720	25,000
Accounting and insurance	13,750	12,000
Taxes	7,500	6,500
Management overhead	65,500	52,500
Employee benefits	18,225	18,000
Total Other Expenses	138,645	120,500
Net Income	$ 4,905	$ 4,500

Reading 14-2: Redesigning Cost Systems: Is Standard Costing Obsolete?

By Carole B. Cheatham and Leo B. Cheatham, Professors at Northeast Louisana University.

SYNOPSIS: Since the early 1980s standard cost systems (SCSs) have been under attack as not providing the information needed for advanced manufacturers. In spite of its critics, SCSs are still the system of choice in some 86 percent of U.S. manufacturing firms.

This paper discusses the criticisms of SCSs that (1) the variances are obsolete, (2) there is not provision for continuous improvement, and (3) use of the variances for responsibility accounting result in internal conflict rather than cooperation. Updates for SCSs in the form of redesigned variances, suggestions for dynamic standards, and refocused responsibility and reporting systems are presented.

The compatibility of SCSs and its main competitor as a cost system, activity-based costing (ABC), is examined. The authors discuss when it is appropriate to use ABC or SCS or some combination of the two.

Since Eli Goldratt's (1983) charge that cost accounting is the number one enemy of productivity in the early 1980s, traditional cost systems have been under attack. Although Goldratt subsequently softened his stand to say that *cost* rather than accounting was the culprit (Jayson 1987), others were quick to jump on the bandwagon to condemn the cost systems in use. New systems were proposed of which the most popular was activity-based costing (ABC).

In spite of all the criticism, a 1988 survey shows 86 percent of U.S. manufacturers using standard cost systems (Cornick et al. 1988). A survey by Schiff (1993) indicates that 36 percent of companies use activity-based costing, but only 25 percent of those use it to replace their traditional cost system. It would seem that only about 9 percent (25 percent of the 36 percent) of companies are using ABC as their main system while the vast majority use a standard cost system (SCS).

This is not to say that traditional SCSs could not benefit from being updated. However, accountants in industry (as well as academia) seem unaware that a redesigned SCS can provide the information they need, and that updating their present system is an easier process than adopting a new system. The SCS is one vehicle of articulation among managerial, financial and operations accounting, and it is a *control* system while the candidates for its replacement typically are only cost *accumulation* systems.

In this article the major criticisms of SCSs are examined along with ways that the weaknesses can be remedied or ameliorated. The criticisms relate to the use of specific variances, the lack of provision for continuous improvement, and the fact that administration of the system results in internal competition rather than cooperation. The appropriate use of ABC systems in conjunction with SCSs is also discussed.

UPDATING THE VARIANCES IN AN SCS

Concerning the variables analyzed in an SCS, most criticisms center on the overemphasis on price and efficiency to the exclusion of quality. Other criticisms center on the use of the volume variance to measure utilization of capacity while ignoring overproduction and unnecessary buildups of inventory. In making such charges, critics fail to realize variance analysis is not "locked-in" to a particular set of variables. Standards are only benchmarks of what performance should be. The particular variables used can be changed as the need arises.

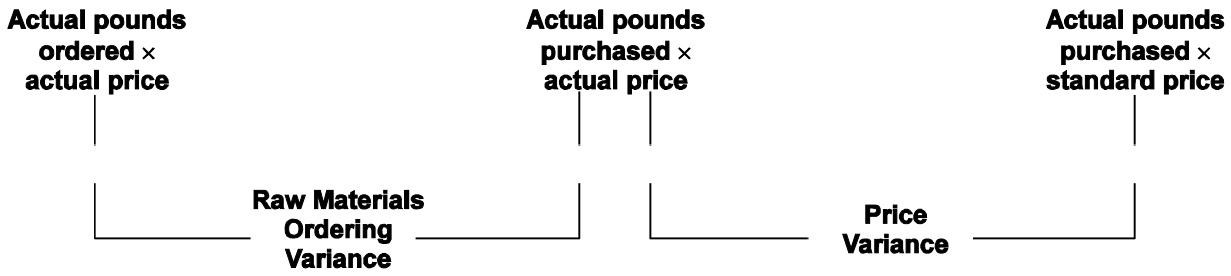
The following discussion focuses on concerns of the new manufacturing environment—raw material ordering and inventory levels, quality, production levels, finished goods inventory levels and completion of sales orders.

VARIANCES PERTAINING TO RAW MATERIALS

The set of variances in **Figure 1** centers on the function of raw material ordering and inventory levels (Harrell 1992). The Raw Material Ordering Variance gives information about the effectiveness of suppliers. It contrasts the raw materials ordered with the raw materials delivered (purchased). Any variation may be considered unfavorable because the goal is to have orders delivered as placed. Too much delivered will result in unnecessary buildups of raw material stocks. Too little delivered is unfavorable because production delays may result.

The Price Variance in **Figure 1** is the traditional price variance computed on materials purchased. This variance has been criticized on the grounds that over-emphasis on price leads purchasing managers to

FIGURE 1
VARIANCES RELATING TO MATERIAL PURCHASING



ignore quality. However, price is a legitimate concern that should not be overlooked. This system also uses a Quality Variance (presented in a following section). If low quality materials are purchased in order to gain a low price, this will result in an unfavorable Quality Variance.

VARIANCES PERTAINING TO MATERIAL INVENTORIES AND EFFICIENT USE

The set of variances in **Figure 2** focuses on raw material inventory levels and quantity or efficiency of material use.

The Raw Materials Inventory Variance (Harrell 1992) shows either more material purchased than used (an inventory buildup) or more material used than purchased (an inventory decrease). With the JIT philosophy, purchasing more than used causes an unfavorable variance, while decreasing previous buildups causes a favorable variance.

The Efficiency Variance in **Figure 2** is based on the difference between the actual pounds of material used and the standard amount for *total* production. The traditional Efficiency or Quantity Variance is the difference between the actual pounds of material used and the standard amount for *good* production. The traditional variance is actually as combination of quality and efficiency factors. As can be seen in the next section, quality is better treated in a separate variance.

VARIANCES PERTAINING TO PRODUCTION LEVELS AND QUALITY

The next set of variances (**Figure 3**) turns from input analysis to output analysis and relates to production levels and quality. All cost factors are included in the "standard cost per unit" including labor and overhead.

The Quality Variance is the standard cost of units produced that did not meet specifications (the difference between total units produced and good units produced). In traditional variance analysis, this variance is buried in the efficiency variances of the various inputs.

Ignoring labor and overhead, suppose a company used two pounds of material per finished unit at a standard cost of $1.00 per pound. Further assume they used 4,900 pounds in the production of 2,500 total units, of which 100 were defective. Traditional variance analysis would show an unfavorable Efficiency Variance of $100 computed on the difference between the standard cost of the 4,800 pounds that should have been used to produce the 2,400 good units and the 4,900 pounds actually used.

A better breakdown of the traditional variance shows a favorable Efficiency Variance of $100 and an unfavorable Quality Variance of $200. The Production Department did use only 4,800 pounds to produce 2,500 units that should have taken 5,000 pounds. The fact that some of these units were defective should appear as a Quality Variance, as it does in this analysis. The Quality Variance is $200 unfavorable representing $2.00 per unit invested in 100 defective units.

This analysis also yields a Production Variance based on the difference between the standard cost of good units produced and the scheduled amount of production. The goal in advanced manufacturing environments is to produce exactly what is needed for sales orders (scheduled production). A variance from scheduled production either way is unfavorable because too much production results in unnecessary buildups of inventory while too little results in sales orders not filled. As is the case with the Raw Material Inventory variance, the critical factor is the cost of the capital invested in excess inventories. It is desirable to highlight this cost in responsibility reports by applying a cost of capital figure. to the excess (Cheatham 1989).

For simplicity's sake, the above illustrations of input analysis pertain to materials. Labor and volume-related variable overhead can be analyzed in a similar manner. Since there is no difference between labor purchased and labor used in production, the labor input variances would include the traditional Rate Variance and the updated Efficiency Variance.

Other than showing a budget variance for the various elements of fixed overhead, there is no point in further analysis in terms of a Volume Variance. The updated Production Variance serves the same purpose in a far better fashion.

FIGURE 2
VARIANCES RELATED TO MATERIAL USAGE

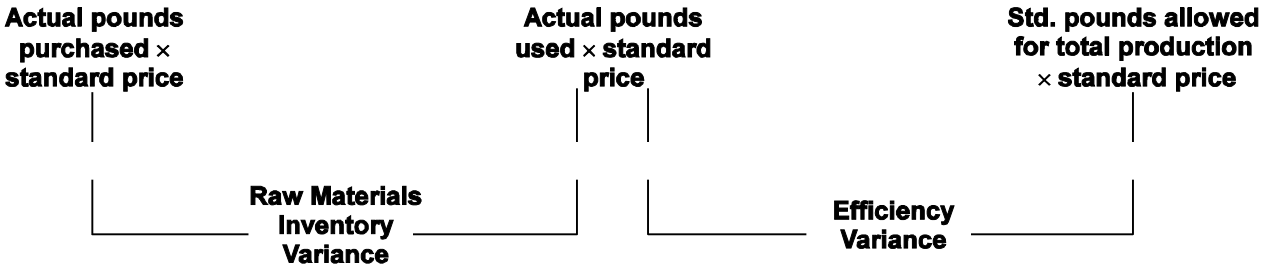
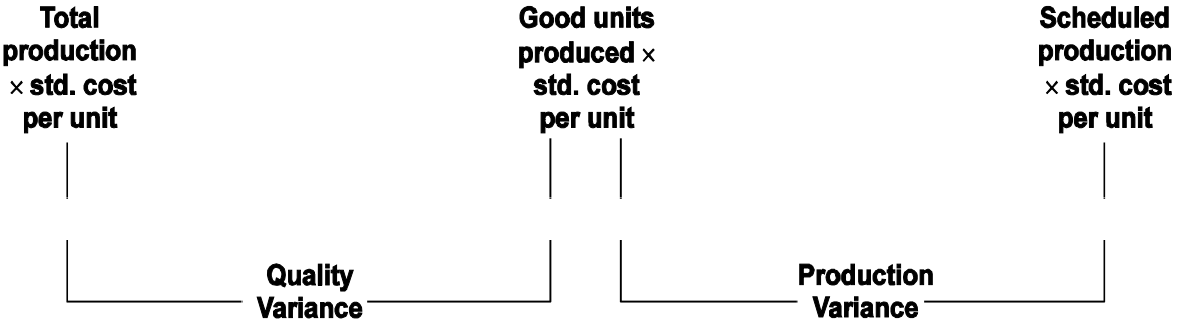


