11 ACTIVITY-BASED COSTING

LEARNING OBJECTIVES After studying this chapter, you should be able to:

- explain why a cost accumulation system is required for generating relevant cost information for decision-making;
- describe the differences between activity-based and traditional costing systems;
- explain why traditional costing systems can provide misleading information for decision-making;
- identify and explain each of the four stages involved in designing ABC systems;
- describe the ABC cost hierarchy;
- distinguish between traditional ABC and time-driven ABC;
- describe the ABC profitability analysis hierarchy;
- describe the ABC resource consumption model.

The aim of the two previous chapters was to provide you with an understanding of the principles that should be used to identify relevant costs and revenues for various types of decision. It was assumed that relevant costs could easily be measured but, in reality, it was pointed out that indirect relevant costs can be difficult to identify and measure. The measurement of indirect relevant costs for decision-making using activity-based costing (ABC) techniques will be examined in this chapter. The aim of this chapter is to provide you with a conceptual understanding of ABC. Some of the issues explored are complex and therefore much of the content of this chapter is appropriate for a second year management accounting course. If you are pursuing a first year course the content relating to ABC that was presented in Chapter 3 should meet your requirements. In addition, you may wish to read this chapter and omit those sections that are labelled advanced reading. Because this chapter extends the material covered in Chapter 3, it is recommended that you refresh your memory by reading pages 51–59 prior to reading this chapter.

Our focus will be on an organization's *existing* products or services. There is also a need to manage *future* activities to ensure that only profitable products and services are launched. Here the emphasis is on providing strategic cost information using techniques such as target costing, life cycle costing and value engineering. These issues will be explored in Chapter 22 and the mechanisms for appraising investments in new products, services or locations will be described in Chapters 13 and 14.

Unless otherwise stated, we shall assume that products are the cost objects but the techniques used, and the principles established, can also be applied to other cost objects such as customers, services and locations. We begin with an examination of the role that a cost accumulation system plays in generating relevant cost information for decision-making.

THE NEED FOR A COST ACCUMULATION SYSTEM IN GENERATING RELEVANT COST INFORMATION FOR DECISION-MAKING

There are three main reasons why a cost accumulation system is required to generate relevant cost information for decision-making. They are:

1. many indirect costs are relevant for decision-making;
2. an attention-directing information system is required that periodically identifies those potentially unprofitable products that require more detailed special studies;
3. product decisions are not independent.

There is a danger that only those incremental costs that are uniquely attributable to individual products will be classified as relevant, and indirect costs will be classified as irrelevant for decision-making. Direct costs are transparent and how they will be affected by decisions is clearly observable. In contrast, how indirect costs will be affected by decisions is not clearly observable.

The costs of many joint resources are indirect but fluctuate in the long term according to the demand for them. The cost of support functions fall within this category. They include activities such as materials procurement, materials handling, production scheduling, warehousing, expediting and customer order processing. Product introduction, discontinuation, redesign and mix decisions determine the demand for support function resources. For example, if a decision results in a 10 per cent reduction in the demand for the resources of a support activity then we would expect, in the long term, for some of the costs of that support activity to decline by 10 per cent. Therefore, to estimate the impact that decisions will have on the support activities (and their future costs) a cost accumulation system is required that assigns those indirect costs, using cause-and-effect allocations, to products.

The second reason relates to the need for a periodic attention-directing reporting system. Periodic product profitability analysis meets this requirement. A cost accumulation system is therefore required to assign costs to products for periodic profitability analysis to identify those potentially unprofitable products/services that require more detailed special studies to ascertain if they are likely to be profitable in the future.

The third reason for using a cost accumulation system is that many product-related decisions are not independent. Consider again those joint resources shared by most products that fluctuate in the longer term according to the demand for them. If we focus only on individual products and assume that they are independent, decisions will be taken in isolation of decisions made on other products. For joint resources, the incremental/avoidable costs relating to a decision to add or drop a *single* product may be zero. Assuming that 20 products are viewed in this manner then the sum of the incremental costs will be zero. However, if the 20 products are viewed as a *whole* there may be a significant change in resource usage and incremental costs for those joint resources that fluctuate according to the demand for them.

Cooper (1990b) also argues that decisions should not be viewed independently. He states:

> The decision to drop one product will typically not change 'fixed' overhead spending. In contrast, dropping 50 products might allow considerable changes to be made. Stated somewhat tritely, the sum of the parts (the decision to drop individual products) is not equal to the sum of the whole (the realizable savings from having dropped 50 products). To help them make effective decisions, managers require cost systems that provide insights into the whole, not just isolated individual parts (p. 58).

TYPES OF COST SYSTEM

Costing systems can vary in terms of which costs are assigned to cost objects and their level of sophistication. Typically, cost systems are classified as follows:

1. direct costing systems;
2. traditional absorption costing systems;
3. activity-based costing systems.

Direct costing systems only assign direct costs to cost objects. Because they do not assign indirect costs to cost objects they report contributions to indirect costs. Periodic profitability analysis would thus be used to highlight negative or low contribution products. An estimate of those indirect costs that are relevant to the decision should be incorporated within the analysis at the special study stage. The disadvantage of direct costing systems is that systems are not in place to measure and assign indirect costs to cost objects. Direct costing systems can only be recommended where indirect costs are a low proportion of an organization's total costs.

Both traditional and ABC systems assign indirect costs to cost objects. The major features of these systems were described in Chapter 3 and the assignment of costs to products was illustrated for both systems. In the next section, the major features that were described in Chapter 3 are briefly summarized but the assignment of costs to products will not be repeated. If you wish to renew your understanding of the detailed cost assignment process you should refer back to Chapter 3 for an illustration of the application of the two-stage allocation process for both traditional and ABC systems.

A COMPARISON OF TRADITIONAL AND ABC SYSTEMS

Figure 3.3 was used in Chapter 3 to illustrate the major differences between traditional costing and ABC systems. This diagram is repeated in the form of Figure 11.1 to provide you with an overview of both systems. Both use a two-stage allocation process. In the first stage, a traditional system allocates overheads to production and service cost centres (typically departments) and then reallocates service department cost centre costs to the production departments. You will see from the lower panel of Figure 11.1 that an ABC system assigns overheads to each major activity (rather than cost centres or departments). With ABC systems, many activity-based cost centres (alternatively known as activity cost pools) are established, whereas with traditional systems overheads tend to be pooled by departments, although they are normally described as cost centres.

Activities consist of the aggregation of many different tasks, events or units of work that cause the consumption of resources. They tend to consists of verbs associated with objects. Typical support activities include: scheduling production, set up machines, move materials, purchase materials, inspect items, process supplier records, expedite and process customer orders. Production process activities include machine products and assemble products. Within the production process, activity cost centres are sometimes identical to the cost centres used by traditional cost systems. Support activities are also sometimes identical to cost centres used by traditional systems, such as when the purchasing department and activity are both treated as cost centres. Overall, however, ABC systems will normally have a greater number of activity cost centres compared with traditional systems.

