

HOW COST ACCOUNTING DISTORTS PRODUCT COSTS

The traditional cost system that defines variable costs as varying in the short term with production will misclassify these costs as fixed.

BY ROBIN COOPER AND
ROBERT S. KAPLAN

In order to make sensible decisions concerning the products they market, managers need to know what their products cost. Product design, new product introduction decisions, and the amount of effort expended on trying to market a given product or product line will be influenced by the anticipated cost and profitability of the product. Conversely, if product profitability appears to drop, the question of discontinuance will be raised. Product costs also can play an important role in setting prices, particularly for customized products with low sales volumes and without readily available market prices.

The cumulative effect of decisions on product design, introduction, support, discontinuance, and pricing helps define a firm's strategy. If the product cost information is distorted, the firm can follow an inappropriate and unprofitable strategy. For example, the low-cost producer often achieves competitive advantage by servicing a broad range of customers. This strategy will be successful if the economies of scale exceed the additional costs, the diseconomies of scope, caused by producing and servicing a more diverse product line. If the cost system does not correctly attribute the additional costs to the products that cause them, then the firm might end up competing in segments where the scope-related costs exceed the benefits from larg-

er scale production.

Similarly, a differentiated producer achieves competitive advantage by meeting specialized customers' needs with products whose costs of differentiation are lower than the price premiums charged for special features and services. If the cost system fails to measure differentiation costs properly, then the firm might choose to compete in segments that are actually unprofitable.

FULL VS. VARIABLE COST

Despite the importance of cost information, disagreement still exists about whether product costs should be measured by full or by variable cost. In a full-cost system, fixed production costs are allocated to products so that reported product costs measure total manufacturing costs. In a variable-cost system, the fixed costs are not allocated and product costs reflect only the marginal cost of manufacturing.

Academic accountants, supported by economists, have argued strongly that variable costs are the relevant ones for product decisions. They have demonstrated, using increasingly complex models, that setting marginal revenues equal to marginal costs will produce the highest profit. In contrast, accountants in practice continue to report full costs in their cost accounting systems.

The definition of variable cost used by academic accountants assumes that product decisions have a short-time horizon, typically a



Robin Cooper and Bob Kaplan are taking research out of the academic setting.

month or a quarter. Costs are variable only if they vary directly with monthly or quarterly changes in production volume. Such a definition is appropriate if the volume of production of all products can be changed at will and there is no way to change simultaneously the level of fixed costs.

In practice, managers reject this short-term perspective because the decision to offer a product creates a long-term commitment to manufacture, market, and support that product. Given this perspective, short-term variable cost is an inadequate measure of product cost.

While full cost is meant to be a surrogate for long-run manufacturing costs, in nearly all of the companies we visited, management was not convinced that their full-cost systems were adequate for its product-related decisions. In particular, management did not believe their systems accurately reflected the costs of resources consumed to manufacture products. But they were also unwilling to adopt a variable-cost approach.

Of the more than 20 firms we visited and documented, Mayers Tap, Rockford, and Schrader Bellows provided particularly useful insights on how product costs were systematically distorted.¹ These companies had several significant common characteristics.

They all produced a large number of distinct products in a single facility. The products formed several distinct product lines and were sold through diverse marketing channels. The range in demand volume for products within a product line was high, with sales of high-volume products between 100 and 1,000 times greater than sales of low-volume products. As a consequence, products were manufactured and shipped in highly varied lot sizes. While our findings are based upon these three companies, the same effects were observed at several other sites.

In all three companies, product costs played an important role in the decisions that surrounded the introduction, pricing, and discontinuance of products. Reported product costs also appeared to play a significant role in determining how much effort should be assigned to marketing and selling products.

Typically, the individual responsible for introducing new products

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also was responsible for setting prices. Cost-plus pricing to achieve a desired level of gross margin predominantly was used for the special products, though substantial modifications to the resulting estimated prices occurred when direct competition existed. Such competition was common for high-volume products but rarely occurred for the low-volume items. Frequently, no obvious market prices existed for low-volume products because they had been designed to meet a particular customer's needs.

