

Inventory Management

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Learning Objectives

By the end of this chapter, participants will be able to:

LEARNING OBJECTIVES

1. Define inventory and inventory management
2. Explain the importance of inventory
3. Identify the main types of inventory
4. Explain inventory-related costs
5. Calculate Economic Order Quantity
6. Determine reorder points
7. Calculate safety stock
8. Explain lead time and service levels
9. Apply ABC, VED and FSN classifications
10. Calculate inventory turnover and inventory days
11. Explain perpetual and periodic inventory systems
12. Apply FIFO and weighted-average valuation
13. Identify inventory risks and internal controls
14. Explain stocktaking and reconciliation
15. Evaluate obsolete, damaged and slow-moving stock
16. Recommend strategies for optimizing inventory

Chapter Roadmap

This chapter covers:

ROADMAP

1. Meaning of inventory
2. Importance of inventory management
3. Types of inventory
4. Inventory costs
5. Demand and lead time
6. Economic Order Quantity
7. Reorder point
8. Safety stock
9. Inventory-classification techniques
10. Inventory-control systems
11. Inventory valuation
12. Inventory performance indicators
13. Stocktaking and reconciliation
14. Inventory risks and controls
15. Inventory optimization

SECTION 1

Introduction to Inventory

01

Understanding what inventory is and why organizations hold it.

What Is Inventory?

INTRODUCTION

Inventory refers to goods, materials and supplies held by an organization for:

- Sale
- Production
- Service delivery
- Maintenance
- Distribution
- Emergency response
- Future operational use

What Is Inventory Management?

INTRODUCTION

Inventory management is the process of:

- Planning inventory requirements
- Purchasing inventory
- Receiving and inspecting goods
- Storing items securely
- Recording stock movements
- Issuing inventory
- Monitoring stock levels
- Replenishing inventory
- Disposing of unusable items

The Central Inventory Question

The goal is to balance:

INTRODUCTION

- Availability
- Cost
- Risk
- Service quality
- Operational continuity

CENTRAL QUESTION

How much inventory should be held, when should it be ordered and how should it be controlled?

Why Inventory Is Held

Organizations hold inventory to:

INTRODUCTION

- Meet customer demand
- Maintain production
- Prevent stockouts
- Manage lead-time uncertainty
- Benefit from bulk purchasing
- Prepare for seasonal demand
- Respond to emergencies
- Maintain service continuity

Inventory as an Investment

INTRODUCTION

Inventory represents financial resources tied up in physical items. Excess inventory may reduce:

- Cash availability
- Profitability
- Return on assets
- Financial flexibility

IMPORTANT

Insufficient inventory may disrupt operations.

Inventory Management Objective

INTRODUCTION

The objective is to maintain:

- The right item
- In the right quantity
- At the right location
- At the right time
- In the right condition
- At the lowest reasonable total cost

02

SECTION 2

Importance of Inventory Management

How sound inventory management supports operations, service and finance.

Operational Continuity

IMPORTANCE

Adequate inventory helps ensure that:

- Production continues
- Services are delivered
- Customers receive goods
- Maintenance activities proceed
- Emergency needs are addressed
- Programme implementation is not delayed

Customer Satisfaction

Effective inventory management improves customer satisfaction by ensuring:

IMPORTANCE

- Product availability
- Timely delivery
- Correct quantities
- Reliable service
- Consistent product quality

Cost Control

Inventory management helps control:

IMPORTANCE

- Purchasing costs
- Ordering costs
- Storage costs
- Insurance costs
- Damage and loss
- Obsolescence
- Emergency procurement
- Financing costs

Cash-Flow Management

IMPORTANCE

Inventory purchases require cash. Excess inventory may create:

- Cash shortages
- Additional borrowing
- Delayed supplier payments
- Reduced investment capacity
- Higher working-capital requirements

Risk Management

IMPORTANCE

Inventory management helps reduce:

- Theft
- Fraud
- Stockouts
- Overstocks
- Expiry
- Damage
- Obsolescence
- Unauthorized use
- Recording errors

Financial Reporting

Inventory affects:

IMPORTANCE

- Current assets
- Cost of sales
- Gross profit
- Net income
- Working capital
- Taxable income

IMPORTANT

Incorrect inventory records may materially distort financial statements.

03

SECTION 3

Types of Inventory

The main categories of inventory found across organizations.

Major Inventory Categories

Inventory may include:

TYPES

- Raw materials
- Work in progress
- Finished goods
- Goods for resale
- Maintenance supplies
- Consumables
- Spare parts
- Relief and programme supplies

Raw Materials

TYPES

Raw materials are basic inputs used in production. Examples include:

- Fabric
- Steel
- Grain
- Chemicals
- Packaging materials
- Timber

Work in Progress

TYPES

Work in progress consists of items that have entered production but are not yet complete. It may include:

- Materials
- Labour
- Production overheads

Finished Goods

TYPES

Finished goods are completed products ready for sale or distribution. Examples include:

- Manufactured products
- Packaged foods
- Garments
- Furniture
- Processed agricultural products

Goods for Resale

TYPES

Goods for resale are purchased in completed form and sold without significant transformation. Examples include:

- Retail products
- Pharmaceuticals
- Office equipment
- Food commodities
- Construction supplies

Maintenance, Repair and Operating Supplies

TYPES

These items support operations but do not normally become part of the finished product. Examples include:

- Lubricants
- Cleaning supplies
- Tools
- Protective equipment
- Machine spare parts
- Office consumables

Programme and Relief Inventory

TYPES

Humanitarian and development organizations may hold:

- Food commodities
- Medical supplies
- Education materials
- Hygiene kits
- Shelter materials
- Water-treatment supplies
- Non-food items

Transit Inventory

Transit inventory consists of goods moving between:

TYPES

- Suppliers and warehouses
- Warehouses and branches
- Production facilities
- Distribution sites
- Project locations

Consignment Inventory

TYPES

Consignment inventory is held by one party but remains owned by another until it is sold or used.

