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Activity-Based Costing: Introduction

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Using Integrated Cost Systems to Drive Profitability and Performance

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Activity-Based Costing: Introduction

We discussed, in Chapter 3, the failures of Stage II standard cost and flexible budgeting systems to provide relevant information about operational improvements and about the costs of organizational processes, products, and customers. Chapters 4 and 5 dealt with the first major component of Stage III cost systems, the systems to provide financial and nonfinancial measurements that will promote employee continuous improvement activities. In this chapter we introduce the innovation of activity-based costing (ABC) as the second major component of Stage III cost systems.

ABC systems require a new kind of thinking. Traditional (Stage II) cost systems are the answer to the question, "How can the organization allocate costs for financial reporting and for departmental cost control?" ABC systems address an entirely different set of questions:

1. What activities are being performed by the organizational resources?
2. How much does it cost to perform organizational activities and business processes?
3. Why does the organization need to perform activities and business processes?
4. How much of each activity is required for the organization's products, services, and customers?

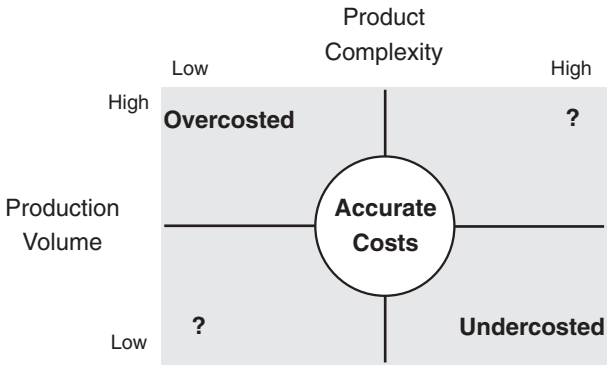
A properly constructed ABC model provides the answers to these questions. An ABC model is an economic map of the organization's expenses and profitability based on organizational activities. Perhaps referring to it as an activity-based economic map rather than as a cost system clarifies its purpose. Can one drive from one location to another without a map? Can one build a house without a set of architectural drawings? Absolutely. If a

manager is working in familiar territory (either a drive we've taken or a house we have built hundreds of times before), the manager can rely on experience and good judgment for a successful outcome. But when the territory is new, and conditions have changed in important ways from prior experience, that's when an information system like a good map or a good set of drawings becomes invaluable.

For companies operating in stable environments, with mature products that the company has extensive experience producing and with stable customer relationships, the company's traditional Stage II cost system, or perhaps no cost system at all, can guide operations. But if the company is producing many new products, introducing new processes, reaching new customers, and satisfying many more customer demands, it is easy for the company to get lost, economically, as it operates in a new environment. An activity-based cost system provides companies with an economic map of their operations by revealing the existing and (as we will see in subsequent chapters) forecasted cost of activities and business processes, which, in turn, leads to knowledge of the cost and profitability of individual products, services, customers, and operating units.

The economic map produced by Stage II cost systems averages resource costs between high- and low-volume products, and between simple and complex products (see *Exhibit 6-1*). Stage II systems flatten the quite different resource consumption pattern between these different types of products. The map produced by Stage II cost systems looks like the Great

Exhibit 6-1 Traditional Systems Distort Product, Customer, and Segment Costs



Plains in the U.S. midwest—the terrain looks the same wherever you look. Managers don't know where to devote their energy and attention. The map produced by a Stage III ABC system, as we will see in the next several chapters, looks like the southeastern part of California, and makes visible the Sierra Madre peaks of profitable products and the Death Valley craters of losses. Managers now have directions about where and how their scarcest resources—energy, time, and attention—should be committed to bring the losses to at least sea level (breakeven), and eventually to modest hills of profitability.

Why ABC Systems? The Pen Factories

The motivation for ABC systems is easy to articulate. We have often introduced the subject by asking people to think about two hypothetical and almost identical factories.[1] Simple Factory makes one million pens, all the same color: blue. Complex Factory also makes one million pens, but of many different colors, sizes, and varieties. This factory, in a typical year, produces about 2,000 different types (SKUs) of pens, ranging from specialty pens, with annual production volume as low as 50–100 per year, to higher-volume standard pens (blue and black), whose annual production volumes are each about 100,000 per year.

Although both factories make the same basic product, Complex Factory requires many more resources. Relative to the blue pen factory, Complex Factory would have a much larger production support staff to schedule machines and production runs; perform setups; inspect items after setup; move materials; ship orders, expedite orders; rework defective items, design new products; improve existing ones; negotiate with vendors; schedule materials receipts; order, receive, and inspect incoming materials and parts; and update and maintain the much larger computer-based information system. Complex would also operate with considerably higher levels of idle time, setup time, overtime, inventory, rework, and scrap. Since both factories have the same physical output, they would both have roughly the same cost of materials (ignoring the slightly higher acquisition costs in Complex Factory for smaller orders of specialty colors and other materials). For actual production, if you assume that all pens are of about the same complexity, both Simple and Complex factories would require the same number of direct labor hours and machine hours for actual production (not counting the higher idle time and setup times in Complex Factory). Complex would likely have about the same property taxes,

security costs, and heating bills as Simple. But Complex Factory would have much higher indirect and support costs (i.e., overhead) because of its more varied product mix and complex production task.

Consider now the operation of a Stage II standard cost system in these two plants. Simple Factory has little need for a cost system to calculate the cost of a blue pen. The financial manager, in any single period, can simply divide total expenses by total production volume to get the cost per blue pen produced. For Complex Factory, the costs of the indirect and support expenses would be traced to its various production cost centers, as described in Chapter 3. Once expenses were accumulated in each production center, they would be applied to products based on the cost driver for that cost center: direct labor, machine hours, units produced, or materials quantity processed. On a per-unit basis, high-volume standard blue and black pens require about the same quantity of each of these cost drivers as the very low-volume, specialty products. Therefore, Complex Factory's overhead costs would be applied to products proportional to their production volumes. Blue and black pens, each representing about 10% of the plant's output would have about 10% of the plant's overhead applied to them. A low-volume product, representing only .01 of 1% of the plant's output (100 pens per year) would have about .01 of 1% of the plant's overhead allocated to it. Therefore, the Stage II standard costing system would report essentially identical product costs for all products, standard and specialty, irrespective of their relative production volumes.

Clearly, however, considerably more of Complex Factory's indirect and support resources are required (on a per-unit basis) for the low-volume, specialty, newly designed products than for the mature, high-volume, standard blue and black pens. Stage II cost systems, even those with hundreds or thousands of production cost centers, will systematically and grossly underestimate the cost of resources required for specialty, low-volume products and will overestimate the resource cost of high-volume, standard products. The distortion in reported costs between standard and specialty products can only be avoided if the standard and specialty pens are manufactured on separate machines in different cost centers.

Abandoning the assignment of support resource costs entirely and moving to direct costing systems does not solve this problem. Under direct or marginal costing, blue and black pens, which have about the same materials and direct labor cost as the low-volume, specialty pens, will have the same variable costs. Also, direct costing systems fail to explain why the

two factories with the exact same physical units of production (e.g., one million pens) have dramatically different levels of so-called fixed costs.