ACCURACY OF PRODUCT COSTS

Managers in all three firms expressed serious concerns about the accuracy of their product-costing systems.

For example, Rockford attempted to obtain much higher margins for its low-volume products to compensate, on an ad hoc basis, for the gross underestimates of costs that it believed the cost system produced for these products. But management was not able to justify its decisions on cutoff points to identify low-volume products or the magnitude of the ad hoc margin increases. Further, Rockford's management believed that its faulty cost system explained the ability of small firms to compete effectively against it for high-volume business. These small firms, with no apparent economic or technological advantage, were winning high-volume business with prices that were at or below Rockford's reported costs. And the small firms

seemed to be prospering at these prices.

At Schrader Bellows, production managers believed that certain products were not earning their keep because they were so difficult to produce. But the cost system reported that these products were among the most profitable in the line. The managers also were convinced that they could make certain products as efficiently as anybody else. Yet competitors were consistently pricing comparable products considerably lower. Management suspected that the cost system contributed to this problem.

At Mayers Tap, the financial accounting profits were always much lower than those predicted by the cost system, but no one could explain the discrepancy. Also, the senior managers were concerned by their failure to predict which bids they would win or lose. Mayers Tap often won bids that had been overpriced because it did not really want the business, and lost bids it had deliberately underpriced in order to get the business.

TWO-STAGE COST ALLOCATION SYSTEM

The cost systems of all companies we visited had many common characteristics. Most important was the use of a two-stage cost allocation system: in the first stage, costs were assigned to cost pools (often called cost centers), and in the second stage, costs were allocated from the cost pools to the products.

The companies used many different allocation bases in the first stage to allocate costs from plant overhead accounts to cost centers. Despite the variation in allocation bases in the first stage, however, all companies used direct labor hours in the second stage to allocate overhead from the cost pools to the products. Direct labor hours was used in the second allocation stage even when the production process was highly automated so that burden rates exceeded 1,000%. Figure 1 illustrates a typical two-stage allocation process.

Of the three companies we examined in detail, only one had a cost accounting system capable of reporting variable product costs. Variable cost was identified at the

budgeting stage in one other site, but this information was not subsequently used for product costing. The inability of the cost system to report variable cost was a common feature of many of the systems we observed. Reporting variable product costs was the exception, not the rule.

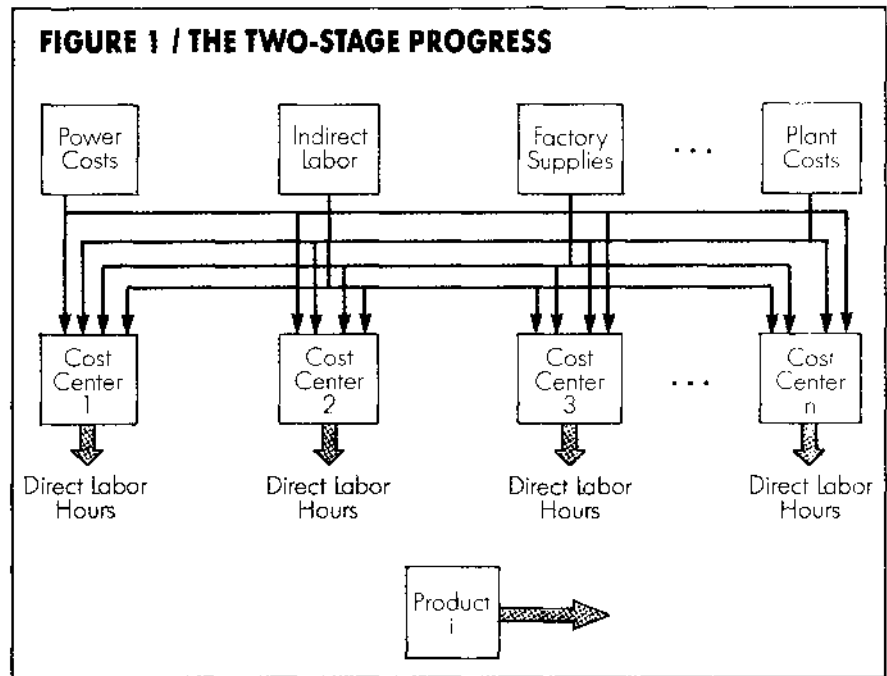
Firms used only one cost system even though costs were collected and allocated for several purposes, including product costing, operational control, and inventory valuation. The cost systems seemed to be designed primarily to perform the inventory valuation function for financial reporting because they had serious deficiencies for operational control (too delayed and too aggregate) and for product costing (too aggregate).