KEY POINT

Ownership and responsibility should be clearly documented.

04

SECTION 4

Inventory by Purpose

Why specific stock is held — from cycle stock to decoupling inventory.

Cycle Inventory

BY PURPOSE

Cycle inventory is the stock held to meet normal demand between replenishment orders. Its size is influenced by:

- Order quantity
- Demand
- Replenishment frequency

Safety Stock

Safety stock is additional inventory held to protect against uncertainty. It helps manage:

BY PURPOSE

- Demand fluctuations
- Supplier delays
- Forecasting errors
- Quality failures
- Transport disruptions

Seasonal Inventory

BY PURPOSE

*Seasonal inventory is accumulated in anticipation of predictable demand changes.
Examples include:*

- Holiday products
- Agricultural supplies
- School materials
- Seasonal clothing
- Emergency-preparedness items

Anticipation Inventory

BY PURPOSE

Anticipation inventory is purchased before an expected event such as:

- Price increases
- Supplier strikes
- Currency depreciation
- Regulatory change
- Supply shortage
- Seasonal demand

Buffer Inventory

BY PURPOSE

Buffer inventory protects one operational stage from disruptions in another. It may be held between:

- Production processes
- Suppliers and production
- Warehouses and distribution sites

Decoupling Inventory

BY PURPOSE

Decoupling inventory allows different production stages to operate independently.

KEY POINT

If one stage stops temporarily, another stage may continue using available stock.

05

SECTION 5

Inventory Costs

The costs that inventory decisions seek to minimize.

Major Inventory Costs

INVENTORY COSTS

The main inventory-related costs are:

- Purchase cost
- Ordering cost
- Carrying cost
- Stockout cost
- Quality and loss costs

Purchase Cost

INVENTORY COSTS

Purchase cost is the amount paid to acquire inventory. It may include:

- Unit price
- Freight
- Customs duties
- Insurance
- Handling
- Inspection
- Non-refundable taxes

Ordering Cost

INVENTORY COSTS

Ordering cost arises each time an order is placed. Examples include:

- Purchase requisition processing
- Supplier communication
- Tender administration
- Purchase-order preparation
- Transport coordination
- Inspection
- Invoice processing

Carrying Cost

INVENTORY COSTS

Carrying cost is the cost of holding inventory over time. It may include:

- Storage
- Insurance
- Security
- Financing
- Opportunity cost
- Obsolescence
- Damage
- Shrinkage
- Handling

Carrying-Cost Formula

INVENTORY COSTS

$$\text{Annual Carrying Cost} = \text{Average Inventory} \times \text{Holding Cost per Unit}$$

Holding cost may also be expressed as a percentage of inventory value.

Stockout Cost

INVENTORY COSTS

Stockout cost occurs when required inventory is unavailable. It may include:

- Lost sales
- Production interruption
- Emergency purchases
- Customer dissatisfaction
- Contract penalties
- Programme delays
- Reputational damage

Obsolescence Cost

INVENTORY COSTS

Inventory becomes obsolete when it is no longer usable or marketable because of:

- Technology changes
- Product redesign
- Expiry
- Reduced demand
- Regulatory changes
- Programme closure

Shrinkage

Shrinkage is the loss of inventory due to:

INVENTORY COSTS

- Theft
- Fraud
- Damage
- Recording errors
- Spillage
- Unexplained shortages
- Unauthorized issue

Inventory Cost Trade-Off

Ordering larger quantities may:

INVENTORY COSTS

- Reduce ordering frequency
- Lower ordering cost
- Increase average inventory
- Increase carrying cost

KEY POINT

Ordering smaller quantities may have the opposite effect.

06

SECTION 6

Demand and Lead Time

Understanding demand patterns and the time it takes to replenish.

Inventory Demand

DEMAND & LEAD TIME

Demand is the quantity of an item required during a particular period. Demand may be:

- Constant
- Variable
- Seasonal
- Independent
- Dependent
- Certain
- Uncertain

Independent Demand

DEMAND & LEAD TIME

Independent demand arises from external customers or users. Examples include:

- Retail products
- Finished goods
- Relief commodities
- Spare parts demanded by users

Dependent Demand

DEMAND & LEAD TIME

Dependent demand is derived from the demand for another item.

EXAMPLE

Example: the number of zippers required depends on the number of garments to be produced.

Lead Time

DEMAND & LEAD TIME

Lead time is the time between placing an order and receiving inventory ready for use. It may include:

- Approval time
- Procurement time
- Supplier processing
- Production
- Transportation
- Customs clearance
- Inspection
- Warehouse receiving

Lead-Time Risk

Long or uncertain lead times increase:

DEMAND & LEAD TIME

- Safety-stock requirements
- Stockout risk
- Forecasting difficulty
- Working-capital needs
- Emergency-purchase risk

Demand During Lead Time

DEMAND & LEAD TIME

Demand During Lead Time = Average Demand per Period × Lead Time

This is the basis for determining reorder points.

SECTION 7

Economic Order Quantity

07

Finding the order size that minimizes total ordering and holding cost.

What Is EOQ?

