Unit 1: 
**BUSINESS LOGISTICS**

- Logistics management – a paradigm shift
- Customer value chain
- Marketing and logistic mix.
- Organizing logistic functions.

Unit 2: 
**PRACTICES OF OPERATIONAL LOGISTICS**

- Market survey and customer care service and attributes.
- Integrated logistics management
- Understanding costs and benefits-quoting rates for services
- Determining the customer service level
- Different mode of payments
- Operations research & logistics decision making
- Logistic auditing
- Relogistics - A new wave for value delivery

Unit 3: 
**LOGISTICS INFORMATION SYSTEM**

- Logistics information needs
- Designing a logistic information system
- Role of technology in logistics
  - Automatic identification technology
  - Electronic Data Interchange (EDI)
  - Warehouse simulation
  - Communication technology

Unit 4: 
**LOGISTIC OUTSOURCING**

- Drivers of outsourcing trends
- Benefits of logistic outsourcing
- Selection of service provider
- Outsourcing-A value proposition

Unit 5: 
**SUPPLY CHAIN MANAGEMENT**

- Supply chain components
- Economics of distribution
- Supplier distributor benchmarking

**BASIC TEXT:**

Sunil Chopra, Peter Meindi, and D. V. Kalra: Supply Chain Management (Pearson Education), OR
Ronald H. Ballou & Samir K. Srivastava: Business logistics / Supply Chain Management (Pearson Education)
 CONTENTS

• DIGITAL ERA OF MARKETING
• IMPORTANCE OF SUPPLY CHAIN
• CHAMPIONS OF SUPPLY CHAIN
• PROFIT TRANGLE
• SUPPLY CHAIN DEFINITIONS
• UPSTREAM AND DOWNSTREAM SCM
• SUPPLY CHAIN CYCLES
• 4 CASE STUDIES, WAL-MART, UPS, TOI, HLL
• SUPPLY CHAIN LEVERS
  STRATEGIC SOURCING
  ASSET OPTIMIZATION
  DISTRIBUTION EFFECTIVENESS
  SUPPLY CHAIN PLANNING
• ROLE OF IT IN SUPPLY CHAIN
EXCITING TIME IN INDIA FOR MARKETING

- NEW DIGITAL AGE, VC, INTERNET, RFID (SMART TAG TECHNOLOGY), ICT, WIRELESS, MOBILE, E-commerce
- E-bay, Amazon. COM, i-tunes.com
- MARKETING IS MANAGING PROFITABLE COSTUMER RELATIONSHIPS
WHAT IS COMMON TO

• WALMART
• CARREFOUR
• DELL
• SEARS
• K-MART
• CATERPILLAR
• TARGET
• UPS (United parcel Service)
• Grainger
• TOI

These Companies focussed on SUPPLY CHAIN and created Value to CUSTOMER
MAXIMISE SHAREHOLDERS PROFITS AND CUSTOMER’S DELIGHT

• PROFIT TRANGLE
Aims of organization

• Customer Satisfaction
• Value
• Profitability
• Competitive Advantage
• Supply chain activities transform natural resources, raw material and components into a finished product that is delivered to end customer

• In SCM companies and corporations involve themselves in supply chain by exchanging information regarding market fluctuations, production capabilities

• Supply chain, logistic network is System of organizations, People, Technology, Activities and Information and resources In moving a product or service from supplier to customer
Definition of Logistics

• Definition by Council of Logistics
• Logistics is that part of supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customer’s requirements
SCM Definition by Mentzer et.al.

- SCM is defined as the systematic, strategic coordination of the traditional business functions and the tactics across these functions, within a particular company and across business within the supply chain, for the purpose of improving the long term performance of the individual companies in the supply chain and the supply chain members collectively.
Functional and Process Perspective

SUPPLY CHAIN PROCESS

ORDER - TO - DELIVERY PROCESS

Procurement  Manufacturing  Distribution  Logistics
Supply Chain flows

• Products
• Services
• Information
• Financial resources
• Demand forecasts
• **KEY ACTIVITIES**
• Customer service staff in coordination with marketing determine customer needs and wants for logistics customer service
• Determine customer response to service
• Set customer service levels
• **Transportation**
  • Mode and transport service selection
  • Freight consolidation
  • Carrier Routing
  • Vehicle scheduling
  • Equipment selection
  • Claims processing
  • Rate Auditing
• **Inventory management**
  • Raw Materials and finished goods stock policies
  • Short term sales Forecasting
  • Product mix at stocking points
  • Number, size and location of stocking points
  • Just in time push and pull strategies
• **Information flows and service management**
Support Activities

- Warehousing
- Material handling
- Purchasing
- Protective packaging
- Information maintenance
- Cooperate with production/operations
Key Problem in SCM

Design a supply chain network that delivers high quality products to the right customers at the right time at minimum cost.
Example of a Typical Supply Chain: IBM Europe PC Supply Chain

Suppliers (International)  
1.2 Million PC/Yr.  
Glasgow U.K.

