GLOBAL EDITION

Weygandt's MANAGERIAL ACCOUNTING

TOOLS FOR BUSINESS DECISION MAKING

JERRY WEYGANDT
PAUL KIMMEL
DONALD KIESO

WILEY

4 Activity-Based Costing

Learning Objectives

- 4.1 Discuss the difference between traditional costing and activity-based costing.
- 4.2 Apply activity-based costing to a manufacturer.
- 4.3 Explain the benefits and limitations of activity-based costing.
- 4.4 Apply activity-based costing to service industries.

LEARNING OBJECTIVE 4.1

Discuss the difference between traditional costing and activity-based costing.

Traditional Costing Systems

- Allocates overhead using a **predetermined rate**.
  - **Job order costing**: direct labor cost may be the relevant activity base.
  - **Process costing**: machine hours may be the relevant activity base.

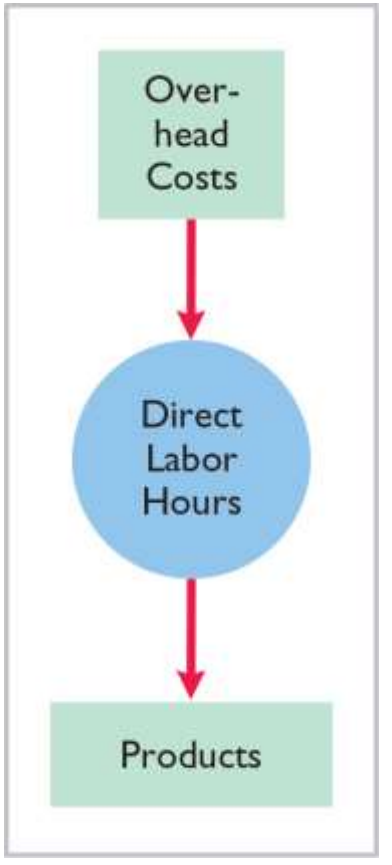
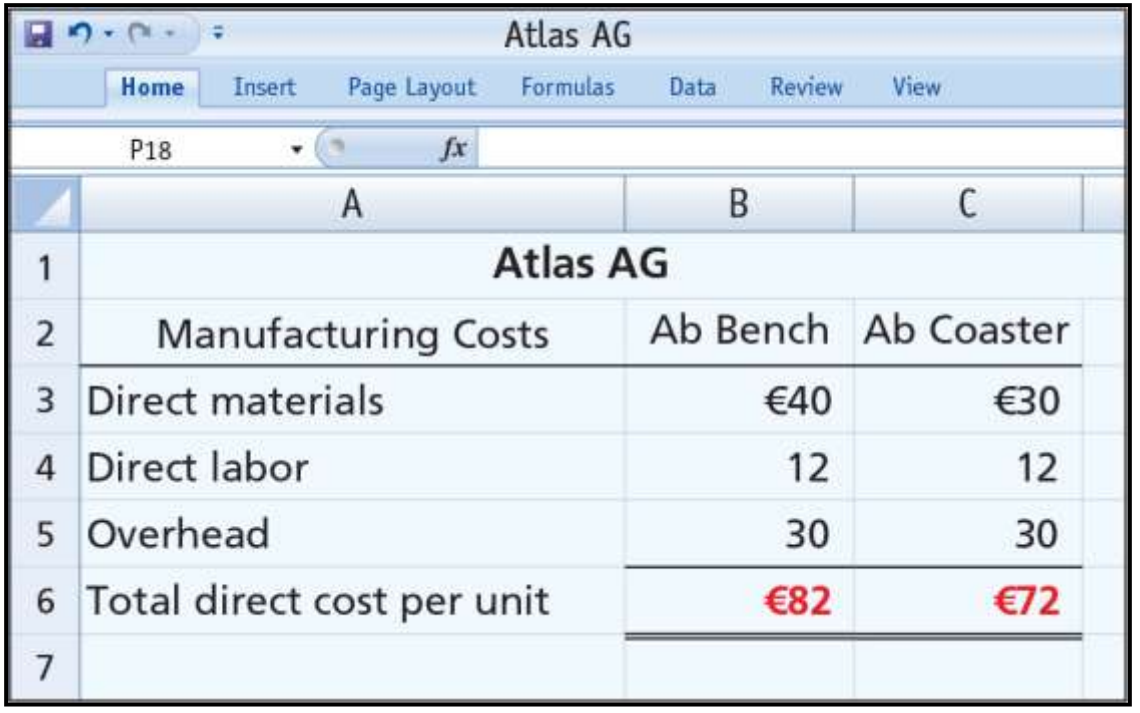


Illustration 4-1
Traditional one-stage costing system

LO 1

Illustration of a Traditional Costing System

Atlas AG produces two abdominal fitness products—the Ab Bench and the Ab Coaster. The direct materials cost per unit is €40 for the Ab Bench and €30 for the Ab Coaster. The direct labor cost is €12 per unit for each product. Both products require one direct labor hour per unit, both products are allocated overhead cost of €30 per unit.



	A	B	C
1	**Atlas AG**		
2	Manufacturing Costs	Ab Bench	Ab Coaster
3	Direct materials	€40	€30
4	Direct labor	12	12
5	Overhead	30	30
6	Total direct cost per unit	€82	€72
7			

Illustration 4-3
Total unit costs—traditional costing

LO 1

The Need for a New Approach

- Tremendous change in manufacturing and service industries.
- Decrease in amount of direct labor usage.
- Significant increase in total overhead costs.
- Inappropriate to use plantwide predetermined overhead rates when a lack of correlation exists.
- Complex manufacturing processes may require multiple allocation bases; this approach is called **activity-based costing (ABC)**.

LO 1

Activity-Based Costing

An approach for allocating overhead costs.

- Allocates overhead to multiple activity cost pools.
- Assigns the activity cost pools to products or services by means of cost drivers.

KEY CONCEPTS

ACTIVITY. Any event, action, transaction, or work sequence that incurs costs when producing a product or performing a service.

ACTIVITY COST POOL. The overhead cost attributed to a distinct activity (e.g., ordering materials or setting up machines).

COST DRIVER. Any factor or activity that has a direct cause-effect relationship with the resources consumed.

LO 1

Activity-Based Costing (Four Steps)

1. Identify and classify the activities involved in the manufacture of specific products and assign overhead to cost pools.

2. Identify the cost driver that has a strong correlation to the costs accumulated in each cost pool.

3. Compute the activity-based overhead rate for each cost pool.

4. Allocate overhead costs to products using the overhead rates determined for each cost pool.

LO 1

Activity-Based Costing

ABC allocates overhead in a two-stage process:

- **Stage 1:** Overhead costs are assigned to activity cost pools (Step 1).
- **Stage 2:** Allocates overhead assigned to the activity cost pools to products, using cost drivers (Steps 2-4).

The more complex a product's manufacturing operation, the more activities and cost drivers are likely to be present.