You will see from Figure 11.1 that stage two of the two-stage allocation process allocates costs from cost centres (pools) to products or other chosen cost objects. Traditional costing systems trace overheads to products using a small number of second stage allocation bases (normally described as overhead allocation rates), which vary directly with the volume produced. Instead of using the terms 'allocation bases' or 'overhead allocation rates' the term **cost driver** is used by ABC systems. You should be able to remember that a cost driver represents a measure that exerts the major influence on the cost of a particular activity. Direct labour and machine hours are the allocation bases that are

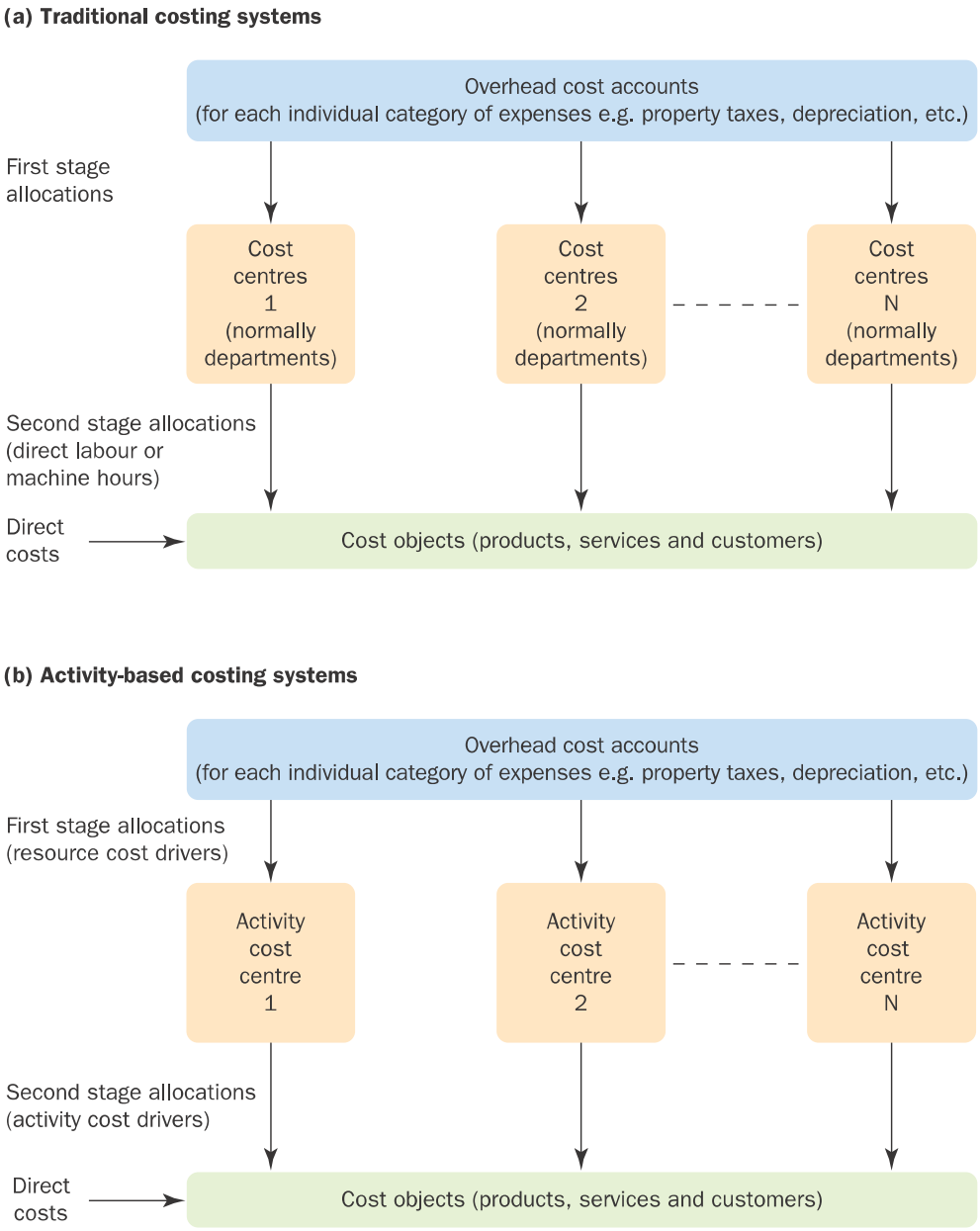


FIGURE 11.1
An illustration of the two-stage allocation process for traditional and activity-based systems

normally used by traditional costing systems. In contrast, ABC systems use many different types of second stage cost drivers, including non-volume-based drivers, such as the number of production runs for production scheduling and the number of purchase orders for the purchasing activity.

Therefore the major distinguishing features of ABC systems are that within the two-stage allocation process they rely on:

1. a greater number of cost centres;
2. a greater number and variety of second stage cost drivers.

By using a greater number of cost centres and different types of cost drivers that cause activity resource consumption, and assigning activity costs to cost objects on the basis of cost driver usage, ABC systems can more accurately measure the resources consumed by cost objects. Traditional cost systems tend to report less accurate costs because they use cost drivers where no cause-and-effect relationships exist to assign support costs to cost objects.

THE EMERGENCE OF ABC SYSTEMS

During the 1990s the limitations of traditional product costing systems began to be widely publicized. These systems were designed decades ago when most companies manufactured a narrow range of products, and direct labour and materials were the dominant factory costs. Overhead costs were relatively small, and the distortions arising from inappropriate overhead allocations were not significant. Information processing costs were high, and it was therefore difficult to justify more sophisticated overhead allocation methods.

Today, companies produce a wide range of products; direct labour often represents only a small fraction of total costs, and overhead costs are of considerable importance. Simplistic overhead allocations cannot be justified, particularly when information processing costs are no longer a barrier to introducing more sophisticated cost systems. Furthermore, today's intense global competition has made decision errors due to poor cost information more probable and more costly.

During the late 1980s a few firms in the USA and Europe implemented ABC type systems. In a series of articles based on observations of innovative ABC-type systems, Cooper and Kaplan (1988) conceptualized the ideas underpinning these systems and coined the term ABC. The articles generated a considerable amount of publicity and consultants began to market and implement ABC systems. Surveys (see Exhibit 11.1) report that approximately 25 per cent of companies in various countries have implemented ABC. Based on their experience of working with early US adopters, Cooper and Kaplan articulated their ideas and reported further theoretical advances in articles published between 1990 and 1992. These ideas and the theoretical advances are described in the remainder of this chapter. ABC ideas have now become firmly embedded in the management accounting literature and educational courses.

REAL WORLD VIEWS 11.1

ABC in China – Xu Ji Electric Co Ltd

Until recently, Xu Ji Electric Co Ltd was a typical stateowned Chinese enterprise manufacturing electrical products such as relays. From an accounting point of view, this implied a manual book-keeping system which was primarily designed to meet external reporting requirements. This was to the detriment of management accounting information, and product costing was not accurate.

The company underwent several changes under Chinese free market developments. If the company were to compete and introduce new products, it needed to invest in more modern production control and testing methods, increase its marketing, increase its research and development, as well as improve its costing system. It decided to adopt an activity-based costing (ABC) system which would trace labour costs directly to products and customer contracts and allocate manufacturing overheads. It took some years for Xu Ji Electric Co Ltd to get the ABC system up and running, but the eventual result was monthly ABC cost reports in some divisions. For example, at the Relays Division which manufactures many types of electrical relay, these reports allocated costs like after-sales service, technical support, warehousing, marketing and production planning to products and customer contracts. At the Relays Division, the activity cost centres included activities such as wiring, labelling, installation, electrical testing and materials management. The Relays division operated in a highly competitive and saturated market and the resulting ABC system assisted the division managers in obtaining more accurate costs and improving divisional performance.