PC Assembly Plant  

Warehouse

Port

13 Transshipment Points (TPs) in Europe

Country-wide Distribution Centers (DCs)

Retailers
SUPPLY CHANGE MANAGEMENT

Managing Upstream and downstream Value added Flows of materials, final Goods and Related Information among suppliers, the company, Resellers and Final Consumers

VALUE CREATION BY COLLABORATING HORIZONTALLY(suppliers,retailers and customers)

Inbound Logistics, Material Mgt ,inventory control etc

Outbound Logistics physical distribution

REVERSE LOGISTICS
A CYCLE VIEW OF SUPPLY CHAIN

Cycles of supply chain process
Customer order cycle
Replenishment cycle
Manufacturing cycle
Procurement cycle

Interface
CUSTOMER
RETAILER
DISTRIBUTER
MANUFACTURER
SUPPLIER

CYCLES ARE TRIGGERED BY CUSTOMER ORDER, REPLENISHMENT ORDERS FROM DISTRIBUTORS OR BY FORECAST OF CUSTOMER DEMAND AND CURRENT PRODUCT AVAILABILITY IN FINISHED GOODS WAREHOUSE
Case study

WAL-MART A US 350 BILLION US DOLLAR COMPANY, OF SAM WALTON AND DAVID GLASS

HEADQUARTERED AT 1.2 MILLION SQUARE FOOT DISTRIBUTION CENTER AT ARKANSAS, BENTONVILLE, MOVES 2.3 BILLION CARTON PER YEAR, 24/7, TWELVE MILES OF CONVEYER STREAM

ELECTRIC ARMS GUIDE EACH STREAM AND GUIDE OUT BOXES ORDERED BY STORES

ANOTHER CONVEYER BELT SWEEPS THEM IN TRUCKS RUSHING PRODUCTS TO RESPECTIVE SHELVES OF STORE

LIFTING OF PRODUCT BY CUSTOMER AND CASHIER SCANS SENDS INFO TO SUPPLIERS EVEN IN CHINA Matching thus Supply and fluctuating demand increasing responsiveness to planning manufacturing capabilities leading towards just in time approach

WALMART SYMPHONY- DELIVERY, SORTING, PACKING, DISTRIBUTION. BUYING, MANUFACTURING, RECORDING, REORDERING, DELIVERY, SORTING, PACKING
CASE STUDY United Parcel Service

UPS A 36 BILLION US dollar Supply Chain outsourcing company

Repairs Toyota LAPTOPS DIRECTLY

Manages LOGISTICS FOR E-BAY

Supply chain for Papa John’s PIZZA

SERVICES HP PRINTERS DIRECTLY

UPS SLOGAN (“YOUR WORLD SYNCHRONIZED)

MANAGES OUTSOURCING OF SUPPLY CHAIN
Case Study TOI
Remote publishing in 18 centers on communication channel reducing freight cost by Air
E-Paper on India-times portal, E-Kiosks
World’s largest English newspaper
SAP digital workflow for space selling, prepress and electronic printing, CTP,
Improvement in Physical distribution through electronic Labeling on bundles and automatic loading on trucks to delivery points/warehouses improving supply chain
Case study

- HLL was market leader in detergent powder and soap with products as Surf and Rin till sixties
- Nirma (kirsen Patel) in 1969 was introduced in detergent powder and bar segment and by 1992, nirma captured 55% market share challenging both surf and rin putting extreme pressure on HLL
- HLL countered nirma by setting third party production UNIT like Stefan chemicals with cheaper and more efficient supply chain and produced WHEEL exceeding sale of 1000 crore
- Moral of the story is only superior cost, quality, delivery and technological performance do not guarantee success but process linkages are the keys.
Examples of Supply Chains in India