FIGURE 3
VARIANCES RELATED TO QUALITY AND PRODUCTION LEVELS



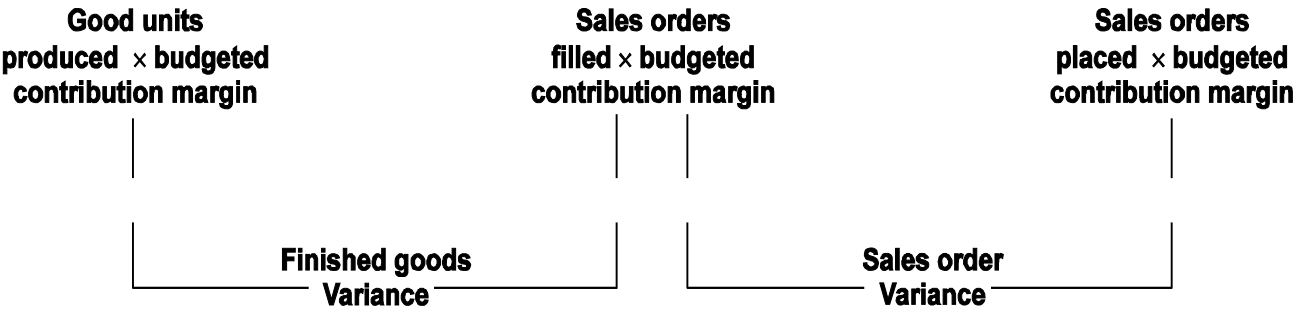
VARIANCES PERTAINING TO SALES ANALYSIS

There are various ways to analyze sales. One method is to use price, mix and volume variances. A further analysis is to break down the volume variance into market size and market share variances. The analysis in **Figure 4** is presented because it articulates well with the output analysis for production.

The sales variances indicate customer service as well as the cost of lost sales. The variances use budgeted contribution margin as a measure of opportunity cost. The Finished Goods Variance indicates the opportunity cost associated with orders completed but not shipped. A delay in shipment causes a loss because of subsequent delay in receiving payment. The Sales Order Variance represents the opportunity cost associated with sales orders that could not be filled during the time period for whatever reason—lack of capacity, scheduling problems, etc.

The above discussion presents a variety of variances that are not used in a traditional standard cost system. The variances can be used for control purposes alone or can be integrated into the financial accounting records (Cheatham and Cheatham 1993).

FIGURE 4
VARIANCES RELATED TO SALES



The system is not intended to be a generic solution for any company's needs. It is intended to demonstrate that, with a little creativity, it is possible to redesign SCSs to measure variables that are important to a particular company in today's manufacturing environment.

UPDATING THE SCS FOR CONTINUOUS IMPROVEMENT

In a manufacturing environment in which continuous improvement is a goal of most companies, the charge has been made that SCSs do not encourage positive change. However, static standards based on engineering studies or historical data are not an essential part of an SCS. Standards can be adjusted to be dynamic, or changing, by any of several methods.

USING PRIOR PERIODS' RESULTS AS STANDARDS

One way to have dynamic standards is to use last period's results as standards. This idea has been advocated in the past as a way for small business to have the benefits of standards without the expense of engineering studies (Lawler and Livingstone 1986; Cheatham 1987). The objection can be made that last period's results may not make very good standards if last period was unrepresentative for whatever reason. If this is the case, last period's results can be modified.

Another variation on using past performances as standards is the use of a base period. Comparisons can be made with the base period and all subsequent periods, if desired. Boer (1991, 40) describes a system of using a base year as a "pseudo flexible budget" from which unit costs are developed. He comments that the system "encourages continuous improvement and never implies that a level of performance is adequate. Instead, it encourages managers to improve continuously."

Still another variation on using prior periods' results as standards is the use of best performance-to-date (BP). BP is a rigorous standard for self-improvement because it motivates workers as well as managers to exceed all past performance.

USING BENCHMARKING

Although past performance costs may be used in a variety of ways to formulate dynamic standards, any such system has an inward focus. Benchmarking looks outside the firm to the performance of industry leaders or competitors. Benchmarking typically is applied to performance measures rather than standard costs. However, using the performance of industry leaders as a standard provides motivation to become world-class in much the same fashion.

The primary barrier to use of benchmarking standards is, of course, lack of information. Edward S. Finein (1990), former vice president and chief engineer of Xerox, lists the following sources of information when using benchmarking for performance measures: (1) external reports and trade publications; (2) professional associations; (3) market research and surveys; (4) industry experts; (5) consultants' studies; (6) company visits; and (7) competitive labs. In the absence of hard information, an approach may be taken to estimate the performance of industry leaders. Trying to meet the supposed standards of industry leaders (or other competitors) can have results that are useful as long as the company is striving toward beneficial goals.

USING MOVING COSTS REDUCTIONS

Still another way to have dynamic standards is through use of predetermined cost reductions. Horngren et al. (1994) describe a system of what they call a "continuous improvement standard cost" or a "moving cost reduction standard cost." This system reduces the standard cost by a predetermined percentage each time period, such as a one percent reduction in standard cost per month computed by setting the new standard at 99 percent of the previous month's standard.

The question that their system raises is how to determine the amount of the cost reduction. One

possibility is the use of cost improvement curves. Cost improvement curves are a new variation of the old learning curve idea. Learning curves were based on reduction of direct labor costs due to learning by the workers. With a large percentage of product conversion being brought about by automated equipment rather than laborers, potential cost reductions relate to the experience factor for the organization as a whole which may be measured by cost improvement curves.

Pattison and Teplitz (1989) calculate the new rate of learning for an organization that replaces labor with automated equipment as:

$$Rate_{new} = Rate_{old} + (1 - Rate_{old}) * L * R$$

where $Rate_{old}$ is the rate of learning for the old system, L is the proportion of learning attributed solely to direct labor stated as a percentage, and R is the proportion of direct labor being replaced. The formula actually reduces the learning rate applicable to labor only, the assumption being that workers can learn but not machinery. An updated version of the formula is needed which encompasses factors such as managers', supervisors' and engineers' experience.

The Japanese stress the formula 2V=2/3C, or if volume is doubled, the cost should be two-thirds of what it was originally. This formula equates to a 67 percent learning curve which represents a high degree of learning. However, their attitude is that learning does not just happen—it should be made to happen.

USING TARGET COSTS

Another idea borrowed from the Japanese is the use of target costs based on the market. Target costs are used in Japan primarily for new products that are still in the design stage. The idea is to set a cost that is low enough to permit a selling price that is viable on the market. The price is the starting point for calculating costs, and the various costs are backed out from the price. Typically, the target cost is very low. Hiromoto (1988) describes the use of target costs at the Daihatsu Motor Company. First, a product development order is issued. Then an "allowable cost" per car is calculated by taking the difference between the target selling price and the profit margin. Then each department calculates an "accumulated cost" based on the standard cost achievable with current technology. Finally, a target cost is set somewhere between the allowable and accumulated cost. All this takes place before the product is designed. The design stage typically takes three years. When the product is finally in production, the target cost is gradually tightened on a monthly basis. Later the actual cost of the previous period is used to drive costs down further.

Market-based target costs have a strong appeal on a basis for standard costs because they focus on the customer rather than on internal engineering capabilities. However, using target costs is easiest with new products because as much as 90 percent of product costs are set in the design stage (Berliner and Brimson 1988). The way a product is designed determines the way it has to be manufactured and sets the stage for further cost reductions.

Standard costs do not have to be static. Dynamic standards can be formulated using a variety of methods including past performance, industry leader's performance, or target costs based on predetermined reductions or the market. Market-based target costs have the most intuitive appeal because the focus is on the future and on the customer. However, they may work better for new products rather than for established products.

UPDATING MANAGEMENT RESPONSIBILITY AND REPORTING

Besides revamping the SCS to better reflect today's concerns in terms of variables to be measured and continuous improvement, there needs to be improved reporting of variances. Old reporting systems tended to foster internal competition and arguments about whose department was to blame for unfavorable variances. There needs to be an attitude of cooperation among workers, managers and departments.

Revised lines of responsibility used with new plant layouts are improving some of the competitive attitudes that once prevailed in manufacturing organizations. Plants that used to feature "push through" production with large masses of raw materials and semi-finished product moving from one process to another are changing to work cells or similar arrangements. The work cell arrangement features equipment that can process a product from start to finish. Workers in the work cell typically can operate all or several types of machinery. This leaner "pull through" approach allows a sales order to be rapidly processed within the work cell which decreases cycle time and holds work in process and finished goods inventories to a minimum.

The work cell arrangement allows a team of workers to be responsible for the entire product and reduces the likelihood that defects will be passed along to the next department. Along with the work cell arrangement many companies are decentralizing functions such as engineering and making these personnel responsible for a particular work area or product line. With the decentralization, there is more focused responsibility. Decentralization and a team approach to production eliminate many conflicts that once existed.

FIGURE 5
WORK CELL A
VARIANCE TRADE-OFF REPORT FOR MONTH OF JULY 19X6

Raw Materials:

	Price	Quantity	Total
Material X	100 F	200 U	100 U
Material Y	50 F	100 U	50 U
Material Z	200 F	150 F	350 F
Total	350 F	150 U	200 F

Labor:

	Rate	Efficiency	Total
Type A	400 F	200 F	600 F
Type B	550 U	250 F	300 U
Total	150 U	450 F	300 F

Traceable Overhead Variances:

	Spending	Efficiency	Total
Power	150 F	50 U	100 F
Supplies	100 U	10 U	110 U
Other	50 F	10 F	60 F
Total	100 F	50 U	50 F

Quality Variance on Dept. A Contribution to Product Cost	
100 Defective Units @ $7.00	700 U
Total	150 U

In addition to the new attitudes about responsibility, there needs to be improved reporting. The variances outlined in this paper can be reported in two types of management reports. The report illustrated in Fig. 5 shows the trade-offs between price, efficiency and quality. This type of report can be done on a plant level or department level as well as a work cell level. The price variance for work cells or departments should be computed on material used rather than purchased because this gives a better picture of the trade-offs involved. Upper-level management reports should probably show both types of price variances if there are significant differences between purchases and use.

