5

Activity-Based Management

In Chapter 4, we saw how activity-based costing enables managers to calculate the costs of their individual products. Typically, an ABC product costing application has its most dramatic impact for a diverse product line, one in which there are hundreds or even thousands of models and variants. Analytically, such a product line will have a graph of cumulative sales volume versus cumulative number of products as shown in Exhibit 5-1:

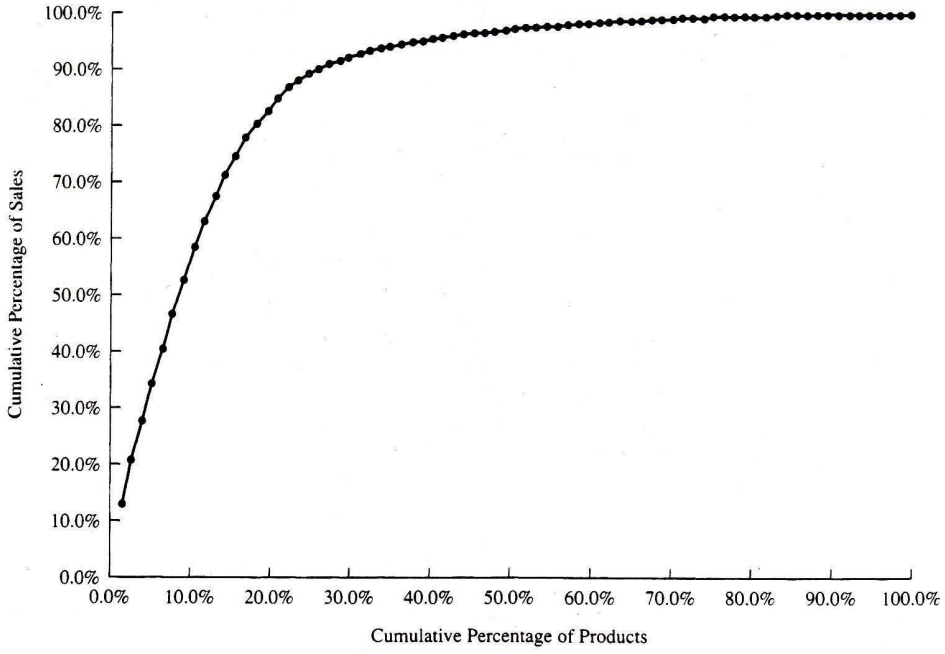


EXHIBIT 5-1 Cumulative Sales Curve

Exhibit 5-1 shows the normal 20–80 rule associated with business activities; the highest-volume 20% products generate about 80% of sales. More revealing, however, is the 60–99 rule: The highest-volume 60% of products generate 99% of sales. Or, looking at the curve from the other direction, the lowest-volume 40% of products generate a cumulative total of 1% of sales. A company's traditional costing system (not a new ABC system) usually indicates, however, that all of the low-volume products are profitable because prices are set as a markup over fully (if inaccurately) allocated costs.

THE PRODUCT PROFITABILITY WHALE CURVE

An activity-based cost analysis, in which the costs of indirect and support resources are applied on the basis of activities performed and the demand for the activities by individual products, can reveal a quite different story about the profitability of many of the company's products. After assigning the costs of setup, purchasing, quality assurance, inventory management, and product support activities, Exhibit 5-2 shows the cumulative profitability across the same product line shown as that in Exhibit 5-1, with products ranked on the horizontal axis from the most profitable to the least profitable. In this example, the most profitable 20% of products generate about 300% of profits. The remaining 80% of products are either break-even or loss items and collectively lose 200% of profits. The curve shown in Exhibit 5-2 is referred to by ABC analysts as the "whale curve." The height, or hump, of the whale indicates the profits earned by the business unit's most profitable products. The remaining products, either just break-even or lose money, bringing total profits back down to "sea level."

Companies encounter a whale curve of cumulative product and customer profitability (such as Exhibit 5-2) in activity-based cost systems built for business units that meet two rules:

1. Large expenses in indirect and support resources
2. Diversity in products, customers, and processes

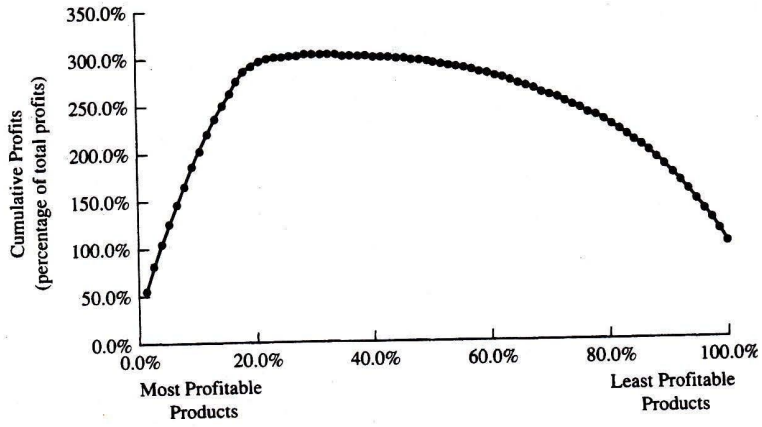


EXHIBIT 5-2 Cumulative Profitability "Whale Curve"

Many companies, operating with signals from either their traditional standard cost system or a direct (marginal) costing system, overproliferate their product lines, overcustomize their product offerings, and overserve their customers. They fail to see how decisions on product variety, customization, and customer support inevitably lead to much higher expenses in the indirect and support resources required to implement a full-line product strategy.

Managers, once they understand their product costs after an ABC analysis, have a great array of actions available to them to increase the profitability of their product lines. The actions, some of which are identified below, are often called activity-based management, referring to managers' decision making using information about activities.

- Reprice products
- Substitute products
- Redesign products
- Improve processes and operations strategy
- Technology investment
- Eliminate products

PRICING

Some companies have little discretion in product pricing. Their high-volume products are sold in highly competitive markets in which it is difficult to differentiate the product along quality or functionality dimensions and where customers find it easy to switch suppliers to obtain the lowest price. Or a company may be a small player in an industry dominated by much larger companies. Unless such a small company has strong customer loyalty (or its customers have high switching costs), the company must follow the pricing policies of the industry leaders. In such situations, companies may not be able to modify their pricing policies, even after conducting a careful cost analysis. These companies must look to actions other than pricing to improve the profitability of their products: for example, redesigning, substituting, or eliminating products or improving processes.

Many companies, however, have considerable discretion for adjusting prices, particularly on their highly customized products. In situations in which products are not sold in competitive markets, managers often set prices using standard markups over the products' standard costs or by extrapolating from prices charged for existing, physically similar products. When pricing policies are derived from a traditional (unit-level) standard costing system, with overhead applied using direct labor or machine hours, managers can make poor pricing decisions. For example, prices for high-volume blue and black pens get established from competitive market forces. Specialty products, such as fuchsia and lavender pens, which appear similar and follow a similar production process, will be priced perhaps a little higher than standard blue and black pens because of their unusual features. Missing from this analysis, however, are the much higher costs for product development, product enhancement, purchasing, receiving, inspection, setup, and maintenance resources required for these specialty colors. Often, for a customer, the item is a small fraction of its total costs (the cost of purchasing specialty pens for writing wedding invitations is less than 0.01% of the total cost of the wedding) and the customer may be

willing to pay a considerable price premium for the high-quality, reliable supply and unique functionality of the specialty product.

Companies, after an initial ABC analysis, have frequently been able to sustain price increases of 50% or more for their specialty, customized, and—as they now see—much more costly products. Conversely, once the costs of the low-volume specialty products have been correctly assigned, the costs of high-volume standard products decrease. Costs of mature products may drop by 5% to 8%. Although such a cost reduction may appear minimal, the high-volume mature products are typically sold in competitive markets, where margin increases of even 3% to 5% are extremely hard to generate. In reality, these products may already be earning such higher margins, once the expenses of resources not being used for these products are not assigned to them. In this situation, companies can now bid more aggressively to increase the sales of these profitable products even further. Managers now see that increased production of these products involves only increases in unit-level expenses but no increases in batch and product-sustaining expenses.

Economists argue that pricing should be set with a recognition of demand considerations not just of costs. They show mathematically—after making appropriate assumptions—that firms in a somewhat monopolistic situation can maximize their profits at the price-output combination where marginal revenue equals marginal costs. In situations in which managers know the algebraic form of both the demand and the cost curves, it is a simple computation to calculate the price-output combination that maximizes company profits.

In practice, however, managers rarely follow the economists' prescriptions. Two big factors have limited the applicability of the economists' pricing model:

1. Difficulty in estimating the demand curve
2. Difficulty in estimating the cost curve

The development of activity-based costing since the mid-1980s has overcome the second of these problems and is the basis for the discussion in this chapter. But the explicit calculation of the demand curve for the company's products remains a major hurdle for following the economists' prescription explicitly.

Demand Curve Estimation

Thinking about the demand curve for the company's products is a useful exercise because it focuses managers' attention on the external environment in which products must be sold. It forces managers to think about not just what it costs to manufacture a product but also about what customers may be willing to pay for it. In practice, however, actual demand curves for products are not readily available. Techniques for estimating demand curves have been developed and have been applied by skilled practitioners for standard products such as agricultural commodities, automobiles, housing, and alcoholic beverages. The techniques have been applied, however, mostly to aggregate demand at the industry level. They have rarely been applied to estimate the demand curves for the products of an individual company.

Certainly for major categories of products, say automobile sales for General Motors or beverage sales for Coca Cola and Pepsi Cola, it is possible to estimate demand relationships at an aggregate level (total number of cars sold, total gallons of carbonated soda). But even these firms have dozens or even thousands of individual products and varieties with complex complementarity and substitutability relationships so that estimating demand curves for individual products becomes an essentially impossible task.

Apart from the difficulty of estimating price-quantity tradeoffs, if the firm is not in a monopolistic situation, it must also recognize the potential reactions of competitors to price changes. Competitive reactions by producers of substitute products, if major price changes were implemented, could upset the calculations of forecasts embedded in a calculated demand curve.

And additional complications arise because price is only one input into a customer's purchasing decision. In fact, much of the entire discipline of marketing helps companies to bypass head-to-head pricing competition. Considerations such as product characteristics and functionality, product quality and innovativeness, advertising and promotion, distribution, service, delivery, credit terms, and postsales service all attempt to transform what appears initially to be a homogeneous, commodity-like product into a differentiated product with unique features, attributes, and services. Studies that look only at price will fail to capture all of the factors that contribute to a customer's purchasing decision. All of these reasons help to explain why many firms make pricing decisions without the "benefit" of a calculated demand curve for each of its products.

Nevertheless, as we stated at the outset, thinking conceptually about demand relationships remains a useful exercise. If managers can identify their price inelastic customers—those for whom demand is relatively insensitive to price—then they can set prices well above any cost-based reference point and can earn substantial profits from sales to these customers. Conversely, for price elastic customers—those for whom small changes in price can lead to large changes in the quantity demanded—managers will know to think a great deal about the consequences of raising or lowering prices. In this case, having an accurate knowledge of product (and customer) costs will be necessary to avoid discounting that attracts additional volume but that leads to net prices falling below the costs of producing products for and serving these customers.

Short-Term Pricing

The discussion in this chapter focuses on setting prices on a long-term basis. Companies do encounter situations in which a customer comes in with a request for a special order and the company must decide whether to accept such a one-time order and at what price. In this situation, many of the longer-run costs embedded in an ABC analysis are not relevant to the decision about pricing or order acceptance. In effect, almost all the resources the organization needs to fulfill the order have already been acquired, and the costs associated with those resources will be incurred whether the order is taken or not. Such a situation moves us back to the discussion and analysis in Chapters 1 and 2 on short-term cost-volume-profit analysis.

When thinking about the relevant costs for short-term decision making, the company needs an estimate of the incremental costs associated with the order. Typically, for a manufacturing company, the incremental costs include:

- The extra materials that must be acquired to produce the order
- Any part-time or additional labor that must be paid to process the materials
- The extra energy and maintenance costs for the machines that will work on the order

In service companies, there may be hardly any incremental expenses associated with an extra order for a customer: For an airline, there's a trivial amount of extra fuel and some food expense (perhaps a bag of peanuts and a can of soda pop); for a health-care institution, perhaps some medicine and medical supplies, such as bandages.

Given how few costs will vary, in the short-run, decisions about one-time special orders have more to do with marketing and competitive issues than with incremental costs. Before agreeing to a low price for the special order, one that covers short-term incremental costs but offers little contribution to cover the expenses of resources already supplied and available, managers should consider the following guidelines:

- Available capacity exists for all resources required to fulfill the order.
- The order requires only a short-term commitment from available resources so that the resources will soon become available again to handle potentially more profitable opportunities in the future.
- The price offered to the customer for the one-time special order will affect neither the pricing to existing customers nor the price the same customer will expect the next time he or she places an order.
- The customer cannot resell the product or service to other customers.

If any of these conditions is violated, then accepting orders that just cover short-term incremental costs can lower company profits. In the remainder of the chapter, we will focus on using cost information for longer-term decision making.

ABC Costing for a New Order

As a specific example of developing an activity-based cost analysis for a new order, consider the Glenn Company, a manufacturer of electromechanical components. It has identified the following principal activities and activity cost driver rates for its manufacturing operations:

ACTIVITY	ACTIVITY COST DRIVER RATE
Direct labor processing	$50/ hour
Machine processing	$60/ hour
Purchase and receive components	$150/ purchase order
Schedule production orders and perform first item inspection	$200/ production run
Set up machines	$80/ setup hour
Process customer orders (negotiate, package, ship, invoice, collect)	$100/ customer order
Perform engineering design and support	$75/ engineering hour

The Glenn Company has recently received a request from a customer for 100 units of a product with the following characteristics:

Material cost per unit	$12.40
Direct labor time per unit produced	0.6 hours
Machine hours per unit produced	0.8 hours
Number of component purchases	10
Number of production runs	6[1]
Average setup time per production run	3 hours
Number of shipments	1
Engineering design and process time	20 hours

The cost buildup for the product is:

Materials (12.40 * 100)	$1,240
Direct labor (0.6 * 50 * 100)	3,000
Machining (0.8 * 60 * 100)	4,800
Unit-level expenses	$9,040
Acquiring materials (10 * 150)	1,500
Production runs (6 * 200)	1,200
Set up machines (6 * 3 * 80)	1,440
Process customer order (1 * 100)	100
Batch-level expenses	$4,240
Engineering support (20 * 75)	$1,500
Product-sustaining expenses	$1,500
Total product expenses	$14,780

In this example, the direct costs (materials and labor) are only about 30% of the total costs, and all unit-level expenses combined (materials, labor, and machine time) represent only 60% of total expenses. The relatively small order size and the high number of components that must be purchased and machined lead to high levels of batch expenses, which actually exceed the direct labor costs of the order. Also, the engineering time required to design the components and the associated manufacturing processes add more than 10% to the total costs.

Notice that many of the costs will be incurred regardless of the number of items produced. For example, if the customer wanted 1,000 units, rather than 100, and if the number of production runs and purchase orders remained the same (because the company orders 1,000 components rather than 100 on the purchase order, and each production run for a component processes 1,000 items rather than 100), the unit-level costs would increase by a factor of 10 (because 10 times as many units are produced), but the batch and product-sustaining costs would remain the same (as shown in the following calculation):

Materials (12.40 * 1,000)	$12,400
Direct labor (0.6 * 50 * 1,000)	30,000
Machining (0.8 * 60 * 1,000)	48,000
Unit-level expenses	$90,400
Acquiring materials (10 * 150)	1,500
Production runs (6 * 200)	1,200
Set up machines (6 * 3 * 80)	1,440
Process customer order (1 * 100)	100
Batch-level expenses	$4,240
Engineering support (20 * 75)	$1,500
Product-sustaining expenses	$1,500
Total product expenses	$96,140

The cost, with the 1,000-unit order size, drops to about $96 per unit from the $148 per unit cost with the 100-unit order size. By seeing how order size, number of unique

components, number of production runs, complexity of setups, number of shipments, and engineering time required affect total order costs, the company's sales representatives are in a much better position to discuss both the functionality of the product and the economics of the order with the customer.

Determining Profit Margins

A cost buildup for a product or a new order just establishes a floor or reference level for pricing, not the actual price itself. Some firms use a standard markup over costs, such as 20%, to obtain a quoted or target price for a product. Few firms, however, follow such a uniform markup price for all their products or keep it constant over time. Most vary their profit markups for individual products, by type of product, and over time in response to economic and competitive conditions. As we will discuss in the next section, the markup, or the discount from a list price, can be adjusted on the basis of the cost to serve individual customers. A standard markup over a full cost calculation (such as from an ABC analysis) serves mainly as a reference point to simplify the hundreds or thousands of pricing decisions that the firm would otherwise have to make on an individual basis. Once calculated, the reference prices are adjusted up or down to reflect competitive and market conditions. For example, for orders that will require resources that currently have a great deal of unused capacity, managers may choose a much lower markup or even accept a price that does not cover all the resource costs required to fulfill the order. Conversely, managers may adjust target profit markups upward for orders that will require processing by resources whose capacity is already fully used.

Target ROI Pricing

Over the long run, companies need to price their products so that they recover all of the resource costs and obtain an adequate return on invested capital. This goal suggests that the profit percentage markups over costs be a function of the invested capital required by individual products, services, and customers. Such invested capital would include long-term assets, such as property, plant, and equipment plus working capital, especially inventory and accounts receivable, used by products and customers.

Let us continue the example of the Glenn Company. Suppose, in addition to the facts already presented, the new order (for 100 units) will require 5% of the capacity of plant and equipment resources whose book value is $300,000. In addition, additional (annual equivalent) inventory levels of purchased components, work-in-process, and finished goods will be $30 per unit ordered, and the customer typically pays for the order 90 days after receiving it. Glenn's risk-adjusted weighted average pretax cost of capital is 16%. The target price, P, that incorporates all production costs and the 16% capital costs must satisfy the following equation:

$$P = \$14{,}780 + 0.16 * [0.05 * \$300{,}000 + 100 * \$30 + (90/365) * P]$$

$$P(1 - 0.04) = 14{,}780 + 0.16 * [15{,}000 + 3{,}000]$$

$$P = \frac{14{,}780 + 2{,}880}{0.96} = \$18{,}396$$

In this example, the cost of invested capital equals $3,616, the difference between the target price and the estimated manufacturing and development costs.

Properties of ROI Pricing

Target return-on-investment (ROI) pricing is intuitively appealing because it relates price not only to the operating expenses of product development and manufacturing but also to the capital investment required for the production and distribution of the product. With pure cost-plus pricing, the percentage markup over costs can be arbitrary and will be unrelated to the use of the firm's assets (unless the assets employed are correlated with costs incurred). The target ROI approach generates a markup over costs that is proportional to the investment dedicated to the product and its customers. Also, as indicated in the above numerical example, the approach is very compatible and consistent with using economic value added (see discussion in Chapter 10) as a performance metric for a division. The cost of capital used for the economic value added calculation can be directly applied in the pricing formula.

Second, target ROI pricing provides some stability to a company's pricing policies. When activity cost driver rates and investment are based on practical capacity, prices will not fluctuate with short-term changes in actual sales. If prices were targeted on the basis of anticipated actual annual sales volumes, the company would find itself following a perverse pricing policy. In high-demand years, the activity cost driver rates and cost of invested capital would be calculated on a large number of production units, lowering the targeted selling price. Conversely, in low-demand years, target prices would have to be raised, because activity cost driver rates and invested capital would be spread over a smaller number of units. Such a policy (low prices in high-demand years; high prices in low-demand years) would be exactly opposite to what a manager would normally wish to do. With the proposed scheme, prices can be established on the basis of expected long-run utilization of capacity so that above-average ROIs will be earned in high-demand years and below-average ROIs in low-demand years.

The target ROI approach also provides a defensible price, permitting the company to cover its costs and earn a competitive return on its invested capital. It provides guidance to an industry price leader wishing to obtain a "fair" return—not so high that it attracts new entrants into the industry or the attention of entrepreneurial antitrust lawyers, but not so low that the company can be accused of predatory pricing by its less-efficient competitors.

Despite these attractive features, ROI pricing has some disadvantages as well. The ROI formula could automate a decision that should demand considerable judgment and evaluation. As one example, the ROI pricing formula usually uses the same cost of capital for all fixed assets (property, plant, and equipment). In practice, a few such resources will likely be used much more heavily than others. Considerable differences may exist among products in their demands for these scarce, or bottleneck, resources. One way to ration scarce capacity is to raise the target return for those products that make heavy demands on scarce resources and lower the target return for products produced on surplus (slack) resources.

As another example of rote use of the formula, in the 1960s and 1970s, managers of many industrial U.S. companies came to feel that they were entitled to the price derived from an ROI calculation. They did not look closely at competitive forces, particularly

from companies in East Asia, such as Japan and South Korea. Rigid adherence to a target ROI price can make a company complacent and unresponsive to the actions of competitors, both domestic and foreign. A price based on an overly optimistic ROI percentage (well above the cost of capital) may encourage competitors to invest heavily in new capacity. Once installed, the new capacity in the industry can place heavy pressure on the profit margins of all companies in the industry. Target ROI pricing will be dysfunctional if it encourages an inward viewpoint by the company: Recover existing costs and get adequate returns on currently invested capital. Competitive and demand elasticity considerations may be suppressed when little consideration is given about whether targeted volumes can be achieved with the price calculated by the ROI pricing formula.