LO 1

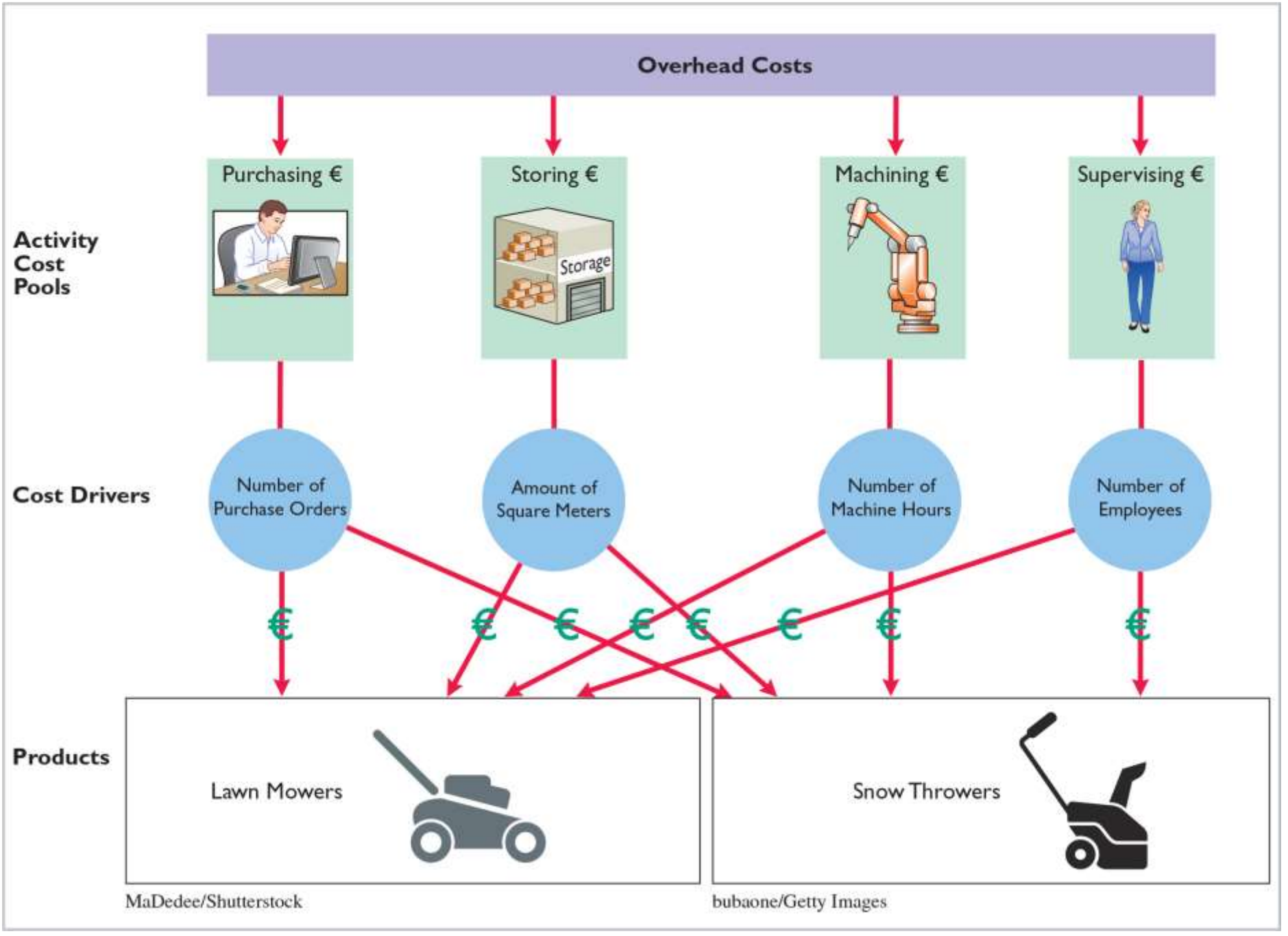


Illustration 4-5
Activities and related cost drivers

LO 1

DO IT! 4.1 Costing Systems

Indicate whether the following statements are true or false.

1. A traditional costing system allocates overhead by means of multiple overhead rates.
2. Activity-based costing allocates overhead costs in a two-stage process.
3. Direct material and direct labor costs are easier to trace to products than overhead.
4. As manufacturing processes have become more automated, more companies have chosen to allocate overhead on the basis of direct labor costs.
5. In activity-based costing, an activity is any event, action, transaction, or work sequence that incurs cost when producing a product.

Solution: 1. F 2. T 3. T 4. Fa 5. Tr

LO 1

LEARNING OBJECTIVE 4.2

Apply activity-based costing to a manufacturer.

Activity-Based Costing

Involves the following **four steps**.

1. **Identify and classify the activities** involved in the manufacture of specific products and **assign overhead to cost pools**.
2. **Identify the cost driver** that has a strong correlation to the costs accumulated in each cost pool.
3. **Compute the activity-based overhead rate** for each cost pool.
4. **Allocate overhead costs to products**, using the overhead rates determined for each cost pool.

LO 2

Identify and Classify Activities and Allocate Overhead to Cost Pools (Step 1)

Overhead costs are assigned directly to the appropriate activity cost pool.