The report illustrated in Fig. 6 shows the effects of variances related to inventories. Raw material excesses at cost, related to both current and past purchases, are listed along with the related cost of capital. In this case it is assumed the excess was held the entire month and the cost of capital was one percent. Work-in-Process excesses are measured in terms of the Production Variance. This variance measures the difference between scheduled and actual production. Presumably if there were excesses from the previous month, there was an adjustment made in the scheduled production. Cost of capital figures show the effect of holding these excess inventories.

In the case of Finished Goods, the crucial factor is the opportunity cost of sales orders not filled measured by the lost contribution margins. Therefore, if orders are completed but not shipped or there is an inability to fill a sales order because of lack of capacity, this is indicated by the Finished Goods Variance or the Sales Order Variance. The illustration assumes a favorable Finished Goods Variance because more sales orders were filled than units produced, indicating a decrease in previous finished goods stock.

Although a reporting system such as that illustrated in **Figures 5** and **6** may not eliminate all conflicts, it is certainly helpful to recognize that trade-offs occur. It is also beneficial for upper-level managers to see the cost of excesses or deficiencies in inventories measured in terms of lost contribution margins and cost of capital.

FIGURE 6
PROFITABLE MANUFACTURING COMPANY
EXCESS INVENTORY REPORT FOR MONTH OF JULY 19X6

	Cost	Cost of Capital
Raw Materials		
Excess from previous month	$5,000	$ 50
Current inventory variance	3,000 F	($ 30)
Total	$2,000	$ 20
Work in Process		
Cell A Production variance	$4,000 U	$ 40
Cell B Production variance	$1,000 U	$ 10
Total	$5,000 U	$ 50
Total Excess and Cost of Capital	$7,000 U	$ 70
Finished Goods:		
		Contribution
Finished goods variance	$ 5,000 F	$(1,500)
Sales order variance	8,000 U	2,400
Total	$ 3,000 U	$ 900
Total Cost of Capital and Lost Contribution Margins		$ 970

STANDARD COST SYSTEMS AND ABC

A final consideration in updating SCSs is how an SCS relates to ABC. Although ABC potentially has broader uses, it primarily has been used for manufacturing overhead.

When a company has a significant amount of indirect product cost, ABC results in better product costing because ABC is superior for allocating these costs among products. This permits company managers to more knowledgeably price products. However, ABC is a cost *accumulation* system rather than a cost *control* system. When used with process value analysis (PVA) or activity based management (ABM), ABC can have a cost *management* feature, but there is no day-to-day monitoring system to assure that costs are within certain parameters.

Most companies can benefit from some combination of ABC and an SCS. One possibility is use of ABC for indirect costs and an updated SCS for direct costs. Another possibility is use of an SCS for financial records and ABC for analysis of indirect costs outside the main record-keeping system. A combination of the two systems retains the advantages of the superior control features of an SCS with the benefits of better overhead analysis from ABC.

CONCLUSION

SCSs are not really the dinosaurs of cost systems, but they may benefit from a little evolution. Updated variances along with dynamic standards will vastly improve the usefulness of most SCSs. ABC can coexist with an SCS and bring some order to the general area of indirect costs. Improvements in the reporting of variances can allow managers to assess trade-offs and inventory stocks and their impact on profits.

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Reading 14-3: Can Variance Analysis Make Media Marketing Managers More Accountable?

by Ted Mitchell, Ph.D., and Mike Thomas, Ph.D.

Arguments and assumptions made more than 50 years ago essentially established how we calculate cost variances today. It is time to review the accuracy and relevance of our traditional calculations, especially as variance analysis moves into new fields, such as marketing, and new applications, such as using nonfinancial performance measures. Indeed, models appropriate for the paper and pencil world of a hands-on analyst in 1950 may be ready for improvements, especially given the widespread use of computers and database control systems today.

We will demonstrate the errors in the traditional cost variance formulas and propose a new set of equations for calculating variances using the Minimum Potential Performance Budget (MPPB) model. After showing how this new model correctly calculates cost variances in all four economic situations, we will apply it to an advertising campaign using the nonfinancial performance measures of reach and frequency. First, though, we will provide background information on the assumptions and explain why they have been generally accepted.

BACKGROUND

More than 75 years ago, Henry Maynard wrote about variance analysis, "It's essential value lies in the fact that it is a control system."[1] Fifty years ago, detailed discussions arose concerning the algebra, formulas, and calculations to use in practice when evaluating financial performance.[2] In 1997, Josef Kloock and Ulf Schiller revisited some of the criticisms regarding variance analysis when companies used it to help improve decision making and in assigning responsibility for performance evaluations.[3]

Assumptions in Variance Analysis

The basic premise of variance analysis is that larger variances are symptoms of larger control problems. The accuracy of variance calculations, however, hinges on two basic assumptions.[4] First, small errors due to the allocation of small joint variances should be of little concern, and, second, the conventional two-variance model (a price and quantity variance) provides the correct calculations in most practical cases.

Considering the first assumption, marketing settings are plagued with large joint variances and thus large potential calculation errors not often expected in traditional manufacturing cost applications. As for the second assumption, we will demonstrate that the conventional two-variance analysis (price and quantity) inflates variances in three of the four possible economic situations. We will also show that the normative three variance solution (price, quantity, and joint variances) is equally flawed. The traditional debate about the efficacy of the three-variance solution over the practical simplicity of the two-variance solution is made moot when we realize both are inaccurate.

To provide accurate, unbiased measures of the primary variances (price and quantity), we need a new method. The solution lies in the economic geometry behind variance analysis and is found in the Minimum Potential Performance Budget.

Reasons for the General Acceptance of the Two-Variance Solution

Apparently, two related causes led to the general acceptance of the traditional two-variance algebraic model taught in current management and cost accounting texts as well as in practice. One was the first Industrial Revolution and the Scientific Management strategy that organized work in the new capital-iintensive factories. The other was the emphasis on external financial reporting in the United States.

To support the development of large, capital-intensive factories during the first Industrial Revolution, companies needed significant investment capital, so top management desired information about investment efficiency. Because these investments were directed toward converting materials and labor into manufactured products, cost accounting systems evolved to provide detailed information about the manufacturing costs of products.

Due in part to the labor environment (i.e., a force that was not highly educated, that was willing to work for low wages, and that was highly motivated to work), Scientific Management became the dominant strategy for organizing work. Specifically, a company broke down value chain activities into tasks that were quickly and easily taught (e.g., shoveling coal) and created departments for controlling similar activities (e.g., welding or painting departments).

Through techniques such as time and motion studies, industrial engineers developed the "one best way" to perform each task, with performance standards (standard times and quantities) and measured variances from them logically following. Because each department was a functional silo operating independently from other departments, measuring efficiency through department cost variance reports dominated the cost accounting system (e.g., G.C. Harrison's 1918 set of equations for analyzing cost variances). Using cost variances to evaluate performance and motivate efficiency gains, the cost accounting system became the company's management accounting system.[5] Thus, the algebraic approach to variance analysis became the accepted pedagogy and practice, and its underlying geometric reality disappeared from our texts.

Through the interaction with a related cause (i.e., the U.S. emphasis on external financial reporting), the algebraic approach became entrenched. To raise the financial capital needed during the first Industrial Revolution, investors purchased stock in the manufacturing companies. Especially since the late 1920s and the American stock market crash, the investing public has demanded accountability for management's stewardship role, which came in the form of publicly available financial reports. Certified public accountants ensured report reliability through audits. To ensure that the financial statements were accurate, auditors required report articulation through a transaction-based financial accounting system following generally accepted accounting principles.

The result was the need for a product's "cost" to be verified objectively through a transaction-based journal entry recording system and, therefore, algebraic equations to calculate and journalize resource cost variances. Through journalized cost attaching, financial accountants could provide a fully absorbed product cost within a system that was simple to install and operate and that also was simple to understand.[6] Using the standard cost systems developed with Scientific Management, a simple two-variance solution and journalized cost variances became the accepted model.

To this day, traditional cost variance analysis supports Scientific Management and external financial reporting, reconciling budgeted and actual monthly earnings reports within an articulated set of external financial reports generated by a journal-entry-driven recording system.

The errors that result when standards are "loose" and joint variances are large, though, force a reconsideration of the two and three-variance models. When one reviews the geometry of budgeted and actual costs and their resulting variances, these errors become obvious, as does a new set of calculations solving this problem.

THE GEOMETRY OF VARIANCE ANALYSIS

The logic of variance analysis is to explore the impact from changes in one variable while holding the other variable constant. **Figure 1** illustrates the geometry. To understand the primary variances, imagine a rectangular clay tablet, A, with the length of one side representing the actual price and the length of the other representing the actual quantity. Tablet A's area represents the total actual cost and includes Areas 1 and 3 in **Figure 1**. A second clay tablet, B, represents the total budgeted cost (Areas 1 and 2).

