

ACCOUNTING

One Cost System Isn't Enough

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FROM THE JANUARY 1988 ISSUE

Many companies now recognize that their cost systems are inadequate for today's powerful competition. Systems designed mainly to value inventory for financial and tax statements are not giving managers the accurate and timely information they need to promote operating efficiencies and measure product costs.

In response, they have tried to redesign their present systems, but results have been disappointing.

- One chemical company's system did a good job of estimating full product costs but could not be used for cost control. It gathered product costs at each production stage and cumulatively absorbed all variances along the production trail. While the system reported actual costs for all products, it provided no information to motivate or evaluate the cost-reduction efforts of production managers.

As competition shifted to low-cost production of commodity products, the company had to develop a new cost system to give unit managers more reliable information about their production efficiency. Headquarters scrapped the old system and installed one that isolated all variances at the cost centers where they occurred. Local managers could now observe the

impact of their efficiency activities. Marketers and business managers disliked the new system, though, because they could now see only standard product costs. They had lost the actual cost information the old system supplied. After several years of bickering, the company overhauled the new system to recapture the old system's output.

- The components division of a heavy machinery business had an excellent system that promoted cost control and production efficiency. It yielded frequent reports on direct labor use and efficiency, scrap buildup, and department expenditures. The only information on product costs, however, came from the standard cost system used to allocate overhead for financial reporting purposes. This system had recently been redesigned so that overhead costs were allocated to products using machine hours and material dollars as well as the traditional direct-labor hour base. But even with this redesigned system, the division's attempts to seek outside customers were undermined by highly distorted product cost estimates.

Why are so many companies having such difficulty? Cost system designers have failed to recognize that their systems need to address three different functions:

Inventory valuation for financial and tax statements, allocating periodic production costs between goods sold and goods in stock.

Operational control, providing feedback to production and department managers on the resources consumed (labor, materials, energy, overhead) during an operating period.

Individual product cost measurement.

Even if cost system designers recognize how important and how different the demands of these three functions are, their efforts are blocked by senior executives' insistence on a single "official" system. And when compromises have to be made, the demands of the financial reporting function (inventory valuation) invariably triumph. The more managerially relevant functions of operational control and product costing usually suffer.

Many businesses know the consequences of this dilemma all too well. Operating costs are reported too late and are too aggregated to benefit production supervisors. Managers must use product cost estimates that focus on the least important cost component—direct labor—and ignore expenses involved in designing, marketing, distributing, and servicing goods.

Businesses can no longer afford cost systems that work well only to value inventory for financial reporting. No single system can adequately cover all three functions. The demands of each differ in terms of reporting frequency, degree of allocation, nature of cost variability, system scope, and degree of objectivity (see the Exhibit).

EXHIBIT

Different Functions, Different Demands

Functions	Frequency	Degree of Allocation	Scope of System	Nature of Variability	Degree of Objectivity
Inventory valuation	Monthly or quarterly	Aggregate	Factory costs	Irrelevant	High
Operational control	Daily, by unit of work accomplished	None	Responsibility center	Short-term variable and fixed	High
Product cost measurement	Annually and at major change points	Extensive, down to individual products or product lines	Entire organization, including production, marketing and distribution, engineering, service, and administration	All variable	Low

Exhibit Different Functions, Different Demands

The chemical company in the first example was better off than most: at least it had one system separate from its method for valuing inventory. Initially, the system estimated product costs; subsequently, the company changed it to improve operational control. Similarly, the heavy machinery company had a good, separate system for operational control, even though it could not estimate product costs well. I have observed many companies whose cost systems weren't good for either function. Executives need a better understanding of the different demands of the three cost system functions.

Inventory Valuation

Under generally accepted accounting principles, manufacturers must allocate periodic production costs to all items produced. Inventory valuation systems divide these costs—labor, materials purchases, and factory overhead—between items sold and those still in stock. Financial accounting principles do not require that assigned overhead costs be causally related to the demands of individual products, so many companies continue to use direct labor to allocate overhead, even though direct labor may account for less than 5% of total manufacturing costs. Moreover, businesses can use a single plantwide burden rate for allocating overhead to products, regardless of the diversity of their production processes.