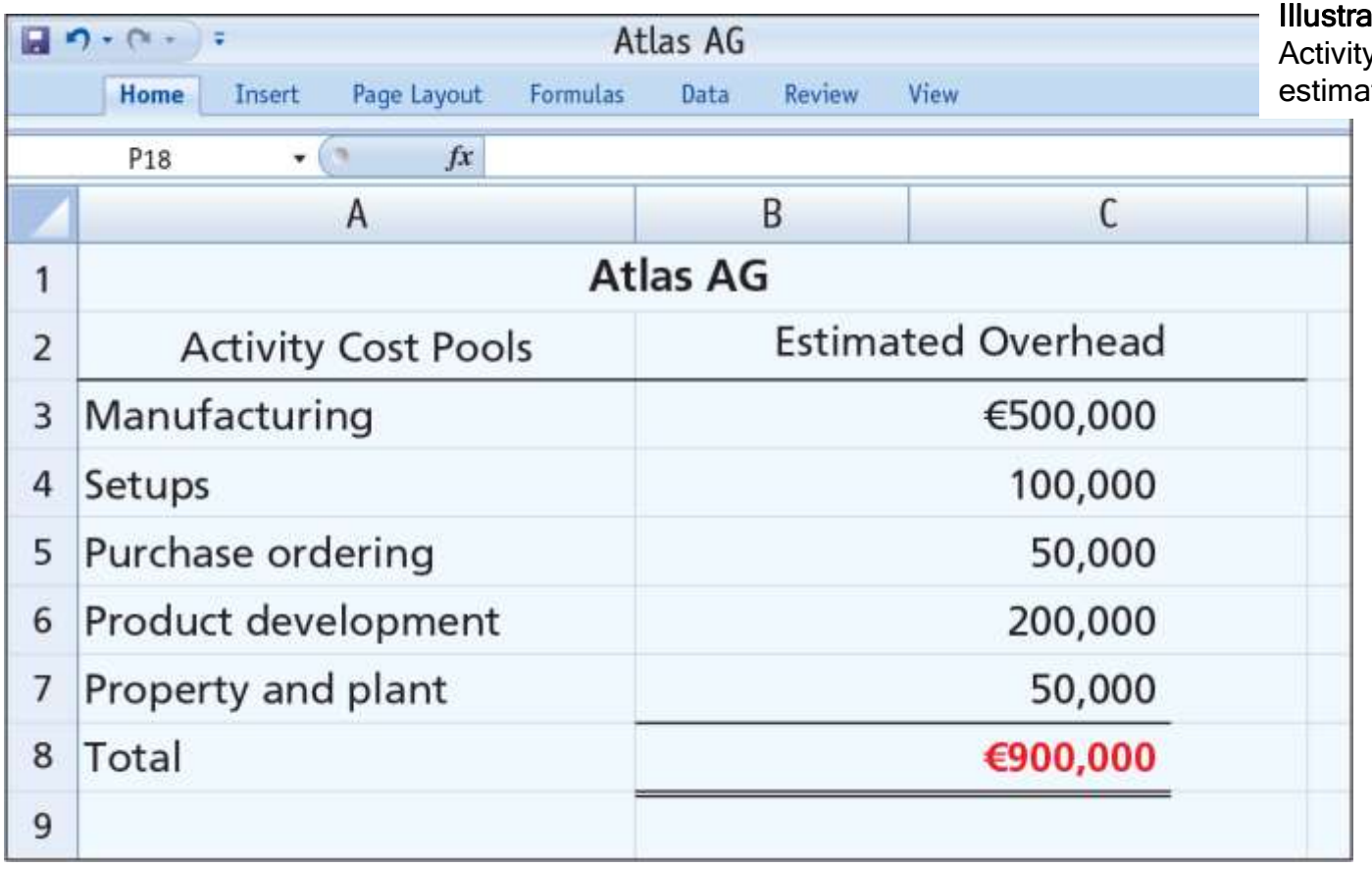


Illustration 4-6
Activity cost pools and estimated overhead

LO 2

Identify Cost Drivers (Step 2)

Cost driver must accurately measure the actual consumption of the activity by the various products.

Illustration 4-7: Cost drivers that Atlas AG identifies and their total expected use per activity cost pool.

Illustration 4-7

Activity Cost Pools	Cost Drivers	Estimated Use of Cost Drivers per Activity
Manufacturing	Machine hours	50,000 machine hours
Setups	Number of setups	2,000 setups
Purchase ordering	Number of purchase orders	2,500 purchase orders
Product development	Products developed	2 products developed
Property and plant	Square meters	25,000 square meters

LO 2

Compute Activity-Based Overhead Rates (Step 3)

Next, the company computes an **activity-based overhead rate** per cost driver.

Illustration 4-8

$$\frac{\text{Estimated Overhead per Activity}}{\text{Estimated Use of Cost Drivers per Activity}} = \text{Activity-Based Overhead Rate}$$

Illustration 4-9

Atlas AG

	A	B	C	D	E	F
1	Atlas AG					
2	Activity Cost Pools	Estimated Overhead	÷	Estimated Use of Cost Drivers per Activity	=	Activity-Based Overhead Rates
3	Manufacturing	€500,000		50,000 machine hours		€10 per machine hour
4	Setups	100,000		2,000 setups		€50 per setup
5	Purchase ordering	50,000		2,500 purchase orders		€20 per order
6	Product development	200,000		2 products developed		€100,000 per product
7	Plant and property	50,000		25,000 square meters		€2 per square meter
8	Total	€900,000				
9						

LO 2

Allocate Overhead Costs to Products (Step 4)

In allocating overhead costs, it is necessary to know the expected use of cost drivers **for each product**. Because of its low volume and higher number of components, the Ab Coaster requires more setups and purchase orders than the Ab Bench.

Activity Cost Pools	Cost Drivers	Estimated Use of Cost Drivers per Activity	Estimated Use of Cost Drivers per Product	
			Ab Bench	Ab Coaster
Manufacturing	Machine hours	50,000 machine hours	30,000	20,000
Setups	Number of setups	2,000 setups	500	1,500
Purchase ordering	Number of purchase orders	2,500 purchase orders	750	1,750
Product development	Products developed	2 products developed	1	1
Property and plant	Square meters	25,000 square meters	10,000	15,000

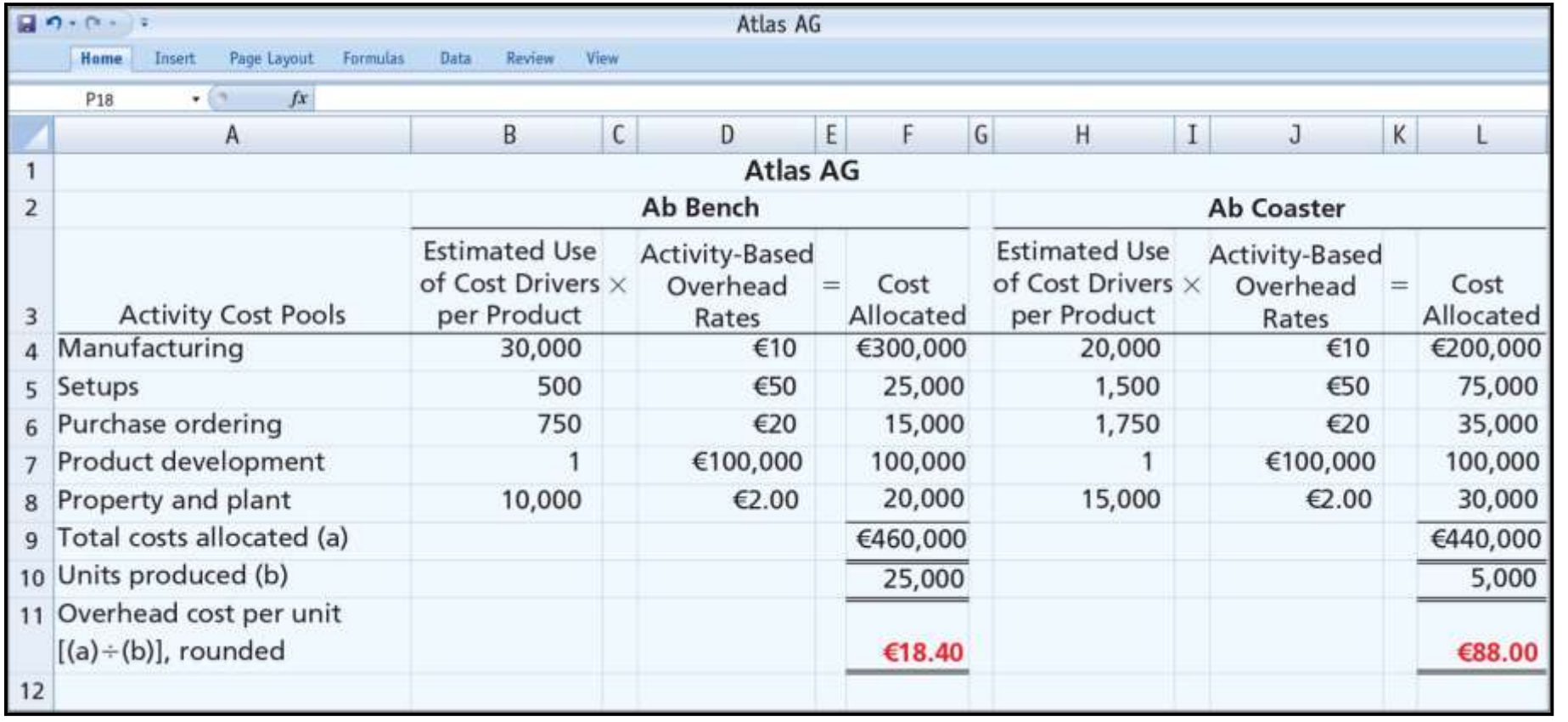
Illustration 4-10
Expected use of cost drivers per product

LO 2

Allocate Overhead Costs to Products (Step 4)

To allocate overhead costs, Atlas multiplies the activity-based overhead rates per cost driver (Ill. 4-9) by the number of cost drivers expected to be used per product (Ill. 4-10).

