

Unintended responses to a traditional purchasing performance metric

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Abstract

Purpose – To describe the tactics that buyers often use to avoid unfavorable purchase price variance (PPV) and identify alternate approaches that will improve purchasing performance and also help achieve company objectives.

Design/methodology/approach – Descriptive: presents for the first time 12 dysfunctional tactics used by buyers of industrial goods use to avoid unfavorable PPV.

Findings – The tactics are shown to increase costs rather than decrease costs and lead to organizational dysfunction. Findings are broadly applicable to large corporations that use legacy software systems or newer enterprise requirement planning (ERP) software systems to track purchasing costs and transactions, and also have a strong management focus on price-based purchasing performance.

Research limitations/implications – Findings are limited to organizations that measure the success of purchasing and supply management activities using price-based metrics.

Practical implications – Should propel managers to identify alternative metrics or processes for managing purchasing performance, reduce system-wide costs, and improve day-to-day work in purchasing organizations.

Originality/value – This paper will be helpful to academics researching operational or behavioral aspects of purchasing, practitioners managing supply chains, auditors assessing the integrity of material cost reporting and management controls, and persons concerned about ethics in business.

Keywords Business ethics, Pricing, Manufacturing resource planning, Purchasing techniques

Paper type Research paper

Introduction

Various features, benefits, and limitations of performance measures used in purchasing and supply management have been reported (Kleijnen and Smits, 2003; Tangen, 2003; Morgan, 2004), including linkages to corporate culture and behavioral factors (Franco and Bourne, 2003; de Waal, 2003). However, a key metric that is widely used in durable goods industries, but often overlooked or understated in the academic literature is “purchase price variance” (PPV), also called “purchase order variance” or “material cost variance.” This metric measures the difference between the current unit price and an earlier unit price figure.

The relationship between the PPV metric and actual, specific workplace actions among the people responsible for the metric have not been previously reported. We present an insider’s look

at 12 tactics that many purchasing and supply management personnel regularly used to avoid unfavorable purchase price variances. This paper is based in part upon the authors’ (Emiliani and Stec) recent experiences as supply and commodity managers while working at a large company in the aerospace industry. A few of the tactics were later revealed to the author (Emiliani) by students in a classroom setting while teaching graduate courses in supply management. In each case, the tactics do not illustrate business at its best. Instead, they highlight serious issues with regards to management controls, business ethics, management education, and even corporate purpose (Emiliani, 2003) – all of which are beyond the scope of this paper.

The tactics presented are judged to be broadly applicable to other major aerospace companies, in particular those that have used or are using similar types of software systems to manage purchase transactions. Due to the widespread penetration of this type of purchasing software system in large corporations since the mid-1960s, it is our judgment that the tactics presented exist in many other purchasing organizations that procure durable goods. It is important to recognize that because these software systems are produced and sold by only a few large global corporations, people assume – mistakenly – that all features, including the PPV metric, are appropriate to use and deliver benefits. Most buyers simply reason that credible suppliers would not sell software with features that could cause significant problems.

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Empirical evidence of the existence of such tactics in other companies or industries could not be obtained because this type of “insider” information is sensitive and potentially problematic with regards to the accuracy of financial reporting or management controls: e.g. Sarbanes-Oxley Act in the USA (SEC, 2002; SOA, 2002). Evidence for the existence of these tactics is the result of industry experience in managing purchasing operations. It should be noted that contemporary enterprise software systems still focus on measuring PPV, but they apparently contain features that preclude some of the twelve tactics from being deployed. However, the PPV metric is, in general, easily subject to abuse. Thus, it is likely that other tactics will be invented to avoid the problems and pain associated unfavorable PPV.

This paper contributes to the literature by describing 12 common tactics that buyers use to manage the PPV metric, often with the aid of people in related areas such as finance, engineering, and materials management, and goes on to show that it results in negative consequences with regards to cost management, the timely delivery of goods to customers, and supplier relations. In addition, the tactics used to manipulate the PPV metric are shown to result in waste (Ohno, 1988), which is defined as activities that add cost but do not add value, instead of creating value for end-use customers (Womack and Jones, 1996). Alternatives to the local optimization routines that the PPV metric inspires are presented, and which instead lead to capability-building and improved long-term competitiveness of both buyer and sellers.