Figure 1: Areas of Primary Variance

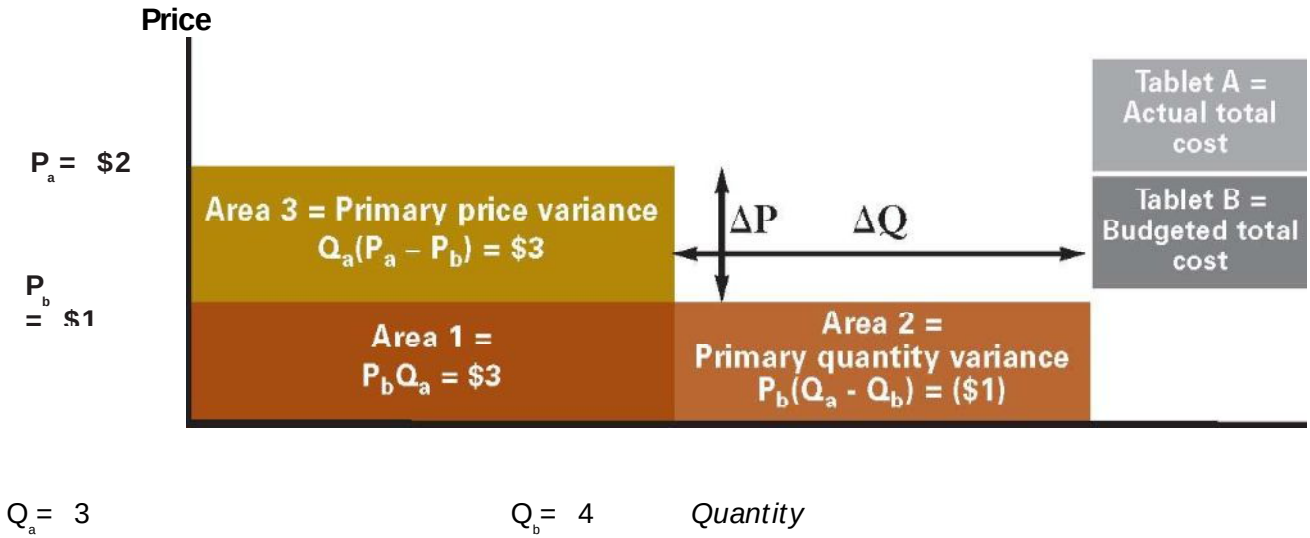
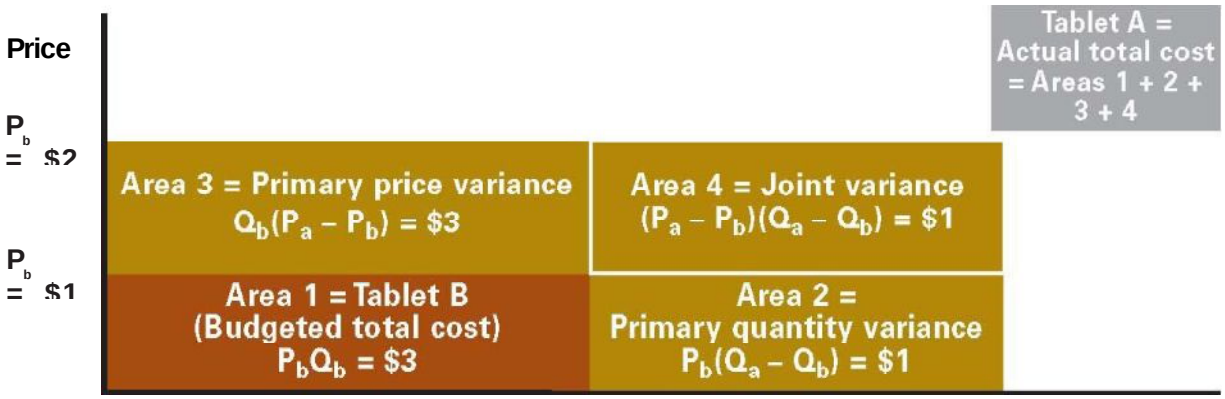


Figure 2: The Geometry of a Joint Variance



The two tablets overlap (Area 1). Area 2 is the primary quantity variance, and Area 3 is the primary price variance. In Figure 1, there is no residual or joint variance. The difference between the actual cost and the budgeted cost is equal to the sum of the two primary variances.

In Figure 2, actual cost is greater than budgeted cost. Area 1 represents the budgeted cost ($C_b = P_bQ_b$) and is like a tablet resting upon another tablet representing the actual cost. The sum of Areas 1, 2, 3, and 4 represents the actual cost, $C_a = P_aQ_a$. The difference between the two total costs, $C_a - C_b$, is the sum of areas 2, 3, and 4.

Area 2 represents the primary quantity variance, which is the change in cost caused by the change in quantity while holding price constant at P_b = \$1. Area 3 represents the primary price variance, which is the change in cost caused by a change in the purchase price when holding quantity constant at $Q_b = 3$.

In both Figures 1 and 2, Area 2 is the same primary quantity variance with the same magnitude, while Area 3 is the same price variance with the same magnitude. There is no difference in absolute values or primary variances. The primary variances provide the same magnitude of symptoms in Figures 1 and 2, and the only difference between the total variances is the joint or residual variance.

There is no joint variance in Figure 1, but, in Figure 2, Area 4 is needed to calculate the difference between actual and budgeted cost. It represents the joint variance and reflects the impact on cost of simultaneous or joint changes in both price and quantity. It is sometimes called the unexplained variance because it cannot be explained solely in terms of changes in a single attribute.

From a managerial point of view, the relative sizes of the primary variances are the diagnostic focus of variance analysis because they identify the impact of one change at a time. Of less interest is the joint or residual variance because it cannot be attributed to the change in a single variable.

The geometry in Figures 1 and 2 provides the basic logic and definitions used in the theory of variance analysis. An important feature of this geometry is that the size of each area remains constant regardless of a change in labels. That is to say, if the budgeted price, P_b, is relabeled to be the actual price, P_a, and vice versa, the size of the primary price variance remains the same, which we will explain later.

It is obvious from Figure 1 that there are situations in which a joint variance should not be calculated (as in the three-variance model) or included in one of the primary variances (as in the two-variance model). But there are some situations, as in Figure 2, in which a joint variance must be calculated when explaining the difference between budgeted and actual cost. Note that the geometrical definitions of the primary variances do not include the joint or residual variance.

ILLUSTRATIONS OF THE FOUR ECONOMIC SITUATIONS

Four situations are possible. Figures 4 through 7 illustrate each by beginning with the geometric solution followed by a three-variance solution, then the two-variance solution used in practice and taught in all texts.

To solve the calculation errors the two and three-variance models create, we propose a new set of variance calculations, the Minimum Potential Performance Budget model. These calculations mimic the geometry of each economic situation (labeled as Cases 1 through 4 in **Figures 4** through **7**). To calculate the primary variances correctly, the multiplier in each primary variance formula must be the minimum value for the other variable. The formulas for each variance are as follows:

Price variance: $Q_{min} \times (P_a - P_b)$

Quantity variance: $P_{min} \times (Qa - Qb)$

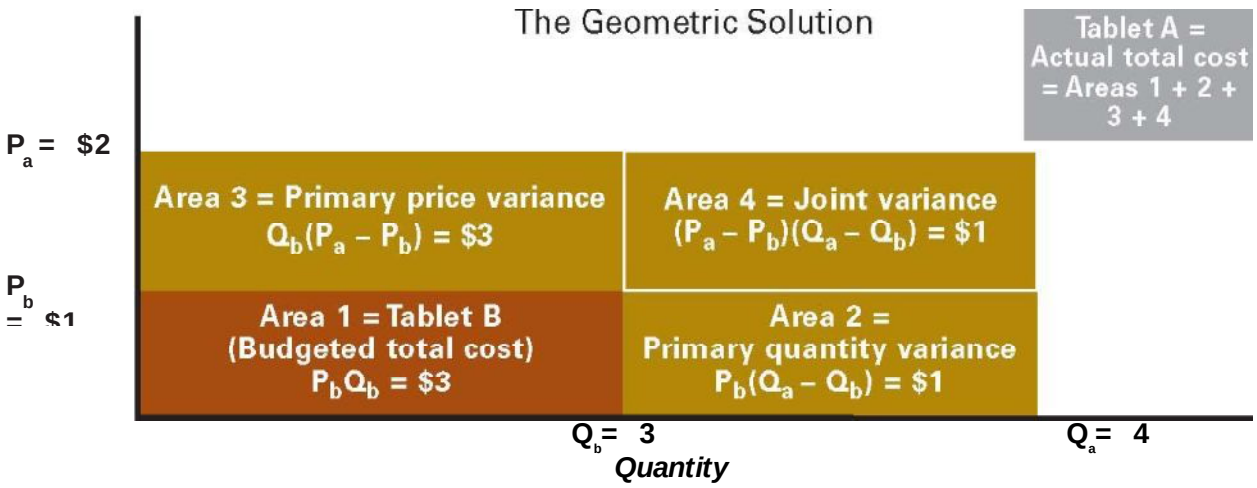
Residual variance: $(C_a - C_b) - [Q_{min}(P_a - P_b)] - [P_{min}(Q_a - Q_b)]$

We will also present these calculations with each economic situation in **Figures 4** through **7**. **Figure 3** summarizes the four economic situations and the errors resulting from the three and two-variance models. Each of the incorrectly calculated variances in **Figures 4** through **7** appears in bold, and an * follows them.

Figure 3: Algebraic Variance Models' Errors

	$P_a > P_b$	$P_a < P_b$
$Q_a > Q_b$	CASE 1 3-variance model: None 2-variance model: Price variance	CASE 3 3-variance model: Quantity & Joint 2-variance model: Price & Quantity
$Q_a < Q_b$	CASE 2 3-variance model: Price & Joint 2-variance model: None	CASE 4 3-variance model: Price, Quantity, & Joint 2-variance model: Quantity

Figure 4: Case 1
$P_a > P_b$ and $Q_a > Q_b$



The Three-Variance Solution
Price variance: $Q_b \times (P_a - P_b) = 3(\$2 - \$1) = \$3$
Quantity variance: $P_b \times (Q_a - Q_b) = \$1(4 - 3) = \$1$
Residual variance: $(Q_a - Q_b) \times (P_a - P_b) = (4 - 3) \times (\$2 - \$1) = \$1$

The Two-Variance Solution
Price variance: $Q_a \times (P_a - P_b) = 4 \times (\$2 - \$1) = \$4$*
Quantity variance: $P_b \times (Q_a - Q_b) = \$1 \times (4 - 3) = \$1$