Illustration 4-11
Allocation of activity cost pools to products



Atlas AG

Home | Insert | Page Layout | Formulas | Data | Review | View

P18

	A	B	C	D	E	F	G	H	I	J	K	L
1	Atlas AG											
2		Ab Bench						Ab Coaster				
3	Activity Cost Pools	Estimated Use of Cost Drivers per Product	×	Activity-Based Overhead Rates	=	Cost Allocated		Estimated Use of Cost Drivers per Product	×	Activity-Based Overhead Rates	=	Cost Allocated
4	Manufacturing	30,000		€10		€300,000		20,000		€10		€200,000
5	Setups	500		€50		25,000		1,500		€50		75,000
6	Purchase ordering	750		€20		15,000		1,750		€20		35,000
7	Product development	1		€100,000		100,000		1		€100,000		100,000
8	Property and plant	10,000		€2.00		20,000		15,000		€2.00		30,000
9	Total costs allocated (a)					€460,000						€440,000
10	Units produced (b)					25,000						5,000
11	Overhead cost per unit [(a)÷(b)], rounded					€18.40						€88.00
12												

LO 2

Comparing Unit Costs

Manufacturing Costs	Ab Bench		Ab Coaster	
	Traditional Costing	ABC	Traditional Costing	ABC
Direct materials	€40.00	€40.00	€30.00	€ 30.00
Direct labor	12.00	12.00	12.00	12.00
Overhead	30.00	18.40	30.00	88.00
Total direct cost per unit	**€82.00**	**€70.40**	**€72.00**	**€130.00**
	Overstated €11.60		**Understated €58.00**	

Illustration 4-12
Comparison of unit product costs

Likely consequence of differences in assigning overhead.

- **Overpricing the Ab Bench** and possibly losing market share to competitors.
- Sacrificing profitability by **underpricing the Ab Coaster.**

LO 2

DO IT! 4.2 Apply ABC to Manufacturer

Zhou Automotive has five activity cost pools and two products. It expects to produce 200,000 units of its automobile scissors jack and 80,000 units of its truck hydraulic jack. Having identified its activity cost pools and the cost drivers for each cost pool, Zhou accumulated the following data relative to those activity cost pools and cost drivers.

Annual Overhead Data				Estimated Use of Cost Drivers per Product	
Activity Cost Pools	**Cost Drivers**	**Estimated Overhead**	**Estimated Use of Cost Drivers per Activity**	**Scissors Jacks**	**Hydraulic Jacks**
Ordering and receiving	Purchase orders	HK$ 2,000,000	2,500 orders	1,000	1,500
Machine setup	Setups	6,000,000	1,200 setups	500	700
Machining	Machine hours	20,000,000	800,000 hours	300,000	500,000
Assembling	Parts	18,000,000	3,000,000 parts	1,800,000	1,200,000
Inspecting and testing	Tests	7,000,000	35,000 tests	20,000	15,000
		HK$53,000,000			

LO 2

DO IT! 4.2 Apply ABC to Manufacturer

Zhou Automotive has five activity cost pools and two products. It expects to produce 200,000 units of its automobile scissors jack and 80,000 units of its truck hydraulic jack. Having identified its activity cost pools and the cost drivers for each cost pool, Zhou accumulated the following data relative to those activity cost pools and cost drivers.

Using the data provided,

a. Prepare a schedule showing the computations of the activity-based overhead rates per cost driver.

b. Prepare a schedule assigning each activity's overhead cost to the two products.

c. Compute the overhead cost per unit for each product.

d. Comment on the comparative overhead cost per unit.

DO IT! 4.2 Apply ABC to Manufacturer

Annual Overhead Data				Estimated Use of Cost Drivers per Product	
Activity Cost Pools	**Cost Drivers**	**Estimated Overhead**	**Estimated Use of Cost Drivers per Activity**	**Scissors Jacks**	**Hydraulic Jacks**
Ordering and receiving	Purchase orders	HK$ 2,000,000	2,500 orders	1,000	1,500
Machine setup	Setups	6,000,000	1,200 setups	500	700
Machining	Machine hours	20,000,000	800,000 hours	300,000	500,000
Assembling	Parts	18,000,000	3,000,000 parts	1,800,000	1,200,000
Inspecting and testing	Tests	7,000,000	35,000 tests	20,000	15,000
		HK$53,000,000			

a. Prepare a schedule showing the computations of the activity-based overhead rates per cost driver.

Activity Cost Pools	Estimated Overhead	÷	Estimated Use of Cost Drivers per Activity	=	Activity-Based Overhead Rates
Ordering and receiving					
Machine setup					
Machining					
Assembling					
Inspecting and testing					

LO 2

DO IT! 4.2

b. Prepare a schedule assigning each activity's overhead cost to the two products.

Annual Overhead Data				Estimated Use of Cost Drivers per Product	
Activity Cost Pools	Cost Drivers	Estimated Overhead	Estimated Use of Cost Drivers per Activity	Scissors Jacks	Hydraulic Jacks
Ordering and receiving	Purchase orders	HK$ 2,000,000	2,500 orders	1,000	1,500
Machine setup	Setups	6,000,000	1,200 setups	500	700
Machining	Machine hours	20,000,000	800,000 hours	300,000	500,000
Assembling	Parts	18,000,000	3,000,000 parts	1,800,000	1,200,000
Inspecting and testing	Tests	7,000,000	35,000 tests	20,000	15,000
		HK$53,000,000			

	Scissors Jacks				Hydraulic Jacks			
Activity CostPools	Estimated Use of Cost Drivers per Product	×	Activity-Based Overhead Rates	= Cost Assigned	Estimated Use of Cost Drivers per Product	×	Activity-Based Overhead Rates	= Cost Assigned
Ordering and receiving	1,000				1,500			
Machine setup	500				700			
Machining	300,000				500,000			
Assembling	1,800,000				1,200,000			
Inspecting and testing	20,000				15,000			
Total assigned costs								

LO 2

DO IT! 4.2 Apply ABC to Manufacturer

c. Compute the overhead cost per unit for each product.

	Scissors Jack	Hydraulic Jack
Total costs assigned	HK$25,600,000	HK$27,400,000
Total units produced	200,000	80,000
Overhead cost per unit	HK$ 128.00	HK$ 342.50

d. Comment on the comparative overhead cost per unit.

These data show that the total overhead assigned to 80,000 hydraulic jacks exceeds the overhead assigned to 200,000 scissors jacks. The overhead cost per hydraulic jack is HK$342.50. It is only HK$128.00 per scissors jack.

