Chapter 7

Lecture Notes

Chapter theme: This chapter introduces students to **activity-based costing (ABC)** which is a tool that has been embraced by a wide variety of **service**, **manufacturing**, and **non-profit organizations**.

 1

1. **Activity-based costing: key definition**

#### ABC is a costing method that is designed to provide managers with cost information for strategic and other decisions that potentially affect capacity, and therefore, “fixed” as well as variable costs. It is ordinarily used as a supplement to, rather than as a replacement for, the company’s usual costing system.

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1. **How costs are treated under activity-based costing**
	1. ABC **differs** from traditional cost accounting in three ways:

*Learning Objective 1: Understand activity-based costing and how it differs from a traditional costing system.*

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* + 1. **Nonmanufacturing as well as manufacturing costs** may be assigned to products, but only on a cause-and-effect basis.

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* + - 1. For example, ABC systems can assign sales commissions, shipping costs, and warranty repair costs to specific products.
		1. Some manufacturing costs may be **excluded** from product costs.
			1. This is because ABC only assigns a cost to a product if decisions concerning that product will cause changes in the cost.

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* + - 1. ABC excludes **two types of costs** from product costs:
				1. Organization-sustaining costs (which will be formally defined later).
				2. The costs of unused or idle capacity.

*Helpful Hint: Emphasize that ABC systems that are used to support internal decision making do not need to conform to GAAP. Therefore, while GAAP requires treating selling and administrative expenses as period expenses and it requires assigning all manufacturing costs to products, ABC systems can assign selling and administrative expenses to products and they can exclude manufacturing costs from product costs where appropriate.*

* + 1. **Numerous overhead cost pools** are used, each of which is allocated to products and other cost objects using its own unique measure of activity.
			1. ABC cost pools are created to correspond to the **activities** performed in an organization that cause the consumption of overhead resources. Therefore, the total number of ABC cost pools will definitely exceed one (as in the plantwide approach) and it is likely to exceed the number of departments within a company (as in the departmental approach) since more than one activity is often performed within each department.

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* + - 1. Each ABC cost pool has its own **unique measure of activity**. On the contrary, traditional cost systems usually rely on **direct labor hours** and/or **machine hours** to allocate all overhead costs to products.

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* + - * 1. Direct labor and machine hours work correctly when changes in the quantity of the base are correlated with changes in the overhead costs being assigned using the base.

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* + - * 1. Relying exclusively on these bases to assign overhead costs to products has come under increased scrutiny since, on an economy-wide basis, direct labor and overhead costs have been moving in **opposite directions** and the variety of products produced by companies has increased.
	1. Key definitions/concepts
		1. An **activity** is any event that causes the consumption of overhead resources.

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* + 1. An **activity cost pool** is a “bucket” in which costs are accumulated that relate to a single activity measure in an ABC system.
		2. An **activity measure** is an allocation base in an activity-based costing system. The term **cost driver** is also used to refer to an activity measure. The two most common types of activity measures are:

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* + - 1. **Transaction drivers** are simple counts of the number of times an activity occurs such as the number of bills sent out to customers.

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* + - 1. **Duration drivers** measure the amount of time required to perform an activity such as the time spent preparing individual bills for customers.

*Helpful Hint: Introduce the cost-benefit concept by explaining that transaction drivers are more prevalent in practice than duration drivers because the data is much easier to obtain. The additional accuracy provided by duration drivers often times does not pass the cost-benefit test*.

* + 1. Traditional cost systems rely exclusively on allocation bases that are **driven by the volume of production**. ABC defines five levels of activity that largely **do not relate to the volume of units produced.**

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* + - 1. **Unit-level activities** are performed each time a unit is produced.
				1. For example, providing power to run processing equipment would be a unit-level activity.
			2. **Batch-level activities** are performed each time a batch is handled or processed, regardless of how many units are in the batch.

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* + - * 1. For example, setting up equipment and shipping customer orders are batch-level activities.
			1. **Product-level activities** relate to specific products and must be carried out regardless of how many batches are run or units are produced or sold.
				1. For example, designing or advertising a product would be product-level activities.
			2. **Customer-level activities** relate to specific customers and are not tied to any specific product.
				1. For example, sales calls and catalog mailings would be customer-level activities.

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* + - 1. **Organization-sustaining activities** are carried out regardless of which customers are served, which products are produced, how many batches are run, or how many units are made.
				1. For example, heating a factory and cleaning executive officesare organization-sustaining activities.
1. **Designing an activity-based costing (ABC) system**

#### Characteristics of a successful ABC implementation:

* + 1. There should be strong **top management support**.