In practice, companies can ameliorate these potential disadvantages. First, managers use the ROI pricing formula iteratively. They determine the price on the basis of full costs and long-run utilization of capacity. Then marketing personnel evaluate whether the forecasted volume can be achieved at the calculated price, with the price adjusted up or down on the basis of their input. In this way, the target ROI price is viewed as a first approximation, with adjustments made about this price to exploit specific information about the nature of demand and competition for the product.

Alternatively, the target price could be established first, independent of costs, by marketing people, on the basis of their judgment as to what price would permit the company to achieve a desired sales volume. Then, after a standard or desired profit margin has been deducted, the pricing formula would be run in reverse to get to a targeted cost for the product. This figure, if below the current projected costs, would stimulate two forms of activity. First, product designers would determine, through a value engineering approach, whether the same functionality could be achieved at a lower cost, or which features should be eliminated to save costs. Second, process and manufacturing engineers would investigate methods and process changes that would improve manufacturing efficiencies so that the targeted cost could be achieved. For a product with an expected productive life of 3–5 years or more, managers may agree to launch the product even with an initial cost above the target cost, if they felt confident that continuous improvement and experience curve effects would enable the target cost to be achieved within, say, 18–24 months of launch. Japanese companies have been particularly successful in this target costing approach,[2] working back from a competitive market price to a targeted cost that must be achieved through collaborative and intensive efforts of marketing and finance people, product designers, and process engineers.

USING ABC FOR ANALYZING CUSTOMER PROFITABILITY

In addition to helping managers understand manufacturing costs, activity-based costing also enables managers to identify the characteristics that cause some customers to be more expensive or less expensive to serve than others. Exhibit 5-3 shows the characteristics of hidden cost (high cost-to-serve) and hidden profit (low cost-to-serve) customers.

All companies can generally recognize customers that exhibit some or all of the high cost-to-serve characteristics. Occasionally companies are fortunate to enjoy low cost-to-serve customers as well. The only downside from having a low cost-to-serve customer arises when the customer itself realizes that its behavior reduces costs to its supplier and demands low prices (high discounts from list price) in exchange.

EXHIBIT 5-3 Characteristics of High and Low Cost-to-Serve Customers

HIGH COST-TO-SERVE CUSTOMERS	LOW COST-TO-SERVE CUSTOMERS
Order custom products	Order standard products
Small order quantities	High order quantities
Unpredictable order arrivals	Predictable order arrivals
Customized delivery	Standard delivery
Change delivery requirements	No changes in delivery requirements
Manual processing	Electronic processing (EDI)
Large amounts of presales support (marketing, technical, and sales resources)	Little to no presales support (standard pricing and ordering)
Large amounts of postsales support (installation, training, warranty, field service)	No postsales support
Require company to hold inventory	Replenish as produced
Pay slowly (high accounts receivable)	Pay on time

When companies apply activity-based costing to their customers, they can view them through the lens of a simple 2 × 2 diagram (see Exhibit 5-4). The vertical axis shows the net margin earned from sales to the customer. The net margin equals net price, after all sales discounts and allowances, less manufacturing cost (as measured by an ABC product costing model, of course). The horizontal axis shows the cost of serving the customer, including order-related costs plus the specific customer-sustaining marketing, technical, selling, and administrative expenses associated with serving each individual customer, as measured by an ABC customer costing model of these expenses.

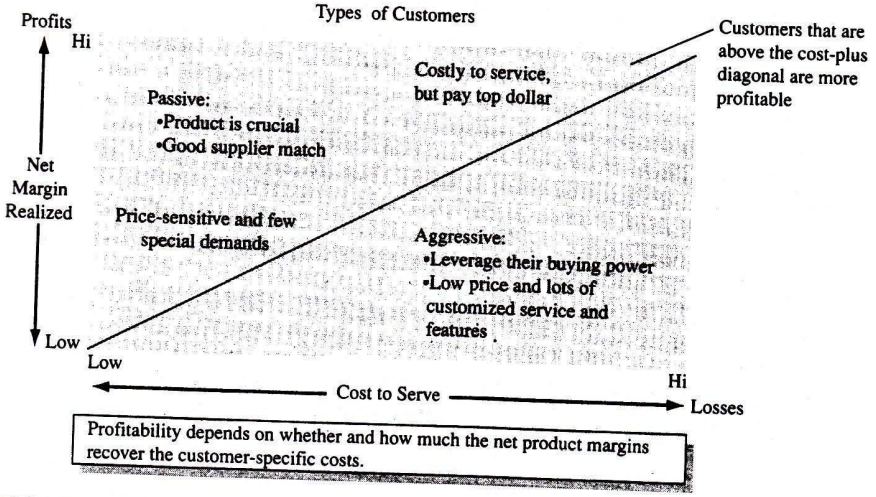


EXHIBIT 5-4 Options for Managing Customers

Source: B. Shapiro, K. Rangan, R. Moriarty, and E. Ross, "Manage Customers for Profits (Not Just Sales)", *Harvard Business Review*, (September–October 1987).

The bill of activities in Exhibit 5-5 still shows costs associated with materials, labor, and machine hours. But the ABC analysis also reveals the costs of batch and product-sustaining activities performed for this product, in this case ordering components, scheduling and handling production orders, setting up machines, processing customer orders, and performing product and process engineering. Previously, we discussed how to use this information to price the product or discuss with the customer possibilities for substituting less-expensive products. The bill of activities suggests an additional set of actions that can lead to lowering the costs of resources required by this product. For example, the company could attempt to improve its operating processes for ordering materials, handling production orders, setting up machines, and processing orders, invoices, and payments from customers.

As improvements in operating processes are made, the same tasks can be accomplished with fewer organizational resources. Such efficiency gains will be quantified, in future ABC models, by having lower activity cost driver rates, which in turn will lead to lower assigned costs to products that use these activities.[4] Thus, the ABC analysis shows how improvements in operating activities and processes will result in quantifiably lower product costs.

Several companies, allured by Toyota's goal of "efficient lot sizes of one," made arbitrary reductions in their batch sizes and allowable inventory levels. This tactic led to many low-volume runs and more frequent shipments to customers. Subsequently, with the insight from an initial ABC model, the companies realized that their cost structure had increased substantially because of the increased number of batch-level activities. A little knowledge is a dangerous thing. In effect, these companies heard only part of the Toyota story. Efficient lot sizes of one are the *result* of success in reducing the cost of batch-level activities, not the driver of the cost reduction. Because no fundamental improvements had been made in performing batch-level activities, frequent changeovers not only raised batch-level expenses, they also consumed valuable equipment capacity. The ABC model pointed out that blind adherence to fashionable management slogans, without making fundamental improvements in the underlying business processes, will raise, not lower, costs.

In addition to its ability to set priorities and make visible the benefits from continuous improvement initiatives, the ABC bill of activities and associated classification by cost hierarchy also provides the understanding for the advocacy by operations management scholars for focused factories.[5] These recommendations can now be understood as advocating that the production of high-volume products (lots of unit-level activities, few batch and product-sustaining ones) be separated from the production of low-volume, customized products (low level of unit-level activities, lots of batch and product-sustaining activities). With focused factories, high-volume products are produced in facilities optimized to perform unit-level activities efficiently. Such facilities, however, may be extraordinarily inefficient for performing batch and product-sustaining activities. Therefore, low-volume, high-variety products are produced in facilities that perform batch and product-sustaining activities highly efficiently—such as a job shop, with skilled operators and general purpose equipment—but that may be quite inefficient for unit-level activities. The unit level activities are more expensive in the job shop because higher quantities and quality of direct labor are required to operate the general purpose machines, and the general purpose machines run more slowly than the specialized, highly automated production equipment. But for the small run sizes of new and customized products, the much lower batch and product-sustaining expenses in a job shop environment more than compensate for the somewhat higher unit-level labor costs and machine run times.

TECHNOLOGY INVESTMENT

Recent work on flexible manufacturing systems (FMS)[6] articulates how advanced manufacturing technologies can break through tradeoffs between mass production efficiency and flexibility. The capabilities of FMS, and other information-intensive production technologies such as computer-aided design (CAD), computer-aided engineering (CAE), and computer-aided software engineering (CASE), can all be viewed as greatly reducing the cost of performing batch and product-sustaining activities (such as changing over production from one product to another, scheduling production runs, inspecting products, moving materials, and designing products) while retaining the efficiencies of high-speed automated production. Thus, the business case for investing in these advanced (and expensive) information-intensive manufacturing technologies can now be justified by appealing to the reduction in costs currently incurred for performing batch and product-sustaining activities with conventional manufacturing technology. These costs, however, are visible only if the organization has developed an ABC system for explicitly measuring the costs of batch and product-sustaining activities. These large and now visible batch and product-sustaining costs become the prime targets for elimination with new investments in computer-integrated manufacturing technology.[7]

ELIMINATE PRODUCTS

We have now illustrated a wide variety of actions that managers can take to transform unprofitable products into profitable ones: reprice, substitute, redesign, process improve, focus factories, and invest in new technology. If none of these actions is feasible or economically justified, then managers may have to confront the final solution: kill unprofitable products.

Marketing and sales personnel may object to dropping unprofitable products, even when no other action is feasible to make them profitable. They argue that these products are complementary to other products that are profitable. Clearly, such an argument is based on the products' demand curves not on their cost curves. ABC, as a cost-estimating model, says nothing about products' demand curves so one cannot respond to such objections from the logic and evidence contained within an ABC model.

Rather than engage in an unproductive debate on the issue, it may suffice to assign the loss from unprofitable products to the appropriate responsibility—say a product manager or customer representative—and allow that person to manage the mix of profitable and unprofitable products to maximize total profitability. One can make small shifts in the incentive structure, by awarding commissions and incentive pay on the basis of profitability rather than sales. Or, even simpler, allow unprofitable products to continue to be produced, marketed, and sold but do not count sales from unprofitable products in salespersons' quotas and incentive pay. In this way, if the unprofitable products do increase total profitability, salespersons can continue to sell them; but if they do not contribute to total profitability, the incentive to continue selling them is dramatically reduced.

SUMMARY

The product-related actions described above, if implemented successfully, will reduce the resources required to produce products and to service customers. Pricing and explicit product substitution will shift the product mix from difficult-to-produce products to simple-to-

produce products. Redesign, process improvement, focused manufacturing facilities, and new technology will enable the same products to be produced with fewer organizational resources. And eliminating products entirely clearly implies that fewer resources are required for the remaining products. In order for the organization to capture the benefits from these actions, however, it must eliminate the spending associated with the resources no longer needed. Most if not all of the batch and product-sustaining expenses associated with unprofitable products are not variable costs, as conventionally defined. Performing one fewer setup, ordering one fewer batch of materials, moving one fewer load of materials, and performing one fewer engineering change notice will not result in any automatic reduction in spending. The totality of product and customer-related actions discussed in this chapter will create additional unused capacity. Benefits will accrue only when managers take action to eliminate the unused capacity created. Doing so requires either reducing spending on the resources no longer needed or deploying the unused capacity to alternative and more profitable applications. This is why activity-based management ultimately must be combined with capacity management if it is to deliver the promised benefits.

ENDNOTES

1. The large number of production runs is required to machine several of the unique components before they can be assembled into the final product.
2. Target costing will be discussed in Chapter 6.
3. See, for example, the new price incentives established by Procter & Gamble in order to influence the retail and wholesale trade to adopt more-efficient practices in logistics and promotions: *Supermarket News* (September 4, 1995), p. 1; and *U.S. Distribution Journal* (October 15, 1995), p. 10.
4. This scenario assumes, of course, that activity cost driver rates are calculated on the basis of practical capacity, not actual utilization. The importance of calculating activity cost driver rates using practical capacity was stressed in R. Cooper and R. S. Kaplan, "Activity-Based Systems: Measuring the Costs of Resource Usage," *Accounting Horizons* (September 1992), pp. 1–13.
5. W. Skinner, "The Focused Factory," *Harvard Business Review* (May–June 1974), pp. 113–21; R. H. Hayes and S. C. Wheelwright, "Link Manufacturing Process and Product Life Cycles," *Harvard Business Review* (January–February 1979), pp. 133–40.
6. R. Jaikumar, "Postindustrial Manufacturing," *Harvard Business Review* (November–December 1986), pp. 69–76.
7. Additional discussion of investments in advanced manufacturing and information technology will appear in Chapter 12.

■ *PROBLEMS*

5-1 Pricing in an Imperfect Market (CMA, Adapted)

Stac Industries is a multiproduct company with several manufacturing plants. The Clinton Plant manufactures and distributes two household cleaning and polishing compounds—regular and heavy duty—under the Cleen-Brite label. The forecasted operating results for

Cleen-Brite Compounds—Clinton Plant Forecasted Results of Operations For the Six-Month Period Ending June 30, 1998 ($000 omitted)

	REGULAR	HEAVY DUTY	TOTAL
Sales	$2,000	$3,000	$5,000
Cost of sales	1,600	1,900	3,500
Gross profit	$ 400	$1,100	$1,500
Selling and administrative expenses			
Flexible	$ 400	$ 700	$1,100
Committed*	240	360	600
Total selling and administrative expenses	$ 640	$1,060	$1,700
Income (loss) before taxes	$ (240)	$ 40	$ (200)

**The fixed selling and administrative expenses are allocated between the two products on the basis of dollar sales volume on the internal reports.*

the first six months of 1998 when 100,000 cases of each compound are expected to be manufactured and sold are presented in the following table.

The regular compound sold for $20 a case and the heavy duty sold for $30 a case during the first six months of 1998. The manufacturing costs per case of product are presented in the following table. Each product is manufactured on a separate production line. Annual normal manufacturing capacity is 200,000 cases of each product. However, the plant is capable of producing 250,000 cases of regular compound and 350,000 cases of heavy duty compound annually.

	COST PER CASE	
	REGULAR	HEAVY DUTY
Raw materials	$ 7.00	$ 8.00
Direct labor	4.00	4.00
Flexible manufacturing overhead	1.00	2.00
Committed manufacturing overhead*	4.00	5.00
Total manufacturing cost	$16.00	$19.00
Flexible selling and administrative costs	$ 4.00	$ 7.00

**Depreciation charges are 50% of the fixed manufacturing overhead of each line.*

The following table reflects the consensus of top management regarding the price/volume alternatives for the Cleen-Brite products for the last six months of 1998.

These are essentially the same alternatives management had during the first six months of 1998.

REGULAR COMPOUND		HEAVY DUTY COMPOUND	
ALTERNATIVE PRICES (PER CASE)	SALES VOLUME (IN CASES)	ALTERNATIVE PRICES (PER CASE)	SALES VOLUME (IN CASES)
$18	120,000	$25	175,000
20	100,000	27	140,000
21	90,000	30	100,000
22	80,000	32	55,000
23	50,000	35	35,000

Top management believes the loss for the first six months reflects a tight profit margin caused by intense competition. Management also believes that many companies will be forced out of this market by next year and profits should improve.

Required

Each question should be considered independently.

(1) What unit selling price should Stac Industries select for each of the Cleen-Brite compounds (regular and heavy duty) for the remaining six months of 1998?
(2) Assume the optimum price/volume alternatives for the last six months were a selling price of $23 and volume level of 50,000 cases for the regular compound and a selling price of $35 and volume of 35,000 cases for the heavy duty compound. Should Stac Industries consider closing down its operations until 1999 in order to minimize its losses?

5-2 *Seneca Foods*

Seneca Foods is a regional producer of low-priced private-label snack foods. Seneca contracts with local supermarkets to supply good-tasting packaged snack foods that the retailers sell at significantly lower prices to price-sensitive consumers. Because Seneca's production costs are low, and it spends no money on advertising and promotion, it can sell its products to retailers at much lower prices than can national-brand snack food companies, such as Frito-Lay. The low purchase prices often allow the retailer to mark this product up and earn a gross margin well above what it earns from brand products, while still keeping the selling price to the consumer well below the price of the brand products.

Seneca has recently been approached by several large discount food chains who wish to offer their consumers a high-quality but much lower-priced alternative to the heavily advertised and high-priced national brands. But each discount retailer wants the recipe for the snack foods to be customized to its own tastes. Also, each retailer wants its own name and label on the snack foods it sells. Thus, the retailer, not the manufacturer, would be providing the branding for the private-label product. In addition, the retail chains want their own retailer-branded product to offer a full snack product line, just as the national brands do.

Seneca's managers are intrigued with the potential for quantum growth by becoming the prime producer of retailer-brand snack foods to large, national discount chains. As they contemplated this new opportunity, Dale Williams, the senior marketing manager, proposed that if Seneca enters this business, it can think of even higher growth opportunities. Seneca does not have to sell just to the discount chains that have approached it. Local supermarket chains may also be attracted to the idea of having their own brand of high-quality but lower-priced snack products that could compete with the national brands, not just be a low-priced alternative for highly price-sensitive consumers. Perhaps Seneca could launch a marketing effort to regional supermarket chains around the country for a retail-brand snack food product line. Williams noted, however, that the local supermarket chains were not as sophisticated as the national discounters in promoting products under their own brand name. Each supermarket chain likely would need extensive assistance and support to learn how to advertise, merchandise, and promote the store-brand products to be competitive with the national-brand products.

John Thompson, director of logistics for Seneca Foods, noted another issue. The national-brand producers used their own salespeople to deliver their products directly to the retailer's store and even stocked their products on the retailer's shelves. Seneca, in contrast, delivered to the retailer's warehouse or distribution center, leaving the retailer to move the product to the shelves of its various retail outlets. The national producers were trying to dissuade the large discount chains from following their proposed private-label (retailer-brand) strategy by showing them studies that the apparently higher margins they would earn on the private label would be eaten away by much higher warehousing, distribution, and stocking costs for these products.

Heather Gerald, the controller of Seneca, was concerned with the new initiatives. She felt that Seneca's current success was due to its focus. It currently offered a relatively narrow range of products aimed at the high-volume snack food segments to supermarket chains in its local region. Seneca got good terms from its relatively few suppliers because of the high volume of business it did with each of them. Also, the existing production processes were efficient for the products and product range currently produced. She feared that customizing products for each discount or supermarket retailer, plus adding additional products so that they could offer a full product line, would cause problems with both suppliers and the production process. She also wondered about the cost of providing new services, such as consulting and promotions, to the supermarket chains and of developing some of the new items required for the proposed full product line strategy. Heather was attracted to the growth prospects offered by becoming the preferred supplier to major discount and supermarket chains. But she was not as optimistic as Dale Williams that these retailers truly believed that selling their own private-label foods would be more profitable than selling the national brands. Perhaps they were only using Seneca as a negotiating ploy, threatening to turn to private labels to increase their power in setting terms with the national manufacturers. Once production geared up, how much volume would these retailers provide to Seneca? How could Seneca convince the large retailers about the profitability associated with the new private-label strategy?

Gerald knew that Seneca's existing cost systems were adequate for their current strategy. Most expenses were related to materials and machine processing, and these costs were well assigned to products with their conventional standard costing system. But the new strategy would seem to involve a lot more spending in areas other than purchasing

materials and running machines. She wished she knew how to provide input into the strategic deliberations now under way at Seneca, but she didn't know how to quantify all the effects of the proposed strategy.

Required

How can activity-based costing help Heather Gerald assess the attractiveness of the proposed policy? Assuming that Seneca starts to supply new customers—large discounters and supermarkets outside its local region—what ABC systems would be helpful to guide the profitability of the strategy and assist Seneca managers in making decisions? Be sure to think about the totality of Seneca's operations, including its relationships with both suppliers and customers.

■ *CASES*

PRICE LEADERSHIP IN AN OLIGOPOLY*

General Motors Corporation

In an article in the *NACA Bulletin*, January 1, 1927, Albert Bradley described the pricing policy of General Motors Corporation. At that time, Mr. Bradley was general assistant treasurer; subsequently, he became vice president, executive vice president, and chairman of the board. There is reason to believe that current policy is substantially the same as that described in the 1927 statement. The following description consists principally of excerpts from Mr. Bradley's article.

General Policy Return on investment is the basis of the General Motors policy in regard to the pricing of product. The fundamental consideration is the average return over a protracted period of time, not the specific rate of return over any particular year or short period of time. This long-term rate of return on investment represents the official viewpoint as to the highest average rate of return that can be expected consistent with a healthy growth of the business, and may be referred to as the economic return attainable. The adjudged necessary rate of return on capital will vary as between separate lines of industry as a result of differences in their economic situations; and within each industry there will be important differences in return on capital resulting primarily from the relatively greater efficiency of certain producers.

The fundamental policy in regard to pricing product and expansion of the business also necessitates an official viewpoint as to the normal average rate of plant operation. This relationship between assumed normal average rate of operation and practical annual capacity is known as standard volume.

The fundamental price policy is completely expressed in the conception of standard volume and economic return attainable. For example, if it is the accepted policy that standard volume represents 80% of practical annual capacity, and that an average of 20%

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per annum must be earned on the operating capital, it becomes possible to determine the standard price of a product—that is, that price which with plants operating at 80% of capacity will produce an annual return of 20% on the investment.

Standard Volume Costs of production and distribution per unit of product vary with fluctuation in volume because of the fixed or nonvariable nature of some of the expense items. Productive materials and productive labor may be considered costs which are 100% variable, since within reasonable limits the aggregate varies directly with volume, and the cost per unit of product therefore remains uniform.

Among the items classified as manufacturing expense or burden there exist varying degrees of fluctuation with volume, owing to their greater or lesser degree of variability. Among the absolutely fixed items are such expenses as depreciation and taxes, which may be referred to as 100% fixed, since within the limits of plant capacity the aggregate will not change, but the amount per unit of product will vary in inverse ratio to the output.

Another group of items may be classified as 100% variable, such as inspection and material handling; the amount per unit of product is unaffected by volume. Between the classes of 100% fixed and 100% variable is a large group of expense items that are partially variable, such as light, heat, power, and salaries.

