



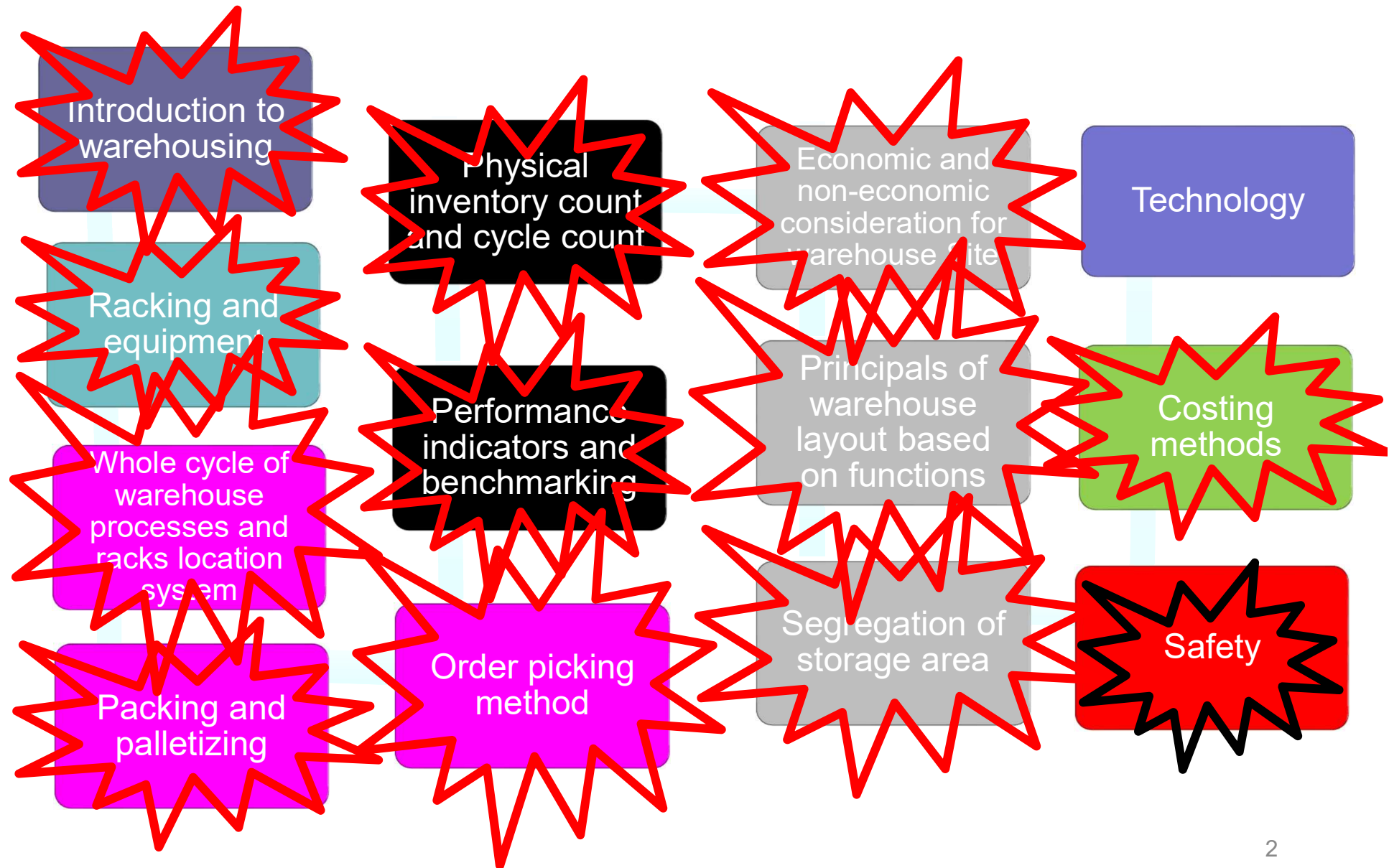
# Problem 12

What is my cost?