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* + - 1. Without leadership from top management, some managers may not be motivated to embrace the need to change.
		1. Top managers should ensure that ABC data are **linked to how people are evaluated and rewarded**.
			1. If employees continue to be evaluated and rewarded using traditional (non-ABC) cost data, they will quickly get the message that ABC is not important and they will abandon it.

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* + 1. A **cross-functional team** should be created to design and implement the ABC system.
			1. Cross-functional employees possess intimate knowledge of operations that is necessary for designing an effective ABC system.
			2. Tapping the knowledge of cross-functional managers lessens their resistance to ABC because they feel included in the implementation process.

#### The five steps for implementing ABC

* + 1. Baxter Battery—background information
			1. The company makes two types of automobile batteries—**SureStart (a standard battery) and LongLife (a deluxe, higher quality battery)**.

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* + - 1. The company has reported its first loss ever of **$2,000,000** as shown on the income statement.
		1. **Step 1: define activities, activity cost pools, and activity measures** (The activities are often identified and defined by interviewing the employees that work in the respective overhead departments. The lengthy list of activities that emerges from this process is usually reduced to a handful by combining similar activities.)

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* + - 1. Baxter Battery selected the **five activity cost pools** and corresponding activity measures as shown.
				1. The definition for each of the activity cost pools is as shown.

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*Learning Objective 2: Assign costs to cost pools using a first-stage allocation.*

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* + 1. **Step 2: assign overhead costs to activity cost pools (this is also called first-stage allocation)**
			1. Baxter’s annual overhead costs (both manufacturing and nonmanufacturing) that it intends to assign to its activity cost pools are as shown. Notice:
				1. The total costs for the Production Department (**$14,000,000**) equal the total manufacturing overhead costs shown in the income statement.

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* + - * 1. The total costs for the General Administrative and Marketing Departments (**$8,000,000**) equal the marketing and general administrative expenses shown in Baxter’s income statement.
				2. Three costs included in Baxter’s income statement—**direct materials, direct labor, and shipping**—are excluded from this slide because Baxter’s existing cost system can directly trace these costs to products or customer orders.

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* + - 1. Baxter’s cross-functional interviews resulted in resource allocations as shown. Notice for example:
				1. The indirect factory workers allocated **30%** of their time to the customer orders activity, **30%** of their time to the design changes activity, **20%** of their time to the order size activity, **10%** of their time to customer relations, and **10%** of their time to the “other” activity.

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* + - * 1. The lease costs are allocated entirely to the “other” activity. Since Baxter has a single facility that it does not plan to contract or expand, the lease costs are treated as organization-sustaining costs.
			1. Once the percentage allocations have been determined, it is a simple matter to assign costs to activity cost pools.
				1. For example, the indirect factory wages assigned to the customer orders activity (**$1,800,000**) was computed by multiplying the total amount of indirect factory wages (**$6,000,000**) by the percentage of time that indirect factory workers spent on this activity (**30%**).

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* + - * 1. As another example, the factory equipment depreciation assigned to the customer orders activity (**$700,000**) was computed by multiplying the total amount of factory equipment depreciation (**$3,500,000**) by the percentage of time that the factory equipment was used to support this activity (**20%**).

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* + - * 1. The complete grid of first-stage allocations would be as shown.

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*Learning Objective 3: Compute activity rates for cost pools.*

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* + 1. **Step 3: calculate activity rates**
			1. The Baxter Battery ABC team determined activity levels for each activity as shown. This information enabled the team to compute ABC rates for each activity by dividing the total cost in each activity cost pool by the respective quantity of the activity measure.

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* + - * 1. The activity rate for each cost pool is as shown. For example, the customer orders activity cost pool has an activity rate of **$452 per order**. Importantly, this is an **average** figure.

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* + - * 1. Notice, the “other” cost pool does not have an activity rate. This is because these **organization-sustaining costs will not be assigned to products or customers**.
			1. Before proceeding, let us get a visual perspective of the Baxter Battery ABC system.

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* + - * 1. The direct materials, direct labor, and shipping costs are **directly traceable** to products or customer orders.
				2. The first-stage allocation process assigned the remaining overhead costs to **five activity cost pools**.

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* + - * 1. Then, **activity measures** were identified, **activity levels** were determined, and **activity rates** were computed for each activity. These rates will be used in the next step to assign overhead costs to cost objects.

