

# LECTURE 10

## STOCK COUNTING AND WAREHOUSE MANAGEMENT SYSTEM

Oran Kittithreerapronchai<sup>1</sup>

<sup>1</sup>Department of Industrial Engineering, Chulalongkorn University  
Bangkok 10330 THAILAND

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# OUTLINE

- 1 STOCK COUNTING: PHYSICAL INVENTORY = INVENTORY IN SYSTEM
- 2 HOW & WHEN SHOULD WE DO STOCK COUNT?
- 3 INTRODUCTION TO WMS
- 4 WAREHOUSE ACTIVITY VIA WMS

source: General references [BH09, Mul94, Fra02, ?]

# WHY DO WE NEED STOCK COUNT?

- **Regulation:** accounting → government tax bureau  
→ share holders (public company)
- **Management:** data update system, generate report
- **Operations:** re-location, check condition, planning & control

**Example:** 360,000 inventory records from 37 stores of a major US retail chain:

- 65% of records were inaccurate
- 29% were inaccurate before opening
- Average error: 30% of on-hand inventory

source: Dehoratius, N. & Raman, A. 2008. [DR08]

# SOURCES OF INACCURACY

- **Inbound:** # item shipped  $\neq$  # on bill, misplaced on arrival
- **Outbound:** pick from wrong locations/items
- **In-house:** company own faults
  - SYSTEM: scan errors, bad units of measure, human integration
  - ITEM: shrinkage, obsolete
  - HUMAN: theft (pilferage), carelessness (put-away at wrong position)

# EFFECTS OF INACCURATE STOCK

- **Tax complications:** black list, investigation
- **Bullwhip Effect:** more safety stock downstream → inconsistency order upstream
- **Stock outs:** (actual < system)
  - reduced customer service level
  - increased levels of safety stock
- **Disruptions:** (actual > system) thought that  $\nexists$  storage location
  - lose creditability, no storage space, dead stock
  - high inventory cost

source:

# HOW DO WE DO STOCK COUNTING?

## Periodic Count/Physical Count

- **What:** count all SKUs at the same time (1-2 time a year) → big gap
- **Pro:** easy to implement, easy to reconcile
- **Con:** no business, many workers, know in advance, difficult to write-out values

## Cycle Count

- **What:** count few SKUs everyday; some SKU may more often
- **Pro:** adjustable workload & workforce, prevent inside thefts
- **Con:** consistency, negotiate with accounting
- **Issue:** How often each SKU gets count (ABC analysis of stock value)

## EXAMPLE: SUGGESTED COUNT FREQUENCY

You are a project engineering, who hires to implement cycle count in a warehouse. Currently, this warehouse have 397 SKUs, which can be classified by their values as follow:

Class	# of SKU	frequency	
		minimum	suggested
A	26	6	$f_A$
B	96	4	$f_B$
C	275	2	$f_C$
D	71	1	$f_D$

The warehouse can spare the **last 20 minutes of 4 workers** to perform cycle count. Assuming that there are 250 working days & each SKU requires 15 minutes to count, on average. What are your suggested frequency of each class?

# SOLUTION: SUGGESTED COUNT FREQUENCY

- **Idea:** average cycle count  $\leq$  total man-hour
- **Total resources:**  
 $250(\text{ day/year}) \times 4(\text{ workers}) \times 20(\text{ minute/day}) = 20000(\text{ worker-minute})$
- **Estimated counting time:**

Alternative	frequency				worker-minute
	A	B	C	D	
A0	6	4	2	1	17,415
A1	9	5	2	1	20,025
A2	6	5	2	2	19,920

## Issues:

- **Management:** x-worker  $\rightarrow$  1 SKU for each worker?
- **Methods:** man-hour **VS** #SKU, **average value**, recording system
- **Operation:** inventory cycle



# STOCK COUNT STRATEGY

- **Eliminate counting:** eliminate loose carton
- **Simplify counting:** weight item

Counting is **not productive** warehouse activity, so plan your next count.

## When to count

- **Count before replenishment:**
- **Few inventory left:** counting 3 units & 300 units are totally different
- **Every so many transactions:** because errors tend to happen

# WHAT IS WMS?

- **Information System:** IT/IS for operational in warehouse
- **Integration:** collect, analyze, & report all **activities**
- **Important:** strategic decision to modernize WH
- **Industry:** high transaction, require tracking
- **Standard Function:** search & track SKU, batch processing, individual report
- **Advance Function:** cycle count, profiling, RF, data transfer

# HISTORY OF WMS

1975 First WMS installed at J.C. Penney.

1990's Hundreds of new stock locators & WMS systems; enable RF; Windows NT platform emerges.

