

## Unit 12 Activity-Based Costing

### **ILO1 Understanding ABC**

### **ILO2. Designing an Activity-Based Costing (ABC) System**

#### **ILO1 Understanding ABC**

The purpose of the Activity based costing system is to give managers the strategic information they need relating to cost, and production. It also provides insight into both fixed and variable costs. Its place in an organization is to support already existing financial systems, rather than as a substitute for them. As additional support it highlights its differences with the more traditional cost accounting in a number of ways.

- Both manufacturing, and nonmanufacturing costs can be allocated to products from a cause and effect position. ABC systems allocate commissions, postage fees and warranty repair costs to products.
- Certain manufacturing costs are not assigned to particular products.
  - ABC allocates costs to a product only if changes to the product; size, packaging etc cause changes in its costs
  - ABC does not include any unused capacity costs (also referred to as idle capacity costs), and organization sustaining costs.
- A variety of overhead cost pools are considered, and assigned to products and other cost objects depending on their level and degree of activity.

These cost pools compliment the production activities used by an organization which uses up resources. As the extent of production activity that is carried out in any manufacturing organization can be numerous, so to the cost pools must be numerous to adequately cover all the departments where value added production takes place.

Contrast to this, the traditional cost system relies on direct labour hours, and in the case of automation, machine hours to determine overhead costs. The ABC system has its own measure of activity.

- Direct labour and machine hours function best when they change consistently with changes to the base quantity of hour used when assigning overhead costs.
- This methodology is often heavily scrutinized as direct labour and overhead costs can move in opposite directions, and as companies embrace economies of scope and increase the variety of products they produce.

#### **ILO2. Designing an Activity-Based Costing (ABC) System**

We begin our exploration into the design of ABC and its application by describing the criteria necessary for successful implementation.

From the onset, senior managers must fully support the system. Without this leadership backing, middle managers and subordinates may lack the motivation to embrace the change. Furthermore, top managers must ensure that ABC data is tied to performance evaluation and reward systems. If employees are evaluated using traditional cost data they may develop the impression that ABC is an inferior process and reject it. To facilitate a smooth transition, a

cross functional team should create and implement the system. This team should be extremely knowledgeable of company operations in order to design an effective ABC system. Taking advantage of such personnel can help reduce any friction middle managers may have in adopting the new approach.

To successfully apply an ABC system, we consider the following five steps used by our company Halley Superconductors.

Halley Superconductor Company Income Statement Year Ended December 31, 2017		
Sales		\$ 50,000,000
Cost of goods sold		
Direct materials	\$ 15,000,000	
Direct labor	12,000,000	
Manufacturing overhead	14,000,000	41,000,000
Gross margin		9,000,000
Selling and administrative expenses		
Shipping expense	3,000,000	
Marketing expense	2,000,000	
General administrative expense	6,000,000	11,000,000
Net operating loss		\$ (2,000,000)

Fig 12.1 Halley Superconductor Income Statement

Halley's main focus is the production of 2 types of conductor. The first is the standard conductor; Beam, while the premium grade conductor is iWave. From the information found in the income statement, Halley has reported a \$2mn loss. We begin our application of the ABC now.

The first step is the creation of activity cost pools. To accurately do this, production activities must be clearly defined, with time this number and degree of activities is often reduced and combined with similar activities. For Halley, we have determined the following activity measures;

- Custom Orders – Costs of resources used in receiving and processing orders are assigned
- Design Changes – Costs of resources used to satisfy customer design requests, are assigned
- Order Size – Cost of resources which are used to complete the number of units produced
- Customer Relations – Costs of resources from the maintenance of customers relations are assigned
- Other – Costs relating to organization sustainment, and unused capacity costs are assigned

The second step is to assign overhead costs to activity cost pools. To make this determination for Halley Company, we need to include some additional information. Halley's overhead costs for both manufacturing, and nonmanufacturing which they intend to assign to the activity cost pools are described below.

- Production department has determined total costs of \$14,000,000, equal to manufacturing overhead costs found in the income statement

- General Administrative and Marketing Departments find total costs to be \$6,000,000 and \$2,000,000 respectively
- Direct materials, labour, and shipping costs are omitted as they can be traced by their current cost system to costs associated with products or customer orders.

Overhead Costs at Halley Superconductor (Manufacturing and Nonmanufacturing)			
<b>Production Department</b>			
Indirect factory wages	\$ 6,000,000		
Factory equipment depreciation	3,500,000		
Factory utilities	2,500,000		
Factory building lease	2,000,000	\$ 14,000,000	
<b>General Administrative Department</b>			
Administrative wages and salaries	4,000,000		
Office equipment depreciation	900,000		
Administrative building lease	1,100,000	6,000,000	
<b>Marketing Department</b>			
Marketing wages and salaries	1,500,000		
Selling expenses	500,000	2,000,000	
<b>Total overhead costs</b>		<b>\$ 22,000,000</b>	

Fig 12.2 Overhead Costs

We expand on this allocation, by finding additional resources costs through manager and employee feedback.