Questions

1 Do you think Xu Ji Electric Co Ltd is a good example of a business where ABC might be useful?

2 Can you think of some activities of Xu Ji Electric Co Ltd other than those stated above?

Reference

Liu, L.Y.J. and Pan, F. (2011) 'Activity based costing in China: A case study of Xu Ji Electric Co. Ltd', *Research Executive Summary* Series, Vol. 7, No. 13, CIMA, London. Available at www.cimaglobal.com/Thought-leadership/Research-topics/Management-accounting-in-different-sectors/Activity-based-costing-in-China/

EXHIBIT 11.1 Surveys of company practice

Surveys indicate that service companies are more likely to implement ABC than manufacturing companies. This is because most of the costs in service organizations are indirect. In contrast, manufacturing companies can trace important components (such as direct materials and direct labour) of costs to individual products. Therefore, indirect costs are likely to be a much smaller proportion of total costs.

A UK survey by Drury and Tayles (2005) reported that 51 per cent of the financial and service organizations surveyed, compared with 15 per cent of manufacturing organizations, had implemented ABC. The international survey by the Chartered Institute of Management (2009) reported that approximately 28 per cent of the respondents used ABC. Both surveys report a higher rate of adoption in larger companies compared with smaller companies.

A more recent survey by Al-Sayed and Dugdale (2016) adopted a wider definition of ABC and focused on activity-based innovations (defined as 'any management accounting practice that uses the concept of "activities" as its hard core'). They reported that 32 per cent were serious users of activity-based innovations (ABI) and that 72 per cent of the business units sampled have had experience or interest in ABI. Based on these findings the authors concluded that ABI can now be regarded as mainstream management accounting practice.

VOLUME-BASED AND NON-VOLUME-BASED COST DRIVERS

Our comparison of ABC systems with traditional costing systems indicated that ABC systems rely on a greater number and variety of second stage cost drivers. The term 'variety of cost drivers' refers to the fact that ABC systems use both volume-based and non-volume-based cost drivers. In contrast, traditional systems use only volume-based cost drivers. **Volume-based cost drivers** assume that a product's consumption of overhead resources is directly related to units produced. In other words, they assume that the overhead consumed by products is highly correlated with the number of units produced. Typical volume-based cost drivers used by traditional systems are units of output, direct labour hours and machine hours. These cost drivers are appropriate for measuring the consumption of expenses such as machine energy costs, depreciation related to machine usage, indirect labour employed in production centres and inspection costs where each item produced is subject to final inspection. For example, machine hours are an appropriate cost driver for energy costs since if volume is increased by 10 per cent, machine hours are likely to increase by 10 per cent, thus causing 10 per cent more energy costs to be consumed. Similarly, an increase in volume of 10 per cent is likely to increase the consumption of direct labour hours by 10 per cent and, assuming that indirect labour hours are correlated with direct labour hours, 10 per cent more indirect labour costs will be consumed.

Volume-based drivers are appropriate in the above circumstances because activities are performed each time a unit of the product or service is produced. In contrast, non-volume related activities are not performed each time a unit of the product or service is produced. Consider, for example, two activities – setting up a machine and re-engineering products. Set-up resources are consumed each time a machine is changed from one product to another. It costs the same to set up a machine for 10 or 5000 items. As more set-ups are done more set-up resources are consumed. It is the number of set-ups, rather than the number of units produced, that is a more appropriate measure of the resources consumed by the set-up activity. Similarly, product re-engineering costs may depend on the number of different engineering works orders and not the number of units produced. For both activities, **non-volume-based cost drivers** such as number of set-ups and engineering orders are needed for the accurate assignment of the costs of these activities.

Using only volume-based cost drivers to assign non-volume related overhead costs can result in the reporting of distorted product costs. The extent of distortion depends on what proportion of total overhead costs the non-volume based overheads represent and the level of product diversity. If a large

proportion of an organization's costs are unrelated to volume there is danger that inaccurate product costs will be reported with a traditional costing system. Conversely, if non-volume related overhead costs are only a small proportion of total overhead costs, the distortion of product costs will not be significant. In these circumstances, traditional product costing systems are likely to be acceptable.

Product diversity applies when products consume different overhead activities in dissimilar proportions. Differences in product size, product complexity, sizes of batches and set-up times cause product diversity. If all products consume overhead resources in similar proportions, product diversity will be low and products will consume non-volume-related activities in the same proportion as volume-related activities. Hence, product cost distortion will not occur with traditional product costing systems. Two conditions are therefore necessary for product cost distortion:

- non-volume-related overhead costs are a large proportion of total overhead costs; and
- product diversity applies.

Where these two conditions exist, traditional product costing systems can result in the overcosting of high volume products and undercosting of low volume products. Consider the information presented in Example 11.1.

The reported product costs and profits for the two products are as follows:

	Traditional system		*ABC system*	
	Product HV (£)	*Product LV (£)*	*Product HV (£)*	*Product LV (£)*
Direct costs	310 000	40 000	310 000	40 000
Overheads allocated[a]	300 000 (30%)	50 000 (5%)	150 000 (15%)	150 000 (15%)
Reported profits/(losses)	(10 000)	60 000	140 000	(40 000)
Sales revenues	600 000	150 000	600 000	150 000

Note
[a]Allocation of £1 million overheads using direct labour hours as the allocation base for the traditional system and number of batches processed as the cost driver for the ABC system.

Because product HV is a high volume product that consumes 30 per cent of the direct labour hours whereas product LV, the low volume product consumes only 5 per cent, the traditional system that uses direct labour hours as the allocation base allocates six times more overheads to product HV. However, ABC systems recognize that overheads are caused by other factors, besides volume. In our example, all of the overheads are assumed to be volume unrelated. They are caused by the number of batches processed and the ABC system establishes a cause-and-effect allocation relationship by using the number of batches processed as the cost driver. Both products require 15 per cent of the total number of batches so they are allocated with an equal amount of overheads.

It is apparent from the consumption ratios of the two products that the traditional system based on direct labour hours will overcost high volume products and undercost low volume products. **Consumption ratios** represent the proportion of each activity consumed by a product. The consumption ratios if direct labour hours are used as the cost driver are 0.30 for product HV and 0.05 for product LV so that six times more overheads will be assigned to product HV. When the number of batches processed are used as the cost driver the consumption ratios are 0.15 for each product and an equal amount of overhead will be assigned to each product. Distorted product costs are reported with the traditional costing system that uses the volume-based cost driver because the two conditions specified above apply:

1. non-volume related overheads are a large proportion of total overheads, being 100 per cent in our example.
2. product diversity exists because the product consumption ratios for the two identified cost drivers are significantly different.

EXAMPLE 11.1

Assume that the Balearic company has only one overhead cost centre or cost pool. It currently operates a traditional costing system using direct labour hours to allocate overheads to products. The company produces several products, two of which are products HV and LV. Product HV is made in high volumes whereas product LV is made in low volumes. Product HV consumes 30 per cent of the direct labour hours and product LV consumes only 5 per cent. Because of the high volume production, product HV can be made in large production batches but the irregular and low level of demand for product LV requires it to be made in small batches. A detailed investigation indicates that the number of batches processed causes the demand for overhead resources. The traditional system is therefore replaced with an ABC system using the number of batches processed as the cost driver. You ascertain that each product accounts for 15 per cent of the batches processed during the period and the overheads assigned to the cost centre that fluctuate in the long term according to the demand for them amount to £1 million. The direct costs and sales revenues assigned to the products are as follows:

	Product HV (£)	*Product LV (£)*
Direct costs	310 000	40 000
Sales revenues	600 000	150 000

Show the product profitability analysis for products HV and LV using the traditional and ABC systems.

The illustration above shows that if the consumption ratios for batches processed had been the same as the ratios for direct labour the traditional and ABC systems would report identical product costs.