Performance measurement

Purchasing and supply management organizations use many different measures to track their performance including purchase price, on-time delivery, quality, inventory dollars (or forward days supply), etc. In some companies, the measures are appropriately balanced, while in others there is a strong emphasis on purchase price. Is it not surprising that purchasing organizations would emphasize price since purchased production materials can account for 50–80 percent of the cost of goods sold (Dobler and Burt, 1996; Monczka *et al.*, 1998a, b; Nicolle, 2003). Chief executive officers expect the purchasing organization to contribute to profitability through price reduction, particularly in markets with flat or low top-line growth. A year-over-year price reduction target of 3–7 percent for goods purchased is common (Dobler and Burt, 1996; Monczka *et al.*, 1998a, b; Shirouzu, 2003; Useem, 2003; Mayne, 2004).

The “purchase price variance” (PPV) or “purchase order variance” (POV) is used by management to evaluate purchased material cost performance against budgets (Monczka *et al.*, 1998a). This metric measures the difference between a “standard cost” and the current unit price. Standard cost is an estimate of the unit purchase price contained in a computerized database that is typically owned by the finance organization or jointly with the purchasing organization. Purchase price variances are calculated as follows:

$$\text{PPV} = (\text{standard cost/unit} \times \text{actual purchase volume}) \\ - (\text{actual cost/unit} \times \text{actual purchase volume})$$

The standard cost is usually the “official” price. Often, the standard cost is based on the prior year’s price, though for

some items the standard price may be several years old. Sometimes the standard cost is adjusted from the prior year’s price (or the previous standard) based on anticipated inflation or changes in volume. A final adjustment is often made to incorporate management’s price reduction target into the standard cost, so that achieving standard performance across the organization will yield the profit desired by management. It is common for price reduction targets to be applied on an across-the-board basis. Because of obsolete standards or adjustments imposed during the annual budgeting process, standard costs or actual prices previously paid do not accurately represent the current prices of purchased materials.

The PPV metric, based on standard cost, is widely used because it is a very simple number to calculate precisely. It supports the conventional approach to managerial control, relying heavily on financial-based responsibility accounting to achieve local optimization. This approach assigns responsibility to functional organizational units, and avoids holding managers responsible for performance they cannot directly influence. Maximizing local operating efficiency of each organizational unit is expected by management to result in efficient overall organizational performance. Only financial outcomes are measured (Hansen and Mowen, 2003).

Emphasizing the PPV metric can indicate to people internally (i.e. purchasing personnel) and externally (i.e. suppliers) that quality and delivery are less important relative to the goal of reducing costs, and also likely reflects the fact that the company, and the purchasing organization in particular, do not understand the cost structure of the goods that they purchase in each value stream (Womack, 2003; Maskell and Baggaley, 2004). The accounting system does not encourage a better understanding of costs because it does not recognize that actions and decisions made in one functional area affect costs in other functional areas. The primary focus of the accounting system regarding material acquisition is unit price.

If the current price is higher than the standard cost, then the purchase price variance is unfavorable. The objective, of course, is to ensure that the PPV metric is favorable, which would indicate that unit cost savings have been achieved. For example, a buyer (i.e. purchasing agent) with a budget of \$1,000,000 is doing a great job if he or she can obtain the required materials for \$900,000 and a poor job if the materials are purchased for \$1,100,000. The buyer’s performance is considered poor if their PPV is unfavorable on a monthly, quarterly, or annual basis. Persistently unfavorable PPV performance usually has a negative impact upon a buyer’s annual performance appraisal. Thus, there is strong personal incentive to avoid unfavorable outcomes.

In addition, while most companies espouse teamwork, part shortages and unfavorable PPV are typically the sole responsibility of individual buyers. They are often blamed for having unfavorable variances. For a buyer with responsibility for hundreds or a few thousand part numbers, the possibility of getting blamed on a regular basis becomes uncomfortably high. Importantly, the root cause of problems usually lay elsewhere, but organizational routines instead focus on blaming people because it is quick and easy to do so.