In General Motors Corporation, standard burden rates are developed for each burden center, so that there will be included in costs a reasonable average allowance for manufacturing expense. In order to establish this rate, it is first necessary to obtain an expression of the estimated normal average rate of plant operation.

Rate of plant operation is affected by such factors as general business conditions, extent of seasonal fluctuation in sales likely within years of large volume, policy with respect to seasonal accumulation of finished and/or semifinished product for the purpose of leveling the production curve, necessity or desirability of maintaining excess plant capacity for emergency use, and many others. Each of these factors should be carefully considered by a manufacturer in the determination of size of a new plant to be constructed, and before making additions to existing plants, in order that there may be a logical relationship between assumed normal average rate of plant operation and practical annual capacity. The percentage accepted by General Motors Corporation as its policy in regard to the relationship between assumed normal rate of plant operation and practical annual capacity is referred to as standard volume.

Having determined the degree of variability of manufacturing expense, the established total expense at the standard volume rate of operations can be estimated. A *standard burden rate* is then developed which represents the proper absorption of burden in costs at standard volume. In periods of low volume, the unabsorbed manufacturing expense is charged directly against profits as unabsorbed burden, while in periods of high volume, the overabsorbed manufacturing expense is credited to profits, as overabsorbed burden.

Return on Investment Factory costs and commercial expenses for the most part represent outlays by the manufacturer during the accounting period. An exception is depreciation of capital assets which have a greater length of life than the accounting period. To allow for this element of cost, there is included an allowance for depreciation in the burden rates used in compiling costs. Before an enterprise can be considered successful and worthy of continuation or expansion, however, still another element of cost must

be reckoned with. This is the cost of capital, including an allowance for profit.

Thus, the calculation of standard prices of products necessitates the establishment of standards of capital requirement as well as expense factors, representative of the normal operating condition. The standard for capital employed in fixed assets is expressed as a percentage of factory cost, and the standards for working capital are expressed in part as a percentage of sales, and in part as a percentage of factory cost.

The calculation of the standard allowance for fixed investment is illustrated by the following example.

Investment in plant and other fixed assets	$15,000,000
Practical annual capacity	50,000 units
Standard volume, percent of practical annual capacity	80%
Standard volume equivalent (50,000 × 80%)	40,000 units
Factory cost per unit at standard volume	$1,000
Annual factory cost of production at standard volume (40,000 × $1,000)	$40,000,000
Standard factor for fixed investment (ratio of investment to annual factory cost of production; $15,000,000/$40,000,000)	0.375

The amount tied up in working capital items should be directly proportional to the volume of business. For example, raw materials on hand should be in direct proportion to the manufacturing requirements—so many days' supply of this material, so many days' supply of that material, and so on—depending on the condition and location of sources of supply, transportation conditions, etc. Work in process should be in direct proportion to the requirements of finished production, since it is dependent on the length of time required for the material to pass from the raw to the finished state, and the amount of labor and other charges to be absorbed in the process. Finished product should be in direct proportion to sales requirements. Accounts receivable should be in direct proportion to sales, being dependent on terms of payment and efficiency of collections.

The Standard Price These elements are combined to construct the standard price as shown in Table 1. Note that the economic return attainable (20% in the illustration) and the standard volume (80% in the illustration) are long-run figures and are rarely changed;[1] the other elements of the price are based on current estimates.

Differences among Products Responsibility for investment must be considered in calculating the standard price of each product as well as in calculating the overall price for all products, since products with identical accounting costs may be responsible for investments that vary greatly. In the illustration given below, a uniform standard selling price of $1,250 was determined. Let us now suppose that this organization makes and sells two products, A and B, with equal manufacturing costs of $1,000 per unit and equal working capital requirements, and that 20,000 units of each product are produced. However, an analysis of fixed investment indicates that $10 million is applicable to Product A, while only $5 million of fixed investment is applicable to Product B. Each product must earn 20% on its investment in order to satisfy the standard condition. Table 2 illus-

[1] A Brookings Institution Survey reported that the principal pricing goal of General Motors Corporation in the 1950s was 20% on investment after taxes.

TABLE 1 Illustration of Method of Determination of Standard Price

	IN RELATION TO	TURNOVER PER YEAR	RATIO TO SALES ANNUAL BASIS	RATIO TO FACTORY COST ANNUAL BASIS
Cash	Sales	20 times	0.050	—
Drafts and accounts receivable	Sales	10 times	0.100	—
Raw material and work in process	Factory cost	6 times	—	$0.16\frac{2}{3}$
Finished product	Factory cost	12 times	—	$0.08\frac{1}{3}$
Gross working capital			0.150	0.250
Fixed investment			—	0.375
Total investment			0.150	0.625
Economic return attainable, 20%			—	—
Multiplying the investment ratio by 20%, the necessary net profit margin is arrived at			0.030	0.125
Standard allowance for commercial expenses, 7%			0.070	—
Gross margin over factory cost			0.100	0.125
			a	*b*

Selling price, as a ratio to factory cost $= \frac{1 + b}{1 - a} = \frac{1 + 0.125}{1 - 0.100} = 1.250$

If standard cost = \$1,000
Then standard price = \$1,000 × 1.250 = \$1,250

trates the determination of the standard price for Product A and Product B.

From this analysis of investment, it becomes apparent that Product A, which has the heavier fixed investment, should sell for \$1.278, while Product B should sell for only \$1.222, in order to produce a return of 20% on the investment. Were both products sold for the composite average standard price of \$1.250, then Product A would not be bearing its share of the investment burden, while Product B would be correspondingly overpriced.

Differences in working capital requirements as between different products may also be important due to differences in manufacturing methods, sales terms, merchandising policies, etc. The inventory turnover rate of one line of products sold by a division of General Motors Corporation may be six times a year, while inventory applicable to another line of products is turned over 30 times a year. In the second case, the inventory investment required per dollar cost of sales is only one-fifth of that required in the case of the product with the slower turnover. Just as there are differences in capital requirements as between different classes of product, so may the standard requirements for the same class of product require modification from time to time due to permanent changes in manufacturing processes, in location of sources of supply, more efficient scheduling and handling of materials, etc.

The importance of this improvement to the buyer of General Motors products may be appreciated from the following example. The total inventory investment for the 12 months

TABLE 2 Variances in Standard Price Due to Variances in Rate of Capital Turnover

	PRODUCT A		PRODUCT B		TOTAL PRODUCT (A PLUS B)	
	RATIO TO SALES ANNUAL BASIS	RATIO TO FACTORY COST ANNUAL BASIS	RATIO TO SALES ANNUAL BASIS	RATIO TO FACTORY COST ANNUAL BASIS	RATIO TO SALES ANNUAL BASIS	RATIO TO FACTORY COST ANNUAL BASIS
Gross working capital	0.150	0.250	0.150	0.250	0.150	0.250
Fixed investment	—	0.500	—	0.250	—	0.375
Total investment	0.150	0.750	0.150	0.500	0.150	0.625
Economic return attainable, 20%	—	—	—	—	—	—
Multiplying the investment ratio by 20%, the necessary net profit margin is arrived at	0.030	0.150	0.030	0.100	0.030	0.125
Standard allowance for commercial expenses, 7%	0.070	—	0.070	—	0.070	—
Gross margin over factory cost	0.100	0.150	0.100	0.100	0.100	0.125
	a	*b*	*a*	*b*	*a*	*b*
Selling price, as a ratio to Factory cost $= \frac{1 + b}{1 - a}$	$\frac{1. + 0.150}{1. - 0.100} = 1.278$		$\frac{1. + 0.100}{1. - 0.100} = 1.222$		$\frac{1. + 0.125}{1. - 0.100} = 1.250$	
If standard cost equals		$1,000		$1,000		$1,000
Then standard price equals		$1,278		$1,222		$1,250

ended September 30, 1926, would have averaged $182,490,000 if the turnover rate of 1923 (the best performance prior to 1925) had not been bettered, or an excess of $74,367,000 over the actual average investment. In other words, General Motors would have been compelled to charge $14,873,000 more for its products during this 12-month period than was actually charged if prices had been established to yield, say, 20% on the operating capital required.

Conclusion The analysis as to the degree of variability of manufacturing and commercial expenses with increases or decreases in volume of output, and the establishment of "standards" for the various investment items, makes it possible not only to develop "Standard Prices," but also to forecast, with much greater accuracy than otherwise would be possible, the capital requirements, profits, and return on capital at the different rates of operation, which may result from seasonal conditions or from changes in the general business situation. Moreover, whenever it is necessary to calculate in advance the final effect on net profits of proposed increases or decreases in price, with their resulting changes in volume of output, consideration of the real economics of the situation is facilitated by the availability of reliable basic data.

It should be emphasized that the basic pricing policy stated in terms of the economic return attainable is a policy, and it does not absolutely dictate the specific price. At times, the actual price may be above, and at other times below, the standard price. The standard price calculation affords a means not only of interpreting actual or proposed prices in relation to the established policy, but at the same time affords a practical demonstration as to whether the policy itself is sound. If the prevailing price of product is found to be at variance with the standard price other than to the extent due to temporary causes, it follows that prices should be adjusted; or else, in the event of conditions being such that prices cannot be brought into line with the standard price, the conclusion is necessarily drawn that the terms of the expressed policy must be modified.[2]

Required

(1) An article in the *Wall Street Journal*, December 10, 1957, gave estimates of cost figures in "an imaginary car-making division in the Ford-Chevrolet-Plymouth field." Most of the data given below are derived from that article. Using these data, compute the standard price. Working capital ratios are not given: assume that they are the same as those in Table 1.

[2]This paragraph is taken from an article by Donaldson Brown, then vice president, finance, General Motors Corporation, in *Management and Administration*, March 1924.

Investment in plant and other fixed assets	$600,000,000
Required return on investment	30% before income taxes
Practical annual capacity	1,250,000
Standard volume—assume	80%
Factory cost per unit:	
Outside purchases of parts	$ 500*
Parts manufactured inside	600*
Assembly labor	75
Burden	125
Total	$1,300

**Each of these items includes $50 of labor costs.*

"Commercial cost," corresponding to the 7% in Table 1, is added as a dollar amount and includes the following:

Inbound and outbound freight	$ 85
Tooling and engineering	50
Sales and engineering	50
Administrative and miscellaneous	50
Warranty (repairs within guarantee)	15
Total	$250

Therefore, the 7% commercial allowance in Table 1 should be eliminated, and in its place $250 should be added to the price as computed from the formula.

(2) What would happen to profits and return on investment before taxes in a year in which volume was only 60% of capacity? What would happen in a year in which volume was 100% of capacity? Assume that nonvariable costs included in the $1,550 unit cost above are $350 million; i.e., variable costs are $1,550 − $350 = $1,200. In both situations, assume that cars were sold at the standard price established in Requirement 1, since the standard price is not changed to reflect annual changes in volume.

(3) In the 1975 model year, General Motors gave cash rebates of as high as $300 per car off the list price. In 1972 and 1973, prices had been restricted by price control legislation, which required that selling prices could be increased only if costs had increased. Selling prices thereafter were not controlled, although there was always the possibility that price controls could be reimposed. In 1975, demand for automobiles was sharply lower than in 1974, partly because of a general recession and partly because of concerns about high gasoline prices. Does the cash rebate indicate that General Motors adopted a new pricing policy in 1975, or is it consistent with the policy described in the case?

SIEMENS ELECTRIC MOTOR WORKS (A) (ABRIDGED)*

Ten years ago our electric motor business was in real trouble. Low labor rates allowed the Eastern Bloc countries to sell standard motors at prices we were unable to match. We had become the high cost producer in the industry. Consequently, we decided to change our strategy and become a specialty motor producer. Once we adopted our new strategy, we discovered that while our existing cost system was adequate for costing standard motors, it gave us inaccurate information when we used it to cost specialty motors.

Mr. Karl-Heinz Lottes, Director of Business Operations, EMW

*This case was prepared by Professor Robin Cooper and Professor Karen Hopper Wruck.

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Siemens Corporation

Headquartered in Munich, Siemens AG, a producer of electrical and electronic products, was one of the world's largest corporations. Revenues totaled 51 billion deutschmarks [DM] in 1987, with roughly half this amount representing sales outside the Federal Republic of Germany. The Siemens organization was split into seven major groups and five corporate divisions. The largest group, Energy and Automation accounted for 24% of total revenues. Low wattage alternating current (A/C) motors were produced at the Electric Motor Works (EMW), which was part of the Manufacturing Industries Division of the Energy and Au-

tomation Group. High wattage motors were produced at another facility.

The Electric Motor Works

Located in the small town of Bad Neustadt, the original Siemens EMW plant was built in 1937 to manufacture refrigerator motors for "Volkskuhlschraenke" (people's refrigerators). Less than a year later, Mr. Siemens halted the production of refrigerator motors and began to produce electric motors for other applications. At the end of World War II, the Bad Neustadt plant was the only Siemens factory in West Germany capable of producing electric motors. All the other Siemens production facilities had been completely destroyed or seized by Eastern Bloc countries. After an aggressive rebuilding program, Bad Neustadt emerged as the firm's primary producer of electric motors.

Through the 1970s, EMW produced about 200 different types of standard motors, at a total annual volume around 230,000 motors. Standard motors accounted for 80% of sales volumes—the remaining 20% was customized motors. The production process was characterized by relatively long runs of a single type of motor. Because identical motors were used by a wide range of customers, standard motors were inventoried and shipped as orders were received. The market for standard A/C motors was extremely competitive. The firm was under constant pressure to reduce costs so that it could price aggressively and still make a profit. Despite a major expansion and automation program begun in 1974, by the early 1980s EMW found it could not lower its costs sufficiently to offset the lower labor rates of its Eastern Bloc competitors.

Change in Strategy

An extensive study revealed that EMW could become a profitable producer of low volume, customized A/C motors. To help implement this strategy, the Bad Neustadt plant was enlarged and dedicated to the manufacture of A/C motors with power ratings ranging from 0.06 to 18.5 kilowatts. These motors supported a number of applications including automation engineering, machine tools, plastic processing, and paper and printing machines.

For the new strategy to succeed, EMW needed to be able to manufacture efficiently a large variety of motors in small production runs. Between 1985 and 1988 EMW spent DM50 million a year to replace almost every machine on the shop floor and thereby create a production environment that could support its new strategy.

By 1987 the production process was highly automated with numerically controlled machines, flexible machining centers and robotically fed production processes used throughout the factory. Large volume common components were manufactured using dedicated automated equipment, while very low volume components might be made in manual production processes. Where possible flexible manufacturing was used to produce small volume specialty components. While a normal annual production volume for common components might be 100,000 units, a single component could have up to 10,000 custom variations that might have to be produced one at a time.

To design a custom motor, modifications were made to a standard motor design. The process involved determining where standard components could not be used. These standard components were replaced by custom components that provided the functionality required by the customer.

By 1987, the EMW strategy seemed to be successful (see Exhibit 1). Of a total of 65,625 orders accepted, 90% were for custom motors; 48% for only one motor and 74% for fewer than five motors. But EMW high-volume standard motors still accounted for al-

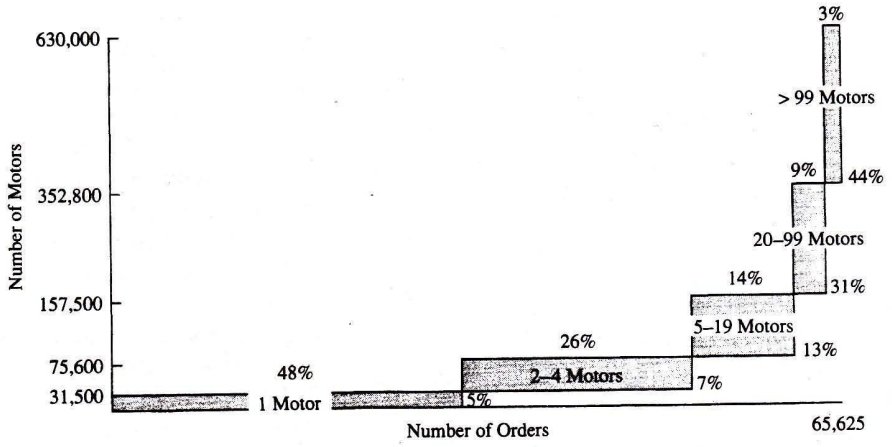


EXHIBIT 1 Distribution of Orders Accepted for Production in 1987

most half the total annual output of 630,000 motors.

Change in the Calculation of Product Costs

EMW's product cost system assigned materials and labor costs directly to the products. Overhead costs were divided into three categories: materials related, production related, and support related. Materials-related overhead, containing costs associated with material acquisition, was allocated to products based on their direct materials costs. Production-related overhead was directly traced to the 600 production cost centers. A production cost center had been created for each type of machine. Cost centers with high labor intensity used direct labor hours to allocate costs to products. For centers with automated machines whose operation required few direct labor hours, machine hours was used as the allocation base. Support-related overhead was allocated to products based on manufacturing costs to date: the sum of direct materials and direct labor costs, materials overhead, and production overhead. The breakdown of each cost category as a percent of total costs was as follows:

	PERCENT OF TOTAL COSTS	BURDEN RATE
Direct materials	29%	
Direct labor	10%	
Materials overhead	2%	6% of materials cost
Production overhead	33%	DM/DLH or DM/MH (600 rates)
Support-related overhead	26%	35% of other manufacturing costs
Total	100%	

Two years after the change in strategy, problems with the traditional cost system became apparent. The traditional cost system seemed unable to capture the relation between the increased support costs and the change in product mix. Management felt that most support costs related more closely to the number of orders received or the number of customized components in a motor rather than to materials expense or to the quantity of labor and machine hours required to build the motor.

An extensive study was undertaken to identify the support costs that management believed were driven by the processing of orders and the processing of special components. The following departments' costs were most affected by the large increases in number of orders and number of special components.

Costs Related to Order Processing
Billing
Order receiving
Product costing and bidding
Shipping and handling
Costs Related to Special Components
Inventory handling
Product costing and bidding
Product development
Purchasing
Receiving
Scheduling and production control
Technical examination of incoming orders

An analysis of the Order Processing costs revealed that the same resources were required to process an order of one custom motor as for an order of 200 standard motors. A similar analysis indicated that the number of different types of special components in each motor design determined the work load for the departments affected by Special Components. The demand for work in these departments was not strongly affected by the total number of special components produced. For example, an order of five custom motors requiring ten special components per unit generated the same amount of work as an order of one custom motor with a design requiring ten special components. In 1987, the factory used 30,000 different special components to customize their motors. The special components were processed 325,000 different times for customized orders.

The costs in each support department associated with these two activities were removed from the support related cost pool and assigned to two new cost pools. Exhibit 2 illustrates, for 1987, the formation of the two new cost pools. The first column presents total costs grouped by traditional costing system definitions. The new cost system removes 6.3 million from engineering support costs, and 27.0 million from administrative support costs. These expenses are then assigned to the new cost pools, 13.8 million to order processing costs, and 19.5 million to special components costs.

Exhibit 3 shows the cost buildup for five typical motor orders. The Base Motor cost includes direct materials and labor costs, materials and production overhead, and the portion of support overhead not assigned to the two new cost pools. To this Base Motor cost must be added the cost of processing the order, and the materials, labor, production overhead and support overhead required for the special components.

Effect of the New Cost System

In 1987 EMW received close to DM1 billion in orders, accepted only DM450 million, and ran the factory at 115% of rated capacity. Mr. Karl-Heinz Lottes, Director of Business Operations, EMW commented on the role of the redesigned cost system with the new strategy:

> Without the new cost system, our new strategy would have failed. The information it

EXHIBIT 2 1987 Reconciliation Transforming the Traditional Cost System (000 DM)

	TRADITIONAL	TRANSFERRED	NEW
Materials	105,000		105,000
Materials overhead	6,000		6,000
Labor	36,000		36,000
Labor or machine overhead	120,000		120,000
Manufacturing cost	267,000 (74%)*		267,000 (74%)
Engineering costs	12,000	6,300	5,700
Tooling costs	22,500	0	22,500
Administrative costs	60,000	27,000	33,000
Support-related cost	94,500 (26%)†	33,300 (9%)	61,200 (17%)
Order processing cost		13,800	13,800
Special components cost		19,500	19,500
Total cost	361,500	0	361,500

**Percent of total cost.*
†This figure corresponds to the 26% of support-related overhead discussed in the text.

EXHIBIT 3 Manufacturing Costs for Five Motor Orders

	A	B	C	D	E
Cost of base motor (without assignment from new cost pools)	295.0	295.0	295.0	295.0	295.0
Cost of all special components* (without assignment from new cost pools)	29.5	59.0	88.5	147.5	295.0
No. of different types of special components per motor	1	2	3	5	10
No. of motors ordered	1	1	1	1	1

	BASE MOTOR COST	SPECIAL COMPONENTS COST
Materials	90	9.0
Materials O/H	5	0.5
Direct labor	35	3.5
Manufacturing O/H	110	11.0
	240	24.0
Support-related overhead†	55	5.5
Unit manufacturing costs	295	29.5

**For illustrative purposes, all different types of special components are assumed to cost 29.5 apiece.*
†Support-related overhead excludes the expenses associated with processing individual customer orders and handling special components.

generated helped us to identify those orders we want to accept. While some orders we lose to competitors, most we turn down because they are not profitable. Anyone who wants to understand the importance of the system, can simply compare some typical orders costed with the traditional system with the costs produced by our new system.

KANTHAL (A)*

Carl-Erik Ridderstråle, president of Kanthal, was describing his motivation for developing a system to measure customer profitability.