With the traditional costing system misleading information is reported. A small loss is reported for product HV and if it were discontinued the costing system mistakenly gives the impression that overheads will decline in the longer term by £300 000. The message from the costing system is to concentrate on the more profitable speciality products such as product LV. In reality, this strategy would be disastrous because low volume products such as product LV are made in small batches and require more people for scheduling production, performing set-ups, inspection of the batches and handling a large number of customer requests for small orders. The long-term effect would be escalating overhead costs.

In contrast, the ABC system allocates overheads on a cause-and-effect basis and more accurately measures the relatively high level of overhead resources consumed by product LV. The message from the profitability analysis is the opposite from the traditional system; that is, product HV is profitable and product LV is unprofitable. If product LV is discontinued, and assuming that the cost driver (number of batches processed) is the cause of all the overheads, then a decision to discontinue product LV should result in the reduction in resource spending on overheads by £150 000.

Example 11.1 is very simplistic. It is assumed that the organization has established only a single cost centre or cost pool, when, in reality, many will be established with a traditional system, and even more with an ABC system. Furthermore, the data have been deliberately biased to show the superiority of ABC. The aim of the illustration has been to highlight the potential cost of errors that can occur when information extracted from simplistic and inaccurate cost systems is used for decision-making.

DESIGNING ABC SYSTEMS

The discussion so far has provided a broad overview of ABC. We shall now examine ABC in more detail by looking at the design of ABC systems. Four steps are involved. They are:

1. identifying the major activities that take place in an organization;
2. assigning costs to cost pools/cost centres for each activity;
3. determining the cost driver for each major activity;
4. assigning the cost of activities to products according to the product's demand for activities.

The first two steps relate to the first stage, and the final two steps to the second stage of the two-stage allocation process shown in Figure 11.1. Let us now consider each of these stages in more detail.

Step 1: Identifying activities

Activities are the aggregation of many different tasks, events or units of work that cause the consumption of resources. For example, purchasing materials might be identified as a separate activity. This activity consists of the aggregation of many different tasks, such as receiving a purchase request, identifying suppliers, preparing purchase orders, mailing purchase orders and performing follow-ups.

REAL WORLD VIEWS 11.2

Activity-based costing in restaurants

Raab, Shoemaker and Mayer (2007) developed a workable ABC model for a restaurant operation in the USA that enabled previously undistributed indirect operating expenses to be traced to individual menu items. Menu prices were previously determined on a cost-plus basis using variable cost as the cost base. In recent years, indirect operating expenses had become a larger percentage of the total cost structure of the restaurant.

The ABC study only examined the restaurant's dinner entrée and beverage service and its lunch menu was not included in the study. The ABC analysis revealed that 11 out of the 14 dinner entrées were unprofitable and were thus a major contributor to the restaurant's negative operating profit. These results reflect the restaurant's relatively high overhead costs which were not taken into account when determining menu prices. The authors conclude that menu ABC profitability analyses that goes beyond the simple analysis of food costs can be applied in the restaurant industry and that a restaurant manager's menu management decisions will differ dramatically if he or she is confronted with the differing results arising from an ABC approach.

Questions

1. The first step in designing an ABC system is to identify the major activities in an organization. What are the major activities in a restaurant?
2. What action should an organization take when the ABC analysis identifies loss-making activities?
3. What are the factors that might prevent the restaurant industry from using ABC?

Reference

Raab, C., Shoemaker, S. and Mayer, K.J. (2007) Activity-based costing – A more accurate way to estimate costs for a restaurant menu, *International Journal of Hospitality & Tourism Administration*, 8(3), 1–15. Available at dx.doi.org/10.1300/J149v08n03_01

The activities chosen should be at a reasonable level of aggregation based on costs versus benefits criteria. For example, rather than classifying purchasing of materials as an activity, each of its constituent tasks could be classified as separate activities. However, this level of decomposition would involve the collection of a vast amount of data and is likely to be too costly for product costing purposes. Alternatively, the purchasing activity might be merged with the materials receiving, storage and issuing activities to form a single materials procurement and handling activity. This is likely to represent too high a level of aggregation because a single cost driver is unlikely to provide a satisfactory determinant of the cost of the activity. For example, selecting the number of purchase orders as a cost driver may provide a good explanation of purchasing costs but may be entirely inappropriate for explaining costs relating to receiving and issuing. Therefore, instead of establishing materials procurement and handling as a single activity it may be preferable to decompose it into three separate activities; namely purchasing, receiving and issuing activities, and establish separate cost drivers for each activity.

The final choice of activities must be a matter of judgement but it is likely to be influenced by factors such as the total cost of the activity centre (it must be of significance to justify separate treatment) and the ability of a single driver to provide a satisfactory determinant of the cost of the activity. Where the latter is not possible, further decomposition of the activity will be necessary. Activities with the same product consumption ratios can use the same cost driver to assign costs to products. Thus, all activities that have the same cost driver can be merged to form a single activity cost centre.

Step 2: Assigning costs to activity cost centres

After the activities have been identified the cost of resources consumed over a specified period must be assigned to each activity. The aim is to determine how much the organization is spending on each of its activities. Many of the resources will be directly attributable to specific activity centres but others (such as labour and lighting and heating costs) may be indirect and jointly shared by several activities. These costs should be assigned to activities on the basis of cause-and-effect cost drivers, or interviews with staff who can provide reasonable estimates of the resources consumed by different activities. Arbitrary allocations should be minimized. The greater the amount of costs traced to activity centres by cost apportionments at this stage the more arbitrary and less reliable will be the product cost information generated by ABC systems. Cause-and-effect cost drivers used at this stage to allocate shared resources to individual activities are called **resource cost drivers**. Employee surveys are frequently used to estimate the amount of time they spend on different activities in order to assign costs to activities. In large organizations this process can be very time-consuming and expensive and has deterred many organizations from adopting ABC.

Step 3: Selecting appropriate cost drivers for assigning the cost of activities to cost objects

In order to assign the costs attached to each activity cost centre to products, a cost driver must be selected for each activity centre. Cost drivers used at this stage are called **activity cost drivers**. Several factors must be borne in mind when selecting a suitable cost driver. First, it should provide a good explanation of costs in each activity cost pool. Second, a cost driver should be easily measurable, the data should be relatively easy to obtain and be identifiable with products. The costs of measurement should therefore be taken into account.

Activity cost drivers consist of transaction and duration drivers. **Transaction drivers**, such as the number of purchase orders processed, number of customer orders processed, number of inspections performed and the number of set-ups undertaken, all count the number of times an activity is performed. Transaction drivers are the least expensive type of cost driver to measure but they are also likely to be the least accurate because they assume that the same quantity of resources is required every time an activity is performed. However, if the variation in the amount of resources required by individual

cost objects is not great, transaction drivers will provide a reasonably accurate measurement of activity resources consumed. If this condition does not apply then duration cost drivers should be used.

Duration drivers represent the amount of time required to perform an activity. Examples of duration drivers include set-up hours and inspection hours. For example, if one product requires a short set-up time and another requires a long time then using set-up hours as the cost driver will more accurately measure activity resource consumption than the transaction driver (number of set-ups) which assumes that an equal amount of activity resources are consumed by both products. Using the number of set-ups will result in the product that requires a long set-up time being undercosted whereas the product that requires a short set-up will be overcosted. This problem can be overcome by using set-up hours as the cost driver, but this will increase the measurement costs.