PPV tactics

Buyers, like any other people, seek to avoid blame when problems arise. To do so they will manipulate or “game”

business measures to achieve more favorable outcomes for themselves (Pfeffer and Sutton, 2000; Cunningham and Fiume, 2003; Steele and Albright, 2004), even though they almost certainly lead to higher costs – the opposite of what the PPV metric is intended to do. Importantly, individual buyers are not to blame. They are simply seeking to survive in a stressful environment that contains many contradictions over the relative importance of price, on-time delivery, quality, and other factors.

Many purchasing executives that have risen through the ranks know the tactics identified in this paper first-hand. Remarkably, few seek to eliminate the PPV metric. Rather than switch from standard costs to more meaningful business metrics based on actual costs (Maskell and Baggaley, 2004), most purchasing executives instead favor the status quo because they too know how to manipulate the PPV metric. They also know it does not accurately reflect actual costs, and therefore permits obfuscation. The fact that this metric is embedded in purchasing information systems makes change even more difficult, and is thus a structural impediment to real improvement.

The tactics identified do not represent every possible tactic that could be used. Rather, they simply illustrate the variety of tactics that are often used to manipulate the PPV metric. While the ethics of such manipulations are obviously questionable, the fact remains that people do manipulate business metrics to avoid unfavorable outcomes (Emiliani, 2000; Pfeffer and Sutton, 2000). Our intent is not to portray buyers as bad people, nor to imply that companies using the PPV metric condone the use of such tactics. Instead, we simply highlight a common problem and present alternate solutions that are known to result in better outcomes.

Tactic No. 1

For new parts, combine the unit price and tooling cost, amortized over the number of pieces required, for the current year. In the following year, use last year's unit price minus the tooling cost to create the appearance of favorable PPV from one year to the next.

Tactic No. 2

For new work, quote only high-priced suppliers. Source new work to one of the high priced suppliers to establish a high standard cost the first year, then switch to a slightly lower price supplier in the second year. Repeat as necessary.

Tactic No. 3

Buyer moves parts with high unfavorable PPV to a different buyer or buying group. Buyer will create a plausible story for why the part should not belong to them. May be done with or without approval (i.e. surreptitiously).

Tactic No. 4

A part has chronically unfavorable PPV – i.e. the standard cost is much less than the actual part price. Buyer works with an engineer to discontinue current part number, replace with a new part number, and then establish a new standard cost. Buyer will input a high unit cost to build a cushion that absorbs cost reduction demands in future years.

Tactic No. 5

A part has chronically unfavorable PPV – i.e. the standard cost is much less than the actual part price. Buyer works with

an engineer to determine if the same part design exists as a different part number. Discontinue current part number and instead use another existing part number (or vice versa). Leverage purchase volumes from both part numbers to obtain a lower price.

Tactic No. 6

Buyer orders a large quantity of an item to obtain a low unit price that closely matches the standard cost, receives 25-75 percent of the quantity of material requested, and then cancels the balance of the order. Settlement of outstanding purchase order requirements accrue to a different budget category. May use in conjunction with Tactic No. 8.

Tactic No. 7

Buyer will have some parts with favorable PPV – i.e. standard cost is much higher than the actual purchase price. Buyer protects these parts to gain favorable variance that is used to offset unfavorable variance from other parts. May receive entire year requirement in January to book the favorable variance. Buyer changes the standard cost only when forced to do so – i.e. when management discovers the driver of unusually high favorable PPV.

Tactic No. 8

Buyer asks a friend in the materials planning department to increase the requirement to obtain a lower unit price. May use in conjunction with Tactic No. 6.

Tactic No. 9

Buyer has a part with unfavorable PPV – i.e. standard cost is much lower than the actual purchase price. Buyer convinces supplier to take the part at the standard cost, then offers the supplier one or more different parts whose standard cost is higher than the quoted price. The parts with higher standard cost offset the supplier's losses from the part with lower standard cost. May use in conjunction with Tactic No. 8.