1995 become \$100 million business

2000 Expanded suites with TMS .

TODAY User-configurability & scalability remain key differentiator

source: Brett Peters. "Collect-Industry Council on Material Handling Education"

## Thailand

1997 introduce by modern trade

2000s adopted by large retailers

TODAY more adoptees, niche market

# EVIL CYCLE IN A WAREHOUSE

- **Business growth:** fear of lost sale → more SKUs & qty
- **Warehouse managing:** inaccuracy, miss delivery → no space, long cycle time
- **Warehouse expansion:** deadstock, seasonality → expansion, more equipments & workers
- **Costs increasing:** more capital → economy of scale

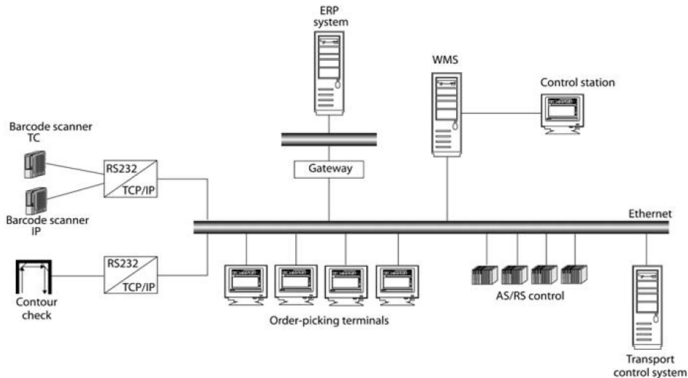
**How to break this cycle?** → better management with WMS

- **Efficiency:** 1<sup>st</sup> step of automation & modern Warehousing Mgt.
- **Transparency:** enabler to change → less flexible to do thing

# MINIMUM REQUIREMENT OF WMS

- **Access & Tracking Control:** multi-users, roles & authorization
- **Radio Frequency:** realtime access, hand held device (Villa Grocery)
- **Flexility :** unit-change, adjust picking policy, manual overwrite, export data
- **Management:** cycle count, picker KPIs, report, integration

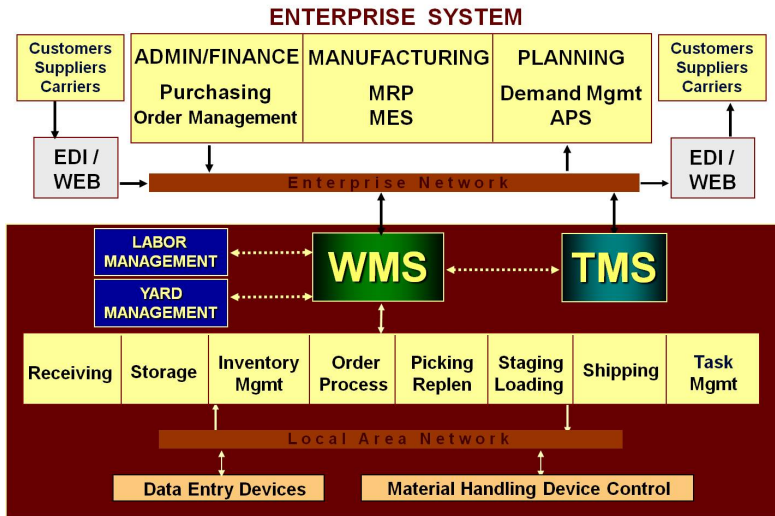
# WORLD OF WMS



source: ten Hompel & Schmidt. "Structure of a WMS from the Example of myWMS" [tHS07]

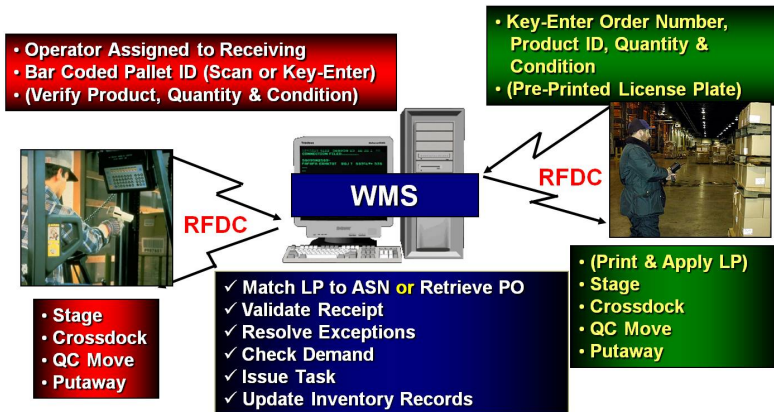
- WMS market is **niche IT market** ↔ equipment, trading, data sharing
- In US, ∃ many new & extinct vendors
- Thailand limited in big company, high volume

# ERP/WMS/TMS



source: Brett Peters. "Collect-Industry Council on Material Handling Education"

# RECEIVING WITH WMS



source: Brett Peters. "Collect-Industry Council on Material Handling Education"