Step 4: Assigning the cost of the activities to products

The final step involves applying the cost driver rates to products. This means that the cost driver must be measurable in a way that enables it to be identified with individual products. Thus, if set-up hours are selected as a cost driver, there must be a mechanism for measuring the set-up hours consumed by each product. Alternatively, if the number of set-ups is selected as the cost driver, measurements by products are not required since all products that require a set-up are charged with a constant set-up cost. The ease and cost of obtaining data on cost driver consumption by products is therefore a factor that must be considered during the third step when an appropriate cost driver is being selected.

ACTIVITY HIERARCHIES

Manufacturing activities can be classified along a cost hierarchy dimension consisting of:

1. unit-level activities;
2. batch-level activities;
3. product-sustaining activities;
4. facility-sustaining activities.

Unit-level activities (also known as volume-related activities) are performed each time a unit of the product or service is produced. Expenses in this category include direct labour, direct materials, energy costs and expenses that are consumed in proportion to machine processing time (such as maintenance). Unit-level activities consume resources in proportion to the number of units of production and sales volume. For example, if a firm produces 10 per cent more units it will consume 10 per cent more labour cost, 10 per cent more machine hours and 10 per cent more energy costs. Typical cost drivers for unit level activities include labour hours, machine hours and the quantity of materials processed. These cost drivers are also used by traditional costing systems. Traditional systems are therefore also appropriate for assigning the costs of unit-level activities to cost objects.

Batch-related activities, such as setting up a machine or processing a purchase order, are performed each time a batch of goods is produced. The cost of batch-related activities varies with the number of batches made, but is common (or fixed) for all units within the batch. For example, set-up resources are consumed when a machine is changed from one product to another. As more batches are produced, more set-up resources are consumed. It costs the same to set up a machine for 10 or 5000 items. Thus the demands for the set-up resources are not determined by the number of units produced after completing the set-up. Similarly, purchasing resources are consumed each time a purchasing order is processed, but the resources consumed are not determined by the number of units included in the purchase order. Other examples of batch-related costs include resources devoted to production scheduling, first-item inspection and materials movement. Traditional costing systems treat batch-related expenses as fixed costs, whereas ABC systems assume that batch-related expenses vary with the number of batches processed.

REAL WORLD VIEWS 11.3

ABC in healthcare

The remuneration system that is applied in healthcare organizations in several countries (e.g. Australia, the USA, Switzerland, Spain and Italy) enables ABC profitability analysis to be applied in hospitals. These countries apply the Diagnosis Related Groups (DRGs) reimbursement system to fund hospital activities. With this system, diagnoses requiring similar treatments are assumed to require similar resources resulting in reimbursement at a standard unit price by the National Health System for the healthcare services. Diagnostic-Therapeutic Pathways (DTPs) identify all the services needed to diagnose and treat a specific disease from the first access of the patient into the healthcare system and are made comparable with the DRG.

Cannavacciuolo *et al*. (2015) report on how ABC was used in an Italian hospital to determine the amount of resources used by each activity included in the DTP and thus develop a DTP cost. The DTP cost was derived from the sum of activity cost pools needed to perform a DTP. Thus it is possible to determine the profitability of each DTP by comparing its cost with the DRG tariff. Where the DTP cost exceeded the DRG tariff, activities are examined with a view to performing them more efficiently. ABC also enabled the most cost-consuming activities to be identified. The determination of the cost of each activity of a DTP also provided the potential to compare the costs of DTPs with those

in other hospitals and thus highlight potential for carrying out the activities more effectively and efficiently.

Questions

1 In some countries revenues may be received in a lump sum and are not assignable to individual diagnosis related groups. What role can ABC play in such organizations?

2 Do you think many business organizations utilize ABC techniques? Why or why not?

Reference

Cannavacciuolo, L., Illario, M., Ippolito, A. and Ponsiglione, C. (2015) 'An activity-based costing approach for detecting inefficiencies of healthcare processes', *Business Process Management Journal*, 21(1), 55–79. Available at dx.doi.org/10.1108/BPMJ-11-2013-0144

Product-sustaining activities or **service-sustaining activities** are performed to enable the production and sale of individual products (or services). Examples of product-sustaining activities include maintaining and updating product specifications and the technical support provided for individual products and services. Other examples are the resources to prepare and implement engineering change notices (ECNs), to design processes and test routines for individual products, and to perform product enhancements. The costs of product-sustaining activities are incurred irrespective of the number of units of output or the number of batches processed and their expenses will tend to increase as the number of products manufactured is increased. ABC uses product-level bases such as number of active part numbers and number of ECNs to assign these costs to products. Where customers are the cost objects the equivalent term for product sustaining is **customer-sustaining activities**. Customer market research and support for an individual customer, or groups of customers if they represent the cost object, are examples of customer-sustaining activities.

The final activity category is **facility-sustaining** (or **business-sustaining**) **activities**. They are performed to support the facility's general manufacturing process and include general administrative staff, plant management and property costs. They are incurred to support the organization as a whole and

are common and joint to all products manufactured in the plant. There would have to be a dramatic change in activity, resulting in an expansion or contraction in the size of the plant, for facility-sustaining costs to change. Such events are most unlikely in most organizations. Therefore these costs should not be assigned to products since they are unavoidable and irrelevant for most decisions. Instead, they are regarded as common costs to *all* products made in the plant and deducted as a lump sum from the total of the operating margins from *all* products.

COST VERSUS BENEFITS CONSIDERATIONS

In Chapter 3, it was pointed out that the design of a cost system should be based on cost versus benefit considerations. A sophisticated ABC system should generate the most accurate product costs. The cost of implementing and operating an ABC system is significantly more expensive than operating a direct costing or a traditional costing system. In particular, the training and software requirements may prohibit its adoption by small organizations. However, the partial costs reported by direct costing systems, and the distorted costs reported by traditional systems (unsophisticated), may result in significant mistakes in decisions (such as selling unprofitable products or dropping profitable products) arising from the use of this information. If the cost of errors arising from using partial or distorted information generated from using these systems exceeds the additional costs of implementing and operating an ABC system, then an ABC (sophisticated) system ought to be implemented.

The optimal costing system is different for different organizations. A simplistic traditional costing system may report reasonably accurate product costs in organizations that have the following characteristics:

1. low levels of competition;
2. non-volume-related indirect costs that are a low proportion of total indirect costs;
3. a fairly standardized product range all consuming organizational resources in similar proportions (i.e. low product diversity).

In contrast, a sophisticated (ABC) system may be optimal for organizations having the following characteristics:

1. intensive competition;
2. non-volume-related indirect costs that are a high proportion of total indirect costs;
3. a diverse range of products, all consuming organizational resources in significantly different proportions (i.e. high product diversity).

TIME-DRIVEN ABC

The survey evidence summarized in Exhibit 11.1 indicates that the ABC adoption rate has been fairly low. The costly design, implementation and operation of such systems have been the major contributory factors explaining the low rate of adoption. Kaplan and Anderson (2004) conclude that many companies have abandoned ABC systems because they took too long to implement and were too expensive to build and implement. To overcome these problems they advocate adapting traditional ABC by using a more simplistic approach called **time-driven ABC**.