Tactic No. 10

Supplier identifies a cost reduction opportunity in the 3rd or 4th quarter. Buyer and supplier agree to defer implementation to obtain favorable PPV in the upcoming year. The buyer will typically budget 50-75 percent of the anticipated savings to achieve both favorable PPV and establish a cushion in case some of the cost reduction is not achieved, or to apply the savings in future years.

Tactic No. 11

Online reverse auctions take advantage of management's strong interest in trendy technological solutions and to achieve what appears to be quick savings (Emiliani and Stec, 2002, 2004, 2005). First qualify several new suppliers on delivery and quality performance, then compete them on price in real-time dynamic bidding via the Internet. PPV metric eclipses efforts to reduce total cost.

Tactic No. 12

Buyer switches sources of supply, from an incumbent supplier to new supplier. The price of the part purchased from incumbent supplier was \$1000, for example. New supplier agrees to supply the parts at zero cost to the buyer for new equipment sales, in exchange for promise of future sales through other distribution channels (e.g. higher volume aftermarket). Buyer's information system requires a price

associated for each part number in the bill of materials. A price of \$0.01 is input into the information system, and purchasing organization then claims \$999.99 in favorable purchase price variance for all parts received in the budget year. Buyer may accelerate delivery schedule to maximize favorable PPV. Similar to Tactic No. 9.

The value of the PPV metric is obviously questionable because it can be easily manipulated (Cunningham and Fiume, 2003; Pfeffer and Sutton, 2000), as these real-world examples illustrate. Senior management, who owns the metrics, has a responsibility to ensure that they and others use business metrics appropriately, or discontinue the use of metrics that are easily manipulated or do not accurately represent performance. This is a facet of corporate responsibility and financial reporting that can be improved upon (SEC, 2002; SOA, 2002).

Abandoning business metrics that drive dysfunctional behaviors is, in general, hard to do because they are institutionalized, and top managers are usually unwilling to change well-established routines even though they often cite the importance of change and the need for improvement (Pfeffer and Sutton, 2000). In other cases, management may want to replace the PPV metric, but they are not sure what measures to use in its place. Thus despite the propensity for misuse documented in the tactics described, many senior managers continue to rely on the PPV metric as a key measure of purchasing performance.

Creating waste or creating value?

In conventional management practice, PPV tactics are just a normal part of daily business activities. It is certainly not the only metric that is quietly manipulated. In manufacturing, the “earned hours” metric, based on standard direct labor cost, is often skillfully manipulated to meet budgets by producing goods that “earn” the most labor hours instead of making the specific goods that customers ordered. This is just one of many examples (Emiliani, 2000). The question is: who benefits from using these tactics? Individual buyers, purchasing managers, and purchasing executives are the primary beneficiaries, as they survive another month, another quarter, or another year. Since PPV is a simple-to-calculate cost reduction metric, it would seem implausible that costs could actually increase. But they do. The reasons become clear only when viewed from a different perspective.

In the Lean management system (Emiliani *et al.*, 2003), senior managers recognize the existence of eight different types of waste, called *muda* in Japanese (Ohno, 1988; Emiliani, 1998):

- 1 overproduction;
- 2 waiting;
- 3 transportation;
- 4 processing;
- 5 inventories;
- 6 movement;
- 7 defects; and
- 8 behaviors.

In addition, they also recognize the need to eliminate unevenness (e.g. uneven work loads, called *mura* in Japanese) and unreasonableness (e.g. unreasonable work requirements, called *muri* in Japanese) (Lu, 1989). The eight wastes, plus *mura* and *muri*, increase costs (Ohno, 1988;

Emiliani *et al.*, 2003; Maskell and Baggaley, 2004). Importantly, business is viewed as a human-centered activity – not solely as a machine to make money – and people are considered valuable resources. Therefore, management takes seriously its responsibility to ensure that people do not spend time creating or managing *muda*, *mura*, and *muri*. Instead, people spend their time eliminating *muda*, *mura*, and *muri* and focus on creating value for end-use customers (Womack and Jones, 1996; Emiliani *et al.*, 2003). Kaizen is the process for differentiating between value-added work, non-value added but necessary work, and waste – including *mura* and *muri* (Ohno, 1988; Lu, 1989). Two key principles are “continuous improvement” and “respect for people” (Toyota, 2001).