Economic Order Quantity is the order size that minimizes the combined annual cost of:

EOQ

- Ordering inventory
- Holding inventory

EOQ Formula

EOQ

WHERE

- D = annual demand
- S = ordering cost per order
- H = annual holding cost per unit

$$EOQ = \sqrt{(2DS \div H)}$$

EOQ Assumptions

EOQ

The basic EOQ model assumes:

- Demand is known and constant
- Lead time is known
- Replenishment is immediate
- No stockouts occur
- Unit price is constant
- Ordering and carrying costs are known

EOQ Example

EOQ

GIVEN

- Annual demand: 12,000 units
- Ordering cost: ETB 300 per order
- Holding cost: ETB 15 per unit annually

$$EOQ = \sqrt{(2 \times 12,000 \times 300) \div 15}$$

EOQ Solution

EOQ

$$\text{EOQ} = \sqrt{480,000}$$

$$\text{EOQ} \approx 693 \text{ units}$$

≈ 693 units per order

The organization should order approximately 693 units per order under the assumptions.

Number of Orders per Year

EOQ

Using the example:

$$\text{Number of Orders} = D \div \text{EOQ}$$

$$12,000 \div 693 \approx 17.3$$

Approximately 17 or 18 orders are required annually.

Time Between Orders

EOQ

If the organization operates 365 days:

$$\text{Time Between Orders} = 365 \div \text{Number of Orders}$$
$$365 \div 17.3 \approx 21 \text{ days}$$

≈ 21 days between orders

Average Cycle Inventory

EOQ

Without safety stock:

$$\text{Average Inventory} = \text{EOQ} \div 2$$

$$693 \div 2 = 346.5 \text{ units}$$

346.5 units

Annual Ordering Cost

EOQ

At EOQ:

$$\begin{aligned}\text{Annual Ordering Cost} &= (D \div Q) \times S \\ (12,000 \div 693) \times 300 &\approx \text{ETB } 5,195\end{aligned}$$

$\approx \text{ETB } 5,195$

Annual Holding Cost

EOQ

$$\begin{aligned}\text{Annual Holding Cost} &= (Q \div 2) \times H \\ (693 \div 2) \times 15 &\approx \text{ETB } 5,198\end{aligned}$$

$\approx \text{ETB } 5,198$

At EOQ, ordering and carrying costs are approximately equal.

Total Relevant Inventory Cost

EOQ

$$TRC = (D \div Q) \cdot S + (Q \div 2) \cdot H$$

Purchase cost is excluded when the unit purchase price remains constant.

Limitations of EOQ

EOQ may be less reliable when:

EOQ

- Demand changes significantly
- Lead times are uncertain
- Quantity discounts apply
- Items are perishable
- Storage capacity is limited
- Procurement regulations affect order size
- Replenishment is gradual

08

SECTION 8

Quantity Discounts

Deciding whether larger orders and lower prices are worthwhile.

Quantity-Discount Decisions

QUANTITY DISCOUNTS

Suppliers may offer lower prices for larger orders. Management must compare:

- Purchase cost savings
- Higher carrying costs
- Storage requirements
- Obsolescence risk
- Financing implications

Quantity-Discount Evaluation

Steps:

QUANTITY DISCOUNTS

1. Calculate EOQ at each price level
2. Confirm whether EOQ qualifies for the price
3. Calculate purchase cost
4. Calculate ordering cost
5. Calculate holding cost
6. Select the lowest total-cost option

Total Cost with Purchase Price

QUANTITY DISCOUNTS

$$TC = D \cdot C + (D \div Q) \cdot S + (Q \div 2) \cdot H$$

Where C is the unit purchase price.

09

SECTION 9

Reorder Point

The stock level that triggers a new replenishment order.

What Is a Reorder Point?

REORDER POINT

The reorder point is the inventory level at which a replenishment order should be placed.

KEY POINT

It ensures that new inventory arrives before existing inventory is exhausted.

Basic Reorder-Point Formula

REORDER POINT

When demand and lead time are certain:

$$\text{ROP} = \text{Average Demand per Period} \times \text{Lead Time}$$

Reorder-Point Example

REORDER POINT

GIVEN

- Daily demand: 40 units
- Lead time: 10 days

$$\text{ROP} = 40 \times 10$$
$$\text{ROP} = 400 \text{ units}$$

An order should be placed when inventory falls to 400 units.

400 units

Reorder Point with Safety Stock

REORDER POINT

$$\text{ROP} = \text{Demand During Lead Time} + \text{Safety Stock}$$

ROP with Safety Stock — Example

REORDER POINT**GIVEN**

- Daily demand: 40 units
- Lead time: 10 days
- Safety stock: 150 units

$$\text{ROP} = 40(10) + 150$$

$$\text{ROP} = 550 \text{ units}$$

550 units

SECTION 10

Safety Stock

10

Protecting service levels against demand and supply uncertainty.

Purpose of Safety Stock

Safety stock protects against uncertainty in:

SAFETY STOCK

- Demand
- Delivery time
- Supplier performance
- Quality
- Transportation
- Forecast accuracy

Cost of Safety Stock

More safety stock:

SAFETY STOCK

- Reduces stockout risk
- Improves service level
- Increases carrying cost
- Increases working-capital requirements
- Increases obsolescence risk

Simple Safety-Stock Formula

SAFETY STOCK

A basic approach is:

$$\text{Safety Stock} = (\text{Max Usage} \times \text{Max Lead Time}) \\ - (\text{Avg Usage} \times \text{Avg Lead Time})$$

Safety-Stock Example

SAFETY STOCK

GIVEN

- Maximum daily use: 60 units
- Maximum lead time: 12 days
- Average daily use: 40 units
- Average lead time: 8 days

$$SS = 60(12) - 40(8)$$

$$SS = 400 \text{ units}$$

400 units

Service Level

SAFETY STOCK

*Service level is the probability that inventory will be available when demanded.
Higher service levels generally require:*

- More safety stock
- Greater carrying cost
- Better forecasting
- Stronger supplier performance

Criticality and Safety Stock

SAFETY STOCK

Safety-stock decisions should reflect item criticality. Critical items may require higher protection even when:

- Unit value is low
- Demand is infrequent
- Holding costs are high

SECTION 11

Maximum and Minimum Stock Levels

Control limits that keep stock within a safe, efficient range.