Therefore, a company's overhead allocation scheme may not correspond to the underlying production process or to the demands individual products make on the enterprise's resources. Auditors won't question cost-of-sales or inventory valuation estimates merely because the company has used an aggregated, simplistic method for assigning overhead costs to products. As long as the split of costs between goods sold and goods still in stock is fairly accurate, in aggregate, the needs of financial reports will have been met.

The cost system for external reporting does not, however, give managers relevant performance measurement and product cost information.

Operational Control

An operational control system must provide accurate, timely feedback to managers on their performance. The system must correspond to the unit manager's level of responsibility, control for known variations in cost behavior, and minimize the incidence of cost allocations. Cost-accounting calculations (like the allocation of overhead to products and departments, or the computation of volume variances) should not be part of a company's operational control system because they obscure the information that cost center managers need to operate effectively.

Frequency. Companies measure performance by comparing actual results against standard or budgeted levels. Comparisons can be made periodically or each time a unit of work is finished. To be most useful, however, the frequency of reported information should follow the cycle of the production process being measured. In departments producing hundreds of parts per hour, the per-unit materials, labor, machine time, and utility consumption should be reported daily or even hourly. The system for control in a support department or research lab could report on a much longer cycle.

Obviously, it is not much help to get monthly cost reports for an operation that turns out many parts per second. A manager controlling work hourly and daily does not want to receive an aggregate variance report in the middle of the subsequent month. Equally as obvious, daily or weekly cost reports would confuse departments taking several months to assemble a complex machine or performing basic research.

For operations under computer control, the digital data can be captured to record what, when, and how much was produced. Companies no longer need to collect production data with stopwatches, time clocks, and clipboards. Automatic bar-code reading of parts

combined with local area networks permit continual tracking of parts and operations. Cost control systems can record these data and provide frequent, accurate reports on actual output and resource consumption.

Cost Fluctuations. Effective operational control requires an understanding of which costs are fixed and which change with short-term variations in activity. Separating costs in this way permits preparation of flexible budgets that adjust for changes in activity levels on the consumption of labor, materials, machine time, energy, and support services.

It is easier to establish a flexible budget for operational control when analysts grasp the underlying scientific or engineering laws governing the production process. They can then build the cost control system on the production standards established by the conversion process. A production process that is stable and repetitive also helps to predict the relationship between inputs and outputs. In both cases, the company can base its cost control system on a flexible budget that adjusts for costs that vary with fluctuations in short-run production activity.

Cost Allocations. Many companies routinely allocate costs to a cost center, even when the center has little or no control over them. This practice evolved because, to value inventory, all factory costs must be allocated to products. With traditional inventory costing systems, plant and overhead costs are first allocated to cost centers and then, using a cost center burden rate, allocated to products.

Once a company separates its system for measuring operating performance from that used to value inventory, however, it does not have to allocate common or noncontrollable costs to individual cost centers. Only those costs that are directly related to actions taken within a cost center and whose consumption can be accurately measured at the cost center level should be reported periodically to the unit manager.

For example, a cost center's metered demand for kilowatt-hours of electricity or pounds of steam should be assigned to that center. But if metering is difficult, a company does not improve cost control activities by allocating a factorywide utility expense to cost centers.

By avoiding allocations, the operating report can be based on accurate, objective data on the cost center's consumption of resources during a period. Ballpark estimates of the quantity of labor, machine time, and support resources used don't help managers' efficiency and productivity improvement efforts. Moreover, operating reports filled with estimated and allocated costs distract cost center managers from their primary responsibilities to monitor and control production efficiencies and to improve productivity. If headquarters occasionally needs unit managers to help monitor costs incurred by the whole division or the company, it can allocate common costs to the cost center—on a one-time basis, for information purposes only.

Nonfinancial Measurements. Cost information may, in fact, play only a minor role in operational control. A company maintains control best at the shop-floor level by frequent reports of measures like yield, defects, output, setup and throughput times, and physical inventory levels. At the department level, monthly summaries of quality control (part-per-million defect rates, percentage of items produced with no rework required), average throughput times, percentage of delivery commitments met, inventory levels, new product introduction times, and marketing and distribution statistics make up the most relevant set of performance measures. Financial measurements are useful for periodically comparing actual with budgeted expenditures in each department. Measures of process costs will be helpful when many inputs are combined into intermediate and finished products. But many companies rely too much on summary financial measures and ignore the powerful opportunities for continual improvement that a well-constructed set of nonfinancial operating measures can give them.