LEARNING OBJECTIVE 4.3

Explain the benefits and limitations of activity-based costing.

ABC has three primary benefits:

1. More cost pools, therefore more accurate product costing.
2. Enhanced control over overhead costs.
3. Better management decisions.

The Advantage of Multiple Cost Pools

Multiple cost pools

- Used instead of one plantwide pool and a single cost driver.
- Numerous activity cost pools with more relevant cost drivers.
  - Costs allocated on basis of cost drivers used to produce each product.

LO 3

The Advantage of Multiple Cost Pools

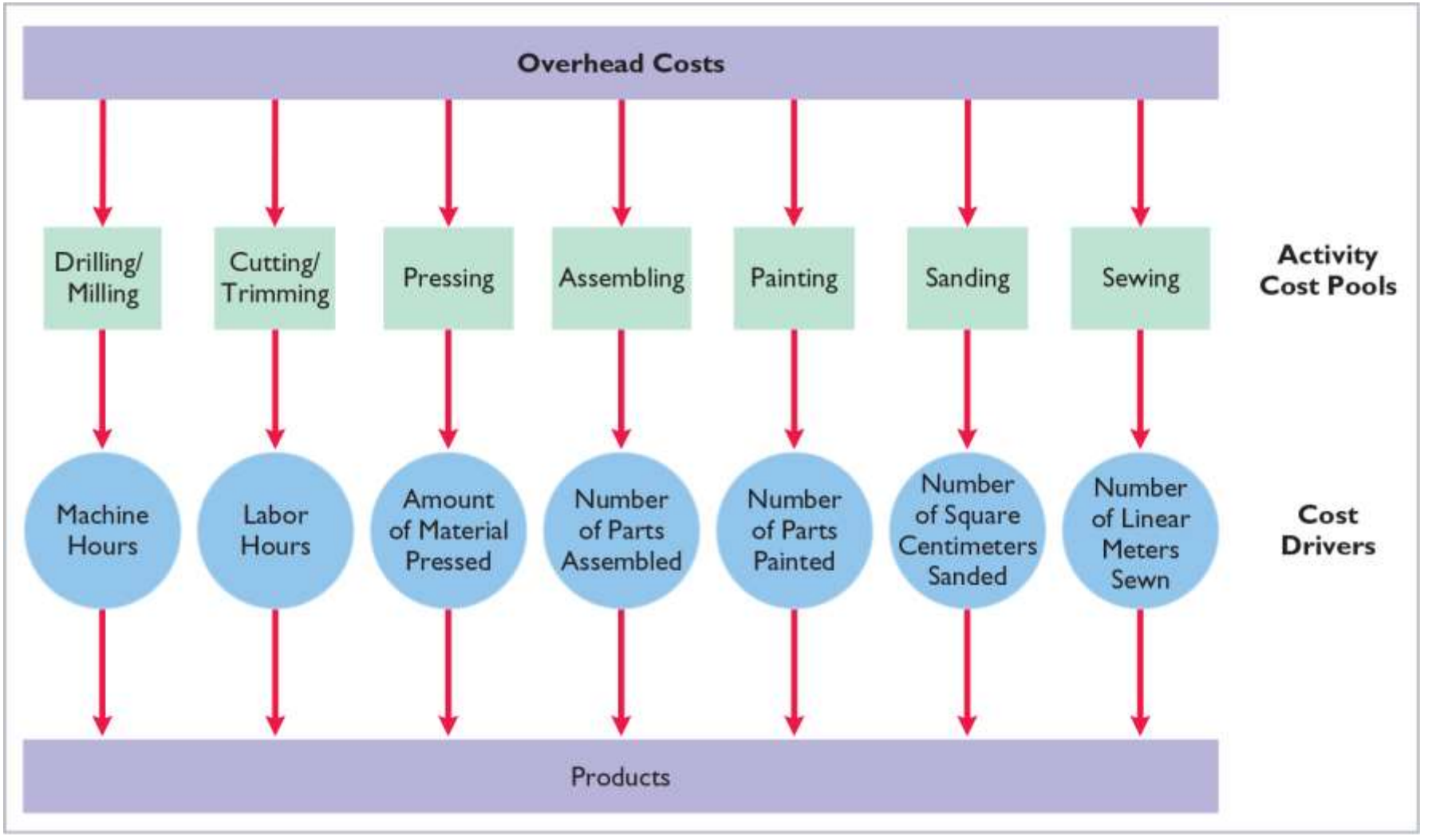
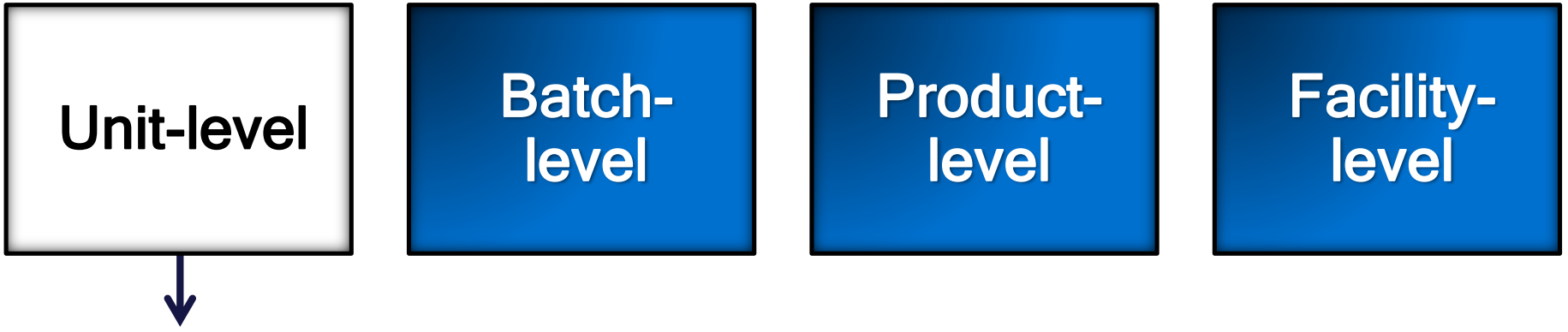