Conventional management practice does not recognize *muda*, *mura*, or *muri*, nor does it view business as a human-centered activity in the same way that lean businesses do. Instead, the purpose of the business is to make money – to maximize shareholder value, usually in the short term – and people are viewed as a cost to be eliminated if possible. Management, often unknowingly, allows people – e.g. individual buyers – to spend time on waste, unevenness, and unreasonableness, as shown in Table I.

The PPV metric, in conjunction with an environment that blames people when they miss their objectives, drives wasteful work activities and behaviors. In addition, four of the tactics shown in Table I result in inventories and overproduction, which in the lean management system are among the greatest wastes of all because they add unnecessary cost to the business – which reduces competitiveness and is thus bad for employees, customers, suppliers, investors, and the community.

In addition, the PPV metric and associated variance analysis activities do not help people understand the root cause of cost problems. Instead, the focus is on price, and valuable human labor and thinking are spent on gaming the PPV metric. Time is spent managing waste, unevenness, and unreasonableness rather than eliminating it. Conventional management practice does not recognize or value “continuous improvement” and “respect for people” (Emiliani *et al.*, 2003)

The PPV metric can misrepresent actual cost savings in both internal financial reports and external financial reporting to shareholders because it does not represent the total cost of purchasing decisions (Emiliani and Stec, 2002). The exclusive focus on invoice price ignores other costs related to the purchasing function such as ordering and transaction costs, storing and transporting materials, and supplier certification and communication. These costs can be considerable, and the 12 PPV tactics listed will increase these costs. Importantly, problems associated with poor purchasing decisions are paid for by budgets in departments that are external to the purchasing organization, such as quality, warranty or after-sales service, or materials management. Perhaps a bigger problem with the PPV metric is that it does not help the purchasing organization develop inter-organizational problem-solving capabilities (Womack *et al.*, 1990; Fujimoto, 1999; Womack, 2003), which will improve long-term competitiveness (Emiliani, 2004).

While senior managers may utter words that indicate the importance of quality and on-time delivery, the use of the PPV metric typically drives behaviors that focus on unit price reduction. Further, it demonstrates that senior managers lack broad awareness of the tools and processes that achieve lower

Table I Unfavorable outcomes caused by manipulating the PPV metric

PPV tactic	Type of waste (<i>muda</i>)	Unevenness (<i>mura</i>)	Unreasonableness (<i>muri</i>)
1	Behaviors	✓	✓
2	Behaviors	✓	✓
3	Behaviors		✓
4	Behaviors		✓
5	Behaviors		✓
6	Behaviors, inventories, overproduction	✓	✓
7	Behaviors	✓	✓
8	Behaviors, inventories, overproduction	✓	✓
9	Behaviors		✓
10	Behaviors	✓	✓
11	Behaviors, inventories, overproduction	✓	✓
12	Inventories, overproduction	✓	✓

prices without making trade-offs against quality and delivery – and also develop capabilities and long-term competitiveness (Ohno, 1988; Monden, 1995; Womack and Jones, 1996; Fujimoto, 1999; Womack, 2003; Emiliani, 2004; Maskell and Baggaley, 2004).

So what should senior managers do to reduce the cost of purchased materials? Alternative solutions based upon collaborative problem solving, rather than power-based bargaining, and leading to long-term intra- and inter-organizational capability building and improved competitiveness have been presented in previous studies (Womack *et al.*, 1990; Nishiguchi, 1994; Monden, 1995; Bounds, 1996; Bounds *et al.*, 1996; Cooper and Slagmulder, 1999; Fujimoto, 1999; Womack, 2003).

A better approach for measuring purchase price performance is to compare the actual price paid to the target or goal for a period, usually monthly (Emiliani *et al.*, 2003):

$$\text{Current cost (target)} - \text{current cost (actual)}$$

At first glance, this may appear to be no different than the PPV metric. What, after all, has changed, other than replacing the standard or budgeted cost with a target cost? The difference may be subtle, but it is more than mere semantics. If the standard has been adjusted to incorporate desired savings, the PPV metric implies that cost improvement is expected to occur instantly. This is unrealistic, and individual buyers faced with an unrealistic goal and no means to avoid unfavorable variances have incentive to manipulate the measure. If the standard has not been adjusted to incorporate a desired cost savings, then the PPV metric encourages people to maintain the status quo.