Product Cost Measurement

Even the best designed and implemented operational control system, however, can be useless for measuring product costs. Take the experience of one company in the transportation industry. By the late 1960s, the company had developed an extensive network for accumulating and reporting costs at each of its more than 5,000 cost centers. It summarized them by different classifications, geographical regions, and degrees of authority for all levels of management. By comparing operating costs against budget and to the same periods in the previous year, the system provided an excellent tool for cost control and productivity improvement.

Then deregulation—and price competition—hit the company. Executives realized that none of the information in their elaborate reporting system could help them to estimate product costs. Without knowledge of product costs, the new freedom to quote prices and to enter or leave markets could have been disastrous. Fortunately, the company developed completely new systems to estimate product costs and to evaluate product and product-line profitability. The company is now prospering in its deregulated environment.

Traditional standard cost systems in manufacturing companies are designed not to measure product costs accurately but to value inventory. The standard costs usually bear no relation to the resources consumed to design, produce, market, and deliver the product. I have seen cases where a more accurate system revealed that products yielding healthy profits according to the standard cost system—with indicated margins of more than 45%—were actually losing money. Similarly, careful analyses of marketing and distribution expenses have shown that product lines, previously considered to be only breaking even, were actually among the company's most profitable.

Seriously distorted product costs can lead managers to choose a losing competitive strategy by de-emphasizing and overpricing products that are highly profitable and by expanding commitments to complex, unprofitable lines. The company persists in the losing strategy because executives have no alternative sources of information to signal when product costs are distorted. Only after many years of declining market share and reduced profitability will managers learn how erroneous product costs led to poor product mix and pricing decisions.

Analysts, attempting to understand the demands a product makes on the company's resources, can start by interviewing the supervisors of production, support, logistics, and marketing departments. They must learn what creates work for the resources in these areas, the cost of performing the work, and the quantity of work demanded by individual products.

Allocations and Estimates. Extensive allocations of support department costs may be necessary to estimate the unit costs of the activities that these departments perform. In the transportation company, for example, virtually all the product costs came from an allocation process.

Product cost estimates will not have the five- and six-digit precision reported by a standard cost system. They will also be more subjective and less precise than the measurements in an operational control system. Executives of multiproduct companies will be fortunate if the first digit in their product cost estimates is valid, and they can make a reasonably good guess at the second. But the estimates will realistically approximate the *long-run* demands each product makes on the organization's resources.

Cost Variability. A company should base most of its important product decisions on estimates of the long-run, variable costs of individual products.¹ Whether costs are fixed or variable, of course, depends on the viewer's time horizon. In the short run, virtually all costs

are fixed: materials have already been acquired, utilities have been turned on, and the workers have showed up for the day. Over a long period, however, costs become variable: machines and plants can be retired or sold, supervisors transferred.

Product decisions have long-term consequences for the organization. Executives should therefore consider virtually all costs to be variable when measuring product costs. That will require a new orientation for many managers. They must recognize that many costs traditionally thought of as fixed actually vary according to the diversity and complexity of products. Much manufacturing overhead, for example, comes from transactions associated with the start or finish of production, such as placing and paying for orders, receiving and inspecting purchased materials, setting up machines, moving inventory, and shipping finished goods.²

To reflect these costs, the system must include not only traditional volume-related measures for tracing costs to products such as labor and machine hours or materials quantities, but also measures that count setups, inspections, receipts, parts, vendors, and engineering change orders. The scheme must determine how indirect production costs vary in the long run, both with regard to production volume and to the activities necessary to produce multiple items in the same facility.

System Scope. While the typical operational control system segregates costs incurred at each responsibility center, a good product cost system should report expenses incurred across the organization's entire value chain. A product's cost includes not only the cost of factory resources to convert raw materials and purchased components to a finished item but also the cost of resources to establish the distribution channel, make the sale (including advertising and promotion), service the product, and supply support services like engineering design, process improvement, purchasing, information systems, financial and cost analysis, and general administration.

All company resources support production and sales. Even corporate expenses should be allocated to product costs, especially if they vary across lines. Legal expenses are a good example. They can vary by risks of product liability and environmental damage, or by antitrust concerns across different categories of products.