Kaplan and Anderson present the data shown in the upper section of Exhibit 11.2 to illustrate a traditional ABC system for a customer services department with a quarterly total expenditure of £560 000 (consisting of the cost of personnel, information technology and other fixed expenses) involving three activities – processing customers orders, handling customer orders and performing credit checks. Employees are surveyed to estimate the percentage of time they expect to spend on the three activities and the department's expenses are assigned to the activities based on the average percentages

EXHIBIT 11.2 Traditional and time-driven ABC

Calculation of cost driver rates using the traditional ABC approach

Activity	*% of time spent*	*Assigned cost (£)*	*Cost driver quantity*	*Cost driver rate (£)*
Process customer orders	70	392 000	49 000	8 per order
Handle customer enquiries	10	56 000	1 400	40 per enquiry
Perform credit checks	20	112 000	2 500	44.80 per credit check
		560 000		

Time-driven ABC reporting

Activity	*Cost driver quantity*	*Unit time (minutes)*	*Total time used (minutes)*	*Cost driver rate (£)*	*Total cost assigned (£)*
Process customer orders	49 000	8	392 000	6.40	313 600
Handle customer enquiries	1 400	44	61 600	35.20	49 280
Perform credit checks	2 500	50	125 000	40.00	100 000
Total used			578 600		462 880
Total supplied			700 000		560 000
Unused capacity			121 400		97 120

Adapted from Kaplan and Anderson (2004).

derived from the survey. The quantities of work for the three activities are obtained in order to derive the cost driver rates shown in the upper section of Exhibit 11.2. These cost driver rates are used to assign the department's resources to the customers or products that use the activities. The traditional ABC approach can be easily applied to the simplistic illustration shown in Exhibit 11.2 but applying this approach in a large organization with thousands of employees and activities that requires surveying how employees spend their time can be prohibitively time-consuming and expensive.

Kaplan and Anderson illustrate how time-driven ABC can be applied to the situation presented in the lower section of Exhibit 11.2. With this approach managers directly estimate the resource demands required by each product, customer or service instead of assigning resource costs to each activity and then to products or customers. This simplified approach requires estimates of only two items:

1. the cost per time unit of supplying resource capacity, and
2. unit times of consumption of resource capacity by products, services or customers.

Estimates of the cost per time unit of supplying resource capacity avoids the need to undertake the very time-consuming approach of surveying employees on how they spend their time. Instead Kaplan and Anderson advocate that managers should first directly estimate the practical capacity of the resources supplied as a percentage of maximum theoretical capacity. An approximate approach is to assume that practical full capacity is around 80 per cent of theoretical maximum capacity so that if an employee works 40 hours per week this theoretical maximum capacity will be reduced to a practical full capacity of 32 hours using an 80 per cent conversion rate. Applying this approach to the customer service department Kaplan and Anderson assume that there are 28 workers in the department working 8 hours per day resulting in each worker supplying 10 560 minutes per month (22 days × 8 hours × 60 minutes) or 31 680 minutes per quarter. Assuming that practical capacity is about 79 per cent of theoretical capacity, around 25 000 hours of practical capacity will be supplied per worker per quarter resulting in a total practical capacity supplied of 700 000 hours

(28 workers × 25 000 hours). The cost per minute of supplying capacity in the department is therefore £0.80 (£560 000 total expenditure/700 000 hours).

The next stage is to *determine the time it takes to perform one unit of each kind of activity.* Kaplan and Anderson suggest that this information can be derived from interviews with employees or direct observation and that reasonable approximations rather than precise observations will suffice. They assume that it takes 8 minutes to process an order, 44 minutes to handle an enquiry and 50 minutes to perform a credit check. Cost driver rates are calculated by multiplying the cost per minute of supplying capacity by the time it takes to perform one unit of each kind of activity. The cost driver rates are £6.40 for processing customer orders (8 × £0.80), £35.20 for handling enquiries (44 × £0.80) and £40 for performing a credit check (50 × £0.80). These rates can now be used to assign cost to individual customers, products or services that use each activity.

The lower part of Exhibit 11.2 shows the time-driven ABC report for the period. The report provides essential information relating to both the quantity and cost of the unused practical capacity. Management should investigate the cost of the unused capacity and decide if or how to reduce the cost of supplying unused resources in future periods. The lower part of Exhibit 11.2 also indicates why the cost driver rates for time-driven ABC are lower than the traditional ABC rates. The traditional ABC cost driver rates are derived from the actual capacity *used* shown in the lower part of Exhibit 11.2 whereas the time-driven approach is derived from the practical capacity *supplied*. Therefore the cost of unused capacity is buried within the traditional ABC cost driver rates.

Besides simplifying the operation of an ABC system, time-driven ABC can capture the complexity of real world operations. The example outlined above assumed that all transactions for each activity were the same and required the same amount of time to process. Kaplan and Anderson illustrate how time equations can be established to capture more complex operations. They provide an example of

REAL WORLD VIEWS 11.4

Time-driven activity-based costing for public services

Public sector organizations increasingly must account for their performance and provide quality services at lower costs. To accomplish this many local authorities and public sector organizations have used ABC systems but many have tried ABC and abandoned it because they were time-consuming and expensive to operate. Rather than abandoning ABC a possible solution is to improve it using time-driven ABC (TDABC). An article published in *Public Money and Management* authored by Stouthuysen *et. al* (2014) illustrates the application TDABC to two indoor swimming pools in a medium-sized Belgian city and financed by the same local authority.

The TDABC model used 'types of pool visitors' as cost objects broken down into four distinct cost object categories. Six main activities were identified. To calculate the cost per time unit spent on an activity, the total annual operating expenses (i.e. the cost of supplied capacity) for each pool was calculated. Next, practical capacity supplied using an annual time measure availability based on the number of full-time equivalent workers at each pool was calculated. Finally, total cost per pool was divided by the practical capacity to obtain the cost per minute of supplying capacity in each pool. Cost driver rates were calculated by multiplying the cost per minute by the time involved for each kind of activity and then assigned cost objects according to their use of each activity.

Questions

1. Can you provide some examples of cost objects and activities that might be applicable to a swimming pool?
2. How might the information produced by an ABC system be used in a leisure centre?

References

Stouthuysen, K., Schierhout, K., Roodhooft, F. and Reusen, E. (2014) 'Time-driven activity-based costing for public services', *Public Money & Management*, 34(4): 289–296. dx.doi.org/10.1080/09540962.2014.920202

processing a chemical for transportation where standard packaging takes 0.5 minutes, special packaging requires an additional 6.5 minutes and if the item is to be transported by air a further 2 minutes are required for the package to be placed in a container that is suitable for air travel. The estimated total time for the packaging process can be determined by multiplying the different types of packaging by the time required for each type of packaging. The resulting cost driver rate per minute would be multiplied by the number of minutes required for the specific type of packaging. In contrast, the traditional ABC approach requires that the varying transaction times are captured by treating each variant of the process as a separate activity and thus increasing the complexity of the ABC system.

Presumably Kaplan and Anderson use the term 'time-driven ABC' for the simplified version of ABC because the capacity of most resources is measured in terms of time availability but they point out that the approach can also be used for resources whose capacity is measured in other units. They illustrate how the capacity of a warehouse or vehicles could be measured by the space provided and memory storage by the megabytes supplied.