Automotive - Telco, ALL, Mahindra, Maruti
Aerospace - ADA, HAL
Chemicals - Asian Paints, Apollo tyres, Reliance
Apparel - Madura Coats, Reliance
Food - Cadbury, Parle, Amul Products, HLL
Consumer durables - HLL, P & G
Forest Products - Papermills
Construction - L & T
Pharmaceutical - Ranbaxy, Glaxo
Electromechanical – Kirloskar, L & T
Tooling - HMT, Widia, Mico
PC/ Computer - IBM, WIPRO, HCL, Intel
THRIVING INDIAN RETAIL SECTOR TO GROW WITH 25% GR
LARGEST INDUSTRY WITH POTENTIAL OF 250 BILLION US DOLLAR IN INDIA IS LARGEST SOURCE OF EMPLOYMENT AFTER AGRICULTURE

IT SEEN AS BIGGEST ENABLER OF SUCCESS
ORACLE AND SUN PROVIDING IT SOLUTION IN RETAILING
IT FOR FINANCE, ACCOUNTING, BUSINESS INTELLIGENCE, VENDOR DEVELOPMENT AND MANAGEMENT, MERCHANDISING AND INVENTORY MANAGEMENT, FACILITIES MANAGEMENT, STORE MANAGEMENT, CRM, BRANDING, MARKETING, SALES PROMOTION, HR]
AND LAST BUT NOT THE LEAST
SUPPLY CHAIN MANAGEMENT
SUPPLY CHAIN LEVERS EFFECT EVA LEVERS VIZ REVENUE, COST, WORKING CAPITAL AND FIXED CAPITAL

EVA - Economic value added

Supply chain levers

Strategic Sourcing

Asset Optimization

Distribution Effectiveness

Supply Chain planning
Strategic Sourcing Framework

- Wheel of Fortune: HIGH
- Automatic Pilot: LOW
- Strategic partnership: HIGH
- The price is Right: LOW
- Financial Impact: LOW
- HIGH

Strategic Importance
Our Business Requirements Pyramid

- Assurance Of Supply
- Quality/Regulatory
- Service
- Cost
- Innovation

Assurance Of Supply
Quality/Regulatory
Service
Cost
Innovation
Business Requirements/Evaluation Model

A long-term capital investment should support

A : Assurance of Supply
   Vendors’ tech. capability, org. stability & reliability of equipment

Q : Quality
   Continuity of production and output quality consistency

S : Service
   After sales service: availability of spare parts / technical support

C : Cost
   Current and future competitiveness

I : Innovation
   Flexibility for different products, upgradability to new technology

R : Regulatory
   Regulatory compliance; Safety requirements; Environmental objectives
Framework for maximizing asset utilization

- **Fixed asset**
  - Increase fixed Asset turn
  - Reduce Downtime
  - Reduce Cycle Time
- **Working capital**
  - Increase Capital turn
  - Reduce Inventory level
  - Reduce investment in receivable
- **Optimize Supplier credit**
- **Asset optimisation**
A MAJOR GLOBAL COMPANY INCREASED ITS ROA (measurable benefit of improving SCM) BY ALIGNING ITS FUNCTIONAL ACTIVITIES WITH SUPPLY CHAIN STRATEGY. READ THE HARD NUMBERS OF IMPROVEMENT.

**Sales revenue**
Increase from 2b to 2.102b

**COSTS**
Inv.c.cost.dec by 5M
Prod.cost by 1m,
Transp c.by 1m
Proc.c. by 1m

**Working capital**
Inventory investment.dec by 45m

**Fixed capital**
Dist.center.investment.dec by 3m

**Net income**
incr from 100m to 108m

**ROA** increased from 14.29%-100/700 to 16.56%-108/652

**Assets**
Cap. Invested.
Dec. from 700m to 652m

Source HBR2007
DISTRIBUTION EFFECTIVENESS- KEY AREAS

**CHANNEL MANAGEMENT** = DEFINE PROFILE OF CHANNEL MEMBERS, IDENTIFY PERFORMANCE METRICS AND MANAGE THEIR PERFORMANCE AND PROFITABILITY

MINIMISE COST TO SERVE OF VARIOUS CHANNEL PARTNERS

USE ROI PRINCIPLE TO MANAGE CHANNEL PARTNER PERFORMANCE

**LOGISTICS**- Configure network based on least total Delivered cost to identify optimal linkages between manufacturing locations and delivery points

**TRANSPORTATION MANAGEMENT**- Manage base of transport service providers to minimize freight costs and ensure desired service level by evaluating them on infrastructure, service and delivery capabilities
Supply chain planning -

AN INTEGRATED PLANNING TO ENSURE AVAILABILITY OF RIGHT FINISHED GOODS AT DESIRED POINT IN TIME FOR DELIVERY TO THE CUSTOMER