11

Minimum Stock Level

STOCK LEVELS

The minimum stock level is the lowest quantity that should normally be held. It protects against:

- Stockouts
- Delivery delays
- Unexpected demand

Maximum Stock Level

STOCK LEVELS

The maximum stock level is the highest quantity that should normally be held. It helps prevent:

- Overinvestment
- Obsolescence
- Excess storage
- Expiry
- Congestion

Danger Level

STOCK LEVELS

The danger level indicates that stock is critically low and urgent replenishment action is required. It may trigger:

- Emergency procurement
- Management notification
- Stock redistribution
- Alternative sourcing

Average Stock Level

STOCK LEVELS

A simplified formula is:

$$\text{Average Stock} = \text{Minimum Stock} + (\text{Order Quantity} \div 2)$$

SECTION 12

Inventory Classification

12

Focusing control on the items that matter most.

Why Classify Inventory?

CLASSIFICATION

Not all inventory items require the same level of control. Classification helps management allocate attention based on:

- Value
- Criticality
- Usage
- Movement
- Availability
- Risk

ABC Analysis

CLASSIFICATION

ABC analysis classifies inventory according to annual consumption value.

$$\text{Annual Consumption Value} = \text{Annual Usage} \times \text{Unit Cost}$$

Category A Items

CLASSIFICATION

Category A items normally represent a small number of items with a high share of value. They require:

- Close monitoring
- Accurate forecasting
- Frequent review
- Strong authorization

Category B Items

Category B items represent moderate value and importance. They require:

CLASSIFICATION

- Regular monitoring
- Standard approval controls
- Periodic review

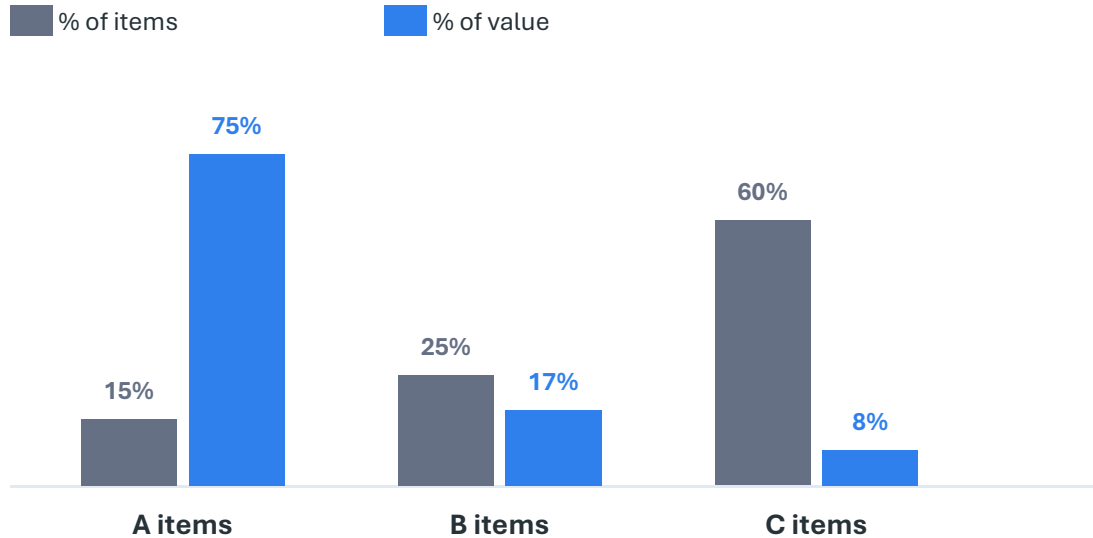
Category C Items

CLASSIFICATION

Category C items represent a large number of items with low individual value. They may use:

- Simpler controls
- Less frequent ordering
- A small share of total inventory value

Typical ABC Distribution



CLASSIFICATION

A few high-value items dominate inventory value.

- A items: ~10–20% of items, 70–80% of value
- B items: ~20–30% of items, 15–20% of value
- C items: majority of items, small share of value

Illustrative typical pattern; the actual distribution differs by organization.

VED Analysis

VED analysis classifies inventory by criticality:

CLASSIFICATION

- Vital
- Essential
- Desirable

KEY POINT

It is common in healthcare, maintenance and emergency operations.

Vital Items

Vital items are essential for operations. Their absence may cause:

CLASSIFICATION

- Service shutdown
- Safety risk
- Loss of life
- Major production interruption
- Serious contractual failure

Essential Items

CLASSIFICATION

Essential items are important, but short-term shortages may be manageable.

KEY POINT

They still require planned replenishment and monitoring.

Desirable Items

CLASSIFICATION

Desirable items improve operations, but their temporary absence may not cause major disruption.

KEY POINT

They may receive lower control priority.

FSN Analysis

FSN analysis classifies inventory based on movement:

CLASSIFICATION

- Fast-moving
- Slow-moving
- Non-moving

Fast-Moving Inventory

Fast-moving items:

CLASSIFICATION

- Are issued frequently
- Require regular replenishment
- May create frequent stockout risk
- Need reliable forecasting

Slow-Moving Inventory

Slow-moving inventory:

CLASSIFICATION

- Has infrequent use
- May tie up cash
- May become obsolete
- Requires periodic management review

Non-Moving Inventory

CLASSIFICATION

*Non-moving inventory has no issue or sale activity for a defined period.
Management should determine whether it should be:*

- Retained
- Transferred
- Sold
- Donated
- Returned
- Written off
- Disposed of

HML Analysis

HML analysis classifies inventory by unit price:

CLASSIFICATION

- High-cost items
- Medium-cost items
- Low-cost items

KEY POINT

It supports purchasing authorization and security controls.