THE FAILURE OF MARGINAL COSTING

The extensive use of fixed-cost allocations in all the companies we investigated contrasts sharply with a 65-year history of academics advocating marginal costing for product decisions. If the marginal-cost concept had been adopted by companies' management, then we would have expected to see product-costing systems that explicitly reported variable-cost information. Instead, we observed cost systems that reported variable as well as full costs in only a small minority of companies.

The traditional academic recommendation for marginal costing may have made sense when variable costs (labor, material, and some overhead) were a relatively high proportion of total manufactured cost and when product diversity was sufficiently small that there was not wide variation in the demands made by different products on the firm's production and marketing resources. But these conditions are no longer typical of many of today's organizations. Increasingly, overhead (most of it considered "fixed") is becoming a larger share of total manufacturing costs. In addition, the plants we examined are being asked to produce an increasing variety of products that make quite different demands on equipment and support departments. Thus, even if direct or marginal costing were once a useful

FIGURE 1 / THE TWO-STAGE PROCESS



recommendation to management, direct costing, even if correctly implemented, is not likely a solution—and may perhaps be a major problem—for product costing in the contemporary manufacturing environment.

THE FAILURE OF FIXED-COST ALLOCATIONS

While we consistently observed managers avoiding the use of variable or marginal costs for their product-related decisions, we observed also their discomfort with the full-cost allocations produced by their existing cost systems. We believe that we have identified the two major sources for the discomfort.

The first problem arises from the use of direct labor hours in the second allocation stage to assign costs from cost centers to products. This procedure may have been adequate many decades ago when direct labor was the principal value-adding activity in the material conversion process. But as firms introduce more automated machinery, direct labor is increasingly engaged in set-up and supervisory functions (rather than actually performing the work on the product) and no longer represents a reasonable surrogate for resource demands by product.

In many of the plants we visited, labor's main tasks are to load the

machines and to act as troubleshooters. Labor frequently works on several different products at the same time so that it becomes impossible to assign labor hours intelligently to products. Some of the companies we visited had responded to this situation by beginning experiments using machine hours instead of labor hours to allocate costs from cost pools to products (for the second stage of the allocation process). Other companies, particularly those adopting just-in-time or continuous-flow production processes, were moving to material dollars as the basis for distributing costs from pools to products. Material dollars provide a less expensive method for cost allocation than machine hours because, as with labor hours, material dollars are collected by the existing cost system. A move to a machine-hour basis would require the collection of new data for many of these companies.

Shifting from labor hours to machine hours or material dollars provides some relief from the problem of using unrealistic bases for attributing costs to products. In fact, some companies have been experimenting with using all three allocation bases simultaneously: labor hours for those costs that vary with the number of labor hours worked (e.g., supervision— if the amount of labor in a product is high, the amount of supervision related to that product also is likely to be

high), machine hours for those costs that vary with the number of hours the machine is running (e.g., power—the longer the machine is running the more power that is consumed by that product), and material dollars for those costs that vary with the value of material in the product (e.g., material handling—the higher the value of the material in the product, the greater the material-handling costs associated with those products are likely to be.)

Using multiple allocation bases allows a finer attribution of costs to the products responsible for the incurrance of those costs. In particular, it allows for product diversity where the direct labor, machine hours, and material dollars consumed in the manufacture of different products are not directly proportional to each other.