- Indirect factory workers divide their time in the following proportions.
  - Customer orders activity – 30%
  - Design change activity – 30%
  - Order size activity – 20%
  - Customer relations – 10%
  - Remaining time to “other” activity – 10%
- The company Halley uses a single manufacturing facility with no intention to expand or relocate, so total lease costs are considered as organization sustaining costs. For our purposes, the lease is assigned entirely to “other” activity.

Activity Cost Pools						
	Customer Orders	Design Changes	Order Size	Customer Relations	Other	Total
<b>Production Department</b>						
Indirect factory wages	30%	30%	20%	10%	10%	100%
Factory equipment depreciation	20%	10%	60%	0%	10%	100%
Factory utilities	0%	10%	60%	0%	30%	100%
Factory building lease	0%	0%	0%	0%	100%	100%
<b>General Administrative Department</b>						
Administrative wages and salaries	30%	10%	10%	30%	20%	100%
Office equipment depreciation	30%	10%	0%	20%	40%	100%
Administrative building lease	0%	0%	0%	0%	100%	100%
<b>Marketing Department</b>						
Marketing wages and salaries	30%	10%	0%	50%	10%	100%
Selling expenses	20%	0%	0%	70%	10%	100%

Fig 12.3 Activity Cost Pools

We can progress this second step further by analyzing percentage allocations and assigning them to the activity cost pools.

- Indirect factory wages due to customer order activity (\$1,800,000) was found by calculating the total indirect factory wages (\$6,000,000) and multiplying by the percentage of time these employees spent on this activity (30%).
- Factory equipment depreciation allocated to customer order activity (\$700,000) was found by multiplying the total factory equipment depreciation of \$3,500,000 by the percent of time the equipment was used in operation, 20%.

Customer Orders		Overhead Costs at Baxter Battery (Manufacturing and Nonmanufacturing)	
Production Department		Production Department	
Indirect factory wages	\$ 1,800,000	Indirect factory wages	\$ 6,000,000
Factory equipment depreciation	700,000	Factory equipment depreciation	3,500,000
Factory utilities		Factory utilities	2,500,000
Factory building lease		Factory building lease	2,000,000
			\$ 14,000,000
General Administrative Department		General Administrative Department	
Administrative wages and salaries		Administrative wages and salaries	4,000,000
Office equipment depreciation		Office equipment depreciation	900,000
Administrative building lease		Administrative building lease	1,100,000
			6,000,000
Marketing Department		Marketing Department	
Marketing wages and salaries		Marketing wages and salaries	1,500,000
Selling expenses		Selling expenses	500,000
			2,000,000
Total		Total overhead costs	\$ 22,000,000

Factory equipment depreciation	\$3,500,000
Percent consumed by customer orders	20%
	\$ 700,000

Fig 12.4 Equipment Depreciation Calculation

We can now look at a preliminary draft of allocations.

	Activity Cost Pools					Total
	Customer Orders	Design changes	Order Size	Customer Relations	Other	
<b>Production Department</b>						
Indirect factory wages	\$ 1,800,000	\$ 1,800,000	\$ 1,200,000	\$ 600,000	\$ 600,000	\$ 6,000,000
Factory equipment depreciation	700,000	350,000	2,100,000	-	350,000	3,500,000
Factory utilities	-	250,000	1,500,000	-	750,000	2,500,000
Factory building lease	-	-	-	-	2,000,000	2,000,000
<b>General Administrative Department</b>						
Administrative wages and salaries	1,200,000	400,000	400,000	1,200,000	800,000	4,000,000
Office equipment depreciation	270,000	90,000	-	180,000	360,000	900,000
Administrative building lease	-	-	-	-	1,100,000	1,100,000
<b>Marketing Department</b>						
Marketing wages and salaries	450,000	150,000	-	750,000	150,000	1,500,000
Selling expenses	100,000	-	-	350,000	50,000	500,000
<b>Total</b>	<b>\$ 4,520,000</b>	<b>\$ 3,040,000</b>	<b>\$ 6,200,000</b>	<b>\$ 3,080,000</b>	<b>\$ 6,160,000</b>	<b>\$ 22,000,000</b>

Fig 12.5 Activity Cost Pools

We can now look at our third step in the ABC implementation process which involves calculating activity rates. Again we consider data from Halley for our study. The cross functional team has found activity levels for each activity in our table below. This data allowed the team to calculate the ABC rates for each activity by dividing the total cost in each cost pool by the quantity of the activity measure.

Computation of Activity Rates			
	(a)	(b)	(a) ÷ (b)
Activity Cost Pools	Total Cost	Total Activity	Activity Rate
Customer orders	\$ 4,520,000	10,000 orders	\$452 per order
Design changes	3,040,000	4,000 changes	\$760 per change
Order size	5,200,000	800,000 MHs	\$6.50 per MH
Customer relations	3,080,000	2,000 customers	\$1,540 per customer
Other	6,160,000	Not applicable	Not applicable
<b>Total</b>	<b>\$ 22,000,000</b>		

Fig 12.6 Activity Rate Calculation

For our examples, we find customer order activity cost pool with an activity rate of \$452 per order. Keep in mind, this figure represents an average, as the total customer order cost of \$4,520,000 is distributed across 10,000 orders. The “other” cost pool does not include a total activity rate as it is considered an organization sustaining cost and is assigned to neither product or consumer.