Fundamentals of ABC Systems

Activity-based cost systems extend traditional Stage II cost systems by linking resource expenses to the variety and complexity of products produced, not just the physical volumes produced. To see the contrast, let's start by examining the structure of a traditional cost system (see *Exhibit 6-2*). Here, factory overhead costs are allocated to production cost centers. Many traditional cost systems fail in the allocation of overhead expenses to cost centers by using arbitrary bases, such as direct labor hours or headcount, to assign overhead costs to production cost centers. As described in Chapter 3, the best Stage II cost systems, such as the GPK and Caterpillar systems, can be quite thoughtful and accurate as they directly

Exhibit 6-2 Traditional Cost Systems Allocate Overhead Costs to Production Cost Centers and Then to Products

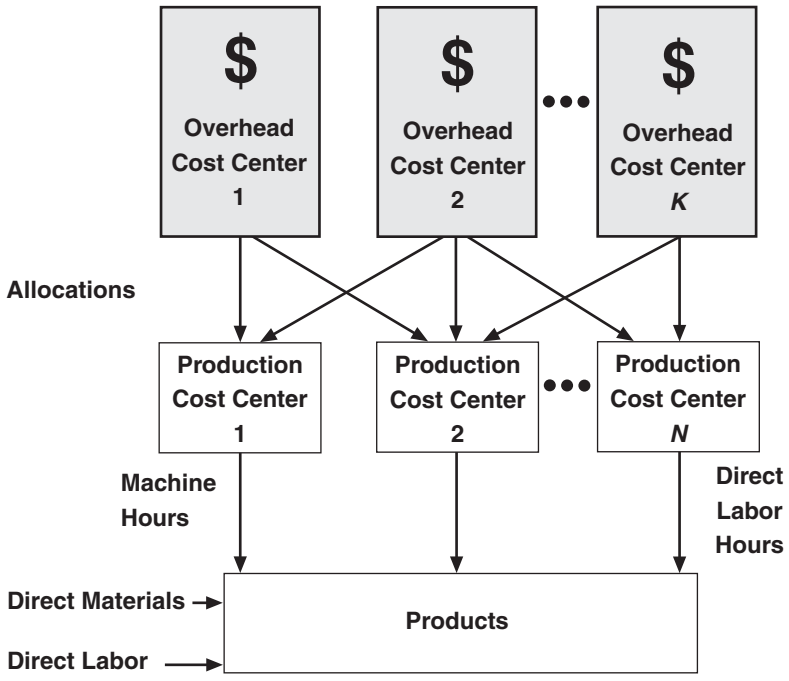
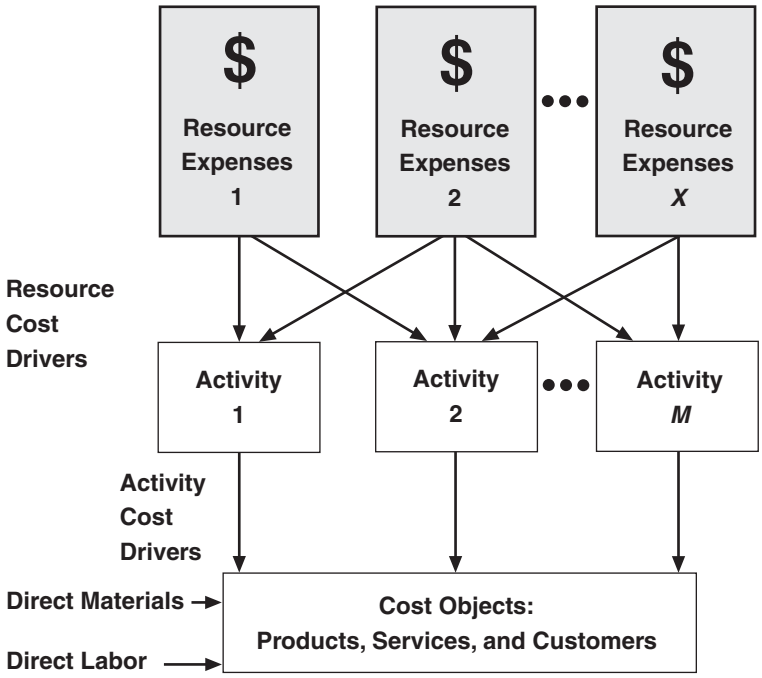


Exhibit 6-3 Activity-Based Cost Systems Trace Resource Expenses to Activities and Use Activity Cost Drivers for Tracing Activity Costs to Objects



attribute, based on actual usage, overhead expenses to production cost centers. Even these excellent systems fail, however, in the next stage, when the costs accumulated in production cost centers are assigned to the products processed through each center. As in the pen factory, Stage II cost systems use drivers, like direct labor dollars, direct labor hours, machine hours, units produced, or materials processed, to allocate production cost center costs to products.

Such Stage II systems provide a simple, inexpensive way to meet the financial reporting requirement to allocate factory overhead costs to production. In fact, were it not for the desire to use the same system to monitor and control costs at the individual cost center level, Stage II cost systems could be even simpler for financial reporting, using only a single cost center for the entire plant, and a single allocation base, such as direct labor. *Exhibit 6-3* shows the structure of an activity-based cost (ABC)

system for factory operations. At first glance the ABC system appears similar. But the underlying structure and concept are quite different. ABC systems are developed through a series of four sequential steps.

Step 1. Develop the Activity Dictionary

Organizations spend money on indirect and support resources so that important activities get performed (for example, scheduling, purchasing, customer administration, and improving products) or to obtain the capabilities being supplied by these resources (such as information technology and suitable production and customer support space). The focus of ABC has already shifted, from how to allocate costs to why the organization is spending money in the first place. In developing an ABC system, the organization first identifies the activities being performed by its indirect and support resources. Activities are described by verbs and associated objects: schedule production, move materials, purchase materials, inspect items, respond to customers, improve products, introduce new products, etc. The identification of activities culminates with construction of an activity dictionary that lists and defines every major activity performed in the production facility.[2]

Initially, when ABC systems were first introduced in the mid- to late 1980s, ABC project teams had to invent activity dictionaries virtually from scratch. Now, with nearly a decade of implementation experience, companies and consulting organizations have developed standard activity dictionaries that provide a template for selecting the appropriate activities to be used in any particular application. The chapter appendix shows a high-level structure for organizing activities within business processes developed by the International Benchmarking Clearing House. Some organizations, however, like to use their front-line employees, in a bottom-up process, to define the activity dictionary. Doing so engages the entire organization in the ABC-modeling exercise and helps build confidence that the model reflects the reality of the organizational setting. This is a longer, more expensive process that may yield compensating benefits in terms of commitment and ownership of the final model.

In some initial applications, engineers and accountants defined activities at a very microlevel, perhaps at an individual task level, leading to several hundred or more activities. This was both expensive and confusing. Now, ABC project teams use rules of thumb, such as ignoring activities that use less than 5% of an individual's time or a resource's capacity. Activity dictionaries can be relatively brief, say 10–30 activities, especially where

the prime focus of the ABC system is to estimate product and customer costs. In other applications, ABC systems continue to be built with hundreds of activities. Typically, such highly detailed systems have been constructed to serve as the foundation for process improvement and process redesign efforts, as we will discuss in Chapter 8. The number of activities, therefore, is a function of the purpose of the model, and the size and complexity of the organizational unit being studied.

With organizational activities identified, we can now move to step two.

Step 2. Determine How Much the Organization Is Spending on Each of Its Activities

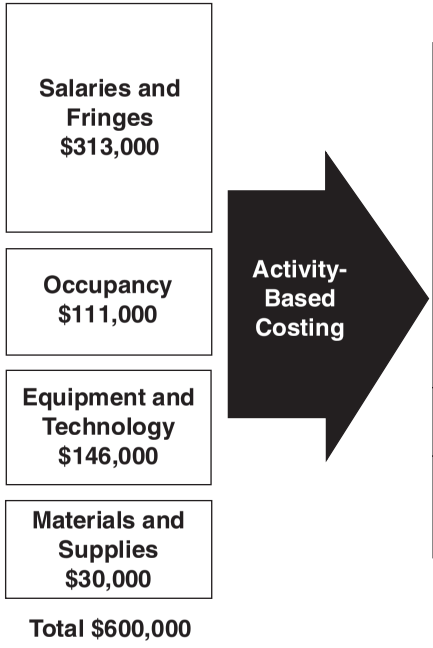
The ABC system now maps from resource expenses to activities, using resource cost drivers (see Exhibit 6-3). The resource cost drivers link spending and expenses, as captured in the organization's financial or general ledger system, to the activities performed.[3] As the internal training manual of an organization states:

> *The resources represent the cost base for the model. A resource comprises a distinct and homogeneous grouping of existing costs fulfilling a similar function or, in the case of people, having a similar work profile. The sum of all resources for a model equals the total cost for an organization, with a set time frame.*[4]

Classifying resource expenses by activities performed accomplishes a 90 degree shift in thinking about expenses (see *Exhibit 6-4*). Data from the organization's financial system categorizes expenses by spending code; for example, salaries, fringe benefits, overtime, utilities, indirect materials, travel, telecommunications, computing, maintenance, and depreciation. The resource cost drivers collect expenses from this system and drive them to the activities being performed by the organizational resources. Thus, after going through this step, organizations learn, usually for the first time, how much they are spending on activities like purchasing materials and introducing new products.