For reported product costs to be correct, however, the allocation bases used must be capable of accounting for all aspects of product diversity. Such an accounting is not always possible even using all three volume-related allocation bases we described. As the number of product items manufactured increases, so does the number of direct labor hours, machine hours, and material dollars consumed. The designer of the cost system, in adopting these bases, assumes that all allocated costs have the same behavior; namely that they increase in direct relationship to the volume of product items manufactured. But there are many costs that vary with the diversity and complexity of products, not by the number of units produced.

THE COST OF COMPLEXITY

The complexity costs of a full-line producer can be illustrated as follows. Consider two identical plants. One plant produces 1,000,000 units of product A. The second plant produces 100,000 units of product A and 900,000 units of 199 similar products. (The similar products have sales volumes that vary from 100 to 100,000 units.)

The first plant has a simple production environment and requires limited manufacturing-support facilities. Few setups, expediting, and scheduling activities are required.

The other plant presents a much more complex production-management environment. Its 200 products have to be scheduled through the plant, requiring frequent setups, inventory movements, purchases, receipts, and inspections. To handle this complexity, the support departments must be larger and more sophisticated.

The traditional cost accounting system plays an important role in obfuscating the underlying rela-

tionship between the range of products produced and the size of the support departments. First, the costs of most support departments are classified as fixed, making it difficult to realize that these costs are systematically varying. Second, the use of volume-related allocation bases makes it difficult to recognize how these support-department costs vary.

Support-department costs must vary with something because they have been among the fastest growing in the overall cost structure of manufactured products. As the example demonstrates, support-department costs vary not with the volume of product items manufactured, rather they vary with the range of items produced (i.e., the complexity of the production process). The traditional definition of variable cost, with its monthly or quarterly perspective, views such costs as fixed because complexity-related costs do not vary significantly in such a short time frame. Across an extended period of time, however, the increasing complexity of the production process places additional demands on support departments, and their costs eventually and inevitably rise.

The output of a support department consists of the activities its personnel perform. These include such activities as setups, inspections, material handling, and scheduling. The output of the departments can be represented by the number of distinct activities that are performed or the number of transactions handled. Because most of the output of these departments consists of human activities, however, output can increase quite significantly before an immediate deterioration in the quality of service is detected. Eventually, the maximum output of the department is reached and additional personnel are requested. The request typically comes some time after the initial increase in diversity and output. Thus, support departments, while varying with the diversity of the demanded output, grow intermittently. The practice of annually budgeting the size of the departments further hides the underlying relationship between the mix and volume of demand and the size of the department. The support departments often are constrained to grow only when budgeted to do so.



The strategic importance of product costing is the focus of Professor Cooper's research efforts.

At the companies visited and studied, we found that a large and growing proportion of total manufacturing costs is considered "fixed." In reality, they are the most variable and rapidly increasing costs for the firm.

TABLE 1 / COMPARISON OF REPORTED PRODUCT COSTS AT SCHRADER BELLOWS

Product	Sales Volume	Existing Cost System		Transaction-Based System		Percent of Change	
		Unit Cost*	Unit Gross Margin	Unit Cost*	Unit Gross Margin	Unit Cost	Unit Gross Margin
1	43,562	7.85	5.51	7.17	6.19	(8.7)	12.3
2	500	8.74	3.76	15.45	(2.95)	76.8	(178.5)
3	53	12.15	10.89	82.49	(59.45)	578.9	(645.9)
4	2,079	13.63	4.91	24.51	(5.97)	79.8	(221.6)
5	5,670	12.40	7.95	19.99	0.36	61.3	(93.4)
6	11,169	8.04	5.49	7.96	5.57	(1.0)	1.5
7	423	8.47	3.74	6.93	5.28	(18.2)	41.2

*The sum of total cost (sales volume x unit cost) for all seven products is different under the two systems because the seven products only represent a small fraction of total production.