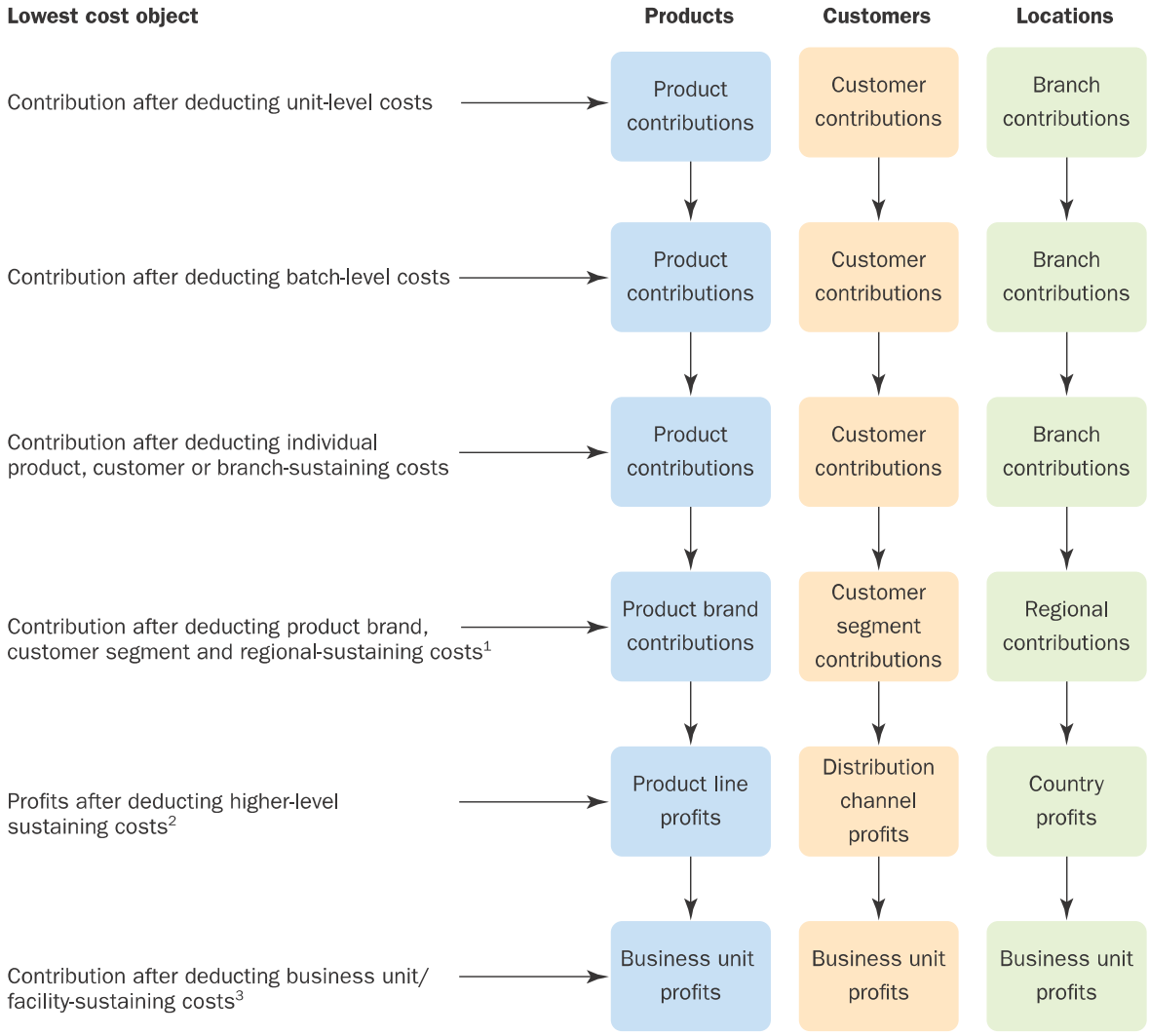
ADVANCED READING

ACTIVITY-BASED COSTING PROFITABILITY ANALYSIS

In the previous chapter, a hierarchical approach to profitability analysis was illustrated using direct costing principles. In this section, we shall examine how Cooper and Kaplan (1991) have applied the ABC hierarchical activity classification to profitability analysis. At this stage, you will find it helpful to refer back to Exhibit 10.1 in the previous chapter so that you can compare the less complex direct costing hierarchical analysis with the more complex ABC hierarchical analysis. The general principles of activity profitability analysis applied to different cost objects is illustrated in Figure 11.2. This approach categorizes costs according to the causes of their variability at different hierarchical levels. Hierarchies identify the lowest level to which cost can meaningfully be assigned without relying on arbitrary allocations. In Figure 11.2, the lowest hierarchical levels (shown at the top of the diagram) are product, customer and branch contributions after deducting unit level costs and, ignoring the business unit level the highest hierarchical levels (shown in the penultimate row prior to the overall business unit) are product lines, distribution channels and country profits.

Let us initially focus on products as the cost object. Look at the column for products as the cost object in Figure 11.2. You will see that a unit-level contribution margin is calculated for each *individual* product. This is derived by deducting the cost of unit-level activities from sales revenues. From this, unit-level contribution expenses relating to batch-related activities are deducted. Next the cost of product-sustaining activities are deducted. Thus, three different contribution levels are reported at the *individual* product level. Differentiating contributions at these levels provides a better understanding of the implications of product mix and discontinuation decisions in terms of cost and profit behaviour.

In Figure 11.2, there are two further levels within the product hierarchy. They are the product brand level and the product line level. Some organizations do not market their products by brands and therefore have only one further level (i.e. the product line) within the product hierarchy. A product line consists of a group of similar products. For example, banks have product lines such as savings accounts, lending services, currency services, insurance services and brokering services. Each product line contains individual product variants. The savings product line would include low balance/low interest savings accounts, high balance/high interest accounts, postal and internet savings accounts and other product variants. The lending services product line would include personal loans, house mortgage loans, business loans and other product variants within the product line. Some expenses such as marketing, research and development, and distribution expenses might be incurred for the benefit of the whole product line and not for any products within the line. Therefore these **product line-sustaining expenses** should be attributed to the product line but no attempt should be made to allocate them to individual products. Finally, the profit for the organizational unit as a whole can be determined by deducting facility-sustaining expenses from the sum of the individual product line contributions.



Notes

[1]Consists of expenses dedicated to sustaining specific product brands or customer segments or regions but which cannot be attributed to individual products, customers or branches.

[2]Consists of expenses dedicated to sustaining the product lines or distribution channels or countries but which cannot be attributed to lower items within the hierarchy.

[3]Consists of expenses dedicated to the business as a whole and not attributable to any lower items within the hierarchy.

FIGURE 11.2

An illustration of hierarchical profitability analysis

A similar approach to the one described above for products can also be applied to other cost objects. The two final columns shown in Figure 11.2 illustrate how the approach can be applied to customers and locations. The aim of ABC hierarchical profitability analysis is to assign all organizational expenses to a particular hierarchical or organizational level where cause-and-effect cost assignments can be established so that arbitrary allocations are non-existent. The hierarchical approach helps to identify the impact on resource consumption by adding or dropping items at each level of the hierarchy. For example, if a product line is dropped, activities at the product line level and below (i.e. above the product line profits row in Figure 11.2) which are uniquely associated with the product line will be affected, but higher level activities (i.e. at the business unit level) will be unaffected. Similarly, if a product within a particular product line is dropped then all unit, batch and product-sustaining activities uniquely associated with that product will be affected but higher level product-level and business unit level activities will be unaffected.

RESOURCE CONSUMPTION MODELS

Cooper and Kaplan (1992) emphasize that ABC systems are **models of resource consumption**. ABC systems measure the cost of using resources and not the cost of supplying resources and highlight the critical role played by unused capacity. To have a good conceptual grasp of ABC, it is essential that you understand the content of this section.