The actual mechanics of selecting resource cost drivers and estimating the quantity of each resource cost driver are reasonably well documented.[5] For our purposes, you can think about employee surveys in which individuals, other than the front-line employees who are doing the production work, are asked to fill in a form on which the activity dictionary appears and estimate the percentage of time they spend on any activity (in excess,

Exhibit 6-4 Activity-Based Costing Shifts Analysis from Expense Categories to Activities Performed

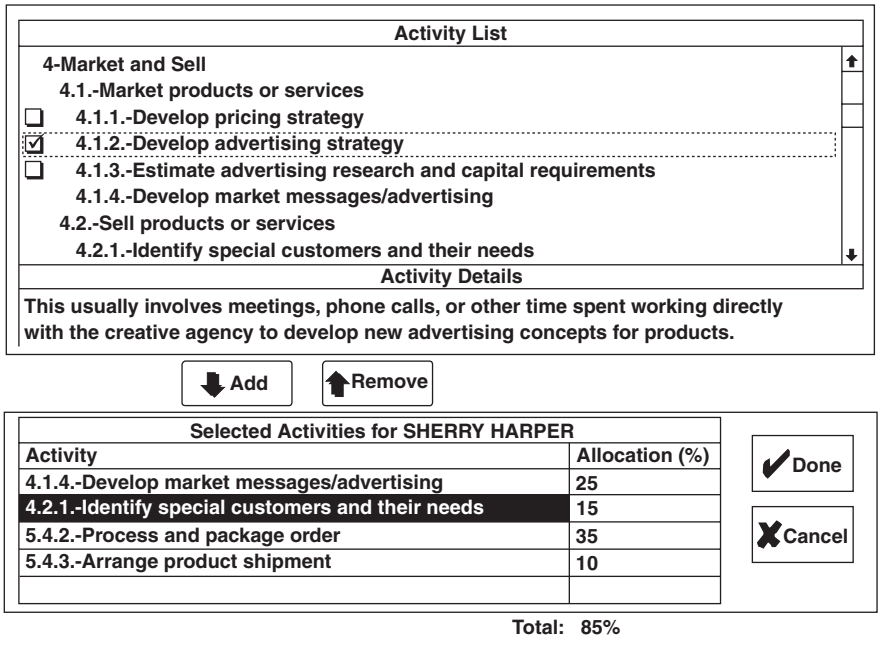


Activity	Salaries and Fringes	Occupancy	Equipment and Technology	Materials and Supplies	Total
Process Customer Orders	$ 31,000	$ 5,300	$ 12,600	$ 800	$ 49,700
Purchase Materials	34,000	6,900	8,800	1,500	51,200
Schedule Production Orders	22,000	1,200	18,400	300	41,900
Move Materials	13,000	2,100	22,300	3,600	41,000
Set Up Machines	42,000	700	4,800	200	47,700
Inspect Items	19,000	13,000	19,700	800	52,500
Maintain Product Information	36,000	2,800	14,500	400	53,700
Perform Engineering Changes	49,000	32,000	26,900	2,400	110,300
Expedite Orders	14,000	900	700	500	16,100
Introduce New Products	35,000	44,000	16,100	18,700	113,800
Resolve Quality Problems	18,000	2,100	1,200	800	22,100
Total	**$313,000**	**$111,000**	**$146,000**	**$30,000**	**$600,000**

say, of 5% of their time) on the list (see *Exhibit 6-5* for a sample screen of an interactive computer program to elicit activity information from employees).

For nonpersonnel resources, the ABC project team either relies on direct measurement (how much power, computer, or telecommunications time) or estimates the percentage of the resource used by each activity in the dictionary. In fact, this procedure does not really differ substantively from that done by the excellent standard cost/flexible budgeting systems described in Chapter 3. The main difference is that Stage II standard cost/flexible budgeting systems drive indirect expenses only to other responsibility centers, typically production cost centers. ABC systems, like Stage II systems, can drive expenses to production cost centers—where the activity is part of the actual product conversion process like *fabricate parts, mix chemicals,* or *assemble products*. But, in addition, the ABC system drives operating expenses to activities that are not directly involved in converting materials into intermediate and finished products like *set*

Exhibit 6-5 Activity Surveys Estimate the Quantity of Resource Cost Drivers



Source: KPMG Peat Marwick LLP. Reprinted by permission.

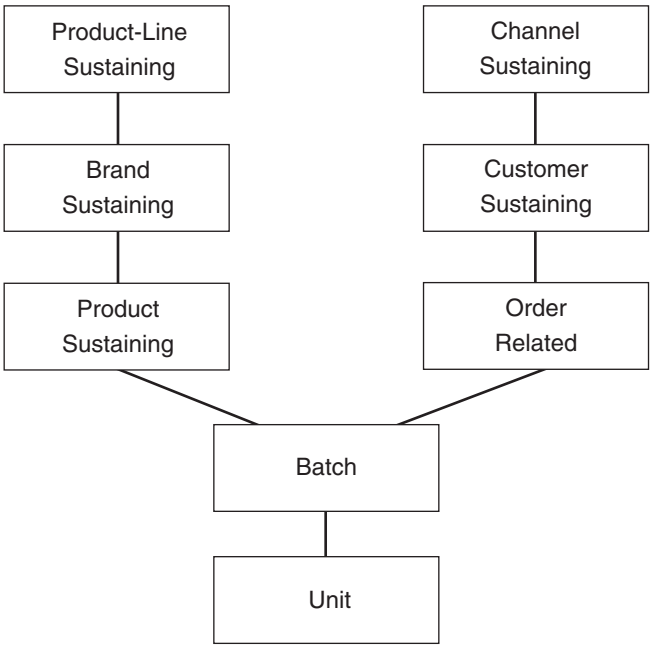
up machines, schedule production runs, and *perform engineering change notices*. Stage II systems, in contrast, drive the expenses of such activities to production cost centers where they are arbitrarily allocated to products proportional to production volumes.

One does not need extensive time-and-motion studies to link resource spending to activities performed. The goal is to be approximately right rather than precisely wrong, as are virtually all traditional product-costing systems. Many traditional standard cost systems calculate product costs out to six significant digits ($5.71462 per unit) but, because of arbitrary allocation procedures, the first digit is wrong.

Hierarchy of Activities

Once resource costs have been traced to activities, managers obtain powerful insights from identifying critical attributes of the activities. One of the most important attributes classifies manufacturing activities along a cost-hierarchy dimension: unit, batch, and product, customer, and facility-sustaining (see *Exhibit 6-6*).[6]

Exhibit 6-6 ABC Hierarchy of Activities



> Unit-level activities *are the activities that have to be performed for every unit of product or service produced. The quantity of unit-level activities performed is proportional to production and sales volumes. Examples include drilling holes in metal parts, grinding metal, and performing 100% inspection.*

Traditional cost systems, which use allocation bases such as labor hours, machine hours, units produced, or sales dollars to assign indirect costs to cost objects, rely exclusively on unit-level cost drivers. One of the principal differences between activity-based and traditional cost systems is the use of nonunit cost drivers (e.g., batch, product-sustaining) for assigning resource costs to products and customers.

> Batch-level activities *are the activities that have to be performed for each batch or setup of work performed. Batch activities include setting up a machine for a new production run, purchasing materials, and processing a customer order.*

The resources required for a batch-level activity are independent of the number of units in the batch. Activity-based cost systems measure and assign the cost of handling production orders, material movements, setups, customer orders, and purchasing to the products, customers, and services that triggered the activity.

> Product-sustaining activities *are performed to enable the production of individual products (or services) to occur. Extending this notion outside the factory leads to* customer-sustaining activities *that enable the company to sell to an individual customer but that are independent of the volume and mix of the products (and services) sold and delivered to the customer. These product- and customer-sustaining activities include maintaining and updating product specifications, special testing and tooling for individual products and services, and technical support provided for individual products and to service individual customers.*

Product- and customer-sustaining activities are easily traced to the individual products, services, and customers for whom the activities are performed. But the *quantity* of resources used in product- and customer-sustaining activities are, by definition, independent of the production and sales volumes, and quantity of production batches and customer orders. Traditional cost systems, relying only on unit-level drivers, cannot trace

product- and customer-sustaining resources accurately to individual products and customers.