Illustration 4-13
A more detailed view of Atlas's machining activities

LO 3

The Advantage of Multiple Cost Pools

CLASSIFICATION OF ACTIVITY LEVELS

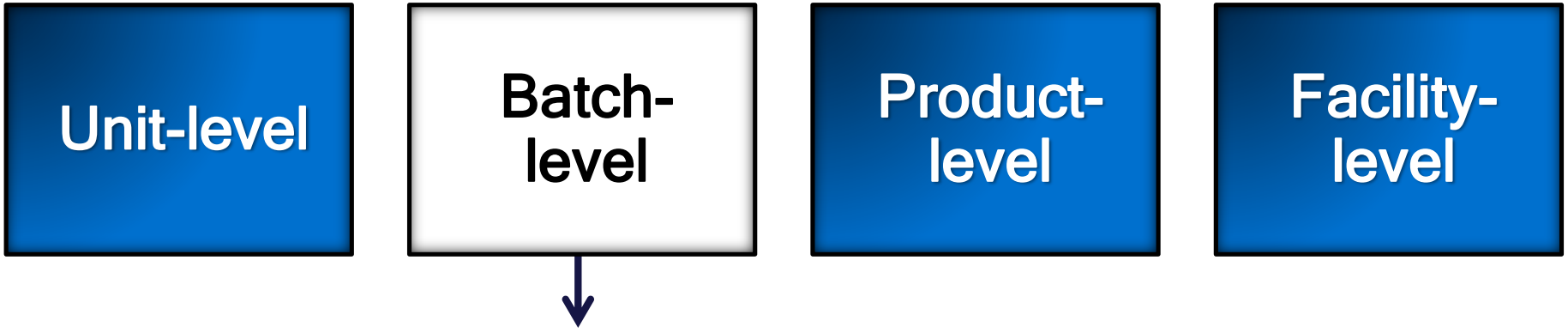


- Performed for each unit of production.
  - Example: Assembly of cell phones

LO 3

The Advantage of Multiple Cost Pools

CLASSIFICATION OF ACTIVITY LEVELS

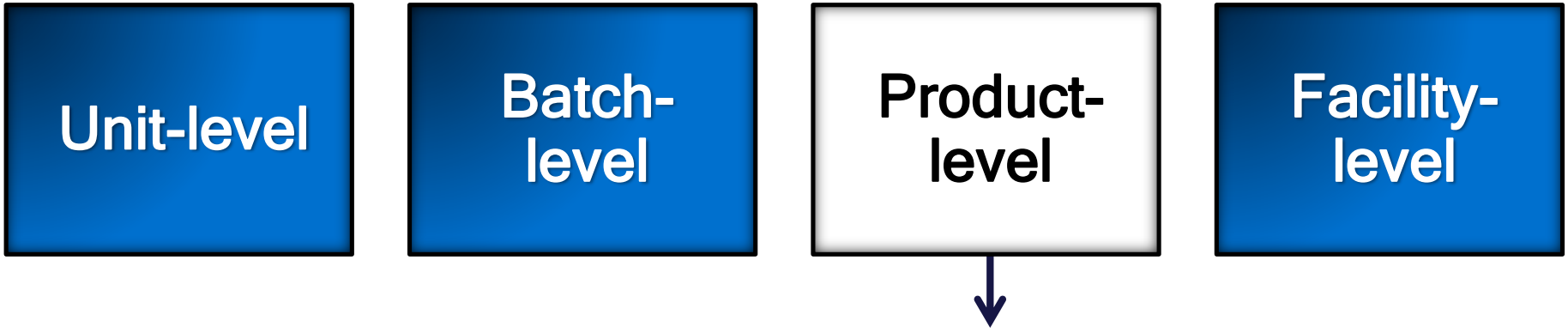


- Performed every time a company produces another batch of a product.
  - Example: Batch of ice cream

LO 3

The Advantage of Multiple Cost Pools

CLASSIFICATION OF ACTIVITY LEVELS

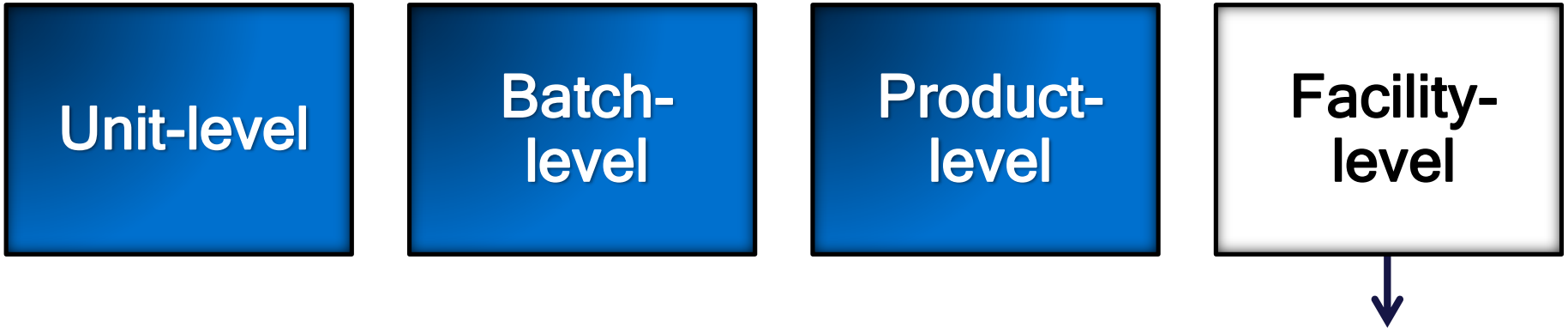


- Performed every time a company produces a new type of product.
  - Example: Time spent testing a new drug by a pharmaceutical company

LO 3

The Advantage of Multiple Cost Pools

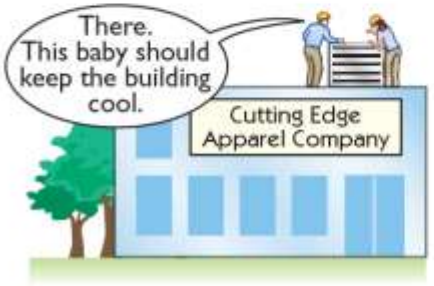
CLASSIFICATION OF ACTIVITY LEVELS



- Required to support or sustain an entire production process.
  - Example: A hospital

LO 3

Illustration 4-14
Hierarchy of activity levels

Four Levels	Types of Activities	Examples of Cost Drivers
Unit-Level Activities		
	Machine-related Drilling, cutting, milling, trimming, pressing	Machine hours
	Labor-related Assembling, painting, sanding, sewing	Direct labor hours or cost
Batch-Level Activities		
	Equipment setups	Number of setups or setup time
	Purchase ordering	Number of purchase orders
	Inspection	Number of inspections or inspection time
	Materials handling	Number of material moves
Product-Level Activities		
	Product design	Number of product designs
	Engineering changes	Number of changes
Facility-Level Activities		
	Plant management salaries	Number of employees managed
	Plant depreciation	Square meters
	Property taxes	Square meters
	Utilities	Square meters

LO 3

The Advantage of Enhanced Cost Control

Value-Added Activities

Increase the perceived value of a product or service to customers, such as:

Manufacturing Company	Service Company
Engineering design	Performing surgery
Machining services	Legal research
Assembly	Delivering packages
Painting	

LO 3

The Advantage of Enhanced Cost Control

Non-Value-Added Activities

Adds cost to, or **increases the time spent** on, a product/service without increasing its perceived value, such as:

Manufacturing Company	Service Company
Storage of inventory	Taking appointments
Moving of inventory	Reception
Inspections	Bookkeeping and billing
Fixing defective goods	Traveling
Set up machines	Ordering supplies
	Advertising

Advantage of Better Management Decisions

Activity-based management (ABM), a management tool that focuses on reducing costs and improving processes and decision-making.

Managers use ABC via ABM

- for both strategic and operational decisions or perspectives.
- to help managers evaluate employees, departments, and business units.
- to establish performance standards, as well as benchmark against other companies.

LO 3

Limitations and Knowing When to use ABC

Limitations

- Expensive to use.
- Arbitrary allocations remain.

When to Use

1. Product lines differ in volume and manufacturing complexity.
2. Product lines are numerous and diverse.
3. Overhead costs constitute a significant portion of total costs.
4. Manufacturing process or the number of products has changed significantly.
5. Production or marketing managers are ignoring data.