SDE Analysis

SDE analysis classifies inventory by availability:

CLASSIFICATION

- Scarce
- Difficult to obtain
- Easily available

KEY POINT

Scarce items may require longer planning horizons and greater safety stock.

Combined Classification

CLASSIFICATION

Organizations may combine classifications, such as:

- ABC–VED
- ABC–FSN
- VED–SDE

KEY POINT

This improves control by considering value and operational importance together.

SECTION 13

Inventory-Control Systems

13

Manual and automated systems for tracking stock.

Perpetual Inventory System

CONTROL SYSTEMS

A perpetual system updates inventory records continuously after every:

- Receipt
- Issue
- Sale
- Transfer
- Return
- Adjustment

Advantages of Perpetual Inventory

CONTROL SYSTEMS

- Real-time stock information
- Better reorder decisions
- Stronger accountability
- Faster discrepancy detection
- Improved reporting
- Better integration with finance

Periodic Inventory System

CONTROL SYSTEMS

A periodic system determines stock balances through physical counts at defined intervals.

KEY POINT

Records may not show real-time balances between counts.

Periodic-System Limitations

CONTROL SYSTEMS

- Limited real-time information
- Delayed discrepancy detection
- Difficult stockout monitoring
- Less accurate interim reporting
- Greater reliance on physical counts

Manual Inventory System

CONTROL SYSTEMS

Manual systems may use:

- Bin cards
- Stock cards
- Goods-received notes
- Issue vouchers
- Ledgers
- Physical registers

KEY POINT

They require strong document control.

Automated Inventory System

CONTROL SYSTEMS

Automated systems may include:

- Barcode scanning
- QR codes
- ERP inventory modules
- Warehouse-management systems
- Mobile applications
- RFID technology

Barcode Systems

Barcode systems help:

CONTROL SYSTEMS

- Identify items
- Record receipts
- Record issues
- Reduce data-entry errors
- Improve stocktaking
- Track locations

RFID Technology

CONTROL SYSTEMS

Radio-frequency identification may support:

- Automatic item identification
- Bulk scanning
- Movement tracking
- Asset and inventory visibility
- Reduced manual handling

IMPORTANT

Implementation costs may be significant.

SECTION 14

Inventory Documentation

14

The records that keep inventory accountable and auditable.

Key Inventory Documents

Common documents include:

DOCUMENTATION

- Purchase requisition
- Purchase order
- Goods-received note
- Inspection report
- Bin card
- Stock card
- Material-requisition form
- Issue voucher
- Transfer form
- Return note
- Disposal authorization

Goods-Received Note

DOCUMENTATION

A goods-received note should record:

- Supplier
- Purchase-order number
- Item description
- Quantity ordered
- Quantity received
- Condition
- Date
- Receiving personnel
- Inspection result

Bin Card

DOCUMENTATION

A bin card records physical movement of one inventory item at its storage location. It normally shows:

- Receipts
- Issues
- Balance
- Date
- Document reference
- Signature

Stock Ledger

A stock ledger may contain:

DOCUMENTATION

- Quantity records
- Unit costs
- Total value
- Transaction dates
- Supporting-document references
- Location
- Batch or serial number

Inventory Issue Controls

DOCUMENTATION

Inventory should be issued only against:

- Approved requisition
- Authorized issue voucher
- Correct item code
- Valid operational need
- Recipient acknowledgement

15

SECTION 15

Inventory Valuation

How the value of inventory is measured for reporting.

Why Inventory Valuation Matters

VALUATION

Inventory valuation affects:

- Cost of sales
- Gross profit
- Net income
- Current assets
- Tax
- Performance indicators
- Financial reporting

Main Valuation Methods

VALUATION

Common inventory valuation methods include:

- Specific identification
- First-In, First-Out (FIFO)
- Weighted-average cost

IMPORTANT

The permitted method depends on applicable accounting standards.

Specific Identification

VALUATION

Specific identification assigns the actual cost to each identifiable item. It may be appropriate for:

- Vehicles
- Specialized machinery
- High-value equipment
- Unique products
- Individually traceable inventory

First-In, First-Out (FIFO)

VALUATION

FIFO assumes that the earliest inventory purchased is issued or sold first.

KEY POINT

Ending inventory therefore reflects more recent purchase costs.

FIFO Example

VALUATION

Purchase layer	Units	Unit cost (ETB)
First purchase	100	10
Second purchase	100	12
Issued (150)	100 @ 10 + 50 @ 12	—

Cost of issue = ETB 1,600

Weighted-Average Cost

VALUATION

Weighted-average cost calculates one average unit cost for available inventory.

$$\text{Average Unit Cost} = \text{Total Cost of Goods Available} \div \text{Total Units Available}$$

Weighted-Average Example

VALUATION

GIVEN

- 100 units at ETB 10
- 100 units at ETB 12

Total cost = 1,000 + 1,200 = ETB 2,200

Average cost = 2,200 ÷ 200 = ETB 11

ETB 11 per unit

Cost of Issue under Weighted Average

VALUATION

Units issued: 150

$$150 \times \text{ETB } 11 = \text{ETB } 1,650$$

$$\text{Remaining inventory: } 50 \times \text{ETB } 11 = \text{ETB } 550$$

$$\text{Cost of issue} = \text{ETB } 1,650$$

Lower of Cost and Net Realizable Value

VALUATION

Inventory should not normally be reported above the amount expected to be recovered from sale or use.

IMPORTANT

If net realizable value falls below cost, a write-down may be required.