IF NOT DONE MAJOR RISKS ARE

• LOST SALES

• BUILD UP INVENTORY

• IDLE TIME ON CRITICAL EQUIPMENT

• SHORTAGE OF A KEY RAW MATERIAL

• RIGHT SKILLS SUCH AS UNDERSTANDING OF BEST PRACTICES, PROCESS DESIGN, PROJECT MANAGEMENT, CHANGE MANAGEMENT AND INFORMATION TECHNOLOGY CAN ONLY BRING BENEFITS OF SCM TO COMPANIES
Role of IT and Telecommunications on supply chain

Global positioning system tracking location of delivery trucks

Satellite communication channels

Transmitting material requirements through Web based EDI

Capturing demand and replenishment data through bar code technology

RFID tags, bar codes, scanners, robotic arms and computers for real time material and product movement

ERP software from SAP, ORACLE for modern and cost effective integrated SCM with three macro processes like CRM, ISCM, SRM with focus on customer, internal supply chain with focus on internal processes, Supplier relationship management focusing on interface with supplier, MM modules

FULL Network connectivity with its partners with VPN based Extranet
Well orchestrated Supply chain will reduce
Manufacturing cost
Inventory cost
Replenishment lead time
Transportation cost
Shipping and receiving cost and INCREASE
Level of product Availability, and
PROFITIBILITY
MICRO-CHIP WITH ANTENNA REPLACING BAR CODE
IDENTIFY EACH STAGE IN SUPPLY CHAIN
PRODUCT SPECS, WHICH MANUFACTURER
EXPIRY DATE
RADIO FREQUENCY IDENTIFICATION
TEMPERATURE
DAILY AND SEASONAL CUSTOMER HABITS
PRIORITISATION
WHEN WE PRODUCE, WHEN WE SHIP AND PUT EXACTLY AT RIGHT PLACE IN TRUCK
Logistics/sc interfaces with marketing

<table>
<thead>
<tr>
<th>Logistics Sample Activities</th>
<th>Interface activities</th>
<th>Marketing Sample activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>Customer service standards</td>
<td>Sample activities</td>
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<tr>
<td>inventory</td>
<td>pricing</td>
<td>Market research</td>
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<tr>
<td>Order processing</td>
<td>packaging</td>
<td>Product mix</td>
</tr>
<tr>
<td>Material handling</td>
<td>Retail location</td>
<td>Sales Force Management</td>
</tr>
</tbody>
</table>
• Marketing Management is the process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create exchanges with target groups that satisfy individual and organizational objectives

• MARKETING CONCERN IS TO PLACE ITS PRODUCT OR SERVICES IN CONVENIENT DISTRIBUTION CHANNELS TO FACILITATE THE EXCHANGE PROCESS

• MARKETING WOULD PRIMARILY BE RESPONSIBLE FOR MARKET RESEARCH, PROMOTION, SALES-FORCE MANAGEMENT AND THE PRODUCT MIX WHICH CREATE POSSESSION VALUE IN THE PRODUCT
Objectives of Business Logistics/SC

- ROLA = CONTRIBUTION TO REVENUE - Logistics Operating Costs/Logistics Assets
- ROLA (return on Logistics Assets)
Organizing Logistics Function - Chapter 15

- LOGISTICS DIVISION A    DIVISION B
- Order entry and processing
- Inventory management and production scheduling
- Transportation
- Procurement
- Warehousing and material management
Supply Chain Measures

• Supply chain Measures fall under 4 main categories.
• Cost
• Assets
• Reliability
• Flexibility
Benchmarking supply chain performance using financial data

• Total length of the chain: The total length of the chain is arrived by adding up the days of inventory for raw materials, work in progress and finished goods. The firm with minimum value is said to have best performance.

• Total length of chain in days = DRM + DWIP + DFG

• Companies like Dell will perform very well on this measure.
Evaluating the efficiency of Supply chain management

- Supply chain management costs (SCC) = distribution cost (DC) + inventory (INV) (all inclusive) * inventory carrying cost (ICC)
- Supply chain inefficiency Ratio = SCC/NS
- NS = net sales
- Firms with efficient supply chain systems will have relatively low inefficiency ratio
Supply Chain working capital productivity

- Supply chain working capital (SWC)
- SWC = inv + AR - AP
- INV = INVENTORY All inclusive of raw materials, semi finished goods and finished goods
- AR = Accounts receivable
- AP = Accounts payable
- SWCP (Supply chain working capital productivity) = NS / SWC
Linking supply chain and business performance

- Impact of various supply chain initiative can be estimated in terms of costs and benefits using the following broad groupings.
  - **Cost reduction** is achieved by –
  - By reduced inventory
  - Reducing logistics expenses
  - Reducing direct material expenses
  - Reducing indirect material expenses
contd