> Before, when we got an order from a big, important customer, we didn't ask questions. We were glad to get the business. But a small company, competing around the world, has to concentrate its sales and marketing resources. We needed an account management system if we were to achieve our strategy for higher growth and profitability. An account management system as part of the Kanthal 90 Strategy will enable us to get sales managers to accept responsibility for promoting high-margin products to high-profit customers.

History

Kanthal, the largest of six divisions in the Kanthal-Hoganas group of Sweden, was headquartered in Hallstahammar a town of 17,000 persons about 150 km northwest of Stockholm. The company's history can be traced back to an ironworks founded in the seventeenth century to exploit the water power available from the stream running through the town. Kanthal specialized in the production and sales of electrical resistance heating elements. "We work for a warmer world," was its motto.

Kanthal had about 10,000 customers and 15,000 items that it produced. Sales during 1985 through 1987 had been level at about SEK 850 million.[1] Export sales, outside of Sweden, accounted for 95% of the total. Summary statistics for the past two years appear in Exhibit 1.

Kanthal consisted of three divisions:

> Kanthal Heating Technology supplied manufacturers of electrical appliances and heating systems with wire that generated heat through electrical resistance. Products included heating wire and ribbon, foil elements, machinery and precision wire. Kanthal's 25% market share made it a world leader in supplying heating alloys. Sales growth was sluggish in Europe and the United States but rapid growth was occurring in the Far East and Latin America.
>
> Kanthal Furnace Products produced a wide range of heating elements for electric industrial furnaces. Its 40% market share gave it a dominant position in the large markets of the United States, Japan, West Germany, and the United Kingdom. A new product, Kanthal Super, was generating substantial growth because of its substantially improved performance over conventional materials, including longer service life, lower service costs, and higher operating temperatures.
>
> Kanthal Bimetals was one of the few companies in the world with fully integrated manufacturing of thermo-bimetals for temperature control devices used in the manufacture of thermostats, circuit breakers, and household appliances.

EXHIBIT 1 Summary of Operations

	1986	1987
Invoiced sales (MSEK)*	839	849
Profit after financial items	87	107
Return on capital	20%	21%
Number of employees	1,606	1,591

**MSEK, million Swedish kroner.*

*Professor Robert S. Kaplan prepared this case.

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[1] In 1988, the Swedish kroner (SEK) was worth about US$0.16.

Kanthal's manufacturing facilities were located in Hallstahammar, Brazil, the United Kingdom, West Germany, the United States, and Italy.

Kanthal 90

Ridderstråle, upon becoming president in 1985, saw the need for a strategic plan for Kanthal.

> The company had been successful in the past. We needed to use this base of experience to influence the future. We had to have a consolidated view to ensure that we did not sub-optimize in narrow markets or with a narrow functional view. Resources were to be allocated so that we could increase profits while maintaining a return on employed capital in excess of 20%.

The Kanthal 90 plan specified overall profit objectives by division, by product line, and by market. Currently, however, salespersons were compensated mostly on gross sales volume. Higher commissions were being paid for selling obviously higher-margin products, such as Super, and higher bonuses were being awarded for achieving sales targets in the high-margin products. But Ridderstråle wanted to achieve the additional growth planned under Kanthal 90 without adding sales and administrative resources to handle the increased volume anticipated.

> We needed to know where in the organization the resources could be taken from and redeployed into more profitable uses. We did not want to eliminate resources in a steady-state environment. We wanted to reallocate people to generate future growth.
>
> With our historically good profitability, and lacking any current or imminent crisis, we could not realistically consider laying off people at the Hallstahammar plant. But we wanted to be able to redeploy people so that they could earn more profit for us; to move people from corporate staff to divisions, from the parent company to operating subsidiaries, and from staff functions into sales, R&D, and production. Ideally, if we could transform an accounting clerk at Hallstahammar into a salesman of Kanthal-Super in Japan, we could generate a substantial profit increase.

Exhibit 2 shows the distribution of Kanthal's incurred costs. The existing cost system treated most sales, marketing, and administrative costs as a percentage of sales revenue. Therefore, customers whose selling price exceeded the standard full cost of manufacturing plus the percentage mark-up for general, selling, and administrative expenses appeared to be profitable, while a customer order whose selling price was below standard manufacturing cost plus the percentage mark-up appeared unprofitable. Ridderstråle knew, however, that individual customers made quite different demands on Kanthal's administrative and sales staff.

> Low profit customers place high demands on technical and commercial service. They buy low-margin products in small orders. Frequently they order nonstandard products that have to be specially produced for them. And we have to supply special selling discounts in order to get the business.
>
> High profit customers buy high-margin, standard products in large orders. They make no demands for technical or commercial service, and accurately forecast for us their annual demands.

He felt that a new system was needed to determine how much profit was earned each time a customer placed a particular order. The system should attempt to measure the costs that individual customer orders placed on the production, sales, and administrative resources of

EXHIBIT 2 Cost Structure

COST COMPONENT	PERCENTAGE
Materials	23
Production salaries and wages	19
Variable processing costs	5
Fixed processing costs	16
Subcontracted services	3
Selling and administrative	34
Total costs	100

the company. The goal was to find both "hidden profit" orders, those whose demands on the company were quite low, and the "hidden loss" orders, those customer orders that under the existing system looked profitable but which in fact demanded a disproportionate share of the company's resources to fulfill.

Ridderstråle pointed out the weaknesses with the present method of profitability measurement.

> We distribute resources equally across all products and customers. We do not measure individual customer's profitability or the real costs of individual orders. In this environment, our sales and marketing efforts emphasize volume, more than profits. In the future, we want Kanthal to handle significantly increased sales volume without any corresponding increase in support resources, and to gain the share in our most profitable products.
>
> Our current method of calculating product costs may show two customers to be equally profitable on a gross margin basis. But there could be hidden profits and hidden costs associated with these customers that we are not seeing (see Exhibit 3). If we could get more accurate information about our own manufacturing cost structure, as well as the costs of supplying individual customers and orders, we could direct our resources to customers with hidden profits, and reduce our efforts to customers with the hidden losses. We might end up with the same market share, so that our competitors would not even see this shift in our strategy, but our profitability would be much higher. To execute such a strategy, however, we need better information about the profitability of each order, each product, and each customer.
>
> The biggest barrier we have to overcome is the notion that production overhead, selling, and administrative costs are "fixed." The definition of strategy is to recognize that all costs are variable. Our sales people must learn how to deploy resources to their most profitable use.

The New Account Management System

Per O. Ehrling, Financial Manager of Kanthal, worked with SAM, a Swedish management advisory group, to develop a system to analyze production, sales, and administrative costs at the Hallstahammar facility. Over a period of several months, finance managers and the consultants conducted extensive interviews with all department heads and key personnel. The interviews were designed to elicit information about the nature of the activities being per-

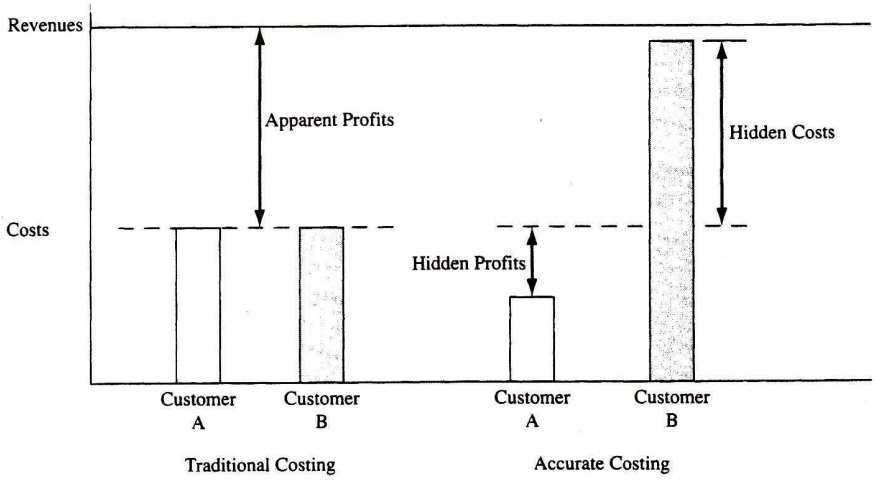


EXHIBIT 3 Hidden Profit and Hidden Cost Customers

formed by support department personnel and the events that triggered the demands for these organizational activities. Ehrling described the philosophy of the new approach:

> In our previous system, indirect costs were either manufacturing costs that were allocated to products based on direct labor, or they were Selling & Administrative Costs, that were treated as period expenses and were unanalyzed. This treatment may have been correct 100 years ago when we had one bookkeeper for every 10 blacksmiths, but today we have eight bookkeepers for every three blacksmiths. This means that most of our costs today are indirect and our previous system didn't know how to allocate them.
>
> We wanted to move away from our traditional financial accounting categories. We found that most of our organizational costs could be classified either as Order-related or Volume Costs. Actually, we did investigate three additional cost drivers—product range, technical support, and new products. But the total costs assigned to these three categories ended up being less than 5% of total costs so we eliminated them.

Using the interview information, the project team determined how much of the expenses of each support department related to the volume of sales and production and how much related to handling individual production and sales orders (see Exhibit 4). The manufacturing volume costs, in addition to material, direct labor, and variable overhead, also included the costs of production orders to replenish inventory stocks. Only 20% of Kanthal's products were stocked in inventory, but these products represented 80% of sales orders so the cost of continually replenishing these products was assumed to be related to the volume of production. Manufacturing order costs therefore included only the

EXHIBIT 4 Order and Volume Costs

TYPE OF PERSONNEL	ORDER-RELATED WORK	VOLUME-RELATED WORK
Production		
Stock replenishment	None	All activities
Production planning	Order planning Order follow-up	Inventory management
Operators	Set-up Start-up expense	Direct hours
Foremen	Order planning Order support	Machine problems
Stock	Order input Order output	Order handling
Transportation	Order planning Order handling	
Selling and Administrative		
Management	Offer discussion Offer negotiation	General management
Sales	Offer work Order negotiation Delivery follow-up	Sales unrelated to orders General public relations Sales management
Secretarial	Offer typing	
Administration	Order booking Order adjustment Invoice typing Customer ledger Supervision	Accounting

cost of set-up and other activities that were triggered when a customer ordered a product not normally stocked. Manufacturing order costs were calculated separately for each major product group. The sales order costs represented the selling and administrative costs that could be traced to processing an individual customer's order. The S&A costs that remained after subtracting sales order costs were treated as sales volume costs and were allocated proportionately to the manufacturing volume costs.

For example, the Sales Department activities (see Exhibit 4) relating to preparing a bid for an order, negotiating with the customer about the order, and following-up with the customer after the order was delivered were classified as "order-related." All remaining activities, such as public relations and sales management, that could not be traced to individual orders were classified as "volume-related."

Follow-up interviews were conducted to corroborate the split of effort in each department between volume- and order-related activities. Sample calculations are shown in Exhibit 5.

EXHIBIT 5 Sample Calculation of Order and Volume Costs, by Product Group

Step 1. Calculate Selling & Administrative (S&A) Order Costs		
Total selling & administrative order costs		SEK2,000,000
Total number of orders	2,000	
Stocked products	1,500	
Non-stocked products	500	
S&A order costs per order		SEK 1,000
Step 2. Calculate Manufacturing Order Cost for Non-stocked Products		
Total manufacturing order costs (for non-stocked products)		SEK1,000,000
Number of orders for non-stocked products		500
Manufacturing order costs per non-stocked order		SEK 2,000
Step 3. Calculate Allocation Factor for S&A Volume Costs		
Compute total manufacturing and S&A costs		SEK7,000,000
Subtract order costs		
Non-stocked products	1,000,000	
Selling & administrative order costs	2,000,000	3,000,000
Total volume costs		SEK4,000,000
Manufacturing volume costs of goods sold (CGS)	3,200,000	
Selling & administrative volume-related costs	800,000	
S&A volume allocation factor: S&A volume costs/mfg. volume CGS (800/3,200)		25%
Step 4. Calculate Operating Profit on Individual Orders for Non-stocked Products		
Sales value		SEK 10,000
Less: Volume costs: Manufacturing cost of goods sold (@ 40% of sales value)		4,000
Volume costs: Selling & administrative (@ 25% of mfg. CGS)		1,000
Margin on volume-related costs		5,000
Less: Mfg. order cost for non-stocked product		2,000
Selling & administrative order cost		1,000
Operating profit for order		SEK 2,000

**SEK, Swedish kroner.*

EXHIBIT 6 Customer Order Analysis

Standard order cost: SEK 572
Manufacturing order cost for non-stocked products: Foil Elements: SEK1508
Finished Wire: SEK2340

COUNTRY CUSTOMER	ORDER LINES	INVOICED VALUE (SEK)	VOLUME COST (SEK)	ORDER COST (SEK)	NON-STOCKED (SEK)	OPERATING PROFIT (SEK)	PROFIT MARGIN %
Sweden							
S001	1	1,210	543	572	0	95	8
S002	3	46,184	10,080	1,716	4,524	29,864	65
S003	8	51,102	50,567	4,576	12,064	(16,105)	−32
S004	9	98,880	60,785	5,148	13,572	19,375	20
S005	1	3,150	1,557	572	2,340	(1,319)	−42
S006	5	24,104	14,889	2,860	4,680	1,675	7
S007	2	4,860	2,657	1,144	4,680	(3,621)	−75
S008	1	2,705	1,194	572	0	939	35
S009	1	518	233	572	0	(287)	−55
S010	8	67,958	51,953	4,576	12,064	(635)	−1
S011	2	4,105	1,471	1,144	0	1,490	36
S012	8	87,865	57,581	4,576	12,064	13,644	16
S013	1	1,274	641	572	2,340	(2,279)	−179
S014	2	1,813	784	1,144	0	(115)	−6
S015	2	37,060	15,974	1,144	3,016	16,926	46
S016	2	6,500	6,432	1,144	3,016	(4,092)	−63

Note: All financial data reported in Swedish kroner (SEK).

Bo Martin Tell, controller of the Furnace Products Division, recalled the amount of tedious work required to collect all the numbers.

> It took almost a year to develop a system to collect the data in the proper form. Even in production, we had problems identifying the costs that related to stocked and non-stocked orders.

Initial Output from the Account Management System

Exhibit 6 shows a profitability report for a sample of individual orders from Swedish customers. Profit margins on these individual orders ranged from −179% to +65%. Previously, almost all of these orders would have appeared profitable. Similar reports were prepared to show total profitability by customer, by product group, or by all the orders received from customers in a country. For example, Exhibit 7 shows, for a given product group—Finished Wire N, the sales volume and profitability of a sample of Swedish customers.

Leif Rick, general manager of Heating Technology remembered the initial reactions to the account management reports:

> The study was a real eye-opener. We saw how the traditional cost accounting system had been unable to truly report costs and profits by market, product, and customer.

EXHIBIT 7 Finished Wire N Customer List

CUSTOMER NO.	INVOICED SALES (SEK)	VOLUME COSTS (SEK)	ORDER COST (SEK)	NON-STOCKED COST (SEK)	OPERATING PROFIT (SEK)	PROFIT MARGIN (%)
33507	3,969	1,440	750	0	1,779	45
33508	4,165	1,692	750	2,150	(427)	−10
33509	601	139	750	2,150	(2,438)	−406
33510	13,655	6,014	750	2,150	4,741	35
33511	2,088	350	750	2,150	(1,162)	−56
33512	1,742	637	750	0	355	20
33513	4,177	932	750	2,150	345	8
33514	7,361	3,134	750	0	3,477	47
33515	1,045	318	750	0	(23)	−2
33516	429,205	198,277	9,000	0	221,928	52
33517	31,696	13,128	3,750	0	14,818	47
33518	159,612	58,036	2,250	6,450	92,876	58
33519	48,648	17,872	9,750	12,900	8,126	17
33520	5,012	1,119	750	2,150	993	20
33521	4,933	2,170	1,500	4,300	(3,037)	−62
33522	17,277	7,278	1,500	0	8,499	49
33523	134	120	1,500	4,300	(5,786)	−4,318
33524	1,825	523	1,500	0	(198)	−11
33525	13,874	4,914	3,750	6,450	(1,240)	−9
33526	3,762	1,452	750	0	1,560	41
33527	64,875	18,559	3,750	8,600	33,966	52
33528	13,052	5,542	3,000	6,450	(1,940)	−15
33529	39,175	12,683	3,750	8,600	14,142	36
33530	383	87	750	0	(454)	−119
33531	6,962	1,865	750	2,150	2,197	32
33532	1,072	314	1,500	0	(742)	−69
33533	14,050	6,333	1,500	2,150	4,067	29
33534	820	244	750	0	(174)	−21
33535	809	181	750	2,150	(2,272)	−281
33536	1,366	316	750	2,150	(1,850)	−135
33537	155,793	65,718	21,750	49,450	18,875	12
33538	7,593	2,772	2,250	2,150	421	6
Total	1,060,731	434,159	84,000	131,150	411,422	39%

Note: All financial data reported in Swedish kroner (SEK).

At first, the new approach seemed strange. We had to explain it three or four times before people started to understand and accept it. People did not want to believe that order costs could be so high; that order costs had to be treated as an explicit cost of selling. Most surprising was finding that customers thought to be very profitable were actually break-even or even loss customers. Salesmen initially thought the approach was part of a master

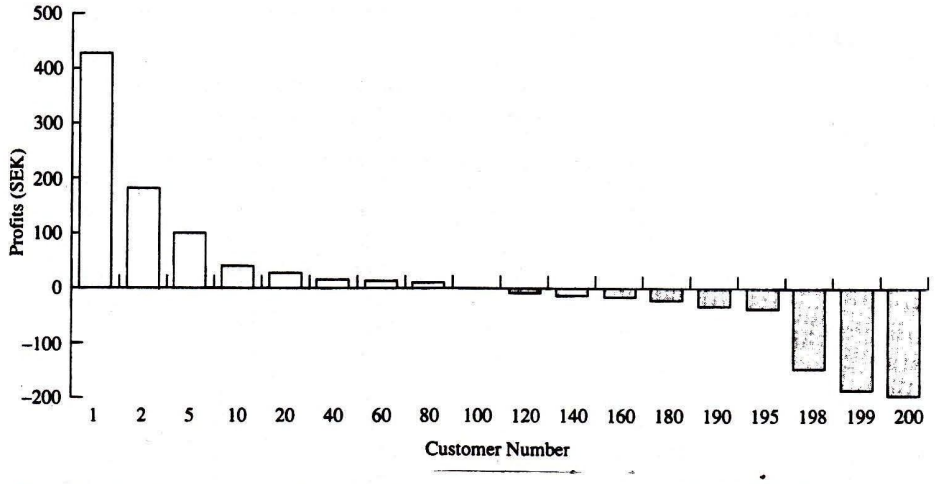


EXHIBIT 8 Customer Profitability: Ranked from Most to Least Profitable Customers

plan to get rid of small customers. But people who have been working with the system now are convinced of its value and are beginning to take sensible actions based on the information.

Exhibit 8 shows the profits from Swedish customers, ranked by customer profitability. The results surprised even Ridderstråle. Only 40% of Kanthal's Swedish customers were profitable and these generated 250% of realized profits. In fact the most profitable 5% of the customers generated 150% of the country's profits. The least profitable 10% of customers lost 120% of the profits (see cumulative profitability chart in Exhibit 9).

Even more surprising, two of the most unprofitable customers turned out to be among the top three in total sales volume. These two

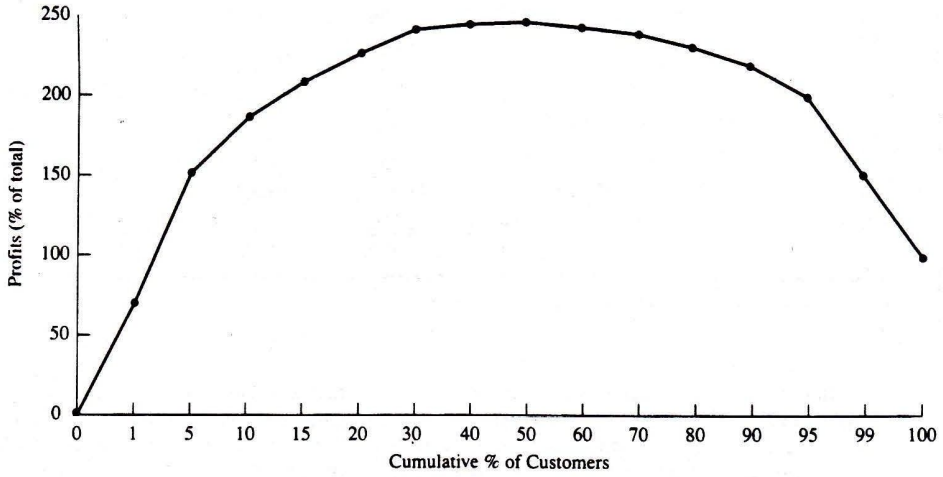


EXHIBIT 9 Cumulative Profitability by Customers

customers had gone to just-in-time (JIT) delivery for its suppliers. They had pushed inventory back onto Kanthal which had not recognized the new demands being placed on its production and order-handling processes by the JIT approach. Moreover, further investigation revealed that one of these customers was using Kanthal as a backup supplier, to handle small special orders of a low-priced item when its main supplier could not deliver. Because of the size and prestige of the two customers, Kanthal people had always welcomed and encouraged their orders. Ridderstråle now realized how expensive it had become to satisfy them.

The immediate problem was to devise a strategy for the large number of nonprofitable customers, particularly the very high volume ones. Corporate management had started a series of meetings with the general and sales managers of the operating divisions in Sweden to discuss how to handle these customers.