16

SECTION 16

Inventory Performance Indicators

Measuring how efficiently inventory is managed.

Inventory Turnover

PERFORMANCE

Inventory Turnover = Cost of Sales ÷ Average Inventory

It measures how frequently inventory is sold or used.

Inventory-Turnover Example

PERFORMANCE

GIVEN

- Cost of sales: ETB 36 million
- Average inventory: ETB 6 million

$$\text{Inventory Turnover} = 36 \div 6 = 6 \text{ times}$$

6 times

Inventory Days

PERFORMANCE

Using the example:

$$\text{Inventory Days} = (\text{Average Inventory} \div \text{Cost of Sales}) \times 365$$
$$(6 \div 36) \times 365 \approx 60.8 \text{ days}$$

$\approx 60.8 \text{ days}$

Stockout Rate

PERFORMANCE

$$\text{Stockout Rate} = (\text{Stockout Events} \div \text{Total Demand Events}) \times 100$$

A high stockout rate may indicate weak forecasting or replenishment.

Inventory Accuracy

PERFORMANCE

$$\text{Inventory Accuracy} = (\text{Correct Stock Records} \div \text{Total Records Checked}) \times 100$$

Accuracy may be measured by item, quantity or value.

Obsolete-Stock Percentage

PERFORMANCE

$$\text{Obsolete Stock \%} = (\text{Value of Obsolete Inventory} \div \text{Total Inventory Value}) \times 100$$

Inventory Shrinkage Rate

PERFORMANCE

$$\text{Shrinkage Rate} = ((\text{Recorded} - \text{Physical}) \div \text{Recorded}) \times 100$$

Order-Fill Rate

PERFORMANCE

$$\text{Order-Fill Rate} = (\text{Orders Filled Completely} \div \text{Total Orders}) \times 100$$

This measures customer-service performance.

SECTION 17

Stocktaking

Verifying physical inventory against the records.

17

What Is Stocktaking?

STOCKTAKING

Stocktaking is the physical counting and verification of inventory. It confirms:

- Quantity
- Condition
- Location
- Ownership
- Record accuracy
- Expiry status

Types of Stocktaking

Stocktaking may be:

STOCKTAKING

- Annual
- Semiannual
- Quarterly
- Monthly
- Surprise
- Continuous
- Cycle counting

Cycle Counting

STOCKTAKING

Cycle counting involves counting selected inventory items regularly throughout the year. Priority may be given to:

- High-value items
- Critical items
- Fast-moving items
- Items with previous discrepancies

Stocktaking Preparation

STOCKTAKING

Preparation should include:

- Freezing stock movement where possible
- Organizing storage areas
- Numbering count sheets
- Assigning independent count teams
- Identifying damaged stock
- Separating third-party inventory
- Preparing item lists

Good Stocktaking Practice

Count teams should:

STOCKTAKING

- Count independently
- Avoid relying only on records
- Record actual quantities
- Mark counted areas
- Recount unusual differences
- Sign count sheets
- Report damaged or expired stock

Inventory Reconciliation

STOCKTAKING

Reconciliation compares:

- Physical count
- Bin-card balance
- Inventory-system balance
- General-ledger balance

IMPORTANT

Differences must be investigated and approved before adjustment.

Common Causes of Inventory Differences

STOCKTAKING

- Unrecorded receipts
- Unrecorded issues
- Data-entry errors
- Wrong unit of measure
- Theft
- Damage
- Misclassification
- Transfers not recorded
- Counting errors

Inventory Adjustment

STOCKTAKING

Adjustments should require:

- Investigation
- Supporting documentation
- Management approval
- Accounting entry
- Updated stock records
- Corrective action
- Follow-up monitoring

18

SECTION 18

Slow-Moving, Damaged and Obsolete Inventory

Managing stock that no longer moves or holds value.

Slow-Moving Inventory

OBSOLETE STOCK

Slow-moving inventory has limited use or sales activity over a defined period. It may result from:

- Excess purchasing
- Poor forecasting
- Product changes
- Reduced demand
- Project delays
- Incorrect specifications

Damaged Inventory

Damaged inventory may be:

OBSOLETE STOCK

- Repairable
- Usable with approval
- Saleable at a discount
- Returnable to supplier
- Unusable

IMPORTANT

Its condition should be documented promptly.

Expired Inventory

OBSOLETE STOCK

Expiry management is critical for:

- Medicines
- Food
- Chemicals
- Laboratory materials
- Seeds
- Hygiene products

IMPORTANT

Expired items should be segregated and controlled.

First-Expiry, First-Out (FEFO)

OBSOLETE STOCK

FEFO means items with the earliest expiry dates are issued first. It is particularly important for:

- Pharmaceuticals
- Food commodities
- Chemicals
- Perishable supplies

Obsolete Inventory Management

OBSOLETE STOCK

Possible actions include:

- Transfer to another location
- Supplier return
- Discounted sale
- Alternative use
- Donation
- Recycling
- Write-off
- Authorized disposal

Inventory Write-Off

A write-off should require:

OBSOLETE STOCK

- Verified loss
- Condition assessment
- Approval
- Accounting adjustment
- Disposal evidence
- Updated records
- Investigation where necessary

SECTION 19

Inventory Risks

19

The threats that inventory controls are designed to manage.