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* + 1. **Step 4: assign overhead costs to cost objects** (this is also called **second stage allocation**)

*Learning Objective 4: Assign costs to a cost object using a second-stage allocation.*

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* + - 1. **Assigning overhead to products**
				1. The data needed to assign overhead costs to Baxter Battery’s two products—SureStart and LongLife—are as shown. Notice:

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**4,000** customer orders were placed for SureStart and **6,000** customer orders were placed for LongLife.

All **4,000** product designs related to LongLife

SureStart consumed **480,000** machine-hours and LongLife consumed **320,000** machine-hours.

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* + - * 1. The overhead cost assignments to SureStart and LongLife are as shown. Notice:

The total overhead costs assigned to SureStart and LongLife are **$4,928,000** and **$7,832,000**, respectively.

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* + - * 1. The total overhead costs assigned to products (**$12,760,000**) plus the total overhead costs not assigned to products (**$9,240,000**) equal the total overhead cost of **$22,000,000** from earlier slides.
			1. **Assigning overhead to** **customers**
				1. The data needed to assign overhead costs to one of Baxter’s customers—**Acme Auto Parts** is as shown.

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* + - * 1. The total overhead cost assigned to Acme Auto Parts (**$12,916**) is calculated as shown.

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*Learning Objective 5: Use activity-based costing to compute product and customer margins.*

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* + 1. **Step 5: prepare management reports**
			1. **Product margin calculations**
				1. The first step in computing product margins is to gather each product’s **sales and direct cost data** which are assumed to be as shown.

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* + - * 1. The second step is to incorporate the previously computed **activity-based cost assignments** pertaining to each product.

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* + - * 1. The third step is to compute product margins (**$8,372,000 for SureStarts and a loss of $1,132,000 for LongLifes**) by deducting each product’s direct and indirect costs from its sales.

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* + - * 1. The product margins can be **reconciled** with the company’s net operating income as shown.

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* + - 1. **Customer margin calculation**
				1. The first step in computing Acme Auto Parts’ customer margin is to gather its **sales and direct cost data** which are assumed to be as shown.

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* + - * 1. The second step is to incorporate Acme Auto’s previously computed **activity-based cost assignments**.

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* + - * 1. The third step is to compute Acme Auto’s customer margin (**$384**) by deducting all its direct and indirect costs from its sales.

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1. **Comparison of traditional and ABC product costs**

#### Product margins computed using the traditional cost system

* + 1. The first step is to gather each product’s sales and direct cost data as shown.

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* + 1. The second step is to compute the **plantwide overhead rate**. Notice:
			1. The numerator is the **$14,000,000 of manufacturing overhead** shown earlier on the company’s income statement.

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* + - 1. The denominator is the **800,000 machine hours** used for the order size activity from the ABC system.
			2. The plantwide overhead rate is **$17.50 per machine-hour**.
		1. The third step is to allocate manufacturing overhead to each product. Notice:
			1. 480,000 machine-hours were worked on SureStarts, so **$8,400,000** (480,000 hours × $17.50) of manufacturing overhead is assigned to this product. LongLifes are assigning the remaining **$5,600,000** (320,000 × $17.50) of manufacturing overhead.

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* + 1. The fourth step is to compute the product margins—**$6,900,000 for SureStarts and $2,100,000 for LongLifes.**

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* + - 1. Notice selling and administrative expenses are **not allocated** to products because they are assumed to be period expenses.

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* + - 1. The overall net loss of **$2,000,000** reconciles with the income statement shown earlier.

#### The differences between ABC and traditional product costs

* + 1. The changes in product margins caused by switching from the traditional cost system to the activity-based costing system are as shown. Notice:
			1. The traditional cost system **overcosts** the SureStarts and consequently reports an artificially low product margin for this product.

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* + - 1. Conversely, the traditional cost system **undercosts** the LongLifes and consequently reports an artificially high product margin for this product.
		1. There are **three reasons** why the reported product margins for the two costing systems differ from one another.
			1. The traditional cost system allocates **all manufacturing overhead to products**. The ABC system only assigns manufacturing overhead costs **consumed** by products to those products. More specifically:

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* + - * 1. The ABC system does not assign the manufacturing overhead costs consumed by the **customer relations** activity to products because these costs are caused by customers, not specific products.
				2. The ABC system does not assign the manufacturing overhead costs included in the “**other”** activity to products because these organization-sustaining and unused capacity costs are not caused by products.

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* + - 1. The traditional cost system allocates all manufacturing overhead costs using a **volume-related allocation base** (machine-hours). The ABC system uses volume-related and **non-volume related allocation bases** to assign manufacturing overhead to products. More specifically:
				1. The traditional cost system allocates **60%** of all manufacturing overhead to SureStarts and **40%** to LongLifes.