Beyond unit, batch, product, and customer-sustaining activities, other resources supply capabilities that cannot be traced to individual products and customers. Some activities, such as product development and advertising, can be classified as *brand* or *product-line sustaining* since they support an entire *brand* or product line. Some activities, such as pricing and invoicing, may be *order-related,* specific to a particular order, but independent of the volume or content of the order. Others provide general production or sales capabilities (*facility-sustaining* expenses—a plant manager and administrative staff) and *channel-sustaining* expenses—trade shows and advertising, catalogs—that cannot be traced to individual products, services, or customers. The expenses of product line, facility, and channel resources can be assigned directly to the individual product lines, facilities, and channels but should not be allocated down to individual products, services, or customers within these categories.

The ABC cost hierarchy, applicable to manufacturing, marketing, and research and development expenses, enables all organizational expenses to be mapped to a particular hierarchical or organizational level where cause and effect can be established. That is, a customer-sustaining expense is not allocated to the products or services purchased by the customer since this expense is incurred independent of the volume and mix of products or services acquired by the customer. The customer-sustaining expense can be avoided or controlled only by operating at the customer level (dropping the customer, changing the level of support provided to the customer), not by changing the volume or mix of the individual products and services the customer acquires.

Returning to our pen factory example, the batch, product-sustaining, and customer-sustaining categories provide powerful insights into why facilities like the two pen factories, which have identical total physical outputs, could have drastically divergent cost structures. Both Simple Factory and Complex Factory have the same quantity of unit-level activities since they have the same physical output of 1 million pens per year. They also likely have the same level of facility-sustaining expenses (assuming that all nonmanufacturing costs occur outside the factories). But Complex Factory requires far more resources than Simple Factory to perform its additional batch and product-sustaining activities required to produce its thousands of products, ranging from low-volume, specialty products to high-volume blue and black pens.

Activities and Business Processes

Activities can also be grouped together into higher-level business processes as shown in the standard activity dictionary of the chapter appendix. Some designers want to organize their entire ABC system around business processes, ignoring the finer detail available from an activity perspective. The problem is that a business process, like procurement, might be too heterogeneous to accumulate costs that then must be driven to products, services, or customers by a single cost driver. For example, activities within the procurement function could include ordering materials, scheduling delivery of materials, receiving materials, inspecting materials, moving materials, storing materials, negotiating with and selecting vendors, and paying vendor invoices. Each activity may require a different cost driver. If all the activities were aggregated, only a single cost driver, say number of purchase orders, would have to be selected for driving all procurement process costs to materials. Such an aggregation would fail to identify differences in the activities required for ordering different types of materials, from different vendors, using different ordering relationships. Activities with unique cost drivers are the basic unit of analysis for ABC systems. They capture the diversity of use by individual products, services, and customers that create the demand for the activities.

Activities, the basic cost collection units for ABC systems, can still be aggregated so that managers can see the total cost of performing a business process. Each activity can be coded, enabling costs to be accumulated and reported by business processes. For example, activities such as ordering materials, scheduling delivery of materials, receiving materials, inspecting materials, moving materials, storing materials, negotiating with and selecting vendors, and paying vendor invoices would be aggregated into a *procurement* process. Understanding costs at the aggregate business process level facilitates internal and external benchmarking. Managers can compare the cost of performing the same business process (e.g., procurement, order entry) at different plants or across different organizational units to identify where to study particularly efficient practices or to improve particularly inefficient processes.

Activity Attributes

The activity cost hierarchy and business process coding are examples of *activity attributes*. Attributes are coding schemes associated with each activity that facilitate reporting of activity costs. Consider an activity dictionary with 125 entries. Activity attributes enable the activity cost

information to be reported at higher levels of aggregation than does tabulating or charting data for 125 individual activities. One report could show the activity expenses and percentages within each level of the activity cost hierarchy; e.g., what percentage of expenses are in unit-level, batch-level, and product-sustaining activities. Another report could show activity expenses and percentages by, say, 12 business processes.

A particularly powerful attribute would be the degree of short-term variability of the activity cost.[7] Such an attribute would enable short-term marginal costs to be incorporated and reported within an ABC framework. At the simplest level, this attribute could be coded as an F-V variable. Consider an activity for which virtually all the resource expenses would stay the same even if the quantity performed of this activity fluctuated up or down by 2% or 10% each period. The activity costs would be considered fixed with respect to short-term variation in demand, and would be labeled with an F. Another activity, however, such as *supply energy to machines,* would be considered variable with short-term fluctuations in use. This activity would be labeled with a V. If all activities are coded in this manner, managers would have a good overview about the percentage of short-term variable and fixed costs in their operations. Such information provides insight about the degree of operating leverage in the facility. And since activity costs are linked and remain visible at the individual product, service, and customer level, managers would be able to quickly and easily see what components of assigned costs will vary, in the short run, with changes in production and sales volume and which will likely remain relatively the same. This information can be useful for detailed production scheduling, pricing of incremental orders, and other such short-term decisions.

A more complex coding of cost variability would recognize the length of time for resource expenses to adjust to actual activity levels. On a scale of one to five, a "one" would represent resources, such as energy to operate machines, whose supply adjusts almost immediately to changes in demand; a "five" would represent a resource such as a unique, special-purpose machine, whose supply is already determined, and which cannot be sold or eliminated even if demand for the machine were to disappear entirely. Within these extremes, resources coded with a "two" would represent personnel who can be shifted to other responsibilities over a period of several weeks or months, a "three" represents such resources as engineers and managers, where the supply adjustment could require up to a year, and a "four" would represent plant and equipment, where the supply adjusts over a period of several years. Such a coding system would give

managers the ability to make decisions over various time horizons and see what portion of total expenses can be influenced over these time horizons by their decisions. Thus, ABC systems, with a simple attribute field, can easily accommodate, in fact expand upon, traditional Stage II cost systems' classification of short-term variable and short-term fixed costs.

Additional activity attributes could also be defined. For example, the location where an activity is performed or the person primarily responsible for the activity could be identified. That would permit sorting of activity expense data by place and by person.

Many firms rank activities according to their value or efficiency of performance. These coding schemes can vary from simple dichotomous ones such as value-added/non-value-added or necessary/unnecessary to more complex schemes using a 5- or 10-point classification scheme. We will illustrate such activity codings in Chapter 8, when we discuss operational activity-based management.

In summary, at the end of the second phase of building an ABC model, the organization knows expenses characterized by activities performed. Through appropriately selected attribute fields, it can view activity expenses from various perspectives, including cost hierarchy, business process, degree of variability, and degree of efficiency. At this stage, organizations already have new information that can be used for a range of activity and process improvement actions. But before turning to how ABC information can be used, let's continue with the construction of the first full ABC model. In the next two steps, activity costs are driven down to cost objects such as products, services, and customers.

Step 3. Identify the Organization's Products, Services, and Customers

Steps 1 and 2 for building an ABC model identify the activities being performed and the cost of performing those activities. Why is the organization performing activities in the first place? The answer, of course, is that the organization needs activities to design, build, and deliver products and services to its customers. Therefore, the ABC project team identifies all the organization's products, services, and customers. Initially, since we are analyzing the indirect and support costs of manufacturing facilities, we will focus here on driving costs to products, deferring the assignment of activity costs to customers and services to Chapters 10 and 12.

Step 3 is simple but important. Many practitioners of activity-based costing skip it and focus only on how to make activities and processes

more efficient. They have not asked themselves whether these activities or processes are worth doing. Is their organization getting paid adequately for performing these activities? Answering that question requires that activity costs be linked to the products, services, and customers who are the ultimate beneficiaries of the organization's activities. Addressing this issue leads naturally to the fourth and final step in building an ABC model.