Support-department costs are perhaps best described as "discretionary" because they are budgeted and authorized each year. The questions we must address are: What determines the level of these discretionary fixed costs? Why, if these costs are not affected by the quantity of production, are there eight people in a support department and not one? What generates the work, if not physical quantities of inputs or outputs, that requires large support-department staffs? We believe the answers to these questions on the origins of discretionary overhead costs (i.e., what drives these costs) can be found by analyzing the activities or transactions demanded when producing a full and diverse line of products.

TRANSACTION COSTING

Low-volume products create more transactions per unit manufactured than their high-volume counterparts. The per unit share of these costs should, therefore, be higher for the low-volume products. But when volume-related bases are used exclusively to allocate support-department costs, high-volume and low-volume products receive similar transaction-related costs. When only volume-related bases are used for second-stage allocations, high-volume products receive an excessively high fraction of support-department costs and, therefore, subsidize the low-volume products.

As the range between low-volume and high-volume products increases, the degree of cross-subsidization rises. Support departments

expand to cope with the additional complexity of more products, leading to increased overhead charges. The reported product cost of all products consequently increases. The high-volume products appear more expensive to produce than previously, even though they are not responsible for the additional costs. The costs triggered by the introduction of new, low-volume products are systematically shifted to high-volume products that may be placing relatively few demands on the plant's support departments.

Many of the transactions that generate work for production-support departments can be proxied by the number of setups. For example, the movement of material in the plant often occurs at the commencement or completion of a production run. Similarly, the majority of the time spent on parts inspection occurs just after a setup or changeover. Thus, while the support departments are engaged in a broad array of activities, a considerable portion of their costs may be attributed to the number of setups.

Not all of the support-department costs are related (or relatable) to the number of setups. The cost of setup personnel relates more to the quantity of setup hours than to the actual number of setups. The number of inspections of incoming material can be directly related to the number of material receipts, as would be the time spent moving the received material into inventory. The number of outgoing shipments can be used to predict the activity level of the finished-goods and shipping departments. The assignment of all these support costs with a

transactions-based approach reinforces the effect of the setup-related costs because the low-sales-volume items tend to trigger more small incoming and outgoing shipments.

Schrader Bellows had recently performed a "strategic cost analysis" that significantly increased the number of bases used to allocate costs to the products; many second-stage allocations used transactions costs to assign support-department costs to products. In particular, the number of setups allocated a sizeable percentage of support-department costs to products.

The effect of changing these second-stage allocations from a direct labor to a transaction basis was dramatic. While the support-department costs accounted for about 50% of overhead (or about 25% of total costs), the change in the reported product costs ranged from about minus 10% to plus 1,000%. The significant change in the reported product costs for the low-volume items was due to the substantial cost of the support departments and the low batch size over which the transaction cost was spread.

Table 1 shows the magnitude of the shift in reported product costs for seven representative products. The existing cost system reported gross margins that varied from 26% to 47%, while the strategic analysis showed gross margin that ranged from -258% to +146%. The trends in the two sets of reported product profitabilities were clear: the existing direct-labor-based system had identified the low-volume products as the most profitable, while the strategic cost analysis indicated exactly the reverse.

There are three important messages in the table and in the company's findings in general.

Traditional systems that assign costs to products using a single volume-related base seriously distort product costs.

The distortion is systematic. Low-volume products are undercosted, and high-volume products are overcosted.

Accurate product costs cannot, in general, be achieved by cost systems that rely only on volume-related bases (even multiple bases such as machine hours and material quantities) for second-stage allocations. A different type of allocation base must be used for overhead costs that vary with the number of transactions performed, as opposed to the volume of product produced.

The shift to transaction-related allocation bases is a more fundamental change to the philosophy of cost-systems design than is at first realized. In a traditional cost system that uses volume-related bases, the costing element is always the product. It is the product that consumes direct labor hours, machine hours, or material dollars. Therefore, it is the product that gets costed.

In a transaction-related system, costs are assigned to the units that caused the transaction to be originated. For example, if the transaction is a setup, then the costing element will be the production lot because each production lot requires a single setup. The same is true for purchasing activities, inspections, scheduling, and material movements. The costing element is no longer the product but those elements the transaction affects.