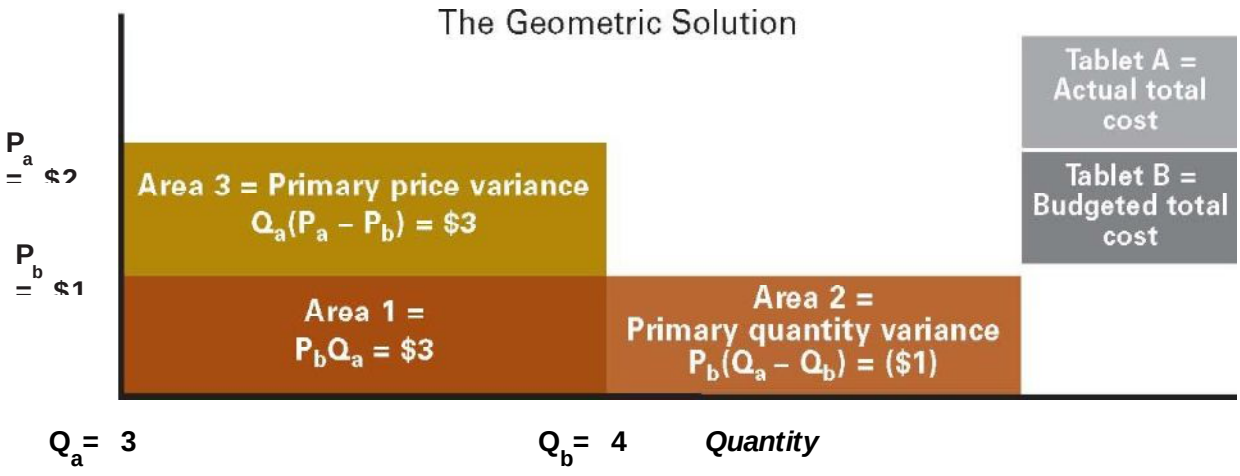
The Minimum Potential Performance Budget Solution
Price variance: $Q_{min} \times (P_a - P_b) = 3 \times (\$2 - \$1) = \$3$
Quantity variance: $P_{min} \times (Q_a - Q_b) = \$1 \times (4 - 3) = \$1$
Residual variance: $(C_a - C_b) - [Q_{min} \times (P_a - P_b)] - [P_{min} \times (Q_a - Q_b)] = \$1$

THE NEED FOR A NEW VARIANCE MODEL

In all four cases, the traditional equations ensure that the sum of the individual variances equals the total variance, but a correct sum is not sufficient for an accurate solution. To provide a correct solution, the primary price and quantity variances must equal the absolute values found in the geometry of the situation.

Because the numbers are the same in all four cases, the sizes of the primary variances represented by Areas 2 and 3 remain constant. Only the labels of actual and budget change from case to case. That is to say, the absolute size of the two primary variances must remain $1 and $3, respectively, if a solution is to be correct.

Figure 5: Case 2: $P_a > P_b$ and $Q_b > Q_a$



The Three-Variance Solution
Price variance: $Q_b(P_a - P_b) = 4(\$2 - \$1) = \$4$*
Quantity variance: $P_b(Q_a - Q_b) = \$1(3 - 4) = (\$1)$
Residual variance: $(Q_a - Q_b)(P_a - P_b) = (3 - 4)(\$2 - \$1) = (\$1)$*

The Two-Variance Solution
Price variance: $Q_a(P_a - P_b) = 3(\$2 - \$1) = \$3$
Quantity variance: $P_b(Q_a - Q_b) = \$1(3 - 4) = (\$1)$

The Minimum Potential Performance Budget Solution
Price variance: $Q_{min}(P_a - P_b) = 3(\$2 - \$1) = \$3$
Quantity variance: $P_{min}(Q_a - Q_b) = \$1(3 - 4) = (\$1)$
Residual variance: $(C_a - C_b) - [Q_{min}(P_a - P_b)] - [P_{min}(Q_a - Q_b)] = \$0$

Errors Resulting from the Two and Three Variance Models

The three-variance solution inflates at least one of the primary variances in three of the four cases. Case 1 is the only case in which the three variance model provides a correct solution. Case 2 inflates the price variance, Case 3 inflates the quantity variance, and Case 4 inflates both primary variances. The geometry demonstrates that the source of the inflated variances is the inclusion of the joint variance. The three-variance model always generates a joint variance, and, in Cases 2 and 3, must be considered wrong because there is not joint variance (Area 4).

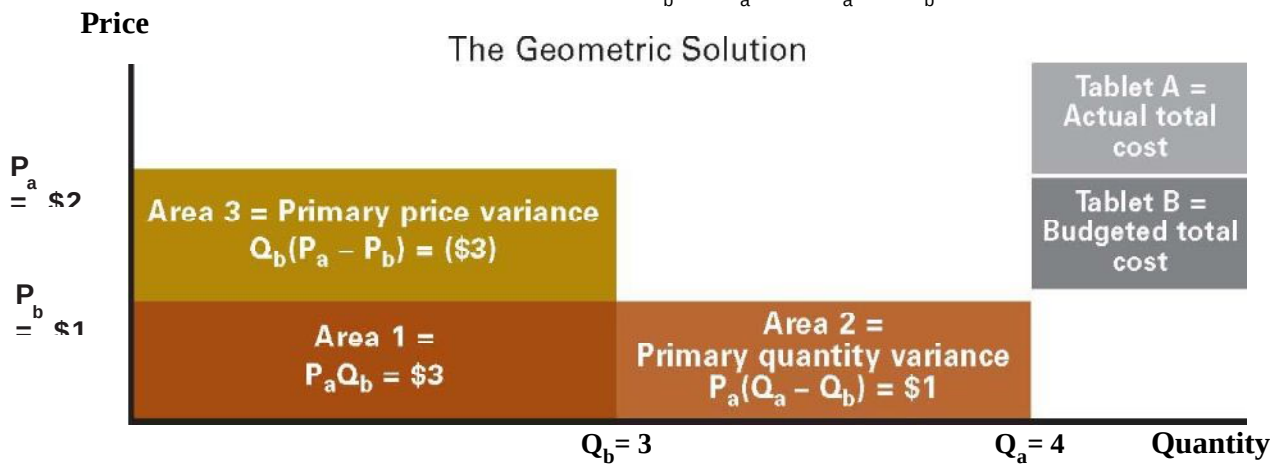
The two-variance solution arbitrarily allocates the joint variance to the primary price variance, which has no theoretical justification.[7] Only in Case 2 does this model provide the correct values found in the geometry of the situation.

Applications in Non-production Environments

If variance analysis is to be widely adopted outside the world of production control and cost accounting, we need a new procedure for calculating unbiased variances. In marketing environments, the standards and forecasts in budgets are not as tight as in production, so the inaccurate standards imply large variances. Large variances imply large joint variances, and large joint variances imply large potential errors due to inflated variances.

When the traditional two-and three-variance models inflate variances in three of four situations, the traditional assumption of small joint variances is crucial. In marketing control we cannot assume the forecasts and standards will be current and the variances will be small.[8] If the standards are not accurate and the variances are large, then Robert Watson's warnings of a potential for biased measurements and distorted decision-making must be taken seriously.[9]

Figure 6: Case 3: $P_b > P_a$ and $Q_a > Q_b$



The Three-Variance Solution
Price variance: $Q_b \times (P_a - P_b) = 3 \times (\$1 - \$2) = (\$3)$
Quantity variance: $P_b \times (Q_a - Q_b) = \$2 \times (4 - 3) =$ **$2***
Residual variance: $(Q_a - Q_b) \times (P_a - P_b) = (4 - 3) \times (\$1 - \$2) =$ **($1)***

The Two-Variance Solution
Price variance: $Q_a \times (P_a - P_b) = 4 \times (\$1 - \$2) =$ **($4)***
Quantity variance: $P_b \times (Q_a - Q_b) = \$2 \times (4 - 3) =$ **$2***

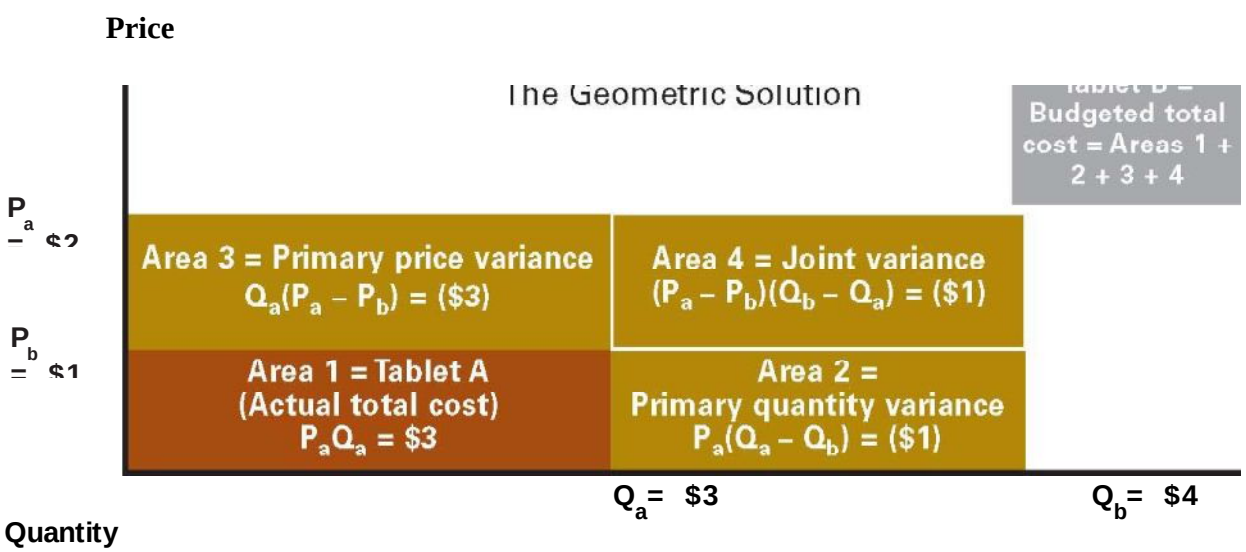
The Minimum Potential Performance Budget Solution
Price variance: $Q_{min} \times (P_a - P_b) = 3 \times (\$1 - \$2) = (\$3)$
Quantity variance: $P_{min} \times (Q_a - Q_b) = \$1 \times (4 - 3) = \$1$
Residual variance: $(C_a - C_b) - [Q_{min}(P_a - P_b)] - [P_{min}(Q_a - Q_b)] = \$0$

The goal of variance analysis should be to calculate the primary variances in a way that ensures excluding the joint variance when it exists. This means the new focal point should be on the minimum potential performance level, $P_{min} \times Q_{min}$ (Area 1), which the following marketing example illustrates.