SCHOOL OF  
ENGINEERING  
E215 –  
Warehousing  
and Storage

# E215 Warehousing and Storage Topic Flow



# Learning Objectives

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- Explain the structure of warehouse cost elements
- Compute the Traditional Costing and Activity-Based Costing (ABC) Methods
- Explain the pros and cons of different costing methods

# Warehouse Costing

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- The elements of warehousing cost normally accounted for are:
  - Transportation (To serve material handling function of warehouse)
  - Storage (To serve material storage function of warehouse)
  - Administration (To serve information handling function of warehouse, etc.)
- The inventory carrying cost is not included in warehousing cost.
- The warehousing cost includes:
  - Fixed cost elements;
  - Variable cost elements.

# Warehouse Costing Method: Traditional

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- Based on the different responsibility centers such as storage, handling, operating administration, and general administration.
- Costs are based on and calculated for the entire facility
- Data is often captured at top level.
  - Example: labor cost is aggregated by facility, not by activity
- Advantage:
  - Data is readily available
- Disadvantage:
  - Unable to calculate profit and loss by customer-level
  - Difficult to identify area of improvement that immediately effect company's bottom line
  - Ability to manage and assess contract/services is restricted

# Warehouse Costing Method: Traditional

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- Cost elements:
  - A. Direct storage
  - B. Direct handling
  - C. Operating administration
  - D. General administration
  
- Steps:
  - 1. Identify direct storage and handling cost
  - 2. Identify operating and general administration cost
  - 3. Calculate storage and handling expense

# Warehouse Costing Method: Traditional

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## **A. Cost of direct storage**

1. Identify appropriate storage modules
2. Space for warehouse activities, office, access, mezzanines, equipment, storage, etc.
3. Identify storage related expenses:
  - Allocate the annual cost and expenses associated with the ownership (or rental), operation, and maintenance of the facility
  - Depreciation (or rental) and interest, taxes, insurance, maintenance, storage equipment depreciation (with interest and maintenance), utilities, security, pest controls, etc.

# Warehouse Costing Method: Traditional

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## **B. Cost of direct handling**

1. Identify handling activities
  - Product flow analysis (new warehouse)
  - Use aggregate labour cost (existing warehouse)
2. Analyse handling activities
  - Based on the amount of labour and equipment used
  - Time studies or pre-determined standard times
3. Identify handling related expenses
  - Labour
  - Handling equipment
  - Others: pallets, supplies, detention/demurrage, recouping warehouse damage to products, trash, others



# Warehouse Costing Method: Traditional

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## **C. Cost of operating administration**

1. Staff salary (including temporary staff)
2. Office equipment and maintenance
3. Office supplies
4. IT (computer and software)
5. Legal and professional cost
6. Travel expenses
7. Taxes and licenses
8. Insurance
9. Others



## 4. Cost of general administration

Not directly related to the operation but support the mission of the company

- Salaries and fringes: executive, marketing, support
- Office space and equipment expenses
- General cost for operating the corporate office (communication, utilities, and carrier)
- IT
- Tax and insurance
- Due, subscriptions, and educational expenses
- Donations, bad debt, and personnel expenses
- Others

# Suggested solution: Traditional Costing Method

Direct Storage Expenses	In SGD
Facility rental	1,114,286
Utilities	50,000
Insurance of facility	5,571
Exterior maintenance/grounds	25,000
<b>Total</b>	<b>1,194,857</b>

Direct Handling Expenses	In SGD
Equipment	
Depreciation and interest	600,000
Batteries/charges/fuel	20,000
Forklifts maintenance	9,000
Supplies and parts	30,000
Labour	
Wages	923,000
Employee Benefit	92,300
Part-timers cost	80,000
<b>Total</b>	<b>1,754,300</b>

Administration Expenses	In SGD
Operating administration	
Supervisory salaries and bonus	164,000
Clerical salaries and bonus	80,000
Off-site travel of warehouse management	9,000
Training of management and supervisory	20,000
IT (computer and software)	400,000
<b>Total</b>	<b>673,000</b>
General administration	
Executive salaries and bonus	427,000
Executive travel	50,000
Other expenses	40,000
<b>Total</b>	<b>517,000</b>