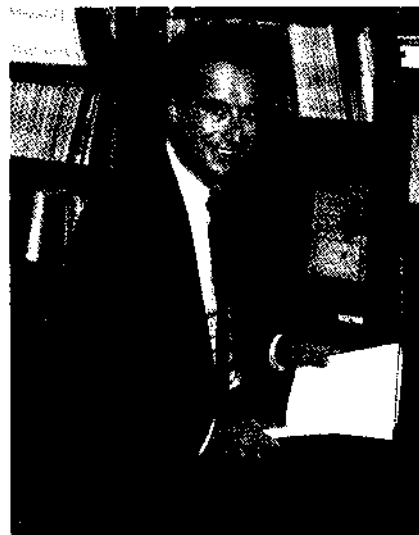
In the transaction-related costing system, the unit cost of a product is determined by dividing the cost of a transaction by the number of units in the costing element. For example, when the costing element is a production lot, the unit cost of a product is determined by dividing the production lot cost by the number of units in the production lot.

This change in the costing element is not trivial. In the Schrader Bellows strategic cost analysis (see Table 1), product seven appears to violate the strong inverse relationship between profits and produc-

tion-lot size for the other six products. A more detailed analysis of the seven products, however, showed that product seven was assembled with components also used to produce two high-volume products, (numbers one and six) and that it was the production-lot size of the components that was the dominant cost driver, not the assembly-lot size, or the shipping-lot size.

In a traditional cost system, the value of commonality of parts is hidden. Low-volume components appear to cost only slightly more than their high-volume counterparts. There is no incentive to design products with common parts. The shift to transaction-related costing identifies the much lower costs that derive from designing products with common (or fewer) parts and the much higher costs generated when large numbers of unique parts are specified for low-

Direct costing, even if correctly implemented, is not a solution and is perhaps a major problem for product costing.



Professor Kaplan has an MS degree in engineering from MIT and a Ph.D. in operations research from Cornell.

volume products. In recognition of this phenomenon, more companies are experimenting with assigning material-related overhead on the basis of the total number of different parts used, and not on the physical or dollar volume of materials used.

LONG-TERM VARIABLE COST

The volume-unrelated support-department costs, unlike traditional variable costs, do not vary with short-term changes in activity levels. Traditional variable costs vary in the short run with production fluctuations because they represent cost elements that require no managerial actions to change the level of expenditure.

In contrast, any amount of decrease in overhead costs associated with reducing diversity and complexity in the factory will take many months to realize and will require specific managerial actions. The number of personnel in support departments will have to be reduced, machines may have to be sold off, and some supervisors will become redundant. Actions to accomplish these overhead cost reductions will lag, by months, the complexity-reducing actions in the product line and in the process technology. But this long-term cost response mirrors the way overhead costs were first built up in the factory—as more products with specialized designs were added to the product line, the organization simply muddled through with existing personnel. It was only over time that overworked support departments requested and received additional personnel to handle the increased number of transactions that had been thrust upon them.

The personnel in the support departments are often highly skilled and possess a high degree of firm-specific knowledge. Management is loathe to lay them off when changes in market conditions temporarily reduce the level of production complexity. Consequently, when the workload of these departments drops, surplus capacity exists.

The long-term perspective management had adopted toward its products often made it difficult to use the surplus capacity. When it was used, it was not to make prod-

THE IMPORTANCE OF FIELD RESEARCH

ucts never to be produced again, but rather to produce inventory of products that were known to disrupt production (typically the very low-volume items) or to produce, under short-term contract, products for other companies. We did not observe or hear about a situation in which this capacity was used to introduce a product that had only a short life expectancy. Some companies justified the acceptance of special orders or incremental business because they "knew" that the income from this business more than covered their variable or incremental costs. They failed to realize that the long-term consequence from accepting such incremental business was a steady rise in the costs of their support departments.