The target cost, on the other hand, is a goal to aspire to. Buyers are not expected to immediately achieve the target. What is expected is a trend of continuous improvement in actual costs, reducing the gap between the actual cost and the target cost. This measure of purchase price performance is unambiguous, unlike the standard cost based PPV metric, and reveals the gap that must be closed to achieve the planned price. Importantly, it compels buyers to understand the source of the cost gap, which they can address only if they understand manufacturing processes, and then assist suppliers in the use of various methods and tools such as cellular production, set-up reduction, value analysis, etc., to

eliminate waste, unevenness, and unreasonableness (Ohno, 1988; Lu, 1989; Monden, 1995; Imai, 1997).

Implementation of accounting systems and performance measures consistent with lean principles and practices (e.g. based on value streams) have been previously reported (Emiliani *et al.*, 2003; LEI, 2003; Maskell and Baggaley, 2004). The only measure directly applicable to the purchasing function is total material cost. The goal is not to obtain the lowest price for materials or optimize the purchasing function. Instead, the goal is to reduce the overall cost of value creation by eliminating waste throughout value streams. Similar approaches, such as the “total cost of ownership, have been extensively reported in the literature (Carr and Ittner, 1992; Ellram and Siferd, 1993; Ellram and Siferd, 1998; Ferrin and Plank 2002).

The findings presented in this paper point to numerous avenues for future research, including:

- Conduct empirical studies to identify additional PPV tactics in use.
- Obtain field data to validate the PPV tactics across a larger spectrum of companies in one or more industry segments.
- Determine the impact of efforts to manipulate the PPV metric on the integrity of financial statements.
- Compare extent of use of PPV tactics in legacy purchasing information systems versus modern ERP systems.
- Identify and test improvements that could be made to management education to help eliminate the use of metrics that drive inappropriate behaviors.

Summary

This paper presented 12 tactics that buyers often use to obtain favorable purchase price variance in efforts to avoid unfavorable outcomes for themselves and their work unit. Each tactic results in higher costs and expansion, rather than the elimination of, waste, unevenness, and unreasonableness. For many businesses, ongoing commitment to the PPV metric indicates that manipulating this metric and spending time on related variance analyses are more highly valued skills for people to possess than specific methods used to eliminate cost at the source (AT Kearney, 2003; Womack, 2003).

Most purchasing executives know the tactics identified in this paper first-hand, yet do not seek to eliminate the PPV metric. Operations and finance executives should find the tactics listed extremely unsettling and will hopefully become

catalysts for needed change for this and other business metrics that do not accurately represent performance. Engineering executives should take note because some of the tactics used are directly attributable to engineering design practices that create high cost products and indicate the absence of formal target costing processes (Monden, 1995; AT Kearney, 2003).

The PPV metric is characteristic of a conventional approach to management control that relies on faulty assumptions. It assumes that emphasizing financial outcomes in each functional area leads to operating efficiency. It further assumes that achieving maximum operating efficiency in each functional area will lead to system-wide efficiency. The PPV metric and others like it support this management approach.

However, this conventional approach does not recognize the effect actions taken in one functional area have on cost and efficiency in other functional areas. Local optimization typically does not lead to system-wide efficiency. In contrast, lean management achieves system-wide efficiency through intra- and inter-organizational efforts to eliminate waste. Retaining dysfunctional measures such as the PPV metric creates major obstacles to the implementation of lean management practices.

An alternative measure for purchase price performance, the trend in actual costs compared to a target cost, provides purchasing with better information for understanding cost reduction challenges. Used in concert with operational measures of supplier performance on critical dimensions that affect costs throughout the value stream (LEI, 2003; Womack, 2003; Maskell and Baggaley, 2004), the alternative measure will direct buying organizations to reduce costs in collaboration with suppliers using well-established problem-solving methods and tools.

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