Step 4. Select Activity Cost Drivers That Link Activity Costs to the Organization's Products, Services, and Customers

The linkage between activities and cost objects, such as products, services, and customers, is accomplished by using activity cost drivers. An activity cost driver is a quantitative measure of the output of an activity. For example:

ACTIVITY	ACTIVITY COST DRIVER
Run Machines	Machine Hours
Set Up Machines	Setups or Setup Hours
Schedule Production Jobs	Production Runs
Receive Materials	Material Receipts
Support Existing Products	Number of Products
Introduce New Products	Number of New Products Introduced
Maintain Machines	Maintenance Hours
Modify Product Characteristics	Engineering Change Notices

Selecting Activity Cost Drivers

The selection of an activity cost driver reflects a subjective trade-off between accuracy and the cost of measurement. Because of the large number of potential activity-to-output linkages, designers attempt to economize on the number of different activity cost drivers. For example, all activities triggered by the same event can use the same activity cost driver: number of production runs. For instance, the activities of *preparing production orders, scheduling production runs, performing part inspections,* and *moving materials* can all use *number of production runs* as the activity cost driver. ABC system designers can choose from three different types of activity cost drivers: transaction, duration, and intensity (or direct charging).

Transaction drivers, such as the numbers of setups, receipts, and products supported, count how often an activity is performed. Transaction

drivers can be used when all outputs make essentially the same demands on the activity. For example, scheduling a production run, processing a purchase order, or maintaining a unique part number may take the same time and effort independent of which product is being scheduled, which material is being purchased, or which part is being supported in the system.

Transaction drivers are the least expensive type of cost driver but can be the least accurate since they assume that the same quantity of resources is required every time an activity is performed; that is, the activity is homogeneous across products. For example, the use of a transaction driver like the number of setups assumes that all setups take the same time to perform. For many activities, the variation in use by individual cost objects is small enough that a transaction driver will do for assigning activity expenses to the cost object. If, however, the amount of resources required to perform the activity varies considerably, from product to product, more accurate and more expensive cost drivers are needed.

Duration drivers represent the amount of time required to perform an activity. Duration drivers should be used when significant variation exists in the amount of activity required for different outputs. For example, simple products may require only 10–15 minutes to set up, while complex, high-precision products may require six hours for setup. Using a transaction driver, like number of setups, will overcost the resources required to set up simple products and will undercost the resources required for complex products. To avoid this distortion, ABC designers use a duration driver, like setup hours, to assign the cost of setups to individual products.

Duration drivers include setup hours, inspection hours, and direct labor hours. For materials movement, distance moved can be considered a duration driver; distance is a proxy for the time taken to move materials from one point to another. In general, duration drivers are more accurate than transaction drivers, but they are more expensive to implement since the model requires an estimate of the duration each time an activity is performed.[8] With a transaction driver (number of setups), the designer only needs to know how many times a product was set up, information that should be readily available from the production-scheduling system. Knowing the setup time for each product is an additional, and more costly, piece of information. Some companies estimate duration by constructing an index based on the complexity of the output being handled. The index is a function of the complexity of the product or customer processed by the activity, assuming that complexity influences the time required to perform the activity. The choice between a duration and a

transaction driver is, as always, one of economics, balancing the benefits of increased accuracy against the costs of increased measurement.

For some activities, however, even duration drivers may not be sufficiently accurate. *Intensity drivers* directly charge for the resources used each time an activity is performed. Continuing with our setup example, a particularly complex product may require special setup and quality control people, as well as special gauging and test equipment each time the machine is set up. A duration driver, like setup cost per hour, assumes that all hours are equally costly, but does not reflect extra personnel, especially skilled personnel, and expensive equipment that may be required on some setups but not others. In these cases, activity costs may have to be charged directly to the output, based on work orders or other records that accumulate the activity expenses incurred for that output.

Intensity drivers are the most accurate activity cost drivers but are the most expensive to implement. They should be used only when the resources associated with performing an activity are both expensive and variable each time that activity is performed.

A choice among a transaction, duration, or direct-charging (intensity) cost driver can be made for almost any activity. For example, for preparing engineering change notices (ECNs) to upgrade and support existing products, we could use:

- Cost per engineering change notice (assumes every ECN consumes the same quantity and cost of resources),
- Cost per engineering change hour used for an individual product (allows for ECNs to use different amounts of time to perform but assumes every engineering hour costs the same), or
- Cost of engineering resources actually used (number of engineering hours, price per hour of engineers used, plus cost of equipment such as engineering workstations) on the job.

Similarly for a sales activity, like support existing customers, we could use either a transaction, duration, or intensity driver; for example,

- Cost per customer (assumes all customers cost the same),
- Cost per customer hour (assumes different customers use different amounts of sales resource time, but each hour of support time costs the same), or
- Actual cost per customer (actual or estimated time and specific resources committed to specific customers).

The activity cost driver should match the level of the cost hierarchy of its associated activity. For example, the cost of unit-level activities (such as machining surfaces) should be driven to products and customers using unit-level activity drivers (such as machine hours), and the cost of batch-level activities (set up machines) should be driven to products and customers using batch-level activity drivers (number of setups, setup hours). Neglect of such matching guarantees that product and customer costs will be distorted. For example, using unit-based cost drivers (machine hours) for non-unit-based activities (set up machines) leads to the distortions inherent in traditional cost systems, high-volume and complex products are overcosted and low-volume, simple products are undercosted. Driving product-sustaining costs using batch-level drivers will cause products that use more than the average level of batch activities to be overcosted and those with less than average use of batch activities to be undercosted.

Complexity Indexes

Often, ABC analysts, rather than actually record the time and resources required for an individual product or customer, may simulate an intensity driver with a weighted index approach. They ask individuals to estimate the relative difficulty of performing the task for one type of product/customer or another. A standard product/customer may get a weight of one, a medium complexity product/customer can get a weight of three to five, and a particularly complex (demanding) product/customer can get a weight of, say, ten. In this way, the variation in demands for an activity among products and customers can be captured without an overly complex measurement system. Again, it is important to make an appropriate trade-off between accuracy and the cost of measurement. The goal is to be approximately right; for many purposes, transaction drivers or estimates of relative difficulty may well do for estimating resource consumption by individual products, services, and customers.

The use of weighted index drivers shows how designers economize in selecting cost drivers. They can use a weighted transaction driver in place of a more expensive duration driver, or a weighted duration driver to emulate a more costly intensity driver. For example, identifying long and short setups enables simple and complex setups to be differentially costed. Alternatively, designers can reflect differences in complexity by defining separate activities. For example, instead of using a duration driver for the setup, they could split the setup activity into two distinct activities: setups for manual machines and setups for numeric control (NC) ma-

chines. They can then use a simple transaction driver—such as number of setups—for both activities. The driver rate for the more complex NC setups will, of course, be higher than the rate for the setups on the simpler manual machines.

Activity cost drivers are the central innovation of activity-based cost systems but they are also, as we have noted, the most costly aspects of ABC systems. Often project teams get carried away with the potential capabilities of an activity-based cost system to capture accurately the economics of their operations. The teams see diversity and complexity everywhere and design systems with upward of 500 activities. But in selecting and measuring the activity cost drivers for such a system, reality takes hold. Assuming that each different activity requires a different activity cost driver,[9] and that the organization has, say, 5,000 individual products and customers (not an atypically low number for many organizations), the analyst must be able to enter up to 2,500,000 pieces of information (500 × 5,000). This is why most ABC systems settle down, for product- and customer-costing purposes, to no more than 30–50 activity cost drivers, most of which can be accessed and traced to individual products and customers relatively simply in the existing information system.[10]

Activity-Based Costing: Worth the Price?

Originally, when many people heard the term "activity-based costing," they thought that accountants were just rearranging the deck chairs on the *Titanic* rather than abandoning a fundamentally flawed approach. Apparently, the failings of traditional cost systems were so pervasive that anything that alleged to perform product costing evoked an image of arbitrary allocations, unrelated to actual operations and experience. Asking many operating managers to free-associate about "costing" generates responses like irrelevant, useless, distorted, arbitrary, and "something done by accountants for accountants." Thus, activity-based costing, which is clearly a more complicated and expensive costing approach, can appear to be doing something not very useful in a more complex and expensive way. Obviously, we believe this view of ABC is very wrong. If we had to reintroduce ABC, perhaps we would not include the word "costing" in its title.[11]

Aside from semantic opportunities lost, is ABC merely a more complex and expensive way to allocate costs? No. An activity-based cost system can use its cost assignments to track down underlying economic events. For example, setup costs are assigned based on setups performed for

individual products. Product support costs can be traced back to work performed to maintain products. And customer administration costs can be traced back to handling customer orders, responding to customer requests, and marketing existing and new products to particular customers. ABC systems do use many *estimates*. For example, a system may use a transaction driver to approximate the resources used each time an activity is performed rather than a detailed cost collection (direct charging or intensity driver) for each event occurrence. Or the system may estimate the cost of a machine hour by averaging acquisition costs, maintenance costs, and operating costs of the machine over some period of time. But these estimates are made, not because actual costs are impossible to trace to particular events, but because the cost of doing so seems too great vis-à-vis its value or benefits.