WHEN PRODUCT COSTS ARE NOT KNOWN

The magnitude of the errors in reported product costs and the nature of their bias make it difficult for full-line producers to enact sensible strategies. The existing cost systems clearly identify the low-volume products as the most profitable and the high-volume ones as the least profitable. Focused competitors, on the other hand, will not suffer from the same handicap. Their cost systems, while equally poorly designed, will report more accurate product costs because they are not distorted as much by lot-size diversity.

With access to more accurate product cost data, a focused competitor can sell the high-volume products at a lower price. The full-line producer is then apparently faced with very low margins on these products and is naturally tempted to deemphasize this business and concentrate on apparently higher-profit, low-volume specialty business. This shift from high-volume to low-volume products, however, does not produce the anticipated higher profitability. The firm, believing in its cost system, chases illusory profits.

The firm has been victimized by diseconomies of scope. In trying to obtain the benefits of economy of scale by expanding its product offerings to better utilize its fixed or capacity resources, the firm does not see the high diseconomies it has

The accompanying article, co-authored with Robin Cooper, is excerpted from *Accounting & Management: Field Study Perspectives* (Boston, Mass., Harvard Business School Press, 1987) William J. Bruns, Jr. and Robert S. Kaplan (eds.). The book contains 13 field studies on management accounting innovations presented at a colloquium at the Harvard Business School in June 1986 by leading academic researchers from the U.S. and Western Europe. The colloquium represents the largest single collection of field research studies on management accounting practices in organizations.

The HBS colloquium had two principal objectives. First, the authors were to understand and document the management accounting practices of actual organizations. Some of the organizations would be captured in a process of transition: attempting, and occasionally succeeding to modify their systems to measure, motivate and evaluate operating performance. Other organizations were studied just to understand the system of measurement and control that had evolved in their particular environment.

A second, and even more important, objective of the colloquium was to begin the process by which field research methods in management accounting could be established as a legitimate method of inquiry. Academic researchers in accounting have extensive experience with deductive, model-building, analytic research with the design and analysis of controlled experiments, usually in a laboratory setting; and with the empirical analysis of large data bases. This experience has yielded research guidance and criteria that, while not always explicit, nevertheless are widely shared and permit research to be conducted and evaluated.

At a time when so many organizations are reexamining the adequacy of their management accounting systems it is especially important that university-based researchers spend more time working directly with innovating organizations. We are pleased that MANAGEMENT ACCOUNTING, through publication of this article, is help-

ing to publicize the existence of the field studies performed to date.

The experiences described in the accompanying article, as well as in the other papers in the colloquium volume, indicate a very different role for management accounting systems in organizations than is currently taught in most of our business schools and accounting departments. We believe that present and future field research and case-writing will lead to major changes in management accounting courses. To facilitate the needed changes in curriculum and research, however, requires extensive cooperation between university faculty and practicing management accountants. As noted by observers at the Harvard colloquium:

There is a tremendous store of knowledge about management accounting practices and ideas out there in real companies. Academicians as a whole are far too ignorant of that knowledge. When academics begin to see the relevance of this data base, perhaps generations of students will become more aware of its richness. Such awareness must precede any real progress on prescribing good management accounting for any given situation.

To observe is also to discover. The authors have observed interesting phenomena. We do not know how prevalent these phenomena are or under what conditions they exist or do not exist. But the studies suggest possible relationships, causes, effects, and even dynamic process in the sense that Yogi Berra must have had in mind when he said, "Sometimes you can observe a lot just by watching."

With the research support and cooperation of the members of the National Association of Accountants, many university professors are looking forward to watching and also describing the changes now under way so that academics can begin to develop theories, teach, and finally prescribe about the new opportunities for management accounting. □

Robert S. Kaplan

introduced by creating a far more complex production environment. The cost accounting system fails to reveal this diseconomy of scope.