Kaplan (1994b) used the following equation to formalize the relationship between activity resources supplied and activity resources used for each activity:

$$\text{Cost of resources supplied} = \text{Cost of resources used} + \text{Cost of unused capacity} \qquad (11.1)$$

To illustrate the application of the above formula we shall use Example 11.2. The left-hand side of the above equation indicates that the amount of expenditure on an activity depends on the cost of resources supplied rather than the cost of resources used. Example 11.2 contains data relating to the processing of purchase orders activity in which the equivalent of ten full-time staff are committed to the activity. You will see that the estimated annual cost is £300 000. This represents the **cost of resources supplied**. This expenditure provides the capacity to process 15 000 purchase orders (i.e. the quantity of resources supplied of the cost driver) per annum. It is assumed that the capacity to process 15 000 orders is below the theoretical maximum capacity that could be achieved working at 100 per cent activity without any unavoidable idle time. Therefore the estimated cost of processing each purchase order is £20 (£300 000/15 000 orders that can be processed).

ABC systems measure the cost of resources used by individual products, services or customers. During any particular period the number of orders processed will vary. In Example 11.2, it is assumed that the Etna Company expects to process 13 000 purchase orders (i.e. the quantity of resources used).

EXAMPLE 11.2

The following information relates to the purchasing activity in a division of the Etna Company for the next year:

(1) Resources supplied	
Ten full-time staff at £30 000 per year (including employment costs)	= £300 000 annual activity cost
Cost driver	= Number of purchase orders processed
Quantity of cost driver supplied per year: (Each member of staff can process 1500 orders per year)	= 15 000 purchase orders
Estimated cost driver rate	= £20 per purchase order (£300 000/15 000 orders)
(2) Resources used	
Estimated number of purchase orders to be processed during the year	= 13 000
Estimated cost of resources used assigned to parts and materials	= £260 000 (13 000 × £20)
(3) Cost of unused capacity	
Resources supplied (15 000) − Resources used (13 000) at £20 per order	= £40 000 (2000 × £20)

The ABC system will therefore assign £26 0000 (13 000 orders at £20 per order) to the parts and materials ordered during the year. This represents the **cost of resources used**.

The **cost of unused capacity** represents the difference between the cost of resources supplied and the cost of resources used. Resources have been acquired to enable 15 000 purchase orders to be processed, but during the year only 13 000 orders will be processed giving an unused capacity of 2000 purchase orders. Hence the predicted cost of the unused capacity will be £40 000 (2000 orders at £20 per order).

Unused capacity arises because the supply of some resources has to be acquired in discrete amounts in advance of usage such that the supply cannot be continually adjusted in the short run to match exactly the usage of resources. Typical expenses in this category include the acquisition of equipment or the employment of non-piecework employees. The expenses of supplying these resources are incurred independently of usage in the short run and this independence has led to them being categorized as fixed costs. Kaplan and Cooper (1998) describe such resources as **committed resources**. In contrast, there are other types of resource whose supply can be continually adjusted to match exactly the usage of resources. For example, materials, casual labour and the supply of energy for running machinery can be continually adjusted to match the exact demand. Thus, the cost of supplying these resources will generally equal the cost of resources used and the resources will have no unused capacity. Kaplan and Cooper classify these resources as **flexible resources** although they have traditionally been categorized as variable costs.

The problem of adjusting the supply of resources to match the usage of resources and eliminating unused capacity therefore applies only to committed resources. Where the cost of supplying resources in the short run is fixed, the quantity used will fluctuate each period based on the activities performed for the output produced. Activity-based systems measure the cost of *using* these resources, even though the cost of supplying them will not vary with short-run usage.

Managers make decisions (for example, changes in output volume and mix, process changes and improvements and changes in product and process design) that result in changes in activity resource usage. Assuming that such decisions result in a decline in the demand for activity resources, then the first term on the right-hand side of equation (11.1) will decline (the cost of resources used) but the cost of unused capacity (the second term on the right-hand side of the equation) will increase to offset exactly the lower resource usage cost. To translate the benefits of reduced activity demands into cash flow savings management action is required. They must permanently remove the unused capacity by reducing spending on the supply of the resources. Thus, to make a resource variable in the downward direction requires two management decisions, first to reduce the demand for the resource and, second, to lower the spending on the resource.

Demands for activity resources can also increase because of decisions to introduce new products, expand output and create greater product variety. Such decisions can lead to situations where activity resource usage exceeds the supply of resources. In the short term, the excess demand might be absorbed by people working longer or faster or delaying production. Eventually, however, additional spending will be required to increase the supply of activity resources. Thus, even if permanent changes in activity resource consumption occur that result in either unused or excess capacity, there may be a significant time lag before the supply of activity resources is adjusted to match the revised predicted activity usage. Indeed, there is always a danger that managers may not act to reduce the spending on the supply of resources to match a reduction in demand. They may keep existing resources in place even when there has been a substantial decline in demands for the activities consuming the resources. Consequently, there will be no benefits arising from actions to reduce activity usage. However, if decisions are made based on reported ABC costs, it is implicitly assumed that predicted changes in activity resource usage will be translated into equivalent cash flow changes for the resources supplied.

A major feature of ABC systems is therefore that reported product, service or customer costs represent estimates of the cost of resources used. In a period, many decisions are made that affect the usage of resources. It is not feasible to link the required changes in the supply of resources with the

change in usage predicted by each *individual* decision. The periodic reporting of both the predicted quantity and the cost of unused capacity for each activity signals the need for management to investigate the potential for reducing the activity resources supplied. In the case of committed resources performing one less set-up, ordering one less batch of materials or undertaking one fewer engineering change notice, will not result in an automatic reduction in spending. It will create additional capacity, and changes in spending on the supply of resources will often be the outcome of the totality of many decisions rather than focusing on a one-off product decision. Such ideas are considered to be of such vital importance by Kaplan and Cooper that they conclude that managing used and unused capacity is the central focus of ABC.

PERIODIC REVIEW OF AN ABC DATABASE

The detailed tracking of costs is unnecessary when ABC information is used for decision-making. A database should be maintained that is reviewed periodically, say once or twice a year. In addition, periodic cost and profitability audits (similar to that illustrated in Figure 11.2) should be undertaken to provide a strategic review of the costs and profitability of a firm's products, customers and sales outlets. Rather than focusing on the past it is preferable to concentrate on the future profitability of products and customers using estimated activity-based costs. It is therefore recommended that an activity cost database is maintained at estimated standard costs that are updated on an annual or semi-annual basis.

ABC COST MANAGEMENT APPLICATIONS

Our aim in this chapter has been to look at how ABC can be used to provide information for decision-making by more accurately assigning costs to cost objects, such as products, customers and locations. In addition, ABC can be used for a range of strategic cost management applications. These include cost reduction, activity-based budgeting, performance measurement, benchmarking of activities, process management and business process re-engineering.

The decision to implement ABC should not, therefore, be based only on its ability to produce more accurate and relevant decision-making information. A survey by Innes, Mitchell and Sinclear (2000) on ABC applications reported that the cost management applications tend to outweigh the product costing applications which were central to ABC's initial development. We shall examine ABC applications to strategic cost management in Chapter 22. Finally, you should note that care should be exercised when using unit costs derived from ABC systems. For a discussion of the limitations of ABC unit costs, you should refer to Learning Note 10.2 on the digital support resources.

SUMMARY

The following items relate to the learning objectives listed at the beginning of the chapter.

- **Explain why a cost accumulation system is required for generating relevant cost information for decision-making.**

There are three main reasons why a cost accumulation system is required for generating relevant cost information. First, many indirect costs are relevant for decision-making and a costing system is therefore required that provides an estimate of resources consumed by cost objects using cause- and-effect allocations to allocate indirect costs. Second, an attention-directing information system is required that periodically identifies those potentially unprofitable products that require more detailed special studies. Third, many product decisions are not independent and to capture