Major Inventory Risks

Inventory risks include:

INVENTORY RISKS

- Theft
- Fraud
- Damage
- Expiry
- Obsolescence
- Stockouts
- Overstocking
- Recording errors
- Unauthorized issues
- Supplier failure

Fraud Risks

Inventory fraud may involve:

INVENTORY RISKS

- False receipts
- Inflated quantities
- Unauthorized issues
- Supplier collusion
- Manipulated counts
- Concealed theft
- Duplicate purchasing
- Fictitious suppliers

Storage Risks

Storage risks include:

INVENTORY RISKS

- Fire
- Flooding
- Poor ventilation
- Pest infestation
- Temperature failure
- Unsafe stacking
- Inadequate security
- Restricted-access failure

Supply-Chain Risks

Supply risks may arise from:

INVENTORY RISKS

- Supplier delays
- Transport disruption
- Currency shortages
- Import restrictions
- Political instability
- Quality failure
- Single-source dependence

SECTION 20

Inventory Internal Controls

20

Building strong controls across the inventory cycle.

Core Inventory Controls

Strong controls should cover:

INTERNAL CONTROLS

- Purchasing
- Receiving
- Inspection
- Recording
- Storage
- Issuing
- Transfers
- Stocktaking
- Disposal

Segregation of Duties

INTERNAL CONTROLS

Different staff should be responsible for:

- Requesting inventory
- Approving purchases
- Receiving goods
- Recording receipts
- Storing stock
- Issuing stock
- Reconciling records
- Approving adjustments

Receiving Controls

INTERNAL CONTROLS

Receiving controls should include:

- Purchase-order verification
- Quantity count
- Quality inspection
- Condition check
- Delivery-note confirmation
- Goods-received documentation
- Independent acknowledgement

Storage Controls

Storage controls may include:

INTERNAL CONTROLS

- Restricted access
- Key management
- Security cameras
- Fire protection
- Temperature monitoring
- Item labeling
- Location coding
- Safe stacking
- Pest control

Issue Controls

Inventory issues should require:

INTERNAL CONTROLS

- Approved request
- Correct authorization
- Quantity verification
- Recipient signature
- Stock-record update
- Programme or cost-center coding

Transfer Controls

INTERNAL CONTROLS

Transfers between locations should use:

- Approved transfer form
- Dispatch confirmation
- Receiving confirmation
- Updated records at both locations
- Transportation documentation

System-Access Controls

INTERNAL CONTROLS

Inventory systems should include:

- Individual user accounts
- Role-based permissions
- Password controls
- Audit trails
- Restricted adjustment rights
- Regular access review
- Data backup

Three-Way Matching

INTERNAL CONTROLS

Before supplier payment, compare:

- Purchase order
- Goods-received note
- Supplier invoice

KEY POINT

This confirms that goods were ordered, received and correctly billed.

SECTION 21

Inventory Optimization

21

Achieving target service levels at the lowest total cost.

What Is Inventory Optimization?

OPTIMIZATION

Inventory optimization seeks required service levels at the lowest total inventory cost. It balances:

- Availability
- Demand uncertainty
- Lead time
- Carrying cost
- Stockout risk
- Supplier performance

Demand Forecasting

Good forecasting uses:

OPTIMIZATION

- Historical consumption
- Sales trends
- Seasonal patterns
- Programme plans
- Customer orders
- Market information
- Management judgment

Supplier Performance Management

OPTIMIZATION

Suppliers should be assessed on:

- Delivery time
- Quality
- Quantity accuracy
- Price
- Responsiveness
- Reliability
- Documentation
- Contract compliance

Supplier Diversification

OPTIMIZATION

Supplier diversification reduces dependence on a single source. It can reduce:

- Supply interruption
- Price manipulation
- Delivery risk
- Quality risk
- Political and geographic exposure

Just-in-Time Inventory

OPTIMIZATION

Just-in-Time aims to minimize stock by receiving items close to when they are needed. Potential benefits:

- Lower carrying cost
- Lower storage requirements
- Reduced obsolescence
- Faster inventory movement

JIT Risks

JIT may increase exposure to:

OPTIMIZATION

- Supplier delays
- Transport disruptions
- Demand spikes
- Quality failures
- Emergency shortages

IMPORTANT

It requires reliable suppliers and strong coordination.

Vendor-Managed Inventory

OPTIMIZATION

Under Vendor-Managed Inventory, the supplier helps monitor and replenish the customer's stock. Potential benefits include:

- Reduced stockouts
- Improved replenishment
- Lower administrative effort
- Better supplier coordination

Inventory Centralization

OPTIMIZATION

Centralized inventory may provide:

- Stronger control
- Lower safety stock
- Better purchasing power
- Easier supervision
- Reduced duplication

Inventory Decentralization

OPTIMIZATION

Decentralized inventory may provide:

- Faster local access
- Shorter delivery times
- Better response to local demand
- Greater operational flexibility

IMPORTANT

It may also increase control and duplication risks.

SECTION 22

Practical Exercise

22

Applying the tools to evaluate a real inventory decision.

Practical Exercise — Evaluate an Inventory Decision

Participants will:

PRACTICAL EXERCISE

- Calculate EOQ
- Calculate order frequency
- Calculate reorder point
- Estimate safety stock
- Calculate inventory turnover
- Calculate inventory days
- Identify inventory risks
- Recommend control improvements

Exercise Scenario

A company uses a material with:

PRACTICAL EXERCISE

- Annual demand: 18,000 units
- Ordering cost: ETB 250 per order
- Annual carrying cost: ETB 20 per unit
- Average daily demand: 60 units
- Lead time: 7 days
- Safety stock: 180 units

Step 1 — Calculate EOQ

PRACTICAL EXERCISE

$$EOQ = \sqrt{(2 \times 18,000 \times 250) \div 20}$$

$$EOQ = \sqrt{450,000}$$

$$EOQ \approx 671 \text{ units}$$

≈ 671 units

Step 2 — Calculate Orders per Year

PRACTICAL EXERCISE

$$\text{Orders} = 18,000 \div 671 \approx 26.83$$

≈ 27 orders

Approximately 27 orders should be placed annually.