In principle, if more accurate cost attribution is desired, the ABC designer can install a more precise (and more expensive) measurement system and the task would be accomplished. So one should not confuse the extensive use of estimates in an ABC cost model, which is a design judgment made on a cost/benefit basis, from arbitrary allocations, which are not included in a properly designed ABC system. When arbitrary allocations are used, no cause-and-effect relationship can be established between the cost object to which the cost has been assigned and the resources whose cost has been assigned. In an ABC system, every cost assignment to an activity, or a product, service, or customer, should be transparent and traceable, via cause-and-effect relationships, to the demand for resources by the cost object (whether an activity, product, service, or customer).

Where to Apply Activity-Based Cost Systems

When will activity-based cost systems have the greatest impact? Or, asking this question another way, where should an organization look initially to demonstrate the potential benefits from installing an activity-based cost system? There are two simple rules that guide the search for high-potential ABC applications:

1. The Willie Sutton rule.[12] Look for areas with large expenses in indirect and support resources, especially when these expenses have been growing. Operations where almost all expenses are direct labor and direct materials, which can already be directly traced to individual products by traditional costing systems, may not need ABC systems. In effect,

if organizational activities are all at the unit level (virtually no batch or product-sustaining activities), ABC systems and traditional cost systems will likely give very similar economic signals.

2. The high-diversity rule. Look for a situation where there is a large variety in products, customers, or processes. For example, consider a facility that produces mature and newly introduced products, standard and custom products, high-volume and low-volume products. Or consider a marketing and sales organization that services customers who order high-volume, standard products with few special demands as well as customers who order in small volumes, special volumes, and require large quantities of presales and postsales technical support.

Not all organizations fall within the Willie Sutton rule. Take the example of an early Apple Computer factory that had been designed for automatic, high-efficiency assembly operations. The factory did no component or parts fabrication, no subassembly operations, only final assembly. As a result, more than 90% of the factory expenses were for purchased parts, equipment, and a small amount of direct labor. In this case, direct charging for labor, materials, and machine time can be done well by a Stage II traditional cost system. The indirect and support expenses were extremely small, since the factory had been designed for focused, unit-level operations. The Willie Sutton rule would have led Apple ABC designers to focus on product development, marketing, distribution, and selling expenses, not on factory overhead.

The high-diversity rule is violated by Simple Factory, making only a single product, blue pens.[13] When a factory produces only a single product, all its manufacturing expenses are easily attributable to that product. Simple Factory does not need an ABC system, or any system, to calculate its product costs. The original product mix at Siemens Electric Motor Works also violated the high-diversity rule.[14] The factory formerly produced a limited number of standard electric motors in high volumes. As the product mix shifted to include custom motors, the plant became highly diversified and adopted activity-based costing to implement its new strategy of supplying customers with specialized motors in low volumes as well as standard motors in high volumes.

Even in highly focused factories, however, where product costing is not a major concern, some organizations have still benefited from building ABC models to highlight their underlying process costs. For example, an early ABC implementation occurred in a defense factory that made only a single product: a complex weapon system consisting of tens of thousands

of parts. The plant's management team wanted an ABC model so that it could understand better the costs of all the activities and processes used to produce the weapon system. Thus, the diversity of processes was sufficient to create a demand for a more accurate attribution of costs, in this case to activities and processes, that an ABC model could provide.

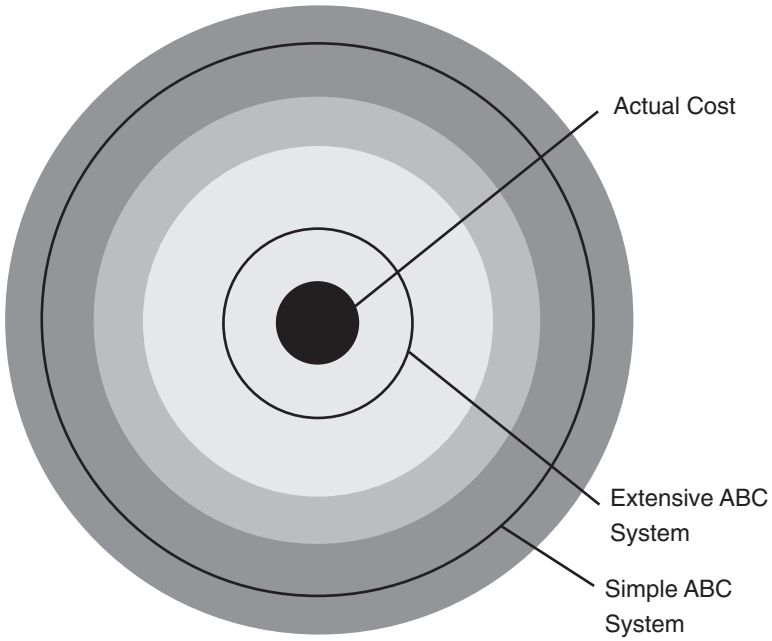
As another example, the initial ABC implementations of the Vitamins and Fine Chemical Division of F. Hoffmann-La Roche focused on installing one-off stand-alone models at individual manufacturing sites. The high indirect and support costs (the Willie Sutton rule) were driven down only to the activity level, not to the product level. This approach accomplished two important goals. First, it signaled that ABC was meant as a management tool, not a new accounting or costing methodology for products. Second, the analysis at the activity and business process level revealed immediate insights for reengineering and operational improvement activities (the subject of Chapter 8). The actions taken, based on these initial insights, led to quick and valuable benefits (cost savings of between 20% and 30% at each site), which were highly visible to management at all levels of the organization. Only in a second implementation phase, when the reengineering and operational improvement activities were completed and the organization was already familiar with ABC principles, were activity costs linked to products.

ABC: The Accuracy/Cost Trade-off

The goal of a properly constructed ABC system is not the most accurate cost system. Consider a target (see *Exhibit 6-7*), where the bull's-eye represents the actual cost of resources used each time a product is made, a service delivered, and a customer served.[15] To hit the bull's-eye each time requires an enormously expensive ABC system. But a relatively simple ABC system—perhaps including 30–50 activities and using good estimates and many transaction drivers, with few intensity drivers or direct charging—should enable an organization to hit consistently the outer and middle rings of the target; that is, activity and process costs will be accurate to within 5% or 10%. Stage II cost systems, in contrast, virtually never even hit the target, or even the wall on which the target is mounted, because of their highly distorted costs. The goal should be to have the best cost system, one that balances the cost of errors made from inaccurate estimates with the cost of measurement (see *Exhibit 6-8*).