Also, while the account management system had been developed for the Swedish operating divisions, some overseas divisions remained skeptical about the value of the exercise. The account management system was seen as yet another intrusion of the headquarters staff into their operations. Ridderstråle knew he faced an uphill battle gaining acceptance for the account management system around the world.

INDIANAPOLIS: ACTIVITY-BASED COSTING OF CITY SERVICES (A)*

Introducing competition and privatization to government services requires real cost information. You can't compete if you are using fake money.

Stephen Goldsmith, Mayor of the City of Indianapolis

The City

The City of Indianapolis is located in the center of Indiana, about 200 miles southeast of Chicago. For the past 25 years the city had enjoyed a healthy economy and steady population growth. When Stephen Goldsmith took office in 1992, Indianapolis had a population of 800,000 and was the 13th largest city in the country. Historically, the city was known mainly for one weekend a year when cars raced 500 miles around an oval track at speeds in excess of 200 miles per hour. The city was shedding its reputation as a sleepy midwestern town by building strength in a number of industries including health care (Eli Lilly), automotive (Cummins Engine) and professional and amateur sports (the city had major league football and basketball teams, and hosted more Olympic governing bodies than any other).

The 1992 city government employed about 5,600 people and the budget was approximately $480 million dollars. The city's budget was divided among six operating departments whose responsibilities ranged from sewage treatment and trash collection to police and fire protection. Prior to Stephen Goldsmith's election in November 1991, the budget had grown at a 6% compounded annual rate since the mid-1980s. In every year since 1987, budgeted expenses had exceeded revenues by between $8 and $14 million dollars and the projected annual deficit when

*This case was prepared by Professor Robert S. Kaplan, with assistance from Matt Ridenour, '95 MBA student.

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Mayor Goldsmith first took office was a record $20 million dollars.

Robomayor

"No more business as usual for many cities." Indianapolis' Goldsmith, a former Republican prosecutor dubbed "Robomayor" by the local press, pushed 60 city services into free-market competition in three years. City "business agencies" now bid against private firms on everything from filling potholes to handling welfare clients.

USA *Today* (*February* 16, 1995)

During the election campaign in 1991, Stephen Goldsmith, a former Republican prosecutor, had pledged to reduce the size of government, hold the line on taxes, and re-invest in the city's infrastructure. Unfortunately, during his first year the mayor would also have to deal with the prior leadership's largely unfunded commitments to two of the largest capital projects in the history of the city: the construction of a $250 million downtown shopping mall, and the opening of a new $500 million United Airlines maintenance terminal at the airport. Additionally, the local chamber of commerce had recently completed a report identifying over $1 billion dollars in badly needed infrastructure improvements. Not only was the city running in the red on an operating basis, but it had a $1.75 billion dollar gap in needed capital funds.

Aside from the financial challenges confronting him, Mayor Goldsmith was generally unhappy with the way government conducted business. After spending 12 years as a prosecutor within Indianapolis government the mayor had seen many problems:

> While the private sector attempts to improve services while reducing cost, the public sector generally spends more money each year while providing the same or lower quality service to the public. Traditional public management tools were clearly incapable of solving the problems our government faced. The staff organizations in the city were worthless; they impeded progress, and subtracted value. The multi-layered bureaucracy was out of control. Lots of unnecessary people were on the payroll because of the patronage process.
>
> Although on many measures Indianapolis was a good deal better off than other cities, we shouldn't be benchmarking ourselves against a failing industry, government. This seemed to be a particularly curious way to approach improving the system.

Mayor Goldsmith established several guiding principles for his administration:

- People governed least are governed best.
- Government should be a rudder, not an engine.
- People know better than government.
- Government should be measured the same way every other enterprise is measured: by its results.

The mayor wanted to make government smaller, to make it more responsive, and to make its managers think about value—the cost and quality of services delivered to its customers, the citizens. A senior manager in the new administration reinforced this philosophy:

> Smaller government is a core philosophy. We believe that individual choice, individual freedom and a lack of intrusiveness are important values; to the extent we can limit government's role or shrink the size of government, then in most cases we are probably doing good.
>
> Now at some point the core philosophy runs up against reality. If you were to eliminate, for example, all police officers, even if you return 100% of the tax dollars back to the citizens, would they be in a better position? Probably not. But there are hundreds of millions of dollars in opportunity before you ever begin to intrude on the essential missions of government.

Pressure from the Mayor After the election but before entering office, the mayor called the current department leaders and asked them for management and financial reports about their departments' performance. He commented on the responses to this request:

> All people had were the income and expense numbers for this and last year's budget. Nothing was broken down by activity and they had no performance-based measurements, so it was impossible to measure anything. Although we were anxious to get in and make changes, we couldn't manage without data.

In the past few years the city had installed a "work management system." This system tracked how many people went out on particular street repair projects, how many hours they worked, and the equipment they used. But the data did not allow city managers to know how much, in total, they had spent to repair roads or to collect garbage.

Upon taking office, Mayor Goldsmith replaced many senior managers and requested that his new team install better systems to measure the performance and efficiency of government, "down to the unit." The mayor wanted to attack the problems of government from two directions. First, he demanded that departments describe and measure the services they provided as well as the cost of providing these services. Second, he established a new office, Enterprise Development, to create competition for the provision of city-supplied services.

Skip Stitt, the first director of the Enterprise Development office, articulated the new philosophy of city government:

> Competition was our core strategy—we defined service quality and price with private-sector marketplace measures. If there were rigorous competition for filling potholes, what would it cost? How would it be done? For some services, such as managing public golf courses, we would ask ourselves if taking a tax dollar out of John Public's pocket to subsidize golf was appropriate at all. If it's not, perhaps we should get out of that business and let the private sector fill the void.

Stitt's office would oversee initiatives to increase the competitiveness of the municipal departments, and to privatize services where these services could be delivered more efficiently by a private service company.

The Department of Transportation Mitch Roob, a former management consultant, was appointed as the new head of the Department of Transportation. The department had a $50 million annual budget, most of it committed to two operating divisions: maintenance and construction. Roob was immediately struck by the lack of planning in the department:

> Programs were not linked to dollars. Management had no idea about the value of the city infrastructure. There was no balance sheet, no capital plan, no maintenance plans. The department simply did what they did the year before and requested a 10% higher budget. We went back through the archives and discovered that their current activities were descendants of priorities established in the mid 1970s. These were not necessarily bad plans, but they were no longer appropriate in the mid-1990s.

Roob faced some long-term issues. How should money be spent among road reconstruction and enhancement, repaving, resurfacing, or simply pot-hole filling? He began by asking the senior managers in the Department of Transportation for a list of their current activities and their cost.

> It seemed like these were simple questions. But we couldn't begin to answer them. We didn't have any relevant data and we had no costing system. No one had ever focused on what they did, on how much it cost to do whatever it was they did, and, certainly, on whether whatever they were doing was being done effectively and efficiently.

Roob also asked the managers what they believed the desired outcome should be from street repair work. The question seemed obvious, but it had not been asked before. Roob believed that the objective of the street maintenance division should be smooth streets, and that any activities that did not help to reach that objective were probably unnecessary.

Roob called a number of accounting firms to help him measure the costs of the Department's activities. One accounting firm said that it could start work on the project in six weeks. Another, KPMG Peat Marwick, said it could start the next day. Time was of the essence. The Mayor wanted rapid results to build momentum for the reforms. Thus, Roob chose KPMG Peat Marwick for a six-week pilot project. KPMG brought experience with implementing activity-based costing (ABC) in local manufacturing firms. Bridget Anderson, a Peat Marwick manager, was assigned to the project and began meeting with Roob and other DOT employees to determine where the costing study should begin.

The Pothole Repair Contract The newly formed team wanted to focus on a service that was highly visible and important to the average citizen. The cost study was scheduled for completion in early Spring, just when the maintenance division would be repairing streets damaged by the freezing and thawing cycle during the winter. The team quickly decided to study the cost of filling potholes. Roob set a tight deadline for completing the study and he announced publicly that pothole maintenance would be put out for open bid after the study's results had been received. On a certain date, private sector bids would be solicited and the cost system would provide the basis for the bid submitted by the city to keep doing the work. The department's cost team had the burden of both understanding the current cost of filling potholes and then working to lower its cost to compete with the bids that would be forthcoming from the private sector.

Bridget Anderson described her introduction to municipal accounting.

> We started by asking people how much it cost them to provide services. People couldn't answer that question. Lots of data were available but none of it was useful for management decisions. No data could be traced to the cost of the activities that delivered services, like filling potholes or keeping streets clean for citizens.

Anderson formed a project team, that included several representatives from the unionized work force and the non-unionized management team, to perform the costing study. Peat Marwick developed a training program that every member of the street maintenance division attended. The goal was for each employee to understand why ABC was being used and how the cost estimates would be determined. Anderson described her working relationship with the city union:

> The mayor and Mitch Roob made it very clear that the union would have to be heavily involved in the process of costing the work activity. In essence, we would be working with the union to help them understand what it cost for them to do a certain job. Then, once they knew the cost, and made efforts to improve it, they would face a bid process. So, both the union and the private sector would have to believe ABC costing was legitimate because it would be the basis of the union's bid. The union's initial reaction to our presence, however, was very cautious, even hostile.

Anderson and her team applied a five-phase approach to implement activity-based costing at the city (see Exhibit 1).

> In Phase 1, we interviewed the people in street maintenance to find out what they did. This was an interesting process. Once they got over their surprise that we were asking them about what they did, they began by telling us they only did 5 or 6 major things for street maintenance—things like "fix a pothole, seal

EXHIBIT 1 Five-Phase Approach to Activity-Based Costing (ABC)

Phase 1:	**Define project objectives and establish department activities and outputs.** The first phase focuses on familiarizing the project team with department operations, personnel, and means of quantifying data. The most effective means of identifying activities and outputs, the foundation for the ABC model, are determined.
Phase 2:	**Collect and analyze appropriate costs and cost drivers.** Collect relevant cost information. Choose appropriate cost drivers for the activities defined in Phase I. Determine the most effective means of measuring departmental outputs.
Phase 3:	**Collect remaining direct and indirect cost information** Establish resource cost pools on PC-based spreadsheets. Resource cost pools include personnel, direct materials, vehicles and equipment, fixed asset and facility costs, and administrative overhead.
Phase 4:	**Develop an ABC Model** Develop an ABC model. First, assign resource costs to activities, and second, use cost drivers to assign activity costs to departmental outputs.
Phase 5:	**Summarize cost information; expand departments' capabilities to continue to use the ABC model.** Hold training session to assist departmental personnel to learn how to use the ABC model on an ongoing basis.

> cracks on the street, or paint a curb." After much discussion and some process mapping we helped them to discover the literally hundreds of activities that go into providing these services. In the end, we were able to consolidate similar activities and ended up with a list of about 35 basic activities that we described in an Activity Dictionary (see Exhibit 2).

In Phase 2, Peat Marwick and the city team gathered data from the controller's office, from the work management system, and from interviews to determine the cost of performing each of the basic activities. Most of the effort was spent estimating how people spent their time among the 35 defined activities since, by far, the largest cost and resource in city government was people. Anderson recalled some of the difficulties at this stage:

> We quickly found out that the data in the work management system weren't all inclusive and had input errors as well. We went through some reconciliation procedures back to payroll registers to try and make the information as credible as it could be.

The team also had to identify the indirect and support costs associated with the 35 primary activities. Support costs included indirect labor, supplies, fixed assets (trucks and buildings), and the cost of services in city offices—human resources, payroll, legal, information systems, and controller. Much of the indirect cost assignments were available from an indirect cost recovery plan performed for reimbursement on federal grants. All the direct and indirect cost data were entered into a personal computer using ABC software.

In Phase 3, the team selected a cost driver, such as hours worked or pounds of material, for each of the 35 activities. The cost driver would be used to assign activity costs to the output of the activities. The team initially had difficulty defining outputs for some of the activities. For example, potholes, unlike standard manufactured products, are all different. They don't come in standard sizes and shapes. The team realized quickly that attempting to find out what it costs to fill potholes would be answering the wrong question. They decided to measure the cost of

EXHIBIT 2 Activity Listing: City Services

MAINTENANCE SECTION (9)	ASSET MANAGEMENT DIVISION (10)
Snow control	Bridge rehabilitation
Curb repair	Bridge replacement
Guardrail repair	Intersection improvements
Crack sealing	Road widening
Strip patching	Street reconstruction
Special maintenance	Street rehabilitation
Mowing and brush cutting	Signal interconnects
Alley repair	Signal upgrades
Drainage repair	Resurfacing
	Curbs and sidewalks
TRAFFIC MANAGEMENT (11)	**PARKING MANAGEMENT DIVISION (5)**
Pavement markings	Administration and planning
Sign installation	Parking lot and garage operations
Sign repair	Parking meter enforcement
Signal installation	Collections
Signal maintenance	Adjudications
Street cleaning	
Sidewalk repair	
Berm repair	
Pothole patching	
Street paving	
Sidewalk paving	

putting a ton of asphalt in potholes, so the "cost object" of the study was the fully loaded cost of filling potholes with a ton of asphalt.

In Phases 4 and 5, the team reviewed the preliminary ABC cost reports and made refinements to the model and to the data after checking against the controller's records to assure that all costs were captured. Exhibits 3A and 3B show the total and unit costs for filling potholes in Indianapolis's five geographic sectors. The collection of costs for each of the five sectors allowed variations in terrain and work procedures in the five sectors to be reflected in the calculated cost of filling potholes.

Some people questioned the tracing of the fixed asset and indirect support costs to pothole filling. They acknowledged that the equipment and vehicles used directly for pothole filling were costs that should be included. But Anderson argued for including the cost of all assets that the city owned:

> What about all the desks, chairs, and computers being used by support people throughout the city? We found that the city did have a fixed asset accounting system that could produce reasonable depreciation figures. Even though the city did not calculate depreciation in its financial statements, we felt that in order to have a true cost to provide services, we needed to adjust out the current year capital purchases, and then add back the cost

EXHIBIT 3A Pothole-Filling Costs: Five Districts, 1992 Actual (Jan.–March)

ACTIVITY	NORTHWEST	NORTHEAST	CENTER	SOUTHWEST	SOUTHEAST	TOTAL
C Labor (laborers)	27,455	27,927	83,482	41,954	25,162	205,980
C Labor overtime	462	2,658	1,558	1,210	908	6,797
D Labor (truck drivers)	175,608	181,869	354,628	188,468	163,748	1,064,322
D Labor overtime	5,225	10,183	16,133	6,192	6,057	43,790
E Labor (equipment oprs.)	43,604	90,373	27,038	20,089	35,844	216,949
E Labor overtime	2,693	6,162	1,067	7,201	3,579	20,702
Supervisors	41,893	47,085	60,008	55,790	38,267	243,044
Transp. supervisors	47,997	89,372	33,440	18,798	43,855	233,463
Personnel costs	$344,939	$455,629	$577,354	$339,703	$317,421	$2,035,046
Binder		432			83	514
Cold mix	6,185	7,266	3,265	4,659	5,589	26,964
Hot mix	14,901	21,644	51,301	23,175	56,987	168,009
Special mix	11,028	11,271	7,320	21,864	17,289	68,772
Tack	2,578	1,070	1,601	484	3	5,735
Direct materials costs	$34,692	$41,683	$63,487	$50,183	$79,950	$269,994
Central admin. expense	99,774	134,680	160,199	89,172	91,152	574,977
Central operations	38,206	51,573	94,792	52,765	34,908	272,244
Central maintenance	34,588	46,688	55,548	28,480	31,604	196,908
Facility expense	14,554	42,218	29,129	8,007	12,278	106,187
Fixed assets	1,098	828	1,536	1,029	936	5,428
Maintenance admin.	17,375	23,456	27,891	14,280	15,885	98,888
Operations admin.	18,172	24,544	29,193	14,946	16,601	103,456
Overhead costs	$223,767	$323,987	$398,290	$208,679	$203,364	$1,358,080
Cargo van				3,086		3,086
Crew cab		11,167				11,167
Crew: Cab pickup 86	12,369			11,699	14,150	38,218
Grader		2,727		4,236		6,963
Hotbox	16,276	4,954	11,396	13,272	18,335	64,233
Loader	1,457	8,958	1,024	1,271	358	13,067
Paver		207				207
Pickup mini	1,815	11,478		4,014		17,307
Roller		69				69
Roller VIB: 2 ton	104			2,541	330	2,976
SAD	40,090	35,607	25,203	41,853	45,535	188,287
SADA	9,005	20,833	19,953	12,243	9,333	71,367
Sedan		6,990				6,990
Tack wagon		777				777
TAD	5,607	1,225	7,213	95	1,432	15,571
TADA	29,397	38,542	18,971	37,940	16,738	141,588
Trailer			5,314			5,314
Truck: 1-ton dump	4,647	11,909	11,054	13,716	10,847	52,173
Truck: Patch 91	11,514		3,713			15,227
Unused equipment	3,769	6,127		7,402	20,537	37,836
Rolling stock costs	$136,050	$161,571	$103,840	$153,367	$137,595	$692,423
Total cost	$739,447	$982,871	$1,142,971	$751,932	$738,330	$4,355,549
Tons filled	1,156	1,726	2,134	2,017	2,753	9,786
Cost per ton	$639.66	$569.45	$535.60	$372.80	$268.19	$445.00

EXHIBIT 3B Pothole-Filling Costs per Ton: Five Districts, 1992 Actual (Jan.–March)

ACTIVITY	NORTHWEST	NORTHEAST	CENTER	SOUTHWEST	SOUTHEAST
C Labor (laborers)	23.75	16.18	39.12	20.80	9.14
C Labor overtime	0.40	1.54	0.73	0.60	0.33
D Labor (truck drivers)	151.91	105.37	166.18	93.44	59.48
D Labor overtime	4.52	5.90	7.56	3.07	2.20
E Labor (equipment oprs.)	37.72	52.36	12.67	9.96	13.02
E Labor overtime	2.33	3.57	0.50	3.57	1.30
Supervisors	36.24	27.28	28.12	27.66	13.90
Transp. supervisors	41.52	51.78	15.67	9.32	15.93
Personnel costs	$298.39	$263.98	$270.55	$168.42	$115.30
Binder		0.25			0.03
Cold mix	5.35	4.21	1.53	2.31	2.03
Hot mix	12.89	12.54	24.04	11.49	20.7
Special mix	9.54	6.53	3.43	10.84	6.28
Tack	2.23	0.62	0.75	0.24	0.00
Direct materials costs	$ 30.01	$ 24.15	$ 29.75	$ s24.88	$ 29.04
Central admin. expense	86.31	78.03	75.07	44.21	33.11
Central operations	33.05	29.88	44.42	26.16	12.68
Central maintenance	29.92	27.05	26.03	14.12	11.48
Facility expense	12.59	24.46	13.65	3.97	4.46
Fixed assets	0.95	0.48	0.72	0.51	0.34
Maintenance admin.	15.03	13.59	13.07	7.08	5.77
Operations admin.	15.72	14.22	13.68	7.41	6.03
Overhead costs	$193.57	$187.71	$186.64	$103.46	$ 73.87
Cargo van				1.53	
Crew cab		6.47			
Crew: Cab pickup 86	10.70			5.80	5.14
Grader		1.58		2.10	
Hotbox	14.08	2.87	5.34	6.58	6.66
Loader	1.26	5.19	0.48	0.63	0.13
Paver		0.12			
Pickup mini	1.57	6.65		1.99	
Roller		0.04			
Roller VIB: 2 ton	0.09			1.26	0.12
SAD	34.68	20.63	11.81	20.75	16.54
SADA	7.79	12.07	9.35	6.07	3.39
Sedan		4.05			
Tack wagon		0.45			
TAD	4.85	0.71	3.38	0.05	0.52
TADA	25.43	22.33	8.89	18.81	6.08
Trailer			2.49		
Truck: 1-ton dump	4.02	6.90	5.18	6.80	3.94
Truck: Patch 91	9.96		1.74		
Unused equipment	3.26	3.55		3.67	7.46
Rolling stock costs	$117.69	$ 93.61	$ 48.66	$ 76.04	$ 49.98
Total cost per ton	$639.66	$569.45	$535.60	$372.80	$268.19

(depreciation) of having fixed assets like vehicles and equipment of all types, as well as the maintenance and repair of these fixed assets. The mayor wanted to have his departments compete against the private sector and these calculations would put city services on a more level playing field with private sector companies.

The team decided, however, not to assign the headquarters expenses to the costs for pothole filling. The rationale was that these expenses would remain in the city, whether the pothole filling was done by municipal workers or private contractors. So only the costs of resources expected to be directly affected by the decision were included in the contract costs.

The ABC team did decide to load the depreciation and maintenance costs of unused equipment into a line item, "unused equipment," in the pothole-filling cost calculation. The cost of unused equipment ranged up to 10% of total costs for some city services. Anderson described how this problem arose:

> The city workers all liked having vehicles available, just in case. We talked with them about only having equipment that they needed on a regular and routine basis; that for the couple of times each year they needed the back-up equipment, because the regular equipment had broken down, it would be cheaper to rent than to maintain the stand-by reserve capacity. Also, they might get better utilization by acquiring multiple-use equipment. Many of the crews may not need a different vehicle for each separate use. The departments could realize savings by sharing their equipment and vehicles with each other. At present, each department had a lot of excess equipment in their fleets.

After six weeks, the work team arrived at an average cost of $445 per ton of asphalt placed in potholes (see Total column in Exhibit 3A).