LO 3

DO IT! 4.3 Classify Activity Levels

Xiaorong Toys manufactures six primary product lines in its Hong Kong plant. As a result of an activity analysis, the accounting department has identified eight activity cost pools. Each of the toy products is produced in large batches, with the whole plant devoted to one product at a time. Classify each of the following activities as either unit-level, batch-level, product-level, or facility-level:

a. Engineering design
b. Machine setup
c. Toy design
d. Interviews of prospective employees
e. Inspections after each setup
f. Polishing parts
g. Assembling parts
h. Health and safety

a. Product-level
b. Batch-level
c. Product-level
d. Facility-level
e. Batch-level
f. Unit-level
g. Unit-level
h. Facility-level

LO 3

LEARNING OBJECTIVE 4.4

Apply activity-based costing to service industries.

Overall objective: Identify key activities that generate costs and keep track of how many of those activities are completed for each service performed.

- General approach is to identify activities, cost pools, and cost drivers.
- Labeling of activities as value-added or non-value-added.
- Sometimes, a larger proportion of overhead costs are company-wide costs that cannot be directly traced to specific services provided by the company.

Traditional Costing Example

The accounting firm of Check and Doublecheck prepares the following condensed annual budget.

Check and Doublecheck
Annual Budget

Revenue		£4,000,000
Direct labor	£1,200,000	
Overhead (estimated)	600,000	
Total costs		1,800,000
Operating income		£2,200,000

$$\frac{\text{Estimated overhead}}{\text{Direct labor cost}} = \text{Predetermined overhead rate}$$

$$\frac{£600,000}{£1,200,000} = 50\%$$

Illustration 4-16 Condensed annual budget of a service firm under traditional costing

LO 4

Traditional Costing Example

Assume that Check and Doublecheck records £140,000 of actual direct professional labor cost during its audit of Plano Molding, which was billed an audit fee of £260,000. Under traditional costing, using 50% as the rate for applying overhead to the job, Check and Doublecheck would compute applied overhead and operating income as shown in Illustration 4-17.

Illustration 4-17

Check and Doublecheck
Plano Molding Audit

Revenue		£260,000
Less: Direct professional labor	£140,000	
Applied overhead (50% × £140,000)	70,000	210,000
Operating income		£ 50,000

LO 4

Activity-Based Costing Example

Check and Doublecheck distributes its estimated annual overhead costs of £600,000 to three activity cost pools.

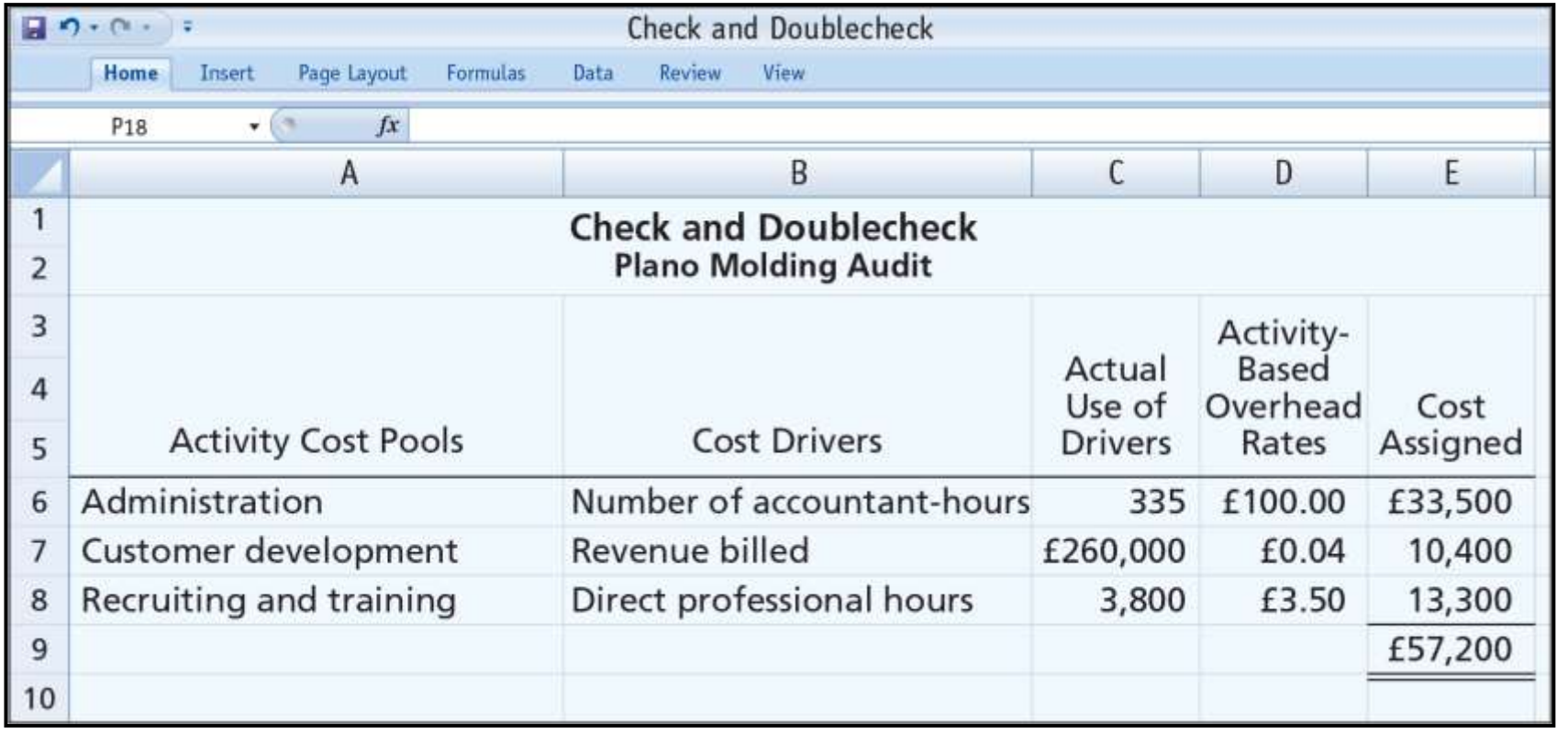
Check and Doublecheck
Annual Overhead Budget

Activity Cost Pools	Cost Drivers	Estimated Overhead	÷	Estimated Use of Cost Drivers per Activity	=	Activity-Based Overhead Rates
Administration	Number of accountant-hours	£335,000		3,350		£100 per accountant-hour
Customer development	Revenue billed	160,000		£4,000,000		£0.04 per £1 of revenue
Recruiting and training	Direct professional hours	105,000		30,000		£3.50 per hour
		£600,000				

Illustration 4-18
Condensed annual budget of a service firm under activity-based costing

Activity-Based Costing Example

Assigning overhead in a service industry.