- Annual Expenses
- Data provided in Worksheet

## Suggested solution: Traditional Costing Method

- Storage Expenses = Direct + 50% Indirect  
= 1,194,857 + 0.5 x (673,000 + 517,000)  
= \$1,789,857
- Yearly per m<sup>3</sup> = 1,789,857 / 50,000  
= \$35.80
- Monthly per m<sup>3</sup> = 35.80 / 12  
= \$2.98
- Yearly per unit = 1,789,857 / 1,080,000  
= \$1.66
- Monthly per unit = 1.66 / 12  
= \$0.14

## Suggested solution: Traditional Costing Method

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### Handling Expenses

$$\begin{aligned} &= \text{Direct} + 50\% \text{ Indirect} \\ &= 1,754,300 + 0.5 \times (673,000 + 571,000) \\ &= \$2,349,300 \end{aligned}$$

$$\begin{aligned} \text{Per man hour} &= 2,349,300 / 101,637 \\ &= \$23.11 \end{aligned}$$

$$\begin{aligned} \text{Per unit} &= 1,993,000 / 17,095,000 \\ &= \$0.18 \end{aligned}$$

# Warehouse Costing Method: ABC

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- Costs are traced to products and services by identifying the costs and quantities of resources and activities to produce the output
- Warehouse managers need to gather and collect all data pertaining to the activities (data may come from many different sources). Cost is then apportioned according to the activities
- Many companies are based on traditional costing method, thus to change to ABC is a major undertaking

# Warehouse Costing Method: ABC



## ■ Advantage

- Detailed cost analysis will enable companies to accurately measure and manage companies' performance
- Ability to zoom in to specific tasks that need immediate improvement (such as cost reduction program)
- Ability to calculate the actual cost of each activity (beneficial for 3PL who often has to deal with customer requirement of additional processes)

## ■ Disadvantage

- Complex cost tracking system
- Accurately allocating cost to overhead and support service to each process can be difficult

## ■ Steps:

1. Identify all cost factors and activities performed
2. Allocate proportion of cost factors for each activity
3. Estimate standard time per activity (*by interviewing staffs, analyse historical data in WMS, or direct observation*)
4. Calculate cost based on the proportion allocated and the standard time per activity

# Warehouse Costing Method: ABC



- Cost Factors
  1. Building cost
    - Land and building
    - Utilities
    - Maintenance
    - Security
    - Property tax
  2. Fixture cost
    - Racking and other storage devices
    - Labels and signs
  3. Equipment cost
    - Forklift and other vehicles
    - Conveyors and other internal transportation devices
    - Sorting devices
    - Other stationary equipment such as disposal and shrink-wrap machines



# Warehouse Costing Method: ABC

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## 4. Staff cost

- Salaries and fringes for warehouse staff
- Outsource services such as cleaning
- Other staff cost such as training and celebration

## 5. IT cost

- Information systems such as WMS
- Hardware such as PC, printers, RF terminals, etc.
- Maintenance, support, and upgrade services

## 6. Consumables

- Pallets
- Packaging material and labels

## 7. Overhead cost

- Partial charges of senior management (some managers are only partly involved in the warehouse management)
- Partial charges for financial services, human resources management, and other support function.