Skip Stitt recalled the surprise from seeing all the costs associated with performing city services:

> It was fascinating. Prior to activity-based costing, employees and their managers only thought about the number of hours that employees spent filling a pothole that day. Nobody ever thought about unproductive time, excess equipment, real estate, inventory, or about overhead, including management. When we began seeing the results from the early ABC studies, it was astonishing. You could look at a specific pothole-filling team and see how many take-home vehicles had been allocated to them, what their annual supplies budget was, and their costs for rent and maintenance of both their facilities and their vehicles. People weren't used to thinking of all the costs that get buried with the asphalt in a pothole. In many cases, employees' hourly wages were only 20% of the fully loaded cost. Before ABC, management might have placed that number at 80%–90% of the cost.
>
> Senior management and line employees suddenly came to the same question: how could they reduce or eliminate costs. As one example, they began to scrutinize the cost to maintain a vehicle, which was done in another division, because the inefficiencies in the equipment-maintenance group and their expensive oil changes were hitting the union employees' and DOT's bottom line cost of fixing potholes.

Bob Larson, a supervisor (and union member) in the Maintenance Department, recalled how the employees started to work to reduce costs:

> Both management and the union sat down and admitted that we had to do better. We shouldn't be going out with a five or six-man repair crew, plus a supervisor, if we could do the job, safely, with a three or four-man self-managed crew. When you had 75 hourly employees out on a street with 36 supervisors, that ratio was not right. A supervisor should be able to handle ten people. It's ridiculous to have that many supervisors. That's why the overhead got so high, paying salary and

benefits to all these people. The guy in the front line doesn't need 20 people to support him.

Steve Fantauzzo, the state executive director of AFSCME,[1] the municipal workers' union, commented on the results of the cost study:

The ABC system really highlighted the amount of overhead, particularly managers, that existed on the city side. We urged city management to "get these guys off our backs." We didn't want to lose bids because the city made us carry managers who don't help us fill potholes.

Mitch Roob responded by dismissing half the supervisors, most of whom had been placed in those jobs by the local Republican party. The union was surprised by this action and Roob recalled its impact:

They now realized that they had no choice. If we were willing to fire half of our guys, we would certainly be prepared to fire all of their guys.

In the following weeks every line item on the ABC report was closely examined and there was tremendous pressure on support groups to justify their expense. The union reconfigured its approach to filling potholes by reducing manpower on each team and changing the type and amount of equipment used. Larson explained how he worked with his union crews to get the cost down:

I move around quite a bit. I just take my laptop loaded with the ABC model out to a work site and say, "OK, suppose we get rid of that single-axle dump, delete that extra mixer off there, take that truck driver off, now look what it would cost you to do a ton a day." The guys know that the next time they show up on a job they better have those improvements made or they'll lose a bid to the private sector and be out of a job.

We also got some benefits by doing multiple tasks with the same resources. While the patching crew was waiting for the asphalt to be picked up and delivered to the pothole, I had them doing other jobs, like sweeping a bridge or picking up limbs. Those were all activities in the ABC model so we could charge their time to those tasks. This way our people are kept busy doing useful tasks, and the pothole filling activity is not charged for unproductive time.

As the improvements in staffing, equipment utilization, and work processes were being made, management and the union recalculated the savings. Soon they would be submitting bids for pothole filling in competition with private sector contractors. Ray Wallace, Assistant to the Mayor, was the liaison for the activity-based costing initiative.

Initially, I was viewed as a bad guy by the union people because I was "management" and a lot of the employees thought this was the mayor's way to break the union. There was a lot of uncertainty and animosity not only towards the process but to Mitch Roob, myself, the consultants, and anyone else from management involved in the process. But when we put together the bid with them, we were all working together, eating pizza at 10:00 in the evening, and staying until 3:00 in the morning. The last night, we worked from 6:00 A.M. through the next day without going home to sleep. So they saw us working just as hard as they were, committed to putting together a quality bid. Somewhere in the middle of that process, the barriers started to lift and we began to win the trust of the people.

By eliminating half the supervisors, changing the crew assignments for filling potholes, from eight down to four or six, and gaining efficiencies in the use and assignment of trucks and other equipment, the union team could realize significant cost reductions. The first test would come when they submitted bids for two pothole filling contracts that would be awarded; one in the Northwest sec-

[1]American Federation of State, County, and Municipal Employees.

EXHIBIT 4 Union Estimates of Resources Required for Two Pothole-Filling Contracts

	NORTHWEST		NORTHEAST	
	QUANTITY	RATE*	QUANTITY	RATE*
Personnel Cost Pool				
C Labor (laborers)	2.60 hours/ton	$23.25/hour	2.60 hours/ton	$11.18/hour
D Labor (vehicle drivers)	2.60 hours/ton	20.00/hour	2.60 hours/ton	23.08/hour
E Labor (eqpmt. operators)	0.35 hours/ton	44.49/hour	1.15 hours/ton	28.01/hour
Materials Cost Pool				
Hotmix for potholes	1 ton	$22.00/ton	1 ton	$22.00/ton
Tack	2.5 gallons/ton	1.54/gallon	2.5 gallons/ton	1.54/gallon
Vehicle Cost Pool				
Crew cab	1 hour/ton	$8.65/hour	1 hour/ton	$8.60/hour
Hotbox	1 hour/ton	17.65/hour	1 hour/ton	11.26/hour
One-ton truck	.6 hours/ton	15.20/hour	.6 hours/ton	18.22/hour
Arrowboard	1 hour/ton	2.00/hour	1 hour/ton	2.00/hour
Indirect Cost Pool	5.55 hours/ton	$17.06/hour	6.35 hours/ton	$19.56/hour

**Labor rates based on projections from union contract; material rates based on actual contractor price quotes.*

tor and one in the Northeast sector of the city. The union estimated the resources—people, materials, and equipment—they now felt they would need to fill potholes using the revised work procedures and submitted their estimates to Bridget Anderson for verification (see Exhibit 4). Anderson, who had been monitoring how the new work procedures were being implemented, concurred that the union's estimates of resources required to do the job were reasonable and consistent with current practice. The union workers submitted a bid based on their revised cost estimates and waited anxiously for the announcement of whether they had won the business against the several private contractors who had also submitted bids for the pothole filling business.

THE CO-OPERATIVE BANK*

We were prepared to make bold, innovative decisions to enhance our profitability. But if you are going to be bold, you had better be sure your facts are correct.

Terry Thomas, Managing Director, The Co-operative Bank

History

In 1994, the co-operative movement celebrated the 150th anniversary of its founding. A small group of people, in 1844, had started a grocer's shop in Rochdale, England (near the city of Manchester):

> to provide the local community with a source of pure, unadulterated goods at fair prices; their guiding principle was that the co-operative should exist for the benefit of the people it served, sharing its profits among them in proportion to their purchases.

*This case was prepared by Professors Srikant Datar and Robert S. Kaplan with extensive assistance from Robin Webster of The Cooperative Bank.

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EXHIBIT 1 Founding Statement of International Co-operative Alliance*

August 22, 1895

The time has come for gathering together the scattered parts of the great co-operative movement, one in aim and one in principle into a strong international alliance.

It is to carry this great idea into execution that the International Co-operative Alliance has been resolved upon. Without interfering in local or national matters or narrowing in any way the independence of each association or national union, the alliance will form a link uniting cooperators who are pursuing very various objects in different countries.

It will thus secure mutual support to each and all, produce a more powerful volume of co-operative opinion than can be created by separate action, help to carry cooperation more successfully foward to new developments, and create means by which cooperators will be enabled steadily to learn from one another by an interchange of opinions, or reports, and of publications.

In carrying out this program the alliance will be an added cause of peace through the inhabited world.

The objects of the alliance are†:

(1) To bring into relation of mutual helpfulness those who are seeking in different countries and in various ways to end the present deplorable warfare between Capital and Labor, and to organize industrial peace based on co-partnership of the worker.

(2) To promote the formation or aid the development in each country of a central institution for helping working people to establish and maintain self-governing workshops and for assisting employers and employed to establish just and harmonious profit-sharing arrangements.

(3) To form an international means of connection and communication between these central institutions through which they may render one another mutual assistance.

(4) Generally to promote the employment of the profits of productive industry.

**From draft outline of a plan for an International Alliance of the friends of cooperative production, to be considered at an inaugural meeting at the Crystal Palace on Monday, August 22, 1895 at 3:00 P.M.*
†From ICA archives.

The founders of the co-operative movement articulated a strong statement of mission and ethical standards (see Exhibit 1). The movement spread throughout the country and was an active force, even 150 years later. In 1994, U.K. co-operative societies generated a turnover of £6 billion, mostly in food retailing, farming, food production, milk sales, funeral supplies, general retailing, car sales and financial services.

The Co-operative Bank

The Co-operative Bank (The Bank) was founded in Manchester in 1872 as a department of the Co-operative Wholesale Society (CWS), a central organization formed by co-operative societies across the country, who were, by then, the dominant retailing force in the U.K. Exhibit 2 summarizes recent financial statistics for the Co-operative Bank. During its first 75 years, The Bank functioned mainly to serve the treasury needs of CWS's operations. Personal accounts were not emphasized though The Bank did attract some personal customers from employees of co-operative societies and local authorities (municipalities).

From the late 1940s through 1971, The Bank began to expand its branch network to support the needs of the CWS and the increasing number of other co-operative societies and local authorities that were bringing their business to The Bank. During this time, the co-operative societies were generating large amounts of cash from their highly suc-

EXHIBIT 2 Selected Financial Statistics: 1990–1994 (£000,000)

	1990	1991	1992	1993
Deposits	2,621	2,438	2,707	2,983
Loans and advances	2,597	2,408	2,637	2,740
Profit (loss) before taxes	(14.9)	(6.0)	9.8	17.8
Pre-tax return on shareholder funds	(9.4%)	(4.0%)	6.7%	12.0%

cessful trading operations and, by 1971, The Bank's deposits had grown to more than £300 million.[1] With this expansion of banking activities, CWS managers realized that they needed to separate the banking business from all their other activities. In 1971, an Act of Parliament established The Bank as a separate legal entity, with the CWS holding the entire issue of share capital. Previously, The Bank's results and financial position had been consolidated with those of the CWS.

Lewis Lee, the first Chief Executive of the newly structured bank, strengthened and broadened The Bank's management expertise by recruiting several senior and middle managers from the larger UK clearing banks. An immediate challenge emerged when The Bank's strong deposit base declined rapidly as the co-operative movement (which supplied 96% of deposits) was confronted with strong competitive pressure on its trading activities. The Bank's managers recognized the need for immediate and radical actions.

To replace the lost retail deposits, The Bank began to pursue, much more aggressively, deposits from personal customers. It became the first UK bank to introduce free banking for customers who maintained credit balances in their current accounts. Over the next ten years, the number and size of personal accounts increased sharply and, while deposits never regained their 1971 highs, the reliance on deposits from the co-operative sector was sharply reduced to 4% of the total.

The Bank pursued a similarly aggressive policy for the asset side of the balance sheet. In 1971, loans to the co-operative movement represented 90% of assets. By the 1990s, this percentage had declined to about 10%–12%, with the remaining assets evenly split between the Personal and Corporate sectors. In 1975, The Bank's broadened customer base for both assets and deposits enabled it to obtain status as a settlement bank so that it could now perform clearing activities and settlements. It was the first new settlement bank in 39 years and the first ever to achieve this status from internal growth.

The Bank, during the 1970s and 80s, also broadened the range of products and services for personal and corporate customers. It introduced credit cards and launched several sophisticated savings products. This broadened mix of product and services, coupled to an increasingly stringent regulatory environment, created demands for more capital, demands that the CWS found difficult to supply given the heavy demands for investment from all its other operations. Therefore, The Bank had to devise a strategy to generate sustainable capital growth from its own operations.

Terry Thomas was appointed Managing Director in 1988, after a 15-year career at The Bank. Thomas had joined The Bank in 1973 as its first Marketing Manager, and had taken on increasing general management re-

[1]This amount was far greater in inflation-adjusted terms, than The Bank's deposits in 1994.

sponsibilities, including election to the Board in 1983. He took command of a bank that had successfully managed the transition from an almost total reliance on the cooperative movement to a viable, broad-based retail clearing bank. But new challenges had to be faced.

The UK financial services market had entered a period of radical change and restructuring. Government legislation to deregulate the financial sector was blurring traditional industry boundaries. Constraints on Building Societies' operations had been relaxed and they were now competing aggressively for products, such as current accounts, credit cards, and personal loans, that had historically been provided only by banking institutions. One of the UK's largest Building Societies, Abbey National, had even changed its status to become a bank in early 1989. New players with radically different cost structures were also entering the financial services market. First Direct was a postal/telephone/ATM service bank that had no branches. Several companies formed just to offer credit cards. And large retailers, like Marks and Spencer, were now marketing credit products to their considerable customer base.

Customer expectations and behavior were changing as well. Customers were more willing to switch banks, and to take products from several institutions. They were becoming more price sensitive and vocal in their demands for service, including expanded use of electronic banking through telephones and

EXHIBIT 3 Mission Statement—1988

We, the Co-operative Bank Group, will continue to develop a successful and innovative financial institution by providing our customers with high quality financial and related services whilst promoting the underlying principles of co-operation which are . . .

1. **Quality and Excellence**

To offer all our customers consistent high quality and good value services and strive for excellence in all that we do.

2. **Participation**

To introduce and promote the concept of full participation by welcoming the views and concerns of our customers and by encouraging our staff to take an active role within the local community.

3. **Freedom of Association**

To be non-partisan in all social, political, racial and religious matters.

4. **Education and Training**

To act as a caring and responsible employer encouraging the development and training of all our staff and encouraging commitment and pride in each other and the Group.

5. **Co-operation**

To develop a close-affinity with organizations which promote fellowship between workers, customers, members and employers.

6. **Quality of Life**

To be a responsible member of society by promoting an environment where the needs of local communities can be met now and in the future.

7. **Retentions**

To manage the business effectively and efficiently, attracting investment and maintaining sufficient surplus funds within the business to ensure the continued development of the Group.

8. **Integrity**

To act at all times with honesty and integrity and within legislative and regulatory requirements.

ues and position in the marketplace. While some customers closed their accounts in protest, a much higher number of new personal and corporate accounts were opened after publicizing these statements.

Thomas's initial steps to restructure the Bank's operations were accomplished through consolidation of personal and corporate account processing tasks. Back office tasks of personal banking operations, previously processed in branches, were consolidated into a Personal Customer Service center. Customers could call this center for the most up-to-date information regarding their accounts and could perform a variety of transactions over the telephone. Similarly many corporate banking tasks were consolidated into Regional Processing Centers. These new centers created 200 new jobs, but they also required eliminating 1,000 jobs (out of a total employee base of nearly 4,300) principally in retail branches. Laying off workers was a sensitive issue for a bank with such close ties to the co-operative and trade union movements. The Bank offered attractive retirement packages and was able to achieve the 1,000 job reduction entirely through voluntary retirements. Most of the terminations, however, were junior, low-level employees and the bank was now operating with a disproportionate number of middle managers.

The Bank also increased its cross-selling activities to existing customers, and began to offer a much wider array of products for customers. Among its major new products were:

VISA Gold Card	A "free for life" (no annual fee) credit card aimed at high net worth individuals
VISA Affinity Cards	Credit cards for specialized groups of customers (for example, The Royal Society for the Protection of Birds)
Pathfinder	A high interest-bearing current account for personal customers, based on a plastic card with no checkbook
Delta	A point of sale debit card/ ATM card/check guarantee card hybrid

Major new services introduced by the bank included:

Telephone banking	Comprehensive remote banking through a centralized operation for personal and corporate customers
Independent financial advice	Investment advice for customers, selling products provided by other financial institutions

Some of these products, particularly Visa Gold and Visa Affinity credit cards, were highly successful. In 1990, the Bank was not an issuer of Gold cards, but two years later, it had become the largest issuer of Visa Gold cards in the U.K., and by 1994 was the largest issuer in all of Europe.

Despite the new products and headcount reduction, the bank's cost-to-income ratio was high, especially when compared to building societies, with whom it was increasingly in direct competion.[2] Also, The Bank was still a small player in the U.K.'s corporate and personal markets.

Project SABRE

Terry Thomas recalled the bank's situation in late 1992.

> In 1988 we had identified the need to be much more focused, in terms of both market niches

[2]The cost-to-income ratio is defined in the U.K. as the ratio of all costs (which exclude the provision for bad debts) to net interest revenue earned plus commissions.

and our operations. We began to concentrate on those niches and segments where we had particular advantages, and we had taken a number of steps to re-structure our operations. However, these were first steps in a process of transforming our business, and in order to continue and accelerate this process, we needed better information to help us make some important decisions.

I felt we had too many products for our customer base. But none of us could agree on which were the profitable or unprofitable products and customers. Some thought the corporate sector was the most profitable by contributing a large number of profitable personal accounts. Others justified the full-line consumer product strategy by asserting that unless you offer a wide range of products the customers won't come to you in the first place. How should we balance the benefits of a wide product range against the costs? Should we promote these extra services or just have the capability to provide these extra services to the extent that certain customers want them? Or should we be out-sourcing many of these services if we cannot do them effectively internally?

I can remember many unproductive meetings when all we did was argue what the numbers were. Each player came to the table with his or her own set of numbers. Human nature being what it is, each of us believed my set of numbers was right and yours must be wrong, especially if yours say my products are losing more money than I think. We never actually got around to arguing or discussing, given any particular set of numbers, what are we going to do?

I wanted to run the bank on the facts and not on perceptions. Having a set of numbers derived by a systematic process to which everyone agrees cuts out the arguing and focuses attention on action plans. It is not very difficult, really, then to make innovative and bold decisions.

In early 1993, Thomas launched Project SABRE (Sales And Business REengineering), a project with several related streams aimed at improving the cost income ratio and the service to customers. A key element of the project was to develop information that would enable the bank to address five corporate needs:

1. Overhead reduction
2. Reengineering of business processes, particularly those that did not add value to customers
3. Product profitability
4. Customer profitability
5. Segment profitability

John Marper, Executive Director of Finance, recognized that the Bank's cost structure, particularly those costs traditionally considered "fixed"—such as in centralized services like technology, transmission, and finance—had to be attacked. "If you are going to attack the fixed cost base, you need to have a better cost system, especially one that can relate the fixed costs to products."

The Bank's existing cost system was a traditional responsibility accounting system that measured expenses for geographic and departmental cost centers. Central headquarters expenses, such as information systems and document transmission, were allocated to operating segments using high-level drivers related to the volume and size of the businesses. The bank measured product revenues using fee income and net interest (equal to gross interest minus funding costs). But the estimated costs of producing these revenues were not identified.

Following a pilot exercise in The Bank's check clearing center, managers became interested in activity-based costing (ABC) as a promising methodology for assigning the bank's operating expenses to its varied products and customers. An ABC team, consisting of Robin Webster, Senior Manager (and later Head of Project SABRE), Dennis Goodman, Head of MIS [Management Information Systems], Steve Kemp, Senior Business Analyst, and eight middle managers from different areas of the bank, began model building and process data gathering. The bank also

brought in Gemini Consulting to assist in the model development and to advise on the reorganization and action implications from the study in conjunction with internal management.

The bank's project team had to make several choices as it began considering the implementation of activity-based costing. How should it define resource pools? What activities should it define? Should it analyze costs by product or by customer? The bank divided its fiscal year into 13 four-week periods. Over what period should it collect the data for an initial historical analysis?

The team concluded that three periods would be reasonably representative to understand the bank's cost structure. They chose to do the analysis for March–May, 1993, the most recent three periods for which data were available.

The ABC team scanned the general ledger and identified about 210 resource cost pools, divided into three broad resource categories:

OPERATIONAL STAFF (85)	INFRASTRUCTURE (85)	MISCELLANEOUS (40)
Personal network—Staff	Personal network	Outsourced processing fees
Processing centers—Staff	VISA administration	Stationery costs
Personal Accts. Opening	Processing centers	Personal checkbooks
	ATM network	VISA statements

The numbers in parentheses indicate the number of resource pools in each broad resource category. The rows in Exhibit 5 identify the major resource cost pools that service the personal banking side of The Bank's business.

Once the resource cost pools were specified, the ABC team spent eight weeks out in the operational areas identifying activities and mapping them on brown paper pasted around the project work room. The team used their knowledge, supplemented with interviews, to identify 235 activities or tasks undertaken at the bank. Examples of activities were open customer accounts, maintain customer accounts, accept checks, process transactions, close accounts, handle customer queries, issue check books, market and sell products, money market transfers, Visa transactions, ATM transactions, encode, train, process loan applications, manage risk, recover money, and prepare financial statements and management reports. The columns of Exhibit 5 identify the eighteen principal activities related to The Bank's personal banking business.

With the resource pools specified and activities selected and defined, the ABC team then asked each area of the bank to match resource costs to the activities (see the cell entries in Exhibit 5). For example, to trace staff costs to activities, all employees of the bank from senior management to the clerical staff filled out time sheets identifying the time they spent on various activities. The employees' compensation (salary and benefits) was then assigned to each activity in proportion to the time spent. Computer costs were assigned based on the amount of computer time required to perform various activities. By aggregating all of the resource pool costs assigned to each activity, the ABC team derived the total costs of each activity (see Total Activity Costs row in Exhibit 5).