EVALUATING MEDIA MANAGERS USING THE MPPB MODEL

This example presents a new model of variance analysis designed to produce accurate measures of deviation impacts to control advertising plans. In the field of media planning, the term variance means the magnitude of impact on an overall advertising goal due to a change in advertising activities.

Figure 7: Case 4: $P_b > P_a$ and $Q_b > Q_a$



The Three-Variance Solution

Price variance: $Q_b \times (P_a - P_b) = 4 \times (\$1 - \$2) = (\$4)$*

Quantity variance: $P_b \times (Q_a - Q_b) = \$2 \times (3 - 4) = (\$2)$*

Residual variance: $(Q_a - Q_b) \times (P_a - P_b) = (3 - 4) \times (\$1 - \$2) = \$1$*

The Two-Variance Solution

Price variance: $Q_a \times (P_a - P_b) = 3 \times (\$1 - \$2) = (\$3)$

Quantity variance: $P_b \times (Q_a - Q_b) = \$2 \times (3 - 4) = (\$2)$*

The Minimum Potential Performance Budget Solution

Price variance: $Q_{min} \times (P_a - P_b) = 3 \times (\$1 - \$2) = (\$3)$

Quantity variance: $P_{min} \times (Q_a - Q_b) = \$1 \times (3 - 4) = (\$1)$

Residual variance: $(C_a - C_b) - [Q_{min} \times (P_a - P_b)] - [P_{min} \times (Q_a - Q_b)] = (\$1)$

The new MPPB model we propose applies to two-variant planning models used in advertising. That is, if we express overall advertising performance, Z, as the product of two advertising activities, X and Y, then the impacts on the overall goal due to the deviations in each activity (X or Y) can be isolated, measured, and compared. In more formal terms:

Equation #1: $Z_a - Z_b = X_a Y_a - X_b Y_b = X_m (Y_a - Y_b) + Y_m (X_a - X_b) + r$

where: $Z_a - Z_b$= the difference between the performance goal and the actual results, and

Equation #2: $X_m \times (Y_a - Y_b)$ = Y variance or the impact due to the deviation in activity Y,

Equation #3: $Y_m \times (X_a - X_b)$ = X variance or the impact due to the deviation in activity X,

Equation #4: $r = Z_a - Z_b - X_m \times (Y_a - Y_b) - Y_m \times (X_a - X_b)$ = joint variance or residual impact due to the simultaneous deviations in X and Y

(Subscripts: **a** = actual result, **b** = planned result, **m** = the minimum of a or b).

To evaluate media advertising campaigns, most companies use gross rating points (GRP), which media planners calculate by multiplying frequency by reach. For example, an advertising plan could call for 240 gross rating points by achieving a frequency of four exposures per household and reaching 60% of households. At the end of the campaign, the media planning results show advertising frequency has deviated from plan by 25% and the reach by 30%. The actual reach was 78%, and the actual exposure frequency was three, which resulted in a total of 234 gross rating points. **Table 1** summarizes this performance.

Table 1: Deviations in Advertising Plan

	Actual Results	Budgeted Values	Deviations from Plan
Gross rating points	G_a = 234	G_b = 240	– 6 GRP
Frequency = number of exposures per household (F)	$F_a = F_m$ = 3*	F_b = 4	- 1 exposure per household (25%)
Reach = percentage of households reached (R)	R_a = 78	$R_b = R_m$ = 60*	+ 18 (30%)

* Minimum level of each activity is labeled with subscript m.

Which of the two deviations from plan is having the greatest impact on the change in advertising performance? Observation leads us to believe it is reach because its variance is 30% compared to the frequency variance of only 25%. This is incorrect. The deviation from the planned frequency is the correct answer because it has the largest impact on the overall GRP performance (60 GRP, shown in **Table 2**). Using the MPPB model, the media planner can accurately identify which of the two deviations in the advertising plan is having the greater impact on GRP, as **Table 2** shows.

Because variance analysis is an alien concept to most media planners, they rely on experience and judgment in determining what to focus on to improve performance. Media planners have not had a model of variance analysis that is accurate enough to test their judgments across the full range of possible media situations. The full range of situations includes differences that can exceed or be short of budget for either reach or frequency.

Table 2: Variance Report—Reach and Frequency

Actual GRPs		234
Planned GRPs		240
Change in GRPs to be explained by deviations in reach and frequency activities		(6)
Impact on GRP due to the 30% increase in reach: $F_m \times (R_a - R_b) = 3 \times (78 - 60)$	54	
Impact on GRP due to the 25% decrease in frequency: $R_m \times (F_a - F_b) = 60 \times (3 - 4)$	(60)	
Residual impact on GRP due to the simultaneous changes in reach and frequency (r)	0	

Thus, each media situation is analogous to the four economic situations (Cases 1 through 4 in Figures 4 through 7). In the **Table 2** situation, the report conveys to the media planner that the 25% decrease in frequency lowered overall performance by 60 gross rating points. The 30% improvement in the number of households reached increased overall performance by 54 gross rating points. The net effect of the two deviations was a decrease of six gross rating points. On the basis of the variance report, the media planner now knows to focus on finding the cause behind the decrease in the frequency of exposures per household rather than the reasons behind the increase in households

reached. If the media planner can increase frequency while maintaining the current reach, overall gross rating points will increase more than with the converse strategy.

PROS AND CONS

Accountants identified the miscalculations resulting from the two and three-variance models many years ago, but they dismissed the potential inaccuracies due to residual variances as offering "no reason for undue concern."[10] In more recent years, these models have been criticized for creating information that leads to inappropriate performance evaluations.[11] The alternative MPPB proposed here is based on the geometry of the four possible economic situations when comparing budgeted and actual results, so it does not produce primary variance errors. Here are some advantages and disadvantages of the MPPB solution.

Advantages

1. It is easier to apply in non-production environments where outcomes are not measured in terms of price and quantities.
2. The procedure produces unbiased measurements of the primary variances. That is, the measurement of the impact due solely to changes in the primary variables is isolated from the impact of the joint movement in several variables. The conventional two-variance solution adds the joint variance to the price variance.
3. It can be applied to a wider range of situations than the conventional flexible budget procedure. For example, it can produce accurate measures in situations with inaccurate forecasts and large variances. Conventional analysis assumes that standards are current and variances are small.
4. The residual joint variances that are unexplained by the changes in the individual variances are reported separately.
5. The proposed procedure eliminates the difficulty of explaining the arbitrary assignment of joint variances to the responsible managers. The conventional system results in the arbitrary allocation of joint variances to one manager or another, and this is perceived as an unfair practice.

Disadvantages

1. The concept of a minimum potential performance budget, $P_{min}Q_{min}$, is more abstract than the concept of the flexible budget, P_bQ_a. The minimum potential performance budget is not a rigid standard but varies with forecasts and performances.
2. The residual variance adds to the variance report's complexity but provides no managerial insights for control. There is very little managerial interpretation that can be given to the size of the residual variance caused by the joint changes in variables.
3. From a pedagogical point of view, the proposed solution makes it almost impossible to teach variance analysis using the traditional columnar format. The ability to assign a constant amount, such as the flexible-budget value, is lost for all four cases. The conventional columnar system based on flexible budgeting is simpler, but, in new fields of application, accuracy is more important than simplicity. If the proposed MPPB model is adopted for textbooks, authors will have to rely on algebraic and geometric presentations.

ISSUES TO DISCUSS

1. While the concept of a minimum level of potential performance (Area 1) makes sense in marketing applications, does it make sense in production applications?
2. Are joint variances taught in cost accounting courses? If not, why not? Are they somehow not important in production applications but important in marketing applications?
3. If the MPPB model is rejected in favor of either the traditional two or three-variance model, how can we refine them so that they produce accurate performance evaluation measures?
4. If the two-variance model is to be applied in situations using nonfinancial performance measures, which measure should be held constant at its actual value, and which measure should be held constant at its budgeted value?

We presented the inaccuracies in current variance models. Both the two and three-variance models produce incorrect variances in three of the four possible economic situations that can result from comparing budgeted and actual performance. The correct analysis for each situation is demonstrated geometrically along with the MPPB equations derived from it.

Current cost accounting pedagogy and practice ignore the joint variance, which results in its inclusion in the price variance. Theoretical problems identified a half century ago are now resurfacing as real practical problems in

performance evaluations. When applied outside cost accounting environments, such as in marketing, the need to calculate unbiased measures of the primary variances and isolate the joint variance are even more important. We hope the proposed MPPB model can be easily adapted to situations in which unbiased measures are needed, such as in nonfinancial marketing performance evaluations. ❋

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ENDNOTES

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[7] Kloock and Schiller.

[8] J. M. Hulbert and N. E. Toy, "A Strategic Framework for Marketing Control," *Journal of Marketing*, April 1977, pp. 12-20; M. M. Weber, "A Framework for Analyzing Sources of Variance in the Supplier Buyer Relationship: Determining the Contribution of Buyer Planning and Supplier Performance to Total Variance," *Journal of Marketing Theory & Practice*, Spring 1996, pp. 61-71; D. R. Lehman, "What's On Marketers' Minds?" *Marketing Management*, November/ December 2002, pp. 17-20; T. Mitchell and H. Olsen, "Marketing Control: Exogenous Aspects of Price Variance," *Journal of Business & Economics Research*, December 2003.

[9] Watson.

[10] Amerman, p. 266.

[11] W. F. Bentz and R. F. Lusch, "Now You Can Control Your Product's Market Performance," *Management Accounting*, January 1980, pp. 1725; Kloock and Schiller.

Reading 14-6: Is Standard Costing Still Relevant? Evidence from Dubai?

by A. Marie, W. Cheffi, R. J. Lewis, and A Rao

Despite claims that it is less relevant than newer accounting methods, standard costing
is far from obsolete, and, in fact, it is experiencing common use in countries as diverse as the United Kingdom, Malaysia, and the United Arab Emirates. With the advent and wide use of methods such as activity-based costing (ABC), Just-in-Time (JIT), the balanced scorecard, and target costing, a number of researchers had predicted the demise of standard costing and variance analysis on the grounds that these tools had become disconnected from actual practices at the industry level where an intense competitive environment often requires a higher level of sophistication in costing systems.