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* + - * 1. The ABC system assigns **40%** and **60%** of customer orders activity cost (a batch-level cost) to SureStarts and LongLifes, respectively.
				2. The ABC system assigns **0%** and **100%** of product design activity cost (a product-level cost) to SureStarts and LongLifes, respectively.
			1. The traditional cost system **disregards selling and administrative expenses** because they are assumed to be period expenses. The ABC system directly traces shipping costs to products and includes nonmanufacturing overhead costs caused by products in the activity cost pools that are assigned to products.

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Helpful Hint: A simple example can be used to illustrate the impact of ABC systems on product costs when batch-level costs are involved. Suppose two products are each run in one batch a year and the cost of setting up a batch is $100 for either product. Other data follow:



*The two batches a year cost a total of $200 to set up. If DLHs are used to allocate the setup costs, the overhead rate would be $2 per DLH or $2 per unit for either product A or product B. However, in an ABC system, $100 will be allocated to product A and $100 to product B. Consequently, the batch setup costs would be $1.25 per unit for product A and $5.00 per unit for product B. ABC systems tend to reduce the per-unit costs of high-volume products and increase the per-unit* *costs of low-volume products, but the impact is more dramatic on the low-volume products.*

1. **Targeting process improvements**

#### Key definitions/concepts

* + 1. **Activity-based management** is used in conjunction with ABC to identify areas that would benefit from process improvement. It involves focusing on activities to eliminate waste, decrease processing time, and reduce defects.
		2. While the theory of constraints approach discussed in Chapter 1 is a powerful tool for targeting process improvement efforts, the **activity rates** computed in ABC can also provide valuable clues concerning where there is waste and the opportunity for improvement.

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* + - 1. **Benchmarking** can be used to compare an organization’s activity rates with standards of performance that are external to the organization.
1. **Activity-based costing and external reports**

#### There are four reasons why most companies do not use ABC for external reporting purposes.

* + 1. External reports are **less detailed** than internal reports in the sense that individual product costs are not reported. External reports only disclose cost of goods sold and ending inventory. Therefore, if some products are undercosted and others are overcosted, the errors tend to cancel each other out when the product costs are added together.

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* + 1. It is often very **difficult to change** a company’s accounting system because it is deeply embedded within complex computer programs that have evolved over many years.
		2. An ABC system, such as the one described in the chapter, **does not conform to generally accepted accounting principles (GAAP)**.

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* + - 1. It excluded some organization-sustaining manufacturing costs, some unused capacity costs, and it included some nonmanufacturing costs in its product cost calculations. These cost system design attributes do not comply with GAAP.
		1. **Auditors are likely to be uncomfortable** with cost allocations that are based on interviews with the company’s personnel. This type of **subjective data** can be easily manipulated by management.
1. **The limitations of activity-based costing**

#### There are five limitations of ABC

* + 1. Implementing an ABC system **requires substantial resources**. The benefits of increased cost accuracy may not outweigh the implementation costs.

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* + 1. ABC systems produce numbers, such as product margins, that are at odds with the numbers produced by traditional cost systems. Managers are not accustomed to managing their operations using these numbers; hence, **ABC inevitably faces resistance**. This underscores the importance of having top management support for and cross-functional involvement with the ABC implementation.
		2. In practice, **most managers insist on fully allocating all costs to products**. The ABC system described in the main portion of this chapter does not conform to this preference.

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* + 1. ABC systems do not automatically identify the **relevant costs** for particular decisions; therefore, ABC data can be easily misinterpreted and must be used with care when making decisions. Costs assigned to products, customers, and other cost objects are only **potentially relevant**.
		2. Most organizations use ABC as a **supplement to rather than a replacement for** their existing cost system. Maintaining two cost systems is costlier than maintaining just one system and it may cause confusion about which set of numbers is to be relied on.
1. **Appendix 7A: ABC action analysis** (slide 54 is a title slide)

*Learning Objective 6: Prepare an action analysis report using activity-based costing data and interpret the report.*

 55

#### Key definitions/concepts

* + 1. A conventional ABC analysis does not identify potentially relevant costs. An **action analysis report** can help in this regard because it shows what costs have been assigned to a cost object and it indicates how difficult it would be to adjust those costs in response to changes in the level of activity.

 56

#### Baxter Battery – revisited

* + 1. **The first-stage allocation** **process**
			1. In addition to computing an overall activity rate for each activity cost pool, **an activity rate is computed for each type of overhead cost** that is consumed supporting a given activity.