# PUT-AWAY WITH WMS

- Operator Assigned to Putaway / Move
- Scan License Plate

- Move to Designated Location
- Scan Location Bar Code



RFDC



RFDC



## Destination

- Storage
- Crossdock
- Quality
- Returns
- Other

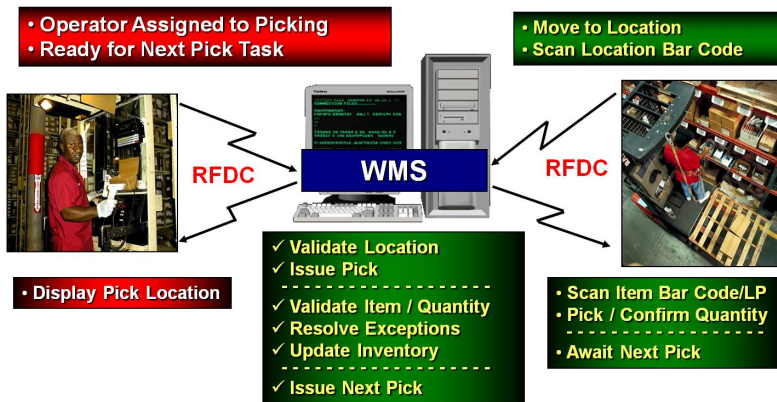
- ✓ Validate Location
- ✓ Resolve Exceptions
- ✓ Issue Drop Instruction

- 
- ✓ Update Inventory
- ✓ Issue Next Task

- Confirm Drop
- Await Next Task

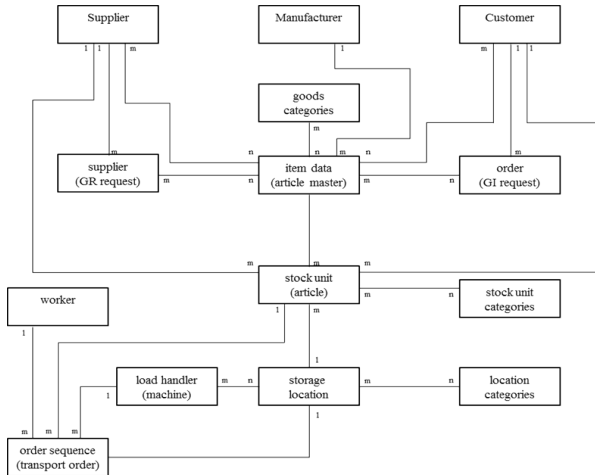
source: Brett Peters. "Collect-Industry Council on Material Handling Education"

# PICKING WITH WMS



source: Brett Peters. "Collect-Industry Council on Material Handling Education"

# ER DIAGRAM OF WMS



source: ten Hompel & Schmidt. "Structure of a WMS from the Example of myWMS" [tHS07]

# COMPONENTS IN WMS

- **Product Files:** (Item Master): SKU ID, descriptions, dimensions, date, lot, units, bills of material, **substitutions**
- **Location Files:** (Location Master): address ID, layout, quantity, sequencing, dimensions, capacity
- **History Files:** (Order Master): date, customer/supplier, document ID, quality, unit
- **Equipment Files:** equipment ID, location, status, capacity
- **Employee Files:** worker ID, labor standards, operator-equipment matrices, incentive,
- **Customer Files:** customer ID, contact, term of payment, evaluation

source: Brett Peters. "Collect-Industry Council on Material Handling Education"

# WMS COST BREAKDOWN

Components	% Total Costs
<b>Hardware</b>	
Computer	6
RF Data Comm	24
Bar Code Applicator	8
<b>Software</b>	
WMS Licence	8
WMS Enhancements	10
Host Interface	6
Other Software Licence	4
<b>Implementation</b>	
Location Labels	6
WMS Installation Service	21
Project Team Cost	6

# SIGNS FOR WMS CONSIDERATION

- **Complaints:** ship accuracy, ↑ # checker,
- **Data management:** cycle count, multi-crowded, picker KPIs
- **Productivity:** 1000 line/ man-hr
- **Cycle time:** hot released for truck
- **Business:** short cycle or long cycle count, high turnover

# WMS JUSTIFICATION

## Task Related Cost

- **Direct labor:** better measure/control individual performance
- **Indirect labor:** reducing training & supervising
- **Administration:** automate collecting & analyzing data

## Possible saving

- **Tangible savings:** space utilization, paperwork, expedited delivery
- **Intangible savings:** customer service, inventory turnover, performance measurement

source: Brett Peters. "Collect-Industry Council on Material Handling Education"

# CHOOSING WMS PROVIDERS

- **Complete package:** limited target group, special functions in modules
- **State-of-Art technology:** text-interface **VS** GUI, web-browser, shorter life cycle
- **Implementation capabilities:** adjustable parameters, experienced consultants
- **Considerable customer base:** recommendation, match with equipments or operations, 'best practice',
- **Professional organization:** trustworthy, after-sale service, stay in business

source: Jeroen van den Berg Consulting. 2002



# WMS TRENDS

- **Connectivity:** RFID, other information system (e.g., supplier ERP)
- **Costing analysis:** activity based costing & management of individual picker
- **Embedded profiling:** facilitate re-layout & inventory slotting
- **Leveraging data:** utilizing more data/information
- **Sharing data:** accessing data by other parties, including consumer
- **Software as a Service (SaaS):** rented on-demand at low monthly cost per user

# PROBLEMS

1. Explain the similarities and differences between *Enterprise Resource Planning* and *Warehouse Management System*
2. Elaborate the main features in Warehouse Management System

# REFERENCE

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