For example, Richard Fleischman and Thomas Tyson claimed that standard costing cannot provide adequate assistance in the areas of construction strategy and operational management.[1] Don Hansen and Maryanne Mowen went so far as to describe it as potentially "dysfunctional."[2] These criticisms have largely contributed to the dismissal of standard costing, especially for large companies that employ more sophisticated methods such as ABC and target costing. Mike Lucas has even raised questions as to whether it is still appropriate for college accounting programs to continue teaching this "outdated" topic.[3]

GLOBAL ACCEPTANCE OF STANDARD COSTING

While several academics were busy pointing out the weaknesses of standard costing, others observed that this accounting tool continues to be widely used throughout the world. Studies conducted in developed countries have shown rates among companies as high as 73% in the U.K. and 86% in Japan.[4]

More specifically, David Lyall and Carol Graham stated that more than 90% of 231 companies surveyed in the U.K. apply standard costing for cost control purposes. Furthermore, they found that 63% of the managers using this technique reported being pleased in terms of its decision-making support.[5] In another study, 76% of 303 accountants in the U.K. and 73% of 85 finance and accounting specialists in New Zealand use standard costing.[6] The authors also found that accountants viewed modern costing and production management tools as having no impact on how widely standard costing and variance analysis are used. (The respondents even predicted an increase in the importance of the older tools.) A study by Maliah Sulaiman, Nik Nazli Nik Ahmad, and Norhayati Mohd Alwi of companies doing business in Malaysia found similar widespread dissemination and persistence of standard costing: 70% of 66 local firms and 76% of 21 Japanese firms.[7]

These studies reveal that standard costing does not overemphasize cost control, and, moreover, it is linked to quality management. In addition, the Lucas and Sulaiman studies have shown that companies use past performance ("after the fact") instead of predetermined engineering standards on actual costs. Instead of employing newer and costlier systems, companies have chosen to reconfigure existing systems with more rigorous schemes, implying that firms have adapted standard costing to their specific needs and have not abandoned it.

A CASE STUDY: DUBAI

In light of conflicting views in the academic research, we examine how standard costing and variance analysis are used in one of the world's fastest-growing economies: Dubai, one of the seven emirates, or states, in the United Arab Emirates. A number of events make our case study appealing, including the steps the Dubai government has taken to free up prices and wages, rationalize indirect taxes, deregulate the financial system, promote foreign direct investment, and encourage all companies to use new information and communication technology. To our knowledge, this study is the first of its kind to shed light on the level of use of standard costing tools in Dubai.

Our study differs from the earlier study by Sulaiman, et al., in that, while they split their sample on the basis of ownership (Japanese vs. local), we disaggregated the companies by

sectors: industrial vs. service. We did this for two reasons. The first is contextual: By law, foreigners in Dubai cannot own 50% or more of a company unless that company is located in the free zones.[8] Thus it is just not possible to differentiate between nonlocal and local companies in Dubai. Second, by studying the service sector separately, we capture its importance in terms of its contribution to Dubai's gross domestic product (GDP). The reason also relates to the fact that the service sector has been studied less than the industrial sector when it comes to the use of standard costing.

A plausible explanation for this might be the perception that standard costing is not appropriate for the service sector and the claim that service companies distance themselves from it. Therefore, we address the following questions:

a. Is standard costing used in Dubai?
b. How important are various functions in standard costing?
c. How frequently are various techniques and cost standards used in standard costing?
d. How important is the analysis of variance for control purposes?

COLLECTING THE DATA

We collected the data presented here through a survey questionnaire, and we had a reasonably good response rate. We chose the companies randomly, covering all subcomponents of the industrial sector and the service and trading (retail) sector, which together constitute the "private sector" in Dubai.[9]

To design our questionnaire, we modified those of Colin Drury, Chris Guilding, and Sulaiman to allow us to compare our study findings with those that looked at U.K. and Malaysian companies.[10] We created the questionnaire, which consists of demographics, characteristics of cost accounting tools, and standard costing practices in Dubai, to answer the following questions:

1. Do accounting and finance professionals in Dubai use standard costing or some other method to make management decisions?
2. Which techniques are used in standard costing in relation to standards based on design/engineering studies, observations based on trial runs, work/study techniques, or average historic usage?
3. How are various types of costing standards practiced by Dubai companies with respect to maximum efficiency standards that are achievable but difficult to attain, average performance standards, or average historic usage?
4. How frequently—monthly, quarterly, semiannually, annually, continuously, or when the variances imply that standards have changed—do companies in Dubai use costing tools for management control?
5. Which methods are employed to investigate a particular variance? For example, are decisions based on managerial judgment, a calculated variance exceeding a specific monetary amount or a given percentage of standards, or through the use of control charts? **6.** How important is the analysis of variances (for example, materials prices and sales prices) for control purposes?[11]

WHAT OUR STUDY FOUND

The largest segment of respondents in Dubai's industrial sector (21%) was engaged in construction activities (see Table1). The rest were fairly evenly distributed among chemicals/plastics and food (14% each) and engineering and paper/packaging (12% each). Textiles and electronics constituted 11% apiece. As expected, oil and gas companies constituted the least at 5%, which is consistent with Dubai's strategy of diversifying from oil-based activities to nonoil-based activities because of shrinking oil resources.

Most of the respondents under the service and trading (retail) sector were from nonfinancial companies (58%) vs. 42% of respondents from financial firms.

We found a slightly higher percentage of large industrial companies compared to large service companies, as shown in Table 2. Most companies had assets in the range of 10 million dirham to 500 million dirham (MDhs): 75% in the industrial sector and 81% in the service sector, indicating that most respondents were small to medium-size companies (SMEs).12

Table 3 reveals that the majority of companies surveyed (68% in the industrial

sector and 77% in the service sector) had fewer than 500 employees. Only 25% of industrial companies and 21% of service companies had more than 500.

Tables 4 and 5 provide a snapshot of the use of standard costing tools in Dubai. The results of the earlier studies by Sulaiman, Guilding, and Drury, which focused on industrial firms, are also reported for comparison purposes. We found that the results for the industrial-sector companies in Dubai (77%) is consistent with those of the other countries studied (73%-76%) but is moderate in contrast with our results for the service sector, implying that standard costing has not become obsolete among either industrial or service companies in Dubai.

Table 5 shows the importance of various standard costing functions in Dubai companies using a seven-point Likert scale, with responses of four or higher evidencing importance and those less than four reflecting less importance.

The cost functions—cost control and performance evaluation, costing inventories, and computing product cost for decision making—were of relatively greater importance to Dubai industrial-sector companies than to their counterparts in Malaysia and the U.K. Moreover, these standard costing functions were of much lower importance in Dubai's service sector. In terms of significance, inventory costing is the key function of standard costing for industries in Dubai, Malaysia, and the U.K., and, for the service sector, budgeting is the most significant function. Mann-Whitney U test results reject the null hypothesis of response bias, suggesting that the industrial-sector companies in Dubai use standard costing to a greater extent than the service sector for the first three functions of standard costing listed in

Table 5. Again, in only one instance has this pattern reverted toward the service sector: the use of standard costing as an aid to budgeting. These findings, on average, are consistent with those of other studies of industrial-sector companies in Malaysia and the U.K.

LABOR AND MATERIAL STANDARDS

The mechanisms of setting labor and material standards are reported in Table 6. Nearly nine out of 10 industrial sector respondents in Dubai employed standards based on design/engineering studies, which is comparable to Japanese companies in Malaysia (81%). These firms appear to be significantly more scientific in their approach to standards setting compared to the service sector in Dubai (48%), local Malaysian companies (46%), and U.K.-based companies (51%). Service-sector companies in Dubai predominantly used "average of historic usage method" (76%).

Dubai companies—both industrial and service-oriented—favored "average past performance" as the type of standard employed in their costing—47% and 50%, respectively. To be realistic and attainable, however, cost standards should reflect both "past performance" and "expected future performance." This is supported in our study because companies favored both past performance and expected future performance through design and engineering studies (Table 6).

Dubai industries have become more international in their operations and hence are facing greater competition in global markets. Thus one would expect these companies to review their costing standards frequently to cope with a changing environment where new products are introduced daily. We found that slightly more than half of them (52%) conduct reviews semiannually, consistent with Japanese respondents in Malaysia (55%). On the other hand, domestic Malaysian firms and companies in the U.K. were more apt to review their costing standards annually at a rate of 35% and 68%, respectively.[14]

When considered together, the results from Tables 4 through 8 signify that companies in Dubai have not abandoned standard costing in their management control decisions. In fact, they have reconfigured existing cost accounting systems to suit their dynamic needs and objectives. These findings are consistent with those from studies of Malaysian companies by Sulaiman and colleagues.

AN EXAMINATION OF VARIANCES

Generally, managers are concerned about variations in costs, materials usage, and sales—especially those outside acceptable ranges. Table 9 shows how companies approach investigating such variances. In Dubai, 39% of industrial companies and 50% of service companies base their costing decisions on

"managerial judgment," compared to roughly half of U.K. companies and one-fourth of local and Japanese companies in Malaysia. On the other hand, 35% of firms in Dubai's industrial sector and 29% in its service sector dug deeper for answers when the variance exceeded a given percentage of standard, which is similar to the rates found in the Malaysian and U.K. studies.

Table 10 shows the importance of variances for control purposes. Some 95% of industrial companies in Dubai were extremely sensitive to variances in sales volume, 90% to variances in materials prices, and 87% to variances in sales price. These responses were similar to those in the Malaysian studies. Also, the service sector in Dubai emphasized monitoring variances in sales volume but with wage rates and labor efficiency considered very important as well.

STANDARD COSTING IS ALIVE AND WELL

Our study enables us to add to the existing costing literature in general, and the United Arab Emirates in particular, and to compare our findings with those of previous studies about the manufacturing sector. Our key findings are as follows:

- Seventy-seven percent of the companies in Dubai's industrial sector use standard costing compared to 39% in the service sector.
- "Inventory costing" is the most important function of standard costing for the industrial sector, while "aid to budgeting" is the most prevalent costing function for the service sector.
- The industrial-sector companies prefer standards based on design/engineering studies, but the service sector favors average historic usage.
- Forty-five percent of the industrial companies and 44% of service companies in Dubai use "maximum efficiency standards" and "achievable but difficult to attain standards" in practice.
- Industries in Dubai are most significantly sensitive to variances in materials prices (90%) and sales prices (87%). Although service-sector companies are also sensitive to costs of materials (80%), they are focused on variances in sales volume (81%) and wage rates (67%) as well.