We can now open the ABC system and see cost assignments and activities.

- Direct materials, labour and shipping costs are traced to either products of customer orders
- We maintain the preliminary activity cost pools; customer orders, design changes, order size, customer relations, other activity
- Activity measures have been identified, levels determined, and activity rates calculated for each activity.

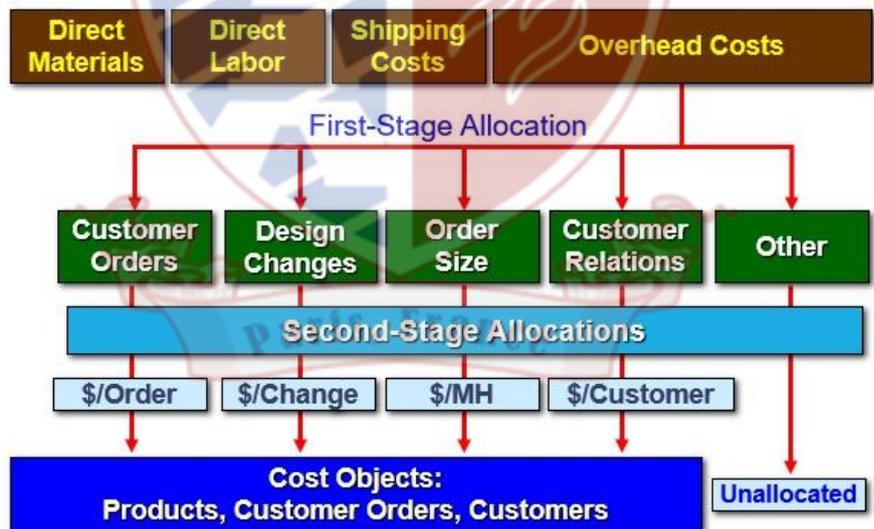


Fig 12.7 Assigning Activity Rates

For step four we assign costs to cost objects. We begin this process by assigning overheads to products. Recall that Halley Company had two main products; conductors Beam, and iWave. We consider the data relating to these two products below.

- Orders for conductor Beam is 4,000
- Orders for conductor iWave is 6,000
- All orders for conductor Beam are custom designed
- Beam uses 480,000 machine hours, iWave uses 320,000

In overhead cost assignment, total costs assigned to Beam amount to \$4,928,000, and for iWave \$7,832,000. The resulting total costs allocated to overheads is \$22,000,000. The additional \$9,240,000 is from overhead costs not assigned to products.

<b>Overhead Cost for Beam</b>			
<i>Activity Cost Pools</i>	(a) <i>Activity Rate</i>	(b) <i>Activity</i>	(a) × (b) <i>ABC Cost</i>
Customer orders	\$ 452.00	4,000	\$ 1,808,000
Design changes	760.00	-	-
Order size	6.50	480,000	3,120,000
<b>Total</b>			<b>\$ 4,928,000</b>

<b>Overhead Cost for iWave</b>			
<i>Activity Cost Pools</i>	(a) <i>Activity Rate</i>	(b) <i>Activity</i>	(a) × (b) <i>ABC Cost</i>
Customer orders	\$ 452.00	6,000	\$ 2,712,000
Design changes	760.00	4,000	3,040,000
Order size	6.50	320,000	2,080,000
<b>Total</b>			<b>\$ 7,832,000</b>

$\$4,928,000 + \$7,832,000 + \$9,240,000 \text{ (not assigned)} = \$22,000,000$

Fig 12.8 Overhead Allocation to Individual Products

We then switch to allocating overheads to customers. For the process, we need the inclusion of a Halley client. For this purpose we will use Acme Computers. We assign overhead costs to Acme for the total amount of \$12,916. We provide the following calculations.

<b>Overhead Cost for Acme Computer</b>			
<i>Activity Cost Pools</i>	(a) <i>Activity Rate</i>	(b) <i>Activity</i>	(a) × (b) <i>ABC Cost</i>
Customer orders	\$ 452.00	12	\$ 5,424
Design changes	760.00	4	3,040
Order size	6.50	448	2,912
Customer relations	1,540.00	1	1,540
<b>Total</b>			<b>\$ 12,916</b>

Fig 12.9 Allocating Overhead Costs to Acme

Our study of the final step will be discussed in Unit 13.

**References:**

1. Managerial accounting, Ray Garrison-Eric Noreen-Peter Brewer - McGraw-Hill Education, 16 ed., 2018
2. Managerial accounting, John Wild-Ken Shaw - McGraw-Hill Education, 7ed, 2019

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