Stage II cost systems may be inexpensive to operate but they create large distortions in the cost of activities, processes, products, services,

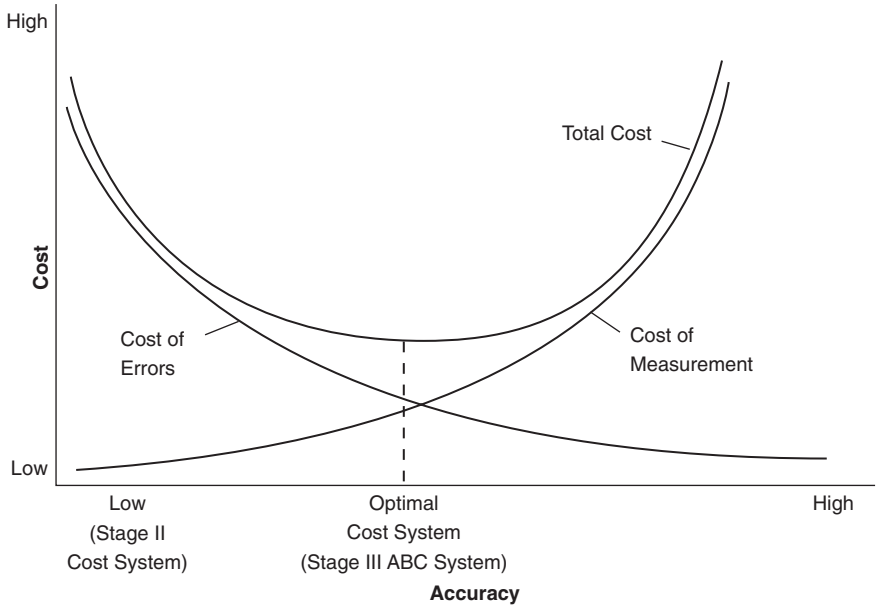
Exhibit 6-7 Cost Accuracy Target



and customers. Consequently, managers may make serious mistakes in decisions taken based on this information; that is, there is a high cost of errors. But attempting to build an ABC system with 1,000 or more activities and directly charging actual resource costs to each activity performed for each product, service, and customer would lead to an enormously expensive system. The cost of operating such a system would greatly exceed the benefits in terms of improved decisions made with this slightly more accurate information.

Exhibit 6-8 indicates why activity-based cost systems only emerged in the mid-1980s. For many decades prior to the 1980s, the errors made by traditional systems were small. Companies had relatively narrow product lines so the distortions from producing high- and low-volume products and standard and customized products in the same facility did not occur. Also, many processes were labor intense and the costs of direct labor were well measured and assigned with traditional costing systems. As organizations automated their processes, greatly reducing or even eliminating direct labor, and introduced more variety into their product lines, they required much higher levels of batch and product-sustaining activi-

Exhibit 6-8 Activity-Based Costing: Designing the Optimal ABC System



ties. Thus, as the cost of batch and product-sustaining activities increased, relative to the cost of unit-level activities, errors from traditional costing systems increased. Furthermore, as competition became more vigorous and more global, the costs of poor decisions—based on distorted information—became much higher. All these factors combined to shift the cost of the error curve upward.

Simultaneously, the continuous and rapid evolution in information technology greatly reduced the cost of measurement. The advent of automatic, remote data entry, new computerized systems for production scheduling, customer order processing, inventory management, engineering design, and many other organizational activities greatly increased the supply of data on current operations. And advances in microcomputers, and distributed computing like client-server systems, made the cost of collecting, processing, and reporting information plummet. The combination of a rapidly rising *cost-of-errors* curve with a rapidly falling *cost-of-measurement* curve led to the optimal cost system's becoming a more accurate, activity-based, cost system.

Using Activity-Based Cost Systems for Financial Reporting

Activity-based cost systems assign manufacturing expenses to products in a more comprehensive and transparent manner than traditional cost systems. So why not scrap Stage II cost systems entirely and use the ABC system to also value inventory in periodic financial statements? In principle, of course, an activity-based cost system can easily serve the financial reporting purpose. There are problems with using ABC systems too soon for this purpose, however, since financial statements must withstand the scrutiny of auditors and tax authorities. This scrutiny typically imposes more severe demands on the cost system for consistency, objectivity, and uniformity than those required for purely managerial purposes. For companies on LIFO, such a switch could trigger a loss of LIFO reserves, and lead to an immediate tax liability.

As noted, Stage III ABC systems should provide managers with a reasonably accurate economic map of the costs of their activities and business processes, and the cost and profitability of the organization's products, services, and customers. To construct such a map, ABC systems depend on much subjective judgment and many estimates. These skills are not normally required of financial accountants, particularly those on less than familiar terms with modern production, marketing, and management processes. Also, ABC systems must be built location by location. They are not embedded in a software program that can be rolled out easily to all manufacturing facilities. Each site must systematically verify the completeness of its activity dictionary, the appropriateness of activity cost drivers, the availability of information about these drivers, and the mapping from resource expenses to activities, and then to individual products. And, for sure, the first ABC model, while likely to be far more accurate than the existing traditional costing model, is still only a first approximation of what the model will look like after several years of feedback, learning, and adaptation.

Organizations typically iterate back and forth between model complexity and measurement cost, as described above, until they feel they are about at the optimal point, balancing the cost of measurement with the benefits from a more detailed and accurate system. As organizations experiment with and update their ABC models, and extend their applicability from initial pilot sites to company-wide implementation, they often prefer to use their existing (Stage II) cost system for external reporting purposes. Otherwise, they might find that a small but growing percentage of facilities

are using ABC information for external reporting while the remainder continue to use the traditional standard cost system. Also, as a factory switches over to using its ABC system for financial reporting, the managers of that system may feel less free to continue updating the structure of the system to respond to new information or changes in the production process. Such innovation could risk a consistency qualification from auditors if the changes are deemed major enough to pass a materiality threshold.

In addition, financial reporting requirements may differ from the principles companies may wish to follow with their ABC product- and customer-costing system. Some expenses that managers want to apply to products may not be permissible to allocate to products for inventory valuation. Conversely, financial-reporting regulations may require the allocation of some expenses (such as facility-sustaining ones) to products that managers may prefer not to assign to those products in their ABC system.

Rather than complicate even more what is already a challenging implementation process, it seems only prudent not to burden it with the constraints imposed by external regulatory authorities. That is why we recommend a period (Stage III) of experimentation, learning, and innovation for newly installed ABC systems, while retaining the existing (or simplified) Stage II cost system for external reporting purposes. In Chapter 13, we describe enhancements to Stage III ABC systems that provide the foundation for Stage IV, where these systems become integrated into the financial reporting and budgeting processes of organizations.

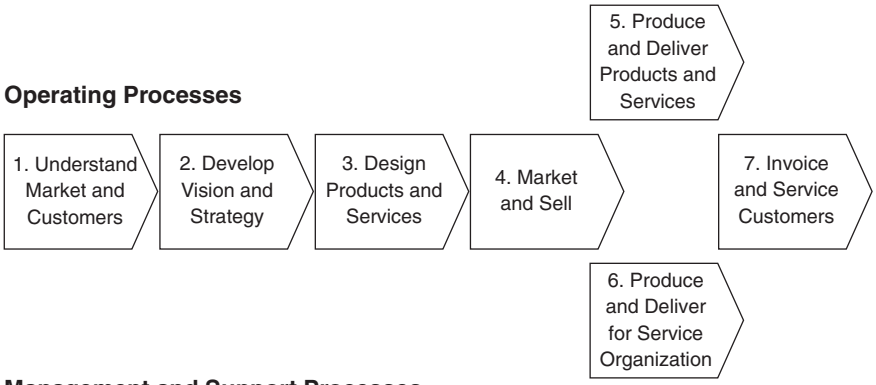
Summary

Stage II cost systems, using only unit-level cost drivers such as direct labor hours, direct labor dollars, machine hours, and units produced, cannot capture the economics of complex, multiproduct production processes. In an attempt to capture some simple aspects of production economics, these systems may distinguish between short-term variable expenses—the expenses expected to change as one more or one less unit is produced—and short-term fixed expenses. Given improvements in production processes and guaranteed payments to employees, a diminishing share of total manufacturing expenses are classified as variable, leaving a large and growing percentage of costs classified as fixed and their causality unanalyzed by the Stage II cost system. Further, because Stage II cost systems must also value inventory for financial reporting purposes, many organizational expenses—including marketing, selling, distribution, and general over-

head—are not traced to any cost objects, whether products, services, customers, or organizational units.

Activity-based cost systems provide more accurate cost information about business activities and processes, and of the products, services, and customers served by these processes. ABC systems focus on organizational activities as the key element for analyzing cost behavior by linking organizational spending on resources to the activities and business processes performed by these resources. Activity cost drivers, collected from diverse corporate information systems, then drive activity costs to the products, services, and customers that create the demand for (or are benefiting from) the organizational activities. These procedures produce good estimates of the unit cost and the amount of the activities and resources deployed for individual products, services, and customers. How to use and interpret this more accurate information is the subject of the next several chapters.