In light of our robust results, we surmise that new costing techniques such as ABC, JIT, the balanced scorecard, and target costing have not made standard costing obsolete, which is consistent with findings of studies conducted in various countries. Companies probably will continue to be attracted to standard costing and variance analysis, regardless of their size, geographical location, and sector. Standard costing's simplicity and affordability, in addition to its flexibility in accommodating state-of-the-art technology, may explain its persistence. Another plausible explanation is that companies use two or more cost accounting methods to build more powerful integrated information systems according to various criteria and different categories.

Also, what about best practices? Even though the majority of chief cost accountants in Dubai earned diplomas from schools in developed countries, it seems that management accounting practices in Dubai have not reached stages 3 (reduction of waste in resources) and 4 (creation of company value) of the International Federation of Accountants' (IFAC) Sustainability Framework. As in Malaysia, the focus in Dubai remains primarily on a mix of cost determination (stage 1) and management planning and control (stage 2). (The Sustainability Framework addresses four perspectives in bringing together all critical areas required to manage a sustainable organization successfully: business strategy, internal management, financial investors, and other stakeholders. The Professional Accountants in Business Committee developed the Framework because it believes that professional accountants need to adapt to a world in which sustainability is the key to long-term business performance and need to understand how, in their diverse functions in organizations, they play a significant role. IFAC notes that, in clearly defining the different facets of sustainability, the Sustainability Framework can help professional accountants grasp all the important aspects of sustainability that they may encounter, directly or indirectly, and that will be important to their organizations. All pertinent information about the Framework can be found at www.ifac.org/PAIB under Sustainability Framework.)

Care must be exercised in generalizing our findings, however. Although the survey was sent to companies of all sizes—measured in terms of total assets or number of employees—the majority of responses were from small and medium-size firms. Thus we cannot expand our findings to large companies. At the academic level, this research shows that standard costing is still a valuable tool for management accounting curricula, at least for the UAE. Nevertheless, it would be interesting to determine whether our findings hold for other Gulf Cooperation Council (GCC) countries. This, along with the identification of contingent factors underlying the persistence of standard costing, is the objective of our future research.

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ENDNOTES

1 Richard K. Fleischman and Thomas N. Tyson, "The Evolution of Standard Costing in the U.K. and U.S.: From Decision Making to Control," Abacus, March 1998, pp. 92-119.

2 Don R. Hansen and Maryanne M. Mowen, *Managerial Accounting*, Thomson/South-Western, Mason, Ohio, 2002.

3 Mike Lucas, "Standard Costing and Its Role in Today's Manufacturing Environment," *Management Accounting*, April 1997, p. 32.

4 Ashish Garg, Debashis Ghosh, James Hudick, and Chuen Nowacki, "Roles and Practices in Management Accounting Today," *Strategic Finance*, July 2003, pp. 30-35. The survey found that more than 76% of members of the Institute of Management Accountants (IMA®) use traditional costing tools such as standard costing.

5 David Lyall and Carol Graham, "Managers' Attitudes to Cost Information," *Management Decision*, Vol. 31, Issue 8, 1993, pp. 41-45.

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7 Maliah Sulaiman, Nik Nazli Nik Ahmad, and Norhayati Mohd Alwi, "Management Accounting Practices in Selected Asian Countries: A Review of the Literature," *Managerial Auditing Journal*, Vol. 19, Issue 4, 2004, pp. 493-508; Maliah Sulaiman, Nik Nazli Nik Ahmad, and Norhayati Mohd Alwi, "Is Standard Costing Obsolete? Empirical Evidence from Malaysia," *Managerial Auditing Journal*, Vol. 20, Issue 2, 2005, pp. 109-124.

8 It is worth noting that even if we were to differentiate between foreign and local companies by surveying companies from the free zones and the rest of Dubai, we would have a sampling problem because the number of companies in the free zones is by far lower than the number of companies in the rest of Dubai.

9 The survey was conducted from May 2007 to April 2008, and questionnaires were e-mailed to 400 companies listed in the Dubai Chamber of Commerce & Industry (DCCI) 2006-2007 Directory. The response rate was poor even after four reminders within six months. The questionnaires were resent by mail to the heads of the management accounting departments of 270 companies, of which, 140 companies were from the industrial sector and 130 from the services and retail sector. A series of follow-ups resulted in a response rate of 41% and 32%, respectively.

10 Colin Drury, Steve Braund, and Paul Osborne, A Survey of Management Accounting Practices in U.K. Manufacturing Companies, Chartered Association of Certified Accountants, London, England, 1993.

11 A sample of the questionnaire is available from the authors.

12 A criterion of ≤500 MDhs is considered for treating such companies as SMEs.

13 One of the issues related to the collection of primary data is the likelihood that the survey questionnaires that were received late might indicate no responses or unreliable responses because managers might fill out the questionnaire just for the sake of it because of their preoccupation. In other words, these late responses may not reflect what is actually happening at the firm, let alone the current practice. We tested for the existence of a nonresponse bias using the Mann- Whitney U test by selecting the first 10 and the last 10 responses. We computed the mean response scores for each question to test whether the differences in the means

were statistically significant across the two subsamples. Our analysis rejected the null hypothesis to conclude that our data does not suffer from the nonresponse bias.
14 This may be due to the fact that the U.K. study was conducted in the beginning of the 1990s when the use of information technology was very limited.

FURTHER READING

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Table 1: **Dubai Company Characteristics (Subsector Type)**

Activities of Dubai Respondents	Percentage
A. Industrial Sector (57 companies)	
1. Chemicals & Plastics	14
2. Engineering	12
3. Textiles	11
4. Food	14
5. Construction	21
6. Paper & Packaging	12
7. Electronics	11
8. Oil & Gas	5
	100
B. Service & Trading Sector (43 companies)	
1. Financial *	42
2. Nonfinancial**	58
	100

*Banks, insurance, financing
**Real estate, hotels, trading (retail), consultancy, education, hospitality

Table 2: Dubai Company Characteristics (Total Assets in MDhs)

Total Assets	Industrial Sector		Service Sector	
	Frequency	Percentage	Frequency	Percentage
10 million-100 million	19	33	14	32
101 millioin-500 million	24	42	21	49
>500 million	9	16	6	14
Missing	5	9	2	5
Total	57	100	43	100

Table 3: Dubai Company Characteristics (Number of Employees)

Number of Employees	Industrial Sector		Service Sector	
	Frequency	Percentage	Frequency	Percentage
<100	12	21	11	26
100-500	27	47	22	51
>500	14	25	9	21
Missing	4	7	1	2
Total	57	100	43	100

Table 4: Extent to Which Companies Use Standard Costing

	Dubai		Malaysia		New Zealand	U.K.
	Industrial %	Service %	Japanese %	Local %		
Yes	77	39	76	70	73	76
No	23	61	24	30	27	24
Total	100	100	100	100	100	100

Table 5: Importance of Standard Costing Functions

	Dubai		Malaysia		U.K.
Function	Industrial %	Service %	Japanese %	Local %	%
1. Cost control and performance evaluation	90**	71	83	82*	72
2. Costing inventories	94*	40	89*	68	80*
3. Computing product cost for decision making	88*	46	83	78	62
4. As an aid to budgeting	78	83*	88	67	69
5. Data processing economies	42	33	75	56	43

Mann-Whitney U test statistic13: *significant at 5% **significant at 10%

Table 6: Methods Used to Set Labor and Material Standards

	Dubai		Malaysia		U.K.
Method	Industrial %	Service %	Japanese %	Local %	%
1. Standards based on design/engineering studies	89**	48	81*	46	51*
2. Observations based on trial runs	57	39	53	42	30
3. Work study techniques	44	54	25	26	42
4. Average of historic usage	54	76*	44	63*	44

Mann-Whitney U test statistic: *significant at 5% **significant at 10%

Table 7: Type of Standards Employed

	Dubai		Malaysia		U.K.
Type	Industrial %	Service %	Japanese %	Local %	%
1. Maximum-efficiency standards	15	19	33	17	5
2. Achievable but difficult-to-attain standards	30	25	22	31	44
3. Average past performance standards	47	50	39	37	46
4. Other	8	6	6	15	5
Total	100	100	100	100	100

Table 8: Frequency of Reviewing Standards

	Dubai		Malaysia		U.K.
Frequency	Industrial %	Service %	Japanese %	Local %	%
1. Monthly or quarterly	17	33	17	24	14
2. Semiannually	52	40	55	18	9
3. Annually	24	27	11	35	68
4. Continuously	5	0	17	15	6
5. When the variances imply that the standards have changed	2	0	0	8	3
Total	100	100	100	100	100

Table 9: Approaches for Investing Variances

	Dubai		Malaysia		U.K.
Approach	Industrial %	Service %	Japanese %	Local %	%
1. No formal method used (decision based on managerial judgment)	39	50	26	22	48
2. Where the variance exceeds a specific monetary amount	19	21	28	33	26
3. Where the variance exceeds a given percentage of standard	35	29	32	33	23
4. Statistical basis using control charts or other statistical method	7	0	14	12	2
Total	100	100	100	100	100

Table 10: Importance of Particular Variances for Control Purposes

	Dubai		Malaysia		U.K.
Approach	Industrial %	Service %	Japanese %	Local %	%
1. Material price	90**	80	94	92	69
2. Material usage	81	31	82	93	66
3. Material mix	66	36	46	52	35
4. Material yield	76	33	60	55	52
5. Wage rate	48	67**	82	70	36
6. Labor efficiency	58	67	88	69	65
7. Variable overhead efficiency	74	40	59	71	32
8. Overhead expenditure	83	25	69	73	69
9. Fixed overhead volume	61	23	50	54	28
10. Fixed overhead volume efficiency	42	21	39	52	18
11. Fixed overhead volume capacity	68	31	54	69	18
12. Sales volume	95	81*	100	90	70
13. Sales price	87**	74	92	91	69

Mann-Whitney U test statistic: *significant at 5% **significant at 10%