	A	B	C	D	E
1	**Check and Doublecheck**				
2	**Plano Molding Audit**				
3					
4					
5	Activity Cost Pools	Cost Drivers	Actual Use of Drivers	Activity-Based Overhead Rates	Cost Assigned
6	Administration	Number of accountant-hours	335	£100.00	£33,500
7	Customer development	Revenue billed	£260,000	£0.04	10,400
8	Recruiting and training	Direct professional hours	3,800	£3.50	13,300
9					£57,200
10					

Illustration 4-19
Assigning overhead in a service company

LO 4

Activity-Based Costing Example

Under activity-based costing, Check and Doublecheck assigns overhead costs of £57,200 as compared to £70,000 under traditional costing.

Check and Doublecheck
Plano Molding Audit

	Traditional Costing		ABC	
Revenue		£260,000		£260,000
Expenses				
Direct professional labor	£140,000		£140,000	
Applied overhead	70,000		57,200	
Total expenses		210,000		197,200
Operating income		**£ 50,000**		**£ 62,800**
Profit margin		**19.2%**		**24.2%**

Illustration 4-20
Comparison of traditional costing with ABC in a service company

LO 4

DO IT! 4.4 Apply ABC to Service Company

We Carry It, SA is a trucking company. It provides local, short-haul, and long-haul services. The company has developed the following three cost pools.

Activity Cost Pools	Cost Drivers	Estimated Overhead	Estimated Use of Cost Drivers per Activity
Loading and unloading	Number of pieces	CHF 70,000	100,000 pieces
Travel	Kilometers driven	250,000	500,000 km
Logistics	Hours	60,000	2,000 hours

(a) Compute the activity-based overhead rates for each pool.

Activity Cost Pools	Estimated Overhead	÷	Estimated Use of Cost Drivers per Activity	=	Activity-Based Overhead Rate
Loading and unloading	CHF70,000		100,000 pieces		CHF0.70 per piece
Travel	250,000		500,000 km		CHF0.50 per mile
Logistics	60,000		2,000 hours		CHF30 per hour

DO IT! 4.4 Apply ABC to Service Company

We Carry It, SA is a trucking company. It provides local, short-haul, and long-haul services. The company has developed the following three cost pools.

Activity Cost Pools	Estimated Overhead	÷	Estimated Use of Cost Drivers per Activity	=	Activity-Based Overhead Rate
Loading and unloading	CHF70,000		100,000 pieces		CHF0.70 per piece
Travel	250,000		500,000 km		CHF0.50 per mile
Logistics	60,000		2,000 hours		CHF30 per hour

(b) Determine the overhead allocated to Job A1027 which has 150 pieces, requires 200 km of driving, and 0.75 hours of logistics.

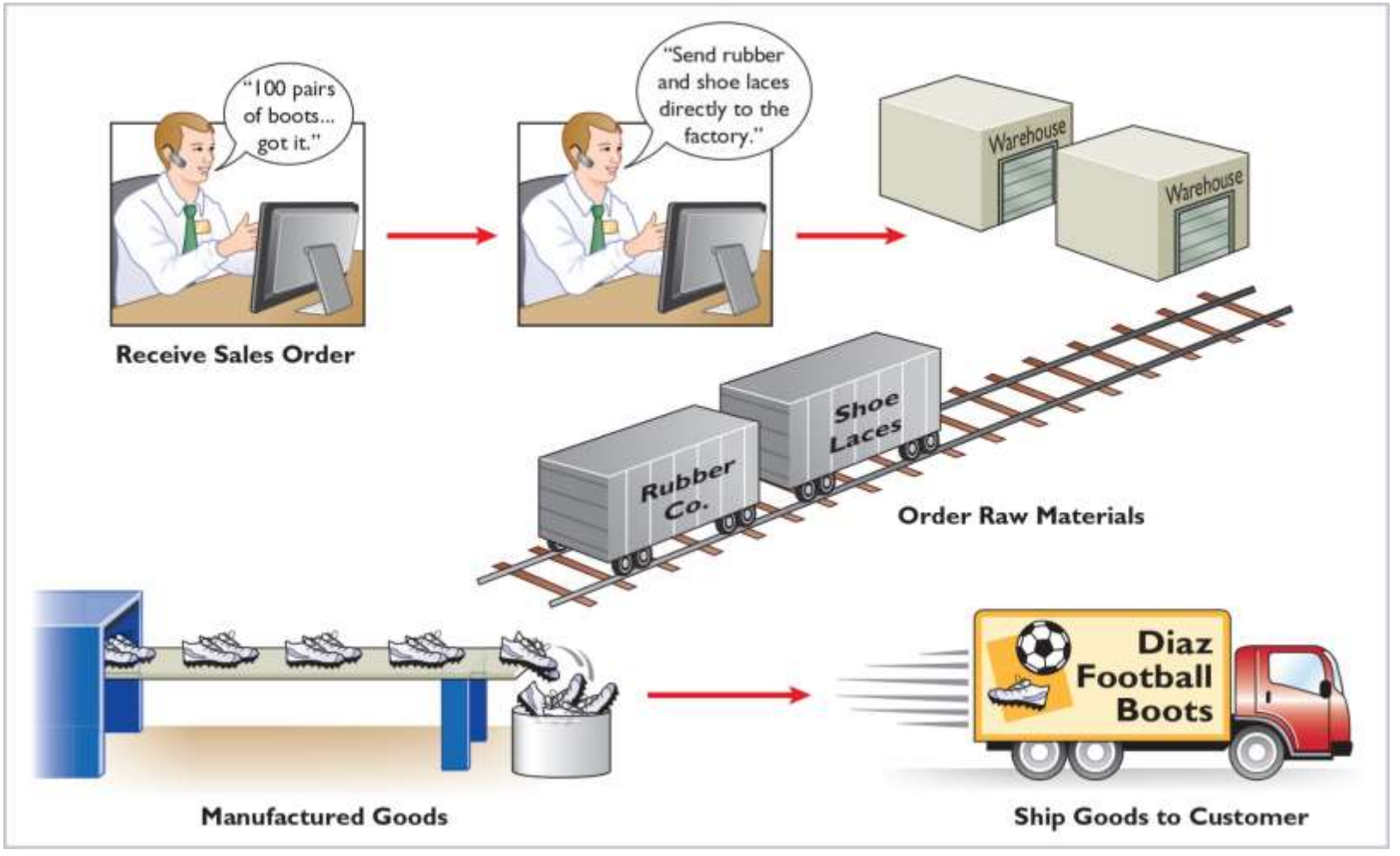
(150 x CHF0.70) + (200 x CHF0.50) + (0.75 x CHF30) = CHF227.50

LEARNING OBJECTIVE 4.5

Appendix 4a: Explain just-in-time (JIT) processing.

JIT manufacturing is dedicated to having the right amount of materials, parts, or products just as they are needed.

Illustration 4A-1



LO 5

LEARNING OBJECTIVE 4.5

APPENDIX 4A: Explain just-in-time (JIT) processing.

Objective of JIT Processing

- To eliminate all manufacturing inventories.

Elements of JIT Processing

- Dependable suppliers.
- Multiskilled work force.
- Total quality control system.

LO 5

LEARNING OBJECTIVE 4.5

APPENDIX 4A: Explain just-in-time (JIT) processing.

Benefits of JIT Processing

- Significant reduction or elimination of manufacturing inventories.
- Enhanced product quality.
- Reduction or elimination of rework costs and inventory storage costs.
- Production cost savings from the improved flow of goods through the processes.

LO 5

Copyright