Appendix: ABC Activity and Process Dictionary



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Operating Processes

1. Understand Market and Customers
    - 1.1 Determine customer needs and wants
    - 1.2 Measure customer satisfaction
    - 1.3 Monitor changes in market or customer expectations
2. Develop Vision and Strategy
    - 2.1 Monitor the external environment
    - 2.2 Define the business concept and organizational strategy
    - 2.3 Design the organizational structure and relationships between organizational units
    - 2.4 Develop and set organizational goals
3. Design Products and Services
    - 3.1 Develop new product/service concept and plans
    - 3.2 Design, build, and evaluate prototype products or services
    - 3.3 Refine existing products/services
    - 3.4 Test effectiveness of new or revised products or services
    - 3.5 Prepare for production
    - 3.6 Manage the product/service development process
4. Market and Sell
    - 4.1 Market products or services to relevant customer segments
    - 4.2 Process customer orders
5. Produce and Deliver Products and Services
    - 5.1 Plan for and acquire necessary resources
    - 5.2 Convert resources or inputs into products
    - 5.3 Deliver products
    - 5.4 Manage production and delivery process
6. Produce and Deliver for Service Organization
    - 6.1 Plan for and acquire necessary resources
    - 6.2 Develop human resource skills
    - 6.3 Deliver service to customer
    - 6.4 Ensure quality of service
7. Invoice and Service Customers
    - 7.1 Bill the customer
    - 7.2 Provide after-sales service
    - 7.3 Respond to customer inquiries

Management and Support Processes

8. Develop and Manage Human Resources
    - 8.1 Create and manage human resource strategy
    - 8.2 Cascade strategy to work level
    - 8.3 Manage deployment of personnel
    - 8.4 Develop and train employees
    - 8.5 Manage employee performance, reward, and recognition
    - 8.6 Ensure employee well-being and satisfaction
    - 8.7 Ensure employee involvement

- 8.8 Manage labor/management relationships
- 8.9 Develop Human Resource Information Systems (HRIS)

9. Manage Information Resources
   - 9.1 Plan for information resources management
   - 9.2 Develop and deploy enterprise support systems
   - 9.3 Implement systems security and controls
   - 9.4 Manage information storage and retrieval
   - 9.5 Manage facilities and network operations
   - 9.6 Manage information services
   - 9.7 Facilitate information sharing and communication
   - 9.8 Evaluate and audit information quality
10. Manage Financial and Physical Resources
   - 10.1 Manage financial resources
   - 10.2 Process finance and accounting transactions
   - 10.3 Report information
   - 10.4 Conduct internal audits
   - 10.5 Manage the tax function
   - 10.6 Manage physical resources
11. Execute Environmental Management Program
   - 11.1 Formulate environmental management strategy
   - 11.2 Ensure compliance with regulations
   - 11.3 Train and educate employees
   - 11.4 Implement pollution prevention program
   - 11.5 Manage remediation efforts
   - 11.6 Implement emergency response program
   - 11.7 Manage government, agency and public relations
   - 11.8 Manage acquisition/divestiture environmental issues
   - 11.9 Develop and manage environmental information system
   - 11.10 Monitor environmental management program
12. Manage External Relationships
   - 12.1 Communicate with shareholders
   - 12.2 Manage government relationships
   - 12.3 Build lender relationships
   - 12.4 Develop public relations program
   - 12.5 Interface with board of directors
   - 12.6 Develop community relations
   - 12.7 Manage legal and ethical issues
13. Manage Improvement and Change
   - 13.1 Measure organizational performance
   - 13.2 Conduct quality assessments
   - 13.3 Benchmark performance
   - 13.4 Improve processes and systems
   - 13.5 Implement TQM

Source: KPMG Peat Marwick LLP. Reprinted by permission.

Notes

Chapter 6

1. Example taken from R. Cooper and R. S. Kaplan, "Measure Costs Right: Make the Right Decisions," *Harvard Business Review* (September–October 1988), 97–98.
2. Later in the chapter, we extend the ABC analysis outside of the factory to include selling, distribution, marketing, and general expenses.
3. We are describing the development of an organization's initial (Stage III) ABC system, in which expense information is historical, based on actual operating results in the most recent period. When companies move from Stage III to Stage IV, they will use activity-based systems with budgeted and forecasted information. We will discuss this extension in Chapter 14.
4. Excerpt from the "Roche Vitamins ABM Manual."
5. See, for example, J. A. Brimson, *Activity Accounting* (New York: John Wiley & Sons, 1991); G. Cokins, A. Stratton, and J. Helbing, *An ABC Manager's Primer* (Chicago: Irwin Professional Publishing, 1993); T. Pryor and J. Sahm, *Using Activity-Based Management for Continuous Improvement* (Arlington, Tex.: ICMS, Inc., 1995); D. T. Hicks, *Activity-Based Costing for Small and Mid-Sized Businesses: An Implementation Guide* (New York: John Wiley & Sons, 1992); and G. Cokins *Activity-Based Cost Management Making It Work: A Manager's Guide to Implementing and Sustaining an Effective ABC System* (Chicago: Irwin Professional Publishing, 1996).
6. R. Cooper, "Cost Classifications in Unit-Based and Activity-Based Manufacturing Cost Systems," *Journal of Cost Management* (Fall 1990), 4–14.
7. Cost variability actually occurs at the resource, not the activity, level. However, for ease of analysis, the coding of activities as being predominantly fixed or variable is useful because it allows the user to predict cost behavior

from the activity-based costing model. In Chapter 14 we discuss the development of activity-based models for analyzing cost behavior at the resource level. These models generate more accurate predictions of cost behavior and can be used for budgeting and what-if analyses.

8. A transaction driver can be more accurate than a duration driver when the work involved is unrelated to the duration of the activity cost driver. For example, many of the activities associated with a setup or production run—such as scheduling, preparing the tooling, releasing the materials from the stockroom, and inspecting the first few items produced after the setup—are performed for each setup, independent of how long the setup actually takes. Therefore, the costs of these activities are more accurately assigned to the setup via a transaction driver (number of setups or number of production runs) rather than a duration driver (length [hours] of setup).
9. For product- and customer-costing purposes, this assumption is correct since any two activities that share a common cost driver (such as number of setups on a particular machine, or number of customer requests) can be combined into a single activity without any loss of accuracy. For understanding activity and process costs, however, ABC designers may keep the activities separate, even when they share a common cost driver, to highlight all the individual activities triggered by an incidence of an activity cost driver (a setup or a customer request).
10. One of the main attractions of integrated, enterprise-wide systems is that many more potential activity cost drivers become automatically available for ABC systems.
11. The term "activity-based costing" was first used in a John Deere pilot study of a new costing approach (see R. S. Kaplan and A. March, "John Deere Component Works (A)," Harvard Business School Case #9-187-107). The term first appeared in R. Cooper, "Cost Management Concepts and Principles: The Rise of Activity-Based Costing—Part One: What Is an Activity-Based Cost System?" *Journal of Cost Management* (Summer 1988), 45–54; and Cooper and Kaplan, "Measure Costs Right: Make the Right Decisions."
12. Willie Sutton was a successful U.S. bank robber during the 1950s; see W. Sutton, *Where the Money Was: The Memoirs of a Bank Robber* (New York: Viking Press, 1976). Willie, who was eventually captured at his home not far from a local police station, was asked during his initial interrogation, "Why do you rob banks?" Willie replied, with the wisdom that had made him successful for many years, "That's where the money is!" When developing ABC systems, we should follow Willie's sage advice (but not his particular application of the insight) to focus on high-cost areas where improvements in visibility and action could produce major benefits to the organization. Applying an ABC analysis to resource expenses that are below 1% of total spending will not lead to high payoffs for the organization.

13. After giving a talk on ABC to a group of controllers and financial managers at Texas Instruments in 1987, one of us was given a factory tour. The hosts pointed with some pride to their "blue pen" factory; a facility that, at the time, did nothing but fabricate 256K DRAMS (memory chips). Thus product costing, even in highly complex production environments like a semiconductor fabrication facility, can still be simple if the product line is narrow.
14. R. Cooper and K. H. Wruck, "Siemens Electric Motor Works (A)," Harvard Business School Case #9-191-006.
15. R. Cooper, "The Rise of Activity-Based Costing—Part Three: How Many Cost Drivers Do You Need and How Do You Select Them?" *Journal of Cost Management* (Winter 1989), 34–46.