EXHIBIT 5 Personal Sector Products—Matrix of Costs by Resource and Activity*

RESOURCE COST POOLS	TOTAL RESOURCE COSTS	PROVIDE ATM SERVICES	CLEAR DEBIT ITEMS	BRANCH OPERATIONS DEBIT ITEMS	ISSUE PERSONAL CHEQUE BOOK	CLEAR CREDIT ITEMS	BRANCH OPERATIONS CREDIT ITEMS	LENDING CONTROL & SECURITY	CUSTOMER INQUIRIES	CUSTOMER CORRESPON-DENCE	MARKETING AND SALES ACTIVITY	COMPUTER PROCESSING
Account management center	£ 1,557,280	£ 0	£ 2,388	£ 66,293	£ 0	£ 509	£ 0	£ 5,647	£ 903,565	£196,803	£ 134	£ 49,745
Account opening teams	368,355	0	0	0	0	0	0	0	0	0	0	0
ATM network	111,031	111,031	0	0	0	0	0	0	0	0	0	0
Branch operations	3,475,959	95,229	40,756	487,269	0	11,641	545,606	5,709	306,263	460,845	1,478,735	0
Clearing operations	833,575	20,099	650,287	1,291	0	135,744	1,394	4,791	0	2,109	25	2,339
Collections	968,256	0	0	36	0	0	1,168	912,190	41,378	10,578	0	0
Collections fees	329,205	0	0	0	0	0	0	329,205	0	0	0	0
Outsourced fees	2,120,071	104,151	0	0	0	0	0	41,611	37,796	3,109	0	22,061
Financial advisors	1,214,383	0	0	0	0	0	0	0	9,799	3,601	81,970	0
Information technology	1,669,453	0	0	65,293	0	0	0	67,261	0	0	1,765	1,535,134
Marketing fees and staff	884,380	16,236	0	0	0	0	0	0	0	279	867,865	0
Postage	713,474	92,397	0	0	107,706	0	0	0	0	48,019	0	0
Regional processing centers	485,102	25,023	328,709	61,263	0	70,107	0	0	0	0	0	0
Stationery	277,746	0	0	0	156,243	0	0	0	0	0	0	24,728
Telesales	129,235	0	0	0	0	0	0	0	0	0	129,235	0
VISA stamps and statements	433,491	0	0	0	0	0	0	0	0	0	0	0
Other	55,671	26,136	0	2,655	0	0	0	14,349	0	863	2,317	7,240
Total activity costs	£15,626,667	£490,302	£1,022,140	£684,100	£263,949	£218,001	£548,168	£1,380,763	£1,298,801	£726,206	£2,562,046	£1,641,247

EXHIBIT 5 Personal Sector Products—Matrix of Costs by Resource and Activity* *continued*

RESOURCE COST POOLS	STATEMENTING & POSTAGE	ADVISE ON INVESTMENTS & INSURANCE	PROCESS VISA TRANSACTIONS	ISSUE VISA STATEMENTS	OPEN AND MAINTAIN HANDYLOANS	OPEN AND CLOSE ACCOUNTS	ADMINISTER MORTGAGES
Account management center	£ 0	£ 0	£ 138,792	£ 0	£ 0	£193,404	£ 0
Account opening teams	0	0	0	0	0	294,181	74,174
ATM network	0	0	0	0	0	0	0
Branch operations	0	40,930	0	0	0	2,976	0
Clearing operations	15,364	0	0	0	0	132	0
Collections	0	0	0	0	0	2,906	0
Collections fees	0	0	0	0	0	0	0
Outsourced fees	0	0	942,629	0	846,806	0	121,908
Financial advisors	0	1,119,013	0	0	0	0	0
Information technology	0	0	0	0	0	0	0
Marketing fees and staff	0	0	0	0	0	0	0
Postage	455,736	0	0	9,616	0	0	0
Regional processing centers	0	0	0	0	0	0	0
Stationery	3,989	0	92,786	0	0	0	0
Telesales	0	0	0	0	0	0	0
VISA stamps and statements	0	0	0	433,491	0	0	0
Other	2,111	0	0	0	0	0	0
Total activity costs	£477,200	£1,159,943	£1,174,207	£443,107	£846,806	£493,599	£196,082

**Numbers disguised to maintain confidentiality.*

The next step traced the costs of each activity to the different bank products. The tracing was accomplished by defining activity cost drivers for each activity (see first two columns in Exhibit 6). The activity cost driver represented the event that triggered the performance of each activity, such as a deposit that was processed or an account that was opened. The team collected information about the quantities of each activity cost driver that occurred during the estimation period (March-May 1993). These data came from various sources: the bank's automated information system (for data such as the number of Visa transactions, checks processed, and cash deposited), manual records (for data like the number of personal accounts opened), and statistical sampling procedures (for data not recorded such as the number of customer queries and complaints handled).

Activity cost driver rates (see the last column in Exhibit 6) were calculated by dividing the cost of each activity by the quantity of the associated activity cost driver. The activity cost driver rate could now be used to trace activity costs to individual products and customers.

EXHIBIT 6 Personal Sector Products: Activity Cost Driver Quantities and Rates*

ACTIVITY DESCRIPTION	ACTIVITY COST DRIVER	TOTAL ACTIVITY COST	QUANTITY OF ACTIVITY COST DRIVER	COST PER UNIT OF ACTIVITY COST DRIVER
Provide ATM service	ATM transactions	£ 490,302	1,021,963	£0.48
Clear debit items	Number of debits processed	1,022,140	5,110,299	0.20
Branch operations for debit items	Number of branch counter debits	684,100	762,111	0.90
Issue personal cheque book	Number of books issued	263,949	40,628	6.50
Clear credit items	Number of credits processed	218,001	871,004	0.25
Branch operations for credit items	Number of branch counter credits	548,168	512,986	1.07
Lending control and security	Number of interventions	1,380,763	765,591	1.80
Customer inquiries	Number of telephone minutes	1,298,801	7,205,560	0.18
Customer correspondence	Number of customer letters	726,206	221,204	3.28
Marketing and sales activity	Number of accounts opened	2,562,046	62,120	41.24
Computer processing	Number of computer transactions (electronic impulses)	1,641,247	16,112,471	0.10
Statementing and postage	Number of statements issued	477,200	1,724,285	0.28
Advise on investments and insurance	Hours of advice given	1,159,943	32,956	35.20
Process VISA transactions	Number of VISA transactions	1,174,207	5,125,248	0.23
Issue VISA statements	Number of VISA statements issued	443,107	1,714,258	0.26
Open/maintain handyloans	Number of Handyloan accounts	846,806	201,521	4.20
Open and close accounts	Number of accounts opened/closed	493,599	57,951	8.52
Administer mortgages	Number of mortgages	196,082	18,609	10.54
		£15,626,667		

**Numbers disguised to maintain confidentiality.*

The project team identified approximately 50 products or groups of closely related products. Corporate products included business loans, corporate current accounts, and leases. Personal banking products included personal loans and advances, current accounts and Visa accounts. Product costs were calculated by determining the quantity of each activity cost driver used by each of the products, multiplying these quantities by the associated activity cost driver rate, and summing across all the activities used by the individual products.

Exhibit 7 summarizes the distribution of activity costs, including funding charges, to various personal banking products (current accounts, ultra account, personal loans, Visa cards and other personal banking products. The last row of Exhibit 7 calculates the product cost as the sum of the activity costs used by individual products.

Not all operating expenses were assigned to banking products. The project team categorized the costs of 10 large activities as sustaining costs—costs of activities that were not directly related to any products, but rather that supported the organization as a whole. No activity cost drivers were defined for these activities, which included accounting, finance, strategy, planning, human resource management, and information technology development activities. These sustaining costs accounted for 15% of the bank's operating expenses.

Product profitability was calculated by subtracting the cost of all activities undertaken to support a particular product (bottom row of Exhibit 7) from the net interest revenue earned from each product plus the fees derived for performing various services for customers. For asset and liability products (such as loans, current accounts, and savings), the bank used a transfer interest rate to represent the rate at which excess funds could be invested or needed funds borrowed on the money markets.[3] The transfer rate used for most products was the LIBOR[4] rate + ¼% (which equaled 6¼% during the initial estimation period); however, where funds were invested or borrowed specifically for certain products ("matched"), the actual matched rate was used.

Robin Webster, the manager leading the ABC study, described the bank's motivation for calculating product profitability for both asset and liability products:

> In addition to fee income, the bank makes money from asset and liability products in two ways: (1) by accessing sources of funds from liability products; and (2) by lending at higher risk-adjusted rates for our asset products. Using transfer rates allows us to see how well we are doing on both sides of the balance sheet. Are we raising funds from liability accounts at a net cost below our LIBOR borrowing cost? If so, and even without good lending opportunities, we could profit by investing these funds at the LIBOR rate. Are our lending operations healthy? Could we borrow money from the markets at the base rate and still turn a profit from our lending and related fee-generating activities?

Exhibit 8 shows the profitability of the individual personal banking products.

Product Decisions

The Bank had always regarded the provision of independent financial advice and the sale of associated investment products as a highly profitable business. The ABC analysis (see Exhibit 8), however, indicated that this business was only generating small profits on the basis of the activity costs that could be directly assigned to it, even with no allocation

[3]For example, the net interest revenue on business loans equaled the actual interest received minus the transfer rate. For liabilities, like corporate deposits and current accounts, net interest revenue equaled the transfer rate minus the interest actually paid.

[4]LIBOR is the London Inter Bank Offer Rate.

EXHIBIT 7 Matrix of Activity Costs Used by Personal Sector Products*

ACTIVITY	TOTAL	CURRENT ACCOUNT PLUS (1)	FREE-FLOW (2)	PERSONAL LOANS (3)	MORT-GAGES (4)	VISA CLASSIC (5)	VISA AFFINITIES (6)	VISA GOLD (7)	HANDY-LOAN/ FASTLINE (8)	INDEPENDENT FINANCIAL ADVICE AND INSURANCE (9)	PATH-FINDER (10)	DEPOSIT PRODUCTS (11)
Provide ATM services	£ 490,302	£ 403,360	£ 4,873	£ 0	£ 0	£ 25,410	£ 7,729	£ 15,447	£ 921	£ 0	£ 22,515	£ 10,047
Clear debit items	1,022,140	921,643	31,915	0	0	33,792	10,397	14,296	0	0	10,071	26
Branch operations for debit items	684,100	487,796	9,774	1,770	0	90,131	35,775	44,617	6,151	0	5,985	2,101
Issue personal checkbook	263,949	252,663	11,286	0	0	0	0	0	0	0	0	0
Clear credit items	218,001	91,982	2,432	4	0	53,731	20,381	45,284	1,149	0	3,004	34
Branch operations for credit items	548,168	506,273	14,964	0	0	3,131	103	807	0	0	3,807	19,083
Lending control and security	1,380,763	532,918	26,288	91,501	20,825	540,563	6,809	143,906	5,387	4,798	4,528	3,240
Customer inquiries	1,298,801	850,569	26,974	97,014	324	107,052	14,749	57,630	5,959	21,053	84,287	33,190
Customer correspondence	726,206	462,178	15,510	64,409	970	56,701	2,439	23,598	6,332	13,277	58,797	21,995
Marketing and sales activity	2,562,046	673,641	4,189	815,211	0	202,552	54,000	197,334	41,210	398,548	85,366	89,995
Computer processing	1,641,247	1,215,933	54,979	113,403	0	31,292	11,317	19,256	38,131	0	49,563	107,373
Statementing and postage	477,200	336,094	18,687	19,179	66	15,241	1,433	49,277	4,430	4,088	22,740	5,965
Advise on investments and insurance	1,159,943	0	0	0	0	0	0	0	0	1,159,943	0	0
Process VISA transactions	1,174,207	223,320	0	18,672	0	468,257	177,895	270,904	15,159	0	0	0
Issue VISA statements	443,107	0	0	0	0	235,406	94,017	113,684	0	0	0	0
Open/maintain handyloans	846,806	0	0	0	0	0	0	0	846,805	0	0	0
Open and close accounts	493,599	188,373	2,786	104,346	0	51,505	1,078	35,397	11,934	0	63,062	35,118
Administer mortgages	196,082	10,596	815	17,117	121,907	0	1,631	0	0	0	13,042	30,974
Total activity costs	£15,626,667	£7,157,339	£225,472	£1,342,626	£144,092	£1,914,764	£439,753	£1,031,437	£983,569	£1,601,707	£426,767	£359,141

**Numbers disguised to maintain confidentiality.*

EXHIBIT 8 Profitability Analysis of Personal Sector Products*

ACTIVITY	CURRENT ACCOUNT PLUS	FREEFLOW	PERSONAL LOANS	MORT-GAGES	VISA CLASSIC	VISA AFFINITIES	VISA GOLD	HANDY-LOAN/ FASTLINE	INDEPENDENT FINANCIAL ADVICE AND INSURANCE	PATH-FINDER	DEPOSIT PRODUCTS	TOTAL
Net interest	£5,283,472	£1,041,384	£4,530,963	£331,027	£2,856,713	£463,204	£ 808,592	£1,811,526	£ 0	£ 261,717	£960,437	£18,349,035
Net commission	3,593,898	358,867	780,608	147,909	2,101,002	686,117	1,562,720	65,987	1,549,634	4,284	(1,141)	10,849,885
Bad debts	(782,000)	(130,000)	(1,192,000)	(274,000)	(882,000)	(182,000)	(508,000)	(274,000)	0	0	0	(4,224,000
Gross profit	8,095,370	1,270,251	4,119,571	204,936	4,075,715	967,321	1,863,312	1,603,513	1,549,634	266,001	959,296	24,974,920
Activity costs (from Exhibit 7)	7,157,339	225,472	1,342,626	144,092	1,914,764	439,753	1,031,437	983,569	1,601,707	426,767	359,141	15,626,667
Direct profit	938,031	1,044,779	2,776,945	60,844	2,160,951	527,568	831,875	619,944	(52,073)	(160,766)	600,155	9,348,253
Allocated infrastructure costs	1,014,145	36,845	204,822	4,213	156,768	22,086	81,053	20,864	263,078	65,066	59,685	1,928,625
Net profit	£ (76,114)	£1,007,934	£2,572,123	£ 56,631	£2,004,183	£505,482	£ 750,822	£ 599,080	£(315,151)	£(225,832)	£540,470	£ 7,419,628

**Numbers disguised to maintain confidentiality.*

of the 15% of expenses classified as "sustaining costs." This came as a particular surprise because the Bank had targeted financial advice and new investment products as a growth area in the deregulated environment.

The analysis showed that several other products were failing to generate adequate returns to pay for the sustaining costs and to support hoped-for improvements in the Bank's cost-income ratio aspirations. For example, The Bank's basic and core product, personal current accounts ("Current Account Plus"), was at best breaking even after considering sustaining costs. This finding was consistent with conventional wisdom at the Bank, and also in the U.K. banking market, where many banks were openly commenting in the press that current accounts were unprofitable. The Bank began contemplating several courses of action to improve the profitability of current accounts.

On a more positive note, all three Visa accounts were revealed to be highly profitable products. The Gold Card is a free for life card that carries a slightly lower interest rate than the Classic Card (which is an ordinary Visa Card) and the Affinity Card. The Affinity Card is attractive to some customers because a portion of the income earned on the Affinity Card is given to specified charities. The Bank saw a clear message to focus its limited marketing resources into growing its personal current accounts and Visa account businesses.

Customer Profitability

The ABC team wanted to extend the analysis to individual customers, but the bank's information systems, many dating back to the 1960s, could not readily access customers' transactions data. The team performed a limited study of customer-specific expenses, based on a sample of current accounts. They did not need to study other products in detail, since most savings accounts had fewer than two transactions per quarter, all loan products had a predictable 12 transactions per year, and credit card costs were found to be mostly constant per account.

The team determined that 55% of current account expenses were related to processing transactions, and 45% were related to maintaining accounts. The maintenance-related costs were divided by the number of accounts, and assigned equally to each account. For assigning transactions-related expenses, the team split customers into three segments—Low, Medium, and High—based on the annual turnover of funds in their accounts. From a month-long sample of customer transactions, they assigned transactions-related expenses to these three segments in the ratios of: 15%, 40% and 45%.

The revenue side was simpler. The team identified, for each product, the income earned from credit balances and fees by individual customers. By matching this income with the assigned cost, the team could now estimate the profitability of each customer.

Next, the Bank identified the entry product (the first product bought by a customer). The five main entry products were Current Accounts, VISA Gold, VISA Affinity cards, VISA Classic and the Pathfinder savings account. All subsequent sales of other products (cross sales) were assigned to the entry product. The results showed that the vast majority of cross sales originated from Current Accounts.

The customer profitability analysis revealed that up to half of all current accounts, particularly those with low balances, were unprofitable. Managers at the Bank began to debate several questions about current accounts. How can it make current accounts attractive to profitable customers? Should The Bank combine and enhance its current account products with features such as service

level warranties and restructured charges? Should the Bank aggressively market these accounts using a special sales force backed by an advertising campaign in local newspapers and on television?

How should the Bank discourage unprofitable customers? Should the Bank alter its tariff to give a wide differential between customers taking credit within approved overdraft limits, and those overdrawing accounts outside approved limits where the greatest risk of loss existed, and which prompted high levels of intervention activity?

The Bank segmented Visa customers into profitable and unprofitable customers. The most profitable customers were customers with large unpaid balances that generated interest income, and customers who transacted frequently, thereby generating high processing fees. The Bank developed a profile of the profitable customers, and its marketing was being redirected to attract the customers with profitable behavior.

David Fawell, Marketing Manager, faced an interesting decision:

> Excluding sustaining costs, both current account and Visa customers are profitable, as I thought. But with pressure to reduce our operating expenses, I have only a limited amount of funds to market these products. I'm not sure whether these funds should be directed to prospective personal current account customers or to Visa account customers? Or should I spread the funds across both types of prospects?

Overhead Reduction and Business Process Reengineering

In addition to decisions about products and customers, the initial information from Project SABRE helped to refocus The Bank from a functionally oriented organization to a process-oriented organization. Activity costs provided a metric to evaluate the effects of business process reengineering decisions. Managers were now attempting to identify which processes were adding value to the customer and which were not, and how the efficiency of different processes could be improved. Improving efficiency would enable the bank to either take costs out of the system, or to use the extra capacity to generate more revenue.

Deeper analysis showed that much of the cost base had a high element of costs that were, in the short to medium term, fixed (for example, computer systems and bank branches) and that radical solutions were required to impact on these costs. In 1994, the Bank outsourced its computer development and ATM network, and began serious negotiations to outsource its London check clearing center with a view to eliminating excess capacity and replacing fixed with variable costs.

Next Steps

While stimulated by the interesting findings of the first-pass ABC analysis, many bank managers were still unsure about the action implications. A newly introduced product like foreign currency exchange seemed to be unprofitable. Should it be discontinued or should it be retained as part of a full-service package for current account customers? Also, would department managers, accustomed to high autonomy and control over their operations, be willing to reengineer their organization to facilitate process flows, and eventually to down-size their operations to achieve a lower cost-to-income ratio. Some managers expressed concern that as profitability improved, from better selection of products and customers, the organization's commitment to reorganize and improve would start to diminish.

Robin Webster and Steve Kemp were disappointed that such a large amount of expenses (15% of costs) had been classified as sustaining costs, where they could not be dri-

ven down to products and customers. They felt that these sustaining expenses could be reduced but because they had been treated as "fixed," independent of products and customers, they would not be targets for cost reduction. Ken Lewis, Executive Director, Group Resources, concurred. He observed that the bank's people costs had been traced readily and easily to activities that related to products and customers, but that property and information technology resources had been largely classified as business-sustaining. Lewis believed that significant opportunities existed to downsize sustaining costs by making better decisions about the types of properties the bank owned and leased, and the level and extent of information technology the bank deployed. Decisions on information technology could be critical. Unmanned, totally automated kiosks were starting to perform activities formerly done by the bank's labor-intensive branch network.

JOHN DEERE COMPONENT WORKS (B)* .

Frank Stevenson had been appointed division manager of Gear and Special Products in September 1986 after spending 20 years in manufacturing and manufacturing engineering. He summarized his division's response to activity-based costing (ABC):[1]

> Few things have generated more excitement. Even though it's still an allocation, it's such an improvement. Parts we suspected we were undercosting have turned out to be even more expensive than we had thought. It's proven what we suspected about the costs of material handling and transport distances, and triggered our making layout changes. When it showed us the costs added by secondary operations, we brought them back onto the main floor.

ABC Cost Estimating Model

In order to use ABC for costing individual parts, a model was developed that could be run using a Lotus 1-2-3 spreadsheet on an IBM personal computer (separate from the overall accounting and data processing systems). It provided considerably more information than the standard cost model, and some elements of the model were interactive. The ABC model, for example, calculated material costs on the basis of the type of steel, part length, and machine number (which affected tools used and waste). Also, materials that were delivered directly to the machines on the floor, bypassing receiving, inspection, and storage, were not charged for any materials overhead. Therefore, material costs depended on how the material was used, as well as its purchase price. (The standard cost system, by contrast, calculated an average cost for parts of a certain weight based entirely on the purchase price of the barstock.) Materials of different prices could be fed into the ABC system, and the model would make cost trade-offs among them. The model could calculate the number of annual runs that produced the lowest manufacturing costs on an annual basis for a part number; it included inventory holding costs as a factor in making this assessment. It could also compare setups on different machines for their differential cost effects.

Although the ABC method was developed on the basis of normal volume, the model could also calculate costs at a par (full capac-

*Research Associate Artemis March prepared this case under the supervision of Professor Robert S. Kaplan.

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[1] See "John Deere Component Works (A)," HBS No. 9-187-107 in Chapter 4.

ity) level of utilization. Par volume was higher than current normal volume and represented what Gear and Special Products managers considered a more reasonable level of utilization than the currently existing very depressed normal volume. Par overhead rates spread period overhead across higher volumes of parts than did normal rates.

Completing the ABC Study

Keith Williams and Nick Vintila, the authors of activity-based costing, were able to demonstrate the change in estimated costs, from standard to ABC, for the sample of 44 parts examined earlier (see Exhibit 1). They also experimented with changing the lot size from that currently being used in the division's MRP system. In particular, the ABC model recommended that the average lot size be doubled—thereby halving the number of annual runs per part—in order to optimize manufacturing costs (see Exhibit 2). The costs saved in reduced setups, materials handling, and production order processing more than offset the increased inventory holding costs.