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* + - * 1. For example, the customer orders activity has **six activity rates** that sum to the total of **$452** from the conventional ABC analysis.

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* + 1. **The second-stage allocation** **process** (this stage requires assigning product costs by **each type of overhead cost.)**

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* + - 1. In the Baxter Battery illustration, there are, for example, **six activity cost assignments** from the customer orders activity to the SureStart batteries. These six assignments total **$1,808,000** as in the conventional ABC analysis.

 59

* + - * 1. Notice, the total ABC costs assigned to SureStart batteries is **$4,928,000** which is the same as in the conventional ABC analysis.
			1. As another example, there are **six assignments** from the design changes activity to the LongLife batteries. These six assignments total **$3,040,000** as in the conventional ABC analysis.

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* + - * 1. Notice, the total ABC costs assigned to the LongLife batteries is **$7,832,000** which is the same as in the conventional ABC analysis.
		1. Labeling costs using an **ease of adjustment code**
			1. Key definitions

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* + - * 1. **Green costs** adjust more or less automatically to changes in activity level without any action by managers.

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For example, direct materials cost would automatically change in response to changes in activity level without management action.

* + - * 1. **Yellow costs** can be adjusted to changes in activity level, but it would require management action to realize the change in cost.

For example, direct and indirect labor may be classified as yellow costs because management action would be required to hire or layoff employees.

* + - * 1. **Red costs** can be adjusted to changes in activity level only with a great deal of difficulty and with management intervention.

 61

For example, a factory building lease would be a red cost because it would be very difficult and expensive to break the lease.

* + - 1. Calculating Baxter Battery’s **green, yellow, and red margins**.
				1. The green, yellow, and red margins for the LongLife batteries would be **$11,700,000**, **$478,000**, and **($1,132,000)**, respectively.

In this example, before managers would decide to eliminate the LongLife batteries product line, they would need to commit to taking management action where required to reduce costs or redeploy resources.

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1. **Appendix 7B: using a modified form of activity-based costing to determine product costs for external reports** (slide 63 is the title slide)

*Learning Objective 7: Use activity-based costing techniques to compute unit product costs for external reports.*

 64

#### Key definitions/concepts

* + 1. A modified form of activity-based costing can be used to develop product costs for **external financial reports**. With this approach, ABC:
			1. **Includes all manufacturing costs,** such as organization-sustaining costs and unused capacity costs, in product costs.

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* + - 1. **Excludes all nonmanufacturing costs** even if they are clearly caused by the products.

#### Simmons Industries – a traditional approach

* + 1. Assume the following information for the company as a whole and for its only two products—deluxe and standard hedge trimmers.

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* + 1. If we assume that Simmons’ traditional cost system relies on one predetermined **plantwide overhead rate** with **direct labor-hours** as the allocation base, then its plantwide overhead rate (**$4.50 per direct labor-hour**) would be computed as shown.

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* + 1. Simmons’ traditional cost system would report unit product costs as shown. Notice:
			1. The deluxe product line is assigned **$9.00** of overhead cost per unit (2.0 DLH × $4.50 per hour).

 68

* + - 1. The standard product line is assigned **$4.50** of overhead cost per unit (1.0 DLH × $4.50 per hour).

#### Simmons Industries – an ABC approach

* + 1. Assume that Simmons assigned its **$1,800,000** of manufacturing overhead costs to three activities with expected activity levels as shown.

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* + 1. The **activity rates** for each of the three activities would be computed as shown.

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* + 1. The **overhead cost assignments** to the deluxe and standard product lines are computed as shown. Notice:

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* + - 1. All manufacturing overhead has been assigned to products (**$1,130,000 + $670,000 = $1,800,000**).
		1. The **activity-based unit product costs** for both product lines are computed as shown. Notice:

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* + - 1. The manufacturing overhead per unit for both products is computed by taking the total overhead assigned to that product and dividing it by the number of units produced.

 73

#### Simmons Industries – comparing the two approaches

* + 1. The difference in unit product costs between the two methods is as shown. Notice, the ABC unit product cost for the deluxe (standard) product line is higher (lower) than what was computed using the traditional cost system. This is because:

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* + - 1. The ABC system contains **two non-volume-related cost pools**—“setting up machines” which is a batch-level activity and “parts administration” which is a product-level activity.
			2. The ABC system accurately assigned these costs to products in a way that **shifted costs from the high volume product (standard) to the low volume product (deluxe)**.