The product cost system can ignore only two classes of costs—expenses incurred that benefit future products, like basic research or development, and the expenses of idle or unused capacity. Existing financial accounting rules require that basic R&D be expensed each period. But for managerial purposes, R&D should be considered investments in future products, not costs of present products. Unused capacity is an expense for a particular period due to cyclical declines in sales, or an investment for future market growth. Either way, allocating unused capacity costs distorts estimates of the long-run, variable production costs of today's products.

Updates. A company does not need to perform the analysis and interviews for the product costing system more than once a year unless it makes major changes in its process technology, product mix, or organizational structure. Decisions regarding product introduction, abandonment, and pricing are strategic matters that should be based on the long-run marginal costs of each product.

The annual product cost computation does not have to be part of the main financial accounting system, nor does it require a lot of time and money to develop and implement. Several businesses have developed prototype product cost systems on personal computers. Of course, if a company has many products going through complex production and distribution processes, its product cost system will be more expensive to build and operate.

Even with only annual updates, managers can use the system throughout the year to influence new product design, introduction, and pricing decisions. A good system yields unit costs for all key activities (labor and machine hours, energy usage, materials, support), and it includes the unit costs of transactions like setups, shipments, part and vendor quantities, and inspections. A company can estimate a new product's cost by specifying its demands on both activities and transactions.

Including the costs of transactions like setups in product costs enhances the information given to product designers. They can better understand the costs of demands of potential products that require, for example, new components, a large number of parts, new vendors, more setups for small batch production, and more inspections for certifying tight tolerances. They can then make trade-offs among these features versus using simpler designs that exploit existing parts and vendors.

When Easy or Difficult?

One cannot generalize about the ease of designing adequate operational control and product cost systems. Companies with only a single product can estimate product costs with a trivial system. Accumulate all the expenses during a period, subtract amounts relating to future products or excess capacity, and divide the remainder by the number of units produced. Similarly, companies with continuous-flow production processes that yield homogeneous outputs can rely on measurement of product costs in units, like cost per ton or cost per gallon. Product costing for large projects like major construction, shipbuilding, or the design and manufacture of a large machine is also rather simple. In contrast, it can be extremely difficult to estimate costs of items produced by complex batch and assembly processes.

Operational control systems are simple to design and install in highly repetitive production environments, especially those governed by well-understood scientific relationships between inputs and outputs. Operational control is also easier in functional organizations

where each unit performs narrowly defined functions. Furthermore, an operational control system can be installed inexpensively when production data are readily available. When product diversity is high, though, especially in production of unique items or with multiperiod production processes (as in construction, shipbuilding, and design and assembly of large, one-of-a-kind machines), operational control systems will be difficult to develop.

No single system can adequately answer the demands made by the diverse functions of cost systems. While companies can use one method to capture all their detailed transactions data, the processing of this information for diverse purposes and audiences demands separate, customized development. Companies that try to satisfy all the needs for cost information with a single system have discovered they can't perform important managerial functions adequately. Moreover, systems that work well for one company may fail in a different environment. Each company has to design methods that make sense for its particular products and processes.

The current economics of information collection, processing, and reporting have made multiple cost systems possible. Managers can exploit new trends in distributed computing by developing decentralized systems for operational control and product costing.

Of course, an argument for expanding the number of cost systems conflicts with a strongly ingrained financial culture to have only one measurement system for everyone. Eventually, designers may be smart enough to create such a system, but we don't have one today. Any time accepted wisdom is overthrown, the world suddenly looks far more complex. When scientists declared a war on cancer more than a decade ago, for example, they thought they would need specialized cures for the hundreds of different forms of the disease. But over time and after extensive experimentation, they have begun to develop unifying theories that offer hope for more general treatments and cures.

In the same way, it is too early to discover the general system that will meet all the organization's demands for cost information. Designers must first attack the individual pieces, then with greater wisdom and insight eventually discover a general cost system that works for all managerial functions. Companies that decide to wait for such a unifying discovery, though, will suffer in the interim the consequences of using inadequate information on operating performance and product costs.

1. See Robin Cooper and Robert S. Kaplan, "How Cost Accounting Systematically Distorts Product Costs," in *Accounting & Management: Field Study Perspectives*, ed. William J. Bruns, Jr. and Robert S. Kaplan (Cambridge: Harvard Business School Press, 1987), p. 204.
2. See Jeffrey Miller and Thomas Vollman, "The Hidden Factory," HBR September–October 1985, p. 142.

A version of this article appeared in the January 1988 issue of *Harvard Business Review*.



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