Step 3 — Calculate Time Between Orders

PRACTICAL EXERCISE

$$365 \div 26.83 \approx 13.6 \text{ days}$$

≈ 13.6 days

Step 4 — Demand During Lead Time

PRACTICAL EXERCISE

$$60 \times 7 = 420 \text{ units}$$

420 units

Step 5 — Calculate Reorder Point

PRACTICAL EXERCISE

$$\text{ROP} = 420 + 180$$

$$\text{ROP} = 600 \text{ units}$$

600 units

An order should be placed when stock falls to 600 units.

Step 6 — Calculate Average Inventory

PRACTICAL EXERCISE

$$\begin{aligned}\text{Average Inventory} &= (\text{EOQ} \div 2) + \text{SS} \\ &= (671 \div 2) + 180 \approx 515.5 \text{ units}\end{aligned}$$

≈ 515.5 units

Additional Financial Information

Assume:

PRACTICAL EXERCISE

- Annual cost of sales: ETB 30 million
- Average inventory value: ETB 5 million

Step 7 — Calculate Inventory Turnover

PRACTICAL EXERCISE

Inventory Turnover = $30 \div 5 = 6$ times

6 times

Step 8 — Calculate Inventory Days

PRACTICAL EXERCISE

$$\text{Inventory Days} = (5 \div 30) \times 365 \approx 60.8 \text{ days}$$

≈ 60.8 days

Interpretation

The company:

PRACTICAL EXERCISE

- Orders approximately 671 units per order
- Places approximately 27 orders annually
- Reorders at 600 units
- Holds approximately 516 units on average
- Turns inventory six times annually
- Holds inventory for approximately 61 days

Sensitivity Exercise

PRACTICAL EXERCISE

Recalculate EOQ and reorder point if:

- Annual demand rises by 20%
- Ordering cost falls by 30%
- Holding cost increases to ETB 30
- Lead time increases to 12 days
- Safety stock increases to 300 units

IMPORTANT

Explain the operational and financial effects.

Group Risk Assessment

Identify risks related to:

PRACTICAL EXERCISE

- Excess inventory
- Stockouts
- Supplier delays
- Theft
- Recording errors
- Obsolescence
- Expiry
- Weak stocktaking

Group Recommendation

PRACTICAL EXERCISE

Each group should present:

- EOQ
- Reorder point
- Safety-stock recommendation
- Inventory-turnover interpretation
- Major control weaknesses
- Three corrective actions
- Suitable classification method
- Final inventory policy recommendation

23

SECTION 23

Chapter Review

Consolidating the key lessons and testing understanding.

Common Inventory-Management Mistakes

CHAPTER REVIEW

- Purchasing without demand forecasts
- Holding excessive safety stock
- Ignoring lead-time variability
- Failing to identify slow-moving stock
- Using inaccurate stock records
- Weak segregation of duties
- Infrequent stocktaking
- Ignoring expiry dates
- Using emergency procurement repeatedly
- Failing to reconcile warehouse and accounting records

Inventory-Management Checklist

CHAPTER REVIEW

Management should regularly review:

- Stock levels
- Reorder points
- Safety stock
- Lead times
- EOQ
- Inventory turnover
- Inventory days
- Slow-moving stock
- Expired inventory
- Stockout frequency
- Supplier performance
- Physical-count differences
- Storage conditions
- Inventory controls

Knowledge Check

CHAPTER REVIEW

1. What is inventory management?
2. Why do organizations hold inventory?
3. What are the major inventory costs?
4. What does EOQ determine?
5. How is a reorder point calculated?
6. Why is safety stock maintained?
7. What is ABC analysis?
8. How does perpetual inventory differ from periodic?
9. What does inventory turnover measure?
10. Why is stock reconciliation important?

Knowledge Check — Answers

CHAPTER REVIEW

1. Planning and controlling inventory from purchase through issue or disposal
2. To meet demand and maintain operational continuity
3. Purchase, ordering, carrying and stockout costs
4. The order quantity minimizing ordering and carrying costs
5. Demand during lead time plus safety stock
6. To protect against demand and lead-time uncertainty
7. Classification based on annual consumption value
8. Perpetual updates continuously; periodic relies on physical counts
9. How frequently inventory is sold or used
10. It identifies differences between physical and recorded inventory

Action Plan

CHAPTER REVIEW

Evaluate one inventory category in your organization and identify:

- Annual demand
- Unit cost
- Ordering cost
- Carrying cost
- Lead time
- Safety stock
- EOQ
- Reorder point
- Inventory turnover
- Inventory days
- Main inventory risk
- Immediate corrective action
- Long-term improvement

Chapter Summary

CHAPTER REVIEW

- Inventory supports production, sales and service delivery
- Inventory management balances availability, cost and risk
- Major costs include ordering, carrying and stockout costs
- EOQ identifies an economical order quantity
- Reorder point determines when replenishment should begin
- Safety stock protects against uncertainty
- Classification focuses control on important items
- Perpetual systems provide continuous stock information
- Valuation affects cost of sales and financial reporting
- Stocktaking verifies quantity, condition and accuracy
- Slow-moving and obsolete inventory require timely action
- Strong internal controls reduce loss, fraud and error
- Effective management improves liquidity, efficiency and service

Key Message

CHAPTER REVIEW

Inventory management is not simply about keeping goods in a warehouse. It requires coordinated decisions about:

THE INVENTORY DECISION CHAIN

Demand → Purchasing → Order Quantity → Lead Time → Storage → Issuing → Replenishment → Risk Control → Operational Performance

THANK YOU

Questions and Discussion

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Effective inventory management ensures that essential materials are available without tying up unnecessary financial resources. It creates value by balancing service continuity, purchasing efficiency, storage cost, operational risk and accurate accountability for every item held.

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