# Suggested Solution: ABC method



	Cost by Items	Building + Fixtures	Equipment	Staff	IT	Consumables	Utility cost	Overhead
	Total	\$ 1,144,857	\$ 629,000	\$ 1,095,300	\$400,000	\$ 30,000	\$ 50,000	\$790,000
Inbound cost	Receiving	10%	13%	7%	18%	20%	10%	8%
Storage	Storage	50%	45%	30%	18%	1%	40%	38%
Outbound Cost	Picking	13%	15%	30%	18%	1%	15%	18%
	Consolidating & packing	12%	10%	10%	18%	30%	15%	10%
	Shipping	12%	10%	10%	18%	20%	15%	10%
VAL	Value Added Logistics	3%	7%	13%	10%	28%	5%	16%

	Cost by Items	Building	Equipment	Staff	IT	Consumables	Utility cost	Overhead	Total
Inbound cost	Receiving	\$ 114,486	\$ 81,770	\$ 76,671	\$ 72,000	\$ 6,000	\$ 5,000	\$ 63,200	\$ 419,127
Storage	Storage	\$ 572,429	\$ 283,050	\$ 328,590	\$ 72,000	\$ 300	\$ 20,000	\$300,200	\$1,576,569
Outbound Cost	Picking	\$ 148,831	\$ 94,350	\$ 328,590	\$ 72,000	\$ 300	\$ 7,500	\$142,200	\$ 793,771
	Consolidating & packing	\$ 137,383	\$ 62,900	\$ 109,530	\$ 72,000	\$ 9,000	\$ 7,500	\$ 79,000	\$ 477,313
	Shipping	\$ 137,383	\$ 62,900	\$ 109,530	\$ 72,000	\$ 6,000	\$ 7,500	\$ 79,000	\$ 474,313
VAL	Value Added Logistics	\$ 34,346	\$ 44,030	\$ 142,389	\$ 40,000	\$ 8,400	\$ 2,500	\$126,400	\$ 398,065

# Suggested Solution: ABC method



Inbound Handling	Average Time (in minutes)	Annual Number of Transaction	Total Time Taken
Pallet	5.00	13,000	65,000
Carton	2.50	150,000	375,000
Piece	1.50	700,000	1,050,000
<b>Total</b>			<b>1,490,000</b>

Total annual inbound handling cost = \$ 286,360

Cost per minutes =  $419,127 / 1,490,000 = \$ 0.28$

- Cost per pallet =  $\$ 0.28 \times 5.00 = \$ 1.41$
- Cost per carton =  $\$ 0.28 \times 2.50 = \$ 0.70$
- Cost per piece =  $\$ 0.28 \times 1.50 = \$ 0.42$

# Suggested Solution: ABC method



Outbound Handling	Average Time (in minutes)	Annual Number of Transaction	Total Time Taken
Pallet	6.00	11,000	66,000
Carton	2.00	320,000	320,000
Piece	1.00	1,600,000	1,600,000
<b>Total</b>			<b>1,986,000</b>

Total annual outbound handling cost = \$ 1,745,397

Cost per minutes

=  $1,745,397 / 1,986,000 = \$ 0.88$

- Cost per pallet =  $\$ 0.88 \times 6.0 = \$ 5.27$
- Cost per carton =  $\$ 0.88 \times 2.0 = \$ 1.76$
- Cost per piece =  $\$ 0.88 \times 1.0 = \$ 0.88$

# Suggested Solution: ABC method

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Monthly storage cost per m<sup>3</sup>

- Effective capacity =  $50,000 \times 80\% = 40,000 \text{ m}^3$
- Annual storage cost = \$ 1,576,569
- Annual cost per m<sup>3</sup> =  $\$ 1,576,569 / 40,000 = \$ 39.41 / \text{m}^3$
- Monthly cost per m<sup>3</sup> =  $\$ 39.41 / 12 = \$ 3.28 / \text{m}^3$

# Traditional costing Vs ABC method



	<b>Pieces</b>	<b>Carton</b>	<b>Pallet</b>
Traditional Handling	\$0.18	\$5.42	\$108.43
ABC – Inbound	\$0.42	\$0.70	\$1.41
ABC - Outbound	\$0.88	\$1.76	\$5.27

- Which costing method do you think is better and/or more realistic? Why?
- Is it fair to compare the 2 methods directly, as per above?

# Learning Outcome



- ✓ Explain the structure of warehouse cost elements
- ✓ Compute the Traditional Costing and Activity-Based Costing (ABC) Methods
- ✓ Explain the pros and cons of different costing methods