A COMPREHENSIVE COST SYSTEM

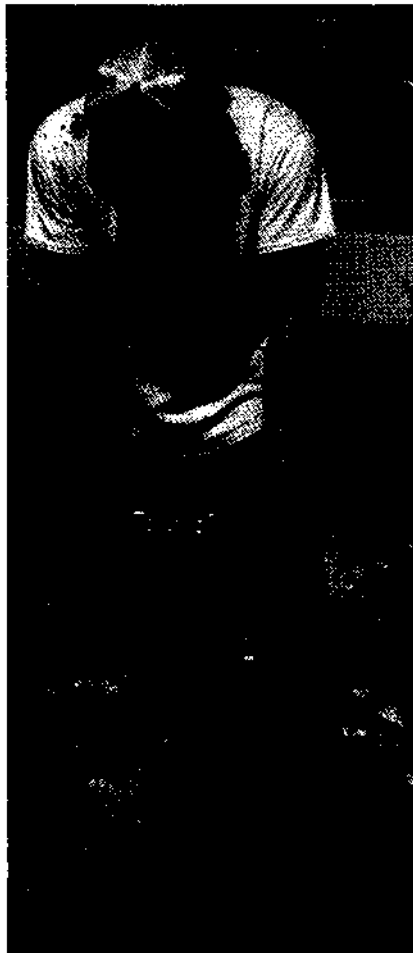
One message comes through overwhelmingly in our experiences with the three firms, and with the many others we talked and worked with. Almost all product-related decisions—introduction, pricing, and discontinuance—are long-term. Management accounting thinking (and teaching) during the past half-century has concentrated on information for making short-run incremental decisions based on variable, incremental, or relevant costs. It has missed the most important aspect of product decisions. Invariably, the time period for measuring “variable,” “incremental,” or “relevant” costs has been about a month (the time period corresponding to the cycle of the firm’s internal financial reporting system). While academics admonish that notions of fixed and variable are meaningful only with respect to a particular time period, they immediately discard this warning and teach from the perspective of one-month decision horizons.

This short-term focus for product costing has led all the companies we visited to view a large and growing proportion of their total manufacturing costs as “fixed.” In fact, however, what they call “fixed” costs have been the most variable and rapidly increasing costs. This paradox has seemingly eluded most accounting practitioners and scholars. Two fundamental changes in our thinking about cost behavior must be introduced.

First, the allocation of costs from the cost pools to the products should be achieved using bases that reflect cost drivers. Because many overhead costs are driven by the complexity of production, not the volume of production, nonvolume-related bases are required. Second, many of these overhead costs are somewhat discretionary. While they vary with changes in the complexity of the production process, these changes are intermittent. A traditional cost system that defines variable costs as varying in the short term with production volume

will misclassify these costs as fixed.

The misclassification also arises from an inadequate understanding of the actual cost drivers for most overhead costs. Many overhead costs vary with transactions: transactions to order, schedule, receive, inspect, and pay for shipments; to move, track, and count inventory; to schedule production work; to set up machines; to perform quality assurance; to implement engineering change orders; and to expedite and ship orders. The cost of these transactions is largely independent of the size of the order being handled; the cost does not vary with the amount of inputs or outputs. It does vary, however, with the need for the transaction itself. If the firm in-



Pneumatic products are manufactured by one of the companies in the study.

roduces more products, if it needs to expedite more orders, or if it needs to inspect more components, then it will need larger overhead departments to perform these additional transactions.

SUMMARY

Product costs are almost all variable costs. Some of the sources of variability relate to physical volume of items produced. These costs will vary with units produced, or in a varied, multiproduct environment, with surrogate measures such as labor hours, machine hours, material dollars and quantities, or elapsed time of production. Other costs, however, particularly those arising from overhead support and marketing departments, vary with the diversity and complexity in the product line. The variability of these costs is best explained by the incidence of transactions to initiate the next stage in the production, logistics, or distribution process.

A comprehensive product cost system, incorporating the long-term variable costs of manufacturing and marketing each product or product line, should provide a much better basis for managerial decisions on pricing, introducing, discontinuing, and reengineering product lines. The cost system may even become strategically important for running the business and creating sustainable competitive advantages for the firm. ■

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'Mayers Tap' (disguised name) is described in Harvard Business School, case series 9-185-111. Schrader-Bellows is described in HBS Case Series 9-186-272.