A third study showed the impact of shifting the product mix to exploit the efficiencies from running longer jobs on the turning machines. Exhibit 3 shows the current workload on the turning machines based on the annual machine hours (ACTS) for each part. The overhead assignment (using the new ABC model) to each class of parts is shown at the bottom of the exhibit. Exhibit 4 shows a simulated overhead assignment assuming that the more than 1,000 parts with less than 100 annual ACTS hours run time were transferred from the machines, with the freed-up machine time used to produce 30 new parts that each required at least 500 annual ACTS hours. This change would reduce by 77% the number of part numbers being processed on the machines and reduce the number of setup hours and orders processed by about 60%. Williams explained the rationale for this study:

> We wanted to estimate the impact from substituting a few high-volume parts for the large number of low-volume parts we are now running. Overhead is reduced by $2.2 million, or about 21%. The overhead rate declines from 593% to 467% of direct labor. The key question is whether actual overhead reductions of that scale would result from such a change.
>
> Our impression is that at least this amount of overhead reduction should occur. The reduced number of parts should directly reduce the expenses for machine setups and for material management scheduling and coordination. Process and tool and industrial engineering would be supporting only a fifth of the part numbers now being supported. Such a change should make it much easier to standardize raw material, which should reduce coordination in that area. Also, it should be much easier to implement other operational improvements such as sequencing jobs so as to minimize setups, using pick-offs or other attachments to eliminate secondary operations, or possible rearrangements to create a cell environment for the high-volume parts.

Division Changes

Stevenson located activity-based costing in the context of a division trying to reorient itself to a new reality: "We must dramatically increase our competitive position in the worldwide market. That requires a quantum leap in manufacturing quality and in reducing our costs." To this end, the division had, during the 1985–1986 period, formally demarcated its product lines into five businesses: gears and shafts, machined parts, cast iron machining, heat treating, and sheet metal work. Wherever possible, departments were reorganized from processes to manufacturing cells and a just-in-time approach adopted to shorten lead times, improve quality, and thus lower costs. Stevenson stated, "We want 'visual management' to replace routing; we want

EXHIBIT 1 Comparison of Machined Parts Overhead: Standard Costing versus Activity-Based Costing for the 44 Sample Items—Turning Machine Operations Only

					ACTS HR			JDCW OVERHEAD COST			ABC OVERHEAD COST			ABC OVERHEAD AS % JDCW		
PART NUMBER	PART DESCRIPTION	QUOTE VOLUME	PART WEIGHT	ABC RUNS/ YEAR	PER 100	ANNUAL	DIRECT LABOR	DIRECT OH	PERIOD OH	TOTAL OH	DIRECT OH	PERIOD OH	TOTAL OH	DIRECT OH	PERIOD OH	TOTAL OH
The 10 Parts Most Helped by ABC																
H265	Hub	4,464	3.703	4	3.4	150	$1,127	$3,750	$4,905	$8,654	$3,347	$3,104	$6,451	89%	63%	75%
R946	Roller	5,904	0.600	3	2.4	139	695	2,621	3,700	6,321	2,064	2,726	4,792	79	74	76
R428	Sprocket	3,180	1.556	2	2.2	70	527	1,672	2,187	3,859	1,575	1,744	3,319	94	80	86
R717	Sprocket	4,869	1.956	2	2.0	95	713	2,035	2,661	4,696	2,181	2,087	4,266	107	78	91
A152	Shaft	2,972	1.252	3	1.7	51	379	1,359	1,777	3,136	1,363	1,618	2,981	100	91	95
P244	Pin	7,383	1.085	3	1.8	132	706	2,198	3,064	5,262	2,358	2,696	5,054	107	88	96
H355	Hub	1,155	3.052	1	2.3	26	130	677	955	1,632	540	1,028	1,568	80	108	96
R157	Roller	3,181	0.243	1	1.5	46	231	839	1,185	2,024	711	1,274	1,984	85	108	98
C784	Cap	71,200	0.166	4	0.4	266	1,994	4,151	5,425	9,576	4,929	4,472	9,401	119	82	98
P379	Pin	6,807	1.116	3	1.8	133	651	2,039	2,843	4,882	2,238	2,561	4,798	110	90	96
	Total/Average	11,112	1.473	2.6	1.9	110	$7,152	$21,341	$28,702	$50,043	$21,306	$23,310	$44,614	100%	81%	89%
The 10 Parts Most Penalized by ABC																
S771	Spacer	11,092	0.039	1	0.2	20	$100	$329	$466	$795	$411	$934	$1,346	125%	200%	169%
P675	Pin	2,596	0.412	1	0.4	14	69	263	371	634	377	858	1,236	144	231	195
P220	Pin	3,204	0.743	3	0.6	19	139	444	580	1,024	824	1,188	2,011	186	205	196
T815	Stud	3,150	0.281	1	0.4	12	58	237	336	573	317	828	1,144	134	246	200
N281	Nut	8,500	0.222	3	0.2	18	135	411	537	949	817	1,183	2,000	199	220	211
T566	Stud	2,452	1.779	3	1.0	24	178	564	738	1,302	1,228	1,519	2,748	218	206	211
R918	Rocker	1,091	0.703	1	0.9	10	40	193	281	473	262	783	1,047	136	279	221
R410	Sprocket	792	2.786	1	0.7	6	42	172	225	397	339	766	1,105	197	341	278
P594	Pin	692	0.722	1	0.3	2	11	61	87	148	207	702	910	338	811	615
S209	Spacer	950	0.141	1	0.3	3	15	58	82	140	173	688	862	299	842	617
	Total/Average	3,229	0.712	1.5	0.5	12	$788	$2,732	$3,702	$6,434	$4,955	$9,449	$14,409	181%	255%	224%

EXHIBIT 1 Comparison of Machined Parts Overhead: Standard Costing versus Activity-Based Costing for the 44 Sample Items—Turning Machine Operations Only *continued*

PART NUMBER	PART DESCRIPTION	QUOTE VOLUME	PART WEIGHT	ABC RUNS/ YEAR	ACTS HR PER 100	ACTS HR ANNUAL	DIRECT LABOR	JDCW OVERHEAD COST DIRECT OH	JDCW OVERHEAD COST PERIOD OH	JDCW OVERHEAD COST TOTAL OH	ABC OVERHEAD COST DIRECT OH	ABC OVERHEAD COST PERIOD OH	ABC OVERHEAD COST TOTAL OH	ABC OVERHEAD AS % JDCW DIRECT OH	ABC OVERHEAD AS % JDCW PERIOD OH	ABC OVERHEAD AS % JDCW TOTAL OH
Remaining Parts																
H346	Hub	1,088	3.614	2	2.8	31	$ 151	$ 823	$ 1,166	$ 1,989	$ 735	$ 1,225	$ 1,960	89%	105%	99%
B823	Button	18,200	0.069	2	0.5	84	417	1,305	1,844	3,149	1,317	1,898	3,215	101	103	102
R316	Roller	18,058	0.042	2	0.4	80	401	1,266	1,784	3,050	1,278	1,854	3,132	101	104	103
T237	Stop	4,258	1.818	5	2.7	116	706	2,072	2,924	4,996	2,413	2,753	5,176	116	94	104
P682	Pin	3,402	1.347	2	1.8	61	325	1,131	1,577	2,708	1,253	1,618	2,872	111	103	106
T586	Stud	10,000	0.602	4	0.7	77	573	1,595	2,086	3,681	1,888	2,061	3,947	118	99	107
S071	Spacer	5,661	1.507	2	1.0	54	407	1,167	1,527	2,694	1,449	1,545	2,994	124	101	111
P583	Pin	3,402	1.253	2	1.5	52	258	935	1,320	2,255	1,056	1,479	2,534	113	112	112
P736	Pin	38,955	0.160	2	0.4	159	795	1,944	2,742	4,686	2,480	2,915	5,394	128	106	115
P423	Pin	3,402	1.354	2	1.5	52	258	931	1,314	2,245	1,131	1,489	2,619	121	113	117
P333	Pin	4,258	0.937	3	1.3	56	282	1,021	1,441	2,462	1,232	1,668	2,899	121	116	118
L209	Lever	5,351	0.533	2	0.8	41	204	747	1,054	1,801	858	1,332	2,190	115	126	122
P057	Pin	1,281	0.569	1	1.5	20	97	438	618	1,056	404	926	1,330	92	150	126
T863	Stud	7,120	1.110	4	1.0	74	553	1,396	1,825	3,220	2,217	2,100	4,316	159	115	134
T166	Stud	5,645	0.258	3	0.6	36	232	757	1,023	1,780	1,098	1,415	2,511	145	138	141
B605	Bolt	10,561	0.286	2	0.3	32	242	659	864	1,523	911	1,250	2,161	138	145	142
P904	Pin	950	2.179	1	1.8	17	86	384	542	925	430	894	1,325	112	165	143
R647	Sprocket	5,167	3.522	3	1.4	74	372	1,254	1,769	3,023	2,329	2,054	4,383	186	116	145
H622	Hub	4,450	1.913	2	0.6	26	130	548	773	1,320	756	1,171	1,927	138	152	146
S451	Spacer	2,785	0.120	1	0.6	17	83	347	490	837	370	887	1,257	107	181	150
H554	Hub	1,490	1.582	1	1.1	16	79	361	510	871	423	895	1,319	117	176	152
T501	Stud	4,879	0.151	1	0.3	17	85	322	454	775	376	894	1,269	117	197	164
F382	Fitting	4,009	0.711	2	0.5	20	153	488	636	1,124	738	1,103	1,840	151	173	164
S245	Spacer	4,912	0.281	1	0.4	19	94	336	475	811	433	921	1,355	129	194	167
	Total/Average	7,054	1.080	2.2	1.1	51	$ 6,983	$22,226	$30,757	$ 52,982	$27,575	$36,357	$ 63,925	124%	118%	121%
Total/Avg. All Parts		7,180	1.102	2.1	1.1	56	$14,924	$46,299	$63,161	$109,459	$53,836	$69,116	$122,948	116%	109%	112%

Note: Dollar figures are annual totals for the quote quantity.

EXHIBIT 2 Comparison of Costs: Changing Lot Size

					PRESENT OPERATION				INDICATED BY ABC							COMPARISON		
												ANNUAL ABC				ABC SAVINGS TO JDCW		
PART DESCRIPTION	MACHINE SETUP TIME	ANNUAL REQUIREMENTS	ACTS HOURS/C	ANNUAL ACTS	OBESRVED RUN SIZE	ANNUAL RUNS	ANNUAL SETUP HOURS	% ANNUAL SETUP TO ANNUAL ACTS	ANNUAL RUNS PER YEAR	ANNUAL SETUP HOURS	% ANNUAL SETUP TO ANNUAL ACTS	SETUP AND ORDER COST			% ABC SETUP HR IMPACT	SETUP AND ORDER COST		
												DIRECT	PERIOD	TOTAL		DIRECT	PERIOD	TOTAL
Valve	2.80	6,566	5.63	370	1,112	6	16.8	5%	3	8.4	2	$ 326	$ 300	$ 626	−50	$ 326	$ 300	$ 626
Pin	5.61	9,330	3.16	295	1,034	10	56.1	19%	4	22.4	8	709	505	1,214	−60	1,064	757	1,821
Bushing	5.61	8,505	2.17	185	1,991	5	28.1	15%	3	16.8	9	532	378	911	−40	355	252	607
Pin	5.61	12,461	1.69	211	2,970	5	28.1	3%	3	16.8	9	532	379	911	−40	355	253	607
Blocker	5.61	2,350	3.02	71	518	5	28.1	40%	2	11.2	16	355	252	607	−60	532	379	911
Sleeve	4.20	16,568	1.02	169	6,904	3	12.6	7%	3	12.6	7	429	340	769	0	0	0	0
Swivel	4.20	20,055	0.31	62	3,750	6	25.2	41%	2	8.4	14	287	227	513	−67	574	453	1,027
Neck	3.27	6,381	1.05	67	1,598	4	13.1	20%	2	6.5	10	240	209	449	−50	240	209	449
Washer	4.20	17,014	0.34	58	7,480	3	12.6	22%	1	4.2	7	145	112	257	−67	289	225	514
Connector	5.61	11,467	1.92	220	1,014	12	67.3	31%	5	28.1	13	886	631	1,517	−58	1,241	883	2,124
Pinion	5.61	642	5.80	37	371	2	11.2	20%	2	11.2	30	355	252	607	0	0	0	0
Pin	2.34	91,629	0.19	174	19,440	5	11.7	7%	3	7.0	4	293	284	577	−40	195	189	385
Plug	4.91	20,825	0.48	100	4,279	5	24.6	25%	4	19.6	20	641	479	1,120	−20	160	120	280
Connector	4.20	11,892	0.32	38	3,370	4	16.8	44%	2	8.4	22	285	226	511	−50	285	226	511
Spacer	3.27	2,154	0.56	12	841	3	9.8	81%	1	3.3	27	120	104	225	−67	240	209	449
Rod	4.20	582	1.22	7	305	2	8.4	118	1	4.2	59	143	113	256	−50	143	113	256
Total/Average				2,075	56,977	80	370	18%	41	189	9%	$6,279	$4,791	$11,070	−49%	$6,000	$4,567	$10,567

EXHIBIT 3 Assignment of Machine Overhead by Activity: Present Distribution of Parts

	PART GROUPING BY ANNUAL ACTS HOURS						
ACTIVITY DATA	0	1–50	50–100	100–500	500–1000	OVER 1000	TOTAL
Direct Labor ($000)	$0	$ 251	$ 207	$ 783	$ 236	$236	$ 1,713
% of total	0.0	14.7	12.1	45.7	13.8	13.8	100.0
Machine (ACTS) Hours	0	17,000	14,000	53,000	16,000	16,000	116,000
% of total	0.0	14.7	12.1	45.7	13.8	13.8	100.0
Number of Part Numbers							
Parts with no requirements	1,110						1,110
Parts with requirements		877	208	256	22	8	1,371
% of total		64.0	15.2	18.5	1.6	0.6	100.0
Annual Setup Hours (est.)							
Orders/part (est.)	0	4	6	8	10	12	
Hours/setup (est.)	4	4	5	5	5	3	
Total setup hours	0	14,032	6,240	10,240	1,100	288	31,900
% of total	0.0	44.0	19.6	32.1	3.4	0.9	100.0
Annual Production Orders							
Orders/part numbers (est.)	0	4	6	8	10	12	
Total production orders	0	3,508	1,248	2,048	220	96	7,120
% of total	0.0	49.3	17.5	28.8	3.1	1.3	100.0
Material Handling Data							
Loading factor (est.)	0	0.67	0.8	1.0	1.0	0.8	
Cost weighting	0	25,373	17,500	53,000	16,000	20,000	131,873
% of total	0.0	19.2	13.3	40.2	12.1	15.2	100.0
Overhead Assignments ($000)							
Direct labor support	$0	$ 278	$ 229	$ 867	$ 262	$262	$ 1,898
Machine operation	0	593	488	1,848	558	558	4,045
Machine setup	0	498	211	356	37	10	1,112
Production orders	0	401	143	237	25	11	817
Material handling	0	58	40	122	37	46	303
Part administration	5	636	151	186	16	6	1,000
General administration	1	268	137	393	102	97	998
Total overhead	$6	$2,732	$1,399	$4,009	$1,037	$990	$10,173
Total overhead/DL$	NA	1,088%	676%	512%	439%	419%	594%

to stand here at the beginning of the process and see parts being completed right within our view." In addition, a marketing department had been added at the factory level.

Use of ABC

ABC was widely embraced for decision making in the machined parts business and for implementing other changes more effectively.

Bidding The ABC model was being used to cost machined parts and to prepare bids to both Deere and outside customers. Sinclair commented, "We are more confident now about our quote prices. And because ABC more properly penalizes low-volume products, we now know which business we don't want." Also, the ABC model could generate costs at either normal or par volume, making it easier to prepare par-based

EXHIBIT 4 Assignment of Machine Overhead by Activity: Assumed Distribution of Parts

	PART GROUPING BY ANNUAL ACTS HOURS					INDICATED CHANGE IN ACTIVITY/COST	
ACTIVITY DATA	0	100–500	500–1,000	OVER 1,000	TOTAL	%	($000)
Direct Labor ($000)	$0	$ 783	$ 465	$ 465	$1,713	0	
% of total	0.0	45.7	27.1	27.1	100.0		
Machine (ACTS) Hours	0	53,000	31,500	31,500	116,000	0	
% of total	0.0	45.7	27.2	27.2	100.0		
Number of Part Numbers							
Parts with no requirements	1,110				1,100	0	
Parts with requirements		256	44	16	316	−77	
% of total		81.0	13.9	5.1	100.0		
Annual Setup Hours (est.)							
Orders/part (est.)	0	8	10	12			
Hours/setup (est.)	4	5	5	3			
Total setup hours	0	10,240	2,200	576	13,016	−59	
% of total	0.0	78.7	16.9	4.4	100.0		
Annual Production Orders							
Orders/part numbers (est.)	0	8	10	12			
Total production orders	0	2,048	440	192	2,680	−62	
% of total	0.0	76.4	16.4	7.2	100.0		
Material Handling Data							
Loading factor (est.)	0	1.0	1.0	0.8			
Cost weighing	0	53,000	31,500	39,375	123,875	−6	
% of total	0.0	42.8	25.4	31.8	100.0		
Overhead Assignments							
Direct labor support	$0	$ 867	$ 515	$ 515	$1,897	0	$ 0
Machine operation	0	1,848	1,098	1,098	4,044	0	0
Machine setup	0	356	74	19	449	−60	(663)
Production orders	0	237	50	22	309	−62	(508)
Material handling	0	122	72	90	284	−6	(19)
Part administration	5	186	32	12	235	−77	(765)
General administration	1	393	200	191	785	−21	(213)
Total overhead	$6	$4,009	$2,041	$1,947	$8,003	−21	$(2,170)
% Overhead/DL$	na	512%	439%	419%	467%	−21%	

Note: Assumes transfer of parts with less than 100 ACTS and replacing available ACTS hours with parts having more than 500 ACTS.

quotes for the machining portion of the parts.

The division had also changed its transfer pricing and bidding practices. Attempting to bid and transfer at full cost had lost Gear and Special Products much internal business. It began to negotiate "market-based prices," which could be below the full costs calculated by the existing cost accounting system. After a period of experimentation, the use of market pricing became official corporatewide policy in April 1986.

Process Planning John Gordon, head of process engineering for the machining area, was using the model to compare relative ma-

chining efficiencies for different types of steel and part numbers in order to decide which parts should be run on which types of machines. Because ABC revealed much higher setup and production order costs than those used in the MRP ordering formula, larger lot sizes and fewer annual runs per part number were indicated. Process engineering was using ABC to cost parts on the basis of optimal runs per year and to negotiate with customers to accept fewer runs at lower prices.

Low Value-Added Parts Gear and Special Products was already accelerating the movement of low-volume, short-running parts off the turning machines. About one-third (31%) of parts required over 20 hours each of direct labor; collectively these accounted for 97% of all direct labor hours and were likely to all remain on the machines. But parts with less than eight hours of labor were being outsourced or would soon go to the low value-added (LVA) jobshop that was being set up adjacent to the machining area. The fate of the remaining parts was still undetermined, but decision making was now aided by the much more accurate costing under ABC. This would eventually allow the division to determine the breakeven point; Dick Sinclair, the manufacturing superintendent, commented, "We don't yet know where the point is that says, 'Put it on the turning machine.' We've eliminated the clearly LVA parts and are working our way up."

The combination of moving LVA parts off the turning machines and moving toward fewer runs for the remaining parts was expected to increase the average run time, reduce scheduling complexity, and eventually reduce the demands for staff support.

Cell Arrangements While physical manufacturing infrastructure constrained dramatic rearrangement from rows of machines to cells, certain machines could be clustered together and dedicated to a particular high-run part. For example, twelve adjacent machines were now dedicated to running just two parts for General Motors.

Layout ABC was helping division managers decide how to arrange the machining departments. Sinclair noted, "We did a lot of things in the 1970s that made a lot of sense then, but now we must undo them." The high cost of secondary operations caused management to move these operations not only back into the division (they had been part of Drive Trains for years), but into a corner of the main floor in S Building where they were now being requalified. To make room for these operations, less-efficient turning machines had been scrapped; relative efficiencies had been revealed by Vintila's detailed machine study. To reduce handling distances, barstock staging had been made more efficient, and packaging and shipping were being relocated closer to final operations.

These layout changes had not yet been tried out during production. They had been made during the August 1986 vacation shutdown, but the factory had been closed until January 1987 by a corporatewide UAW strike.

One layout change implemented in April 1985, however, already had made a considerable impact. Gordon's process engineering group, formerly one-half mile from the shop floor, was now located right in the middle of the machining area. According to Andy Edberg, division head of process engineering, "The effect has been tremendous. The output of our process engineers has tripled, and communication between them and the operators has improved enormously."

Future of ABC

Useful as it was, ABC's impact was still limited. First, it was run on a personal computer and not integrated with the other division

data bases; and second, it was being applied only to turning machine operations.

Extending ABC to secondary operations was Sinclair's top ABC priority: "If we are to price the whole business, we need to extend the model to secondary operations." While the model costed machine operations for parts that would eventually be assembled into major parts such as drive trains, the old standard cost system was still being used for inventory valuation and for costing major parts. Stevenson noted:

> We don't want parallel systems; their development and maintenance is too costly. We would like to get rid of the standard system and have just one system—ABC.