• Improving revenue and profitability by
• -selling higher margin products
• Achieving higher market share
• Reducing lost sales
• Attacking new markets
• Decreasing supply time to market
Reducing working capital by
Reducing inventory
Reducing accounts receivable
• **Improving operational efficiency by**
• Reducing procurement expenses
• Increasing asset utilization
• Delaying capital expenditure
Chrysler in 2006 after the turnaround by Lee-Iacocca failed by sitting on inventory of 83 days of unsold finished goods. Chrysler's dealers were reluctant to lift any more cars as they had a high inventory of 100 days.
Supply chain operation reference (SCOR) MODEL, SOURCE WWW.SUPPLY-CHAIN

- SCOR HAS DEVELOPED 11 PERFORMANCE MEASURES
- Delivery performance
- Order fulfillment performance
- Fill rate
- Order fullfilment lead time
- Perfect order fulfilment
- Supply chain response time
- Production flexibility
- Total logistics management cost
- Value added productivity
- Warranty cost
- Cash to cash cycle time
- Inventory days of supply
- Asset turns
Question 1

Calculate the length of total length of chain for company A and Company B. Comment from the calculated data, which is having a better performance.
Assignment, September, 2009, page 2

DRM = RM * 365 / CRM
DWIP = SFG * 365 / CP
DFG = FG * 365 / CS

CRM, CP, CS Data are for one financial year
CRM is annual cost of raw material, CP is annual cost of production, CS is annual cost of sales

Company A
DRM = 1CR * 365 / 10CR = 36.5 DAYS
DWIP = 1CR * 365 / 50 CR = 7.6 DAYS
DFG = 20 CR * 365 / 100 CR = 73 DAYS
Total number of days = 36.5 + 7.6 + 73 = 117.1 days

Company B
DRM = 50 Lacs * 365 / 10cr = 18.25 DAYS
DWIP = 50 LACS * 365 / 5CR = 36.5 DAYS
DFG = 1CR * 365 / 25CR = 14.6 DAYS
Total number of days = 18.25 + 36.5 + 14.6 = 69.35 days
Question 2.
Which company is better on supply chain inefficiency ratio as performance measure.
Quantify the results based on data given below for company A and Company B

Question 3
Which company is better on supply chain working capital productivity.
Quantify the results based on data given below for company A and Company B

Company A
SCC = DC + INV * ICC
RM = 1 CR, SFG = 1 CR, FG = 18 CR, DC = 5 CR, NS = 100 CR, AR = 2 CR, AP = 5 CR
SCC = 5 + 20 * .2 = 9 CR, SCI = SCC / NS = 9 / 100 = .09

Company B
RM = 50 L, SFG = 50 L, FG = 1 CR, DC = 20 L, NS = 30 CR, AR = 1 CR, AP = 50 L ACS
SCC = 2 + 2 * .2 = 2.4 CR, SCI = SCC / NS = 2.4 / 30 = .08

SCC = Supply chain management cost, INV = total inventory
ICC = Inventory carrying cost, DC = Distribution cost, NS = Net Sales, RM = Raw Material inventory, SFG = Semi Finished Goods inventory, FG = Finished goods Inventory
Numerical contd

• Company A
  \[ \text{SWC} = 20 + 2 - 5 = 23 \text{CR}, \text{SWCP} = 100 / 23 = 4.3 \]

• Company B
  \[ \text{SWC} = 1 \text{CR} + 1 \text{CR} - 0.5 = 1.5 \text{CR}, \text{SWCP} = 30 / 1.5 = 20 \]
• Question 3

• Define Return on logistics cost and discuss its dependence on revenue and logistics assets
Unit 2

• PRACTICES OF OPERATIONAL LOGISTICS
• Market survey and customer care service and attributes.
• Integrated logistics management
• Understanding costs and benefits-quoting rates for services
• Determining the customer service level
• Different mode of payments
• Operations research & logistics decision making
• Logistic auditing
• Relogistics - A new wave for value delivery
• Customer service when utilized effectively is a prime variable that can have significant impact on creating demand and retaining customer loyalty.

• Logistics customer service is….. The speed and dependability with which items ordered can be made available

• Another definition calling customer service as fulfillment process as ….

• The entire process of filling the customer’s order. This process includes the receipt of order, managing the payment, picking and packing the goods, shipping the package, delivering the package, providing customer service for the end user and handling possible the return of goods
Customer service

- Pre-transaction elements
  - Written statement of policy
  - Statement in hands of customer
  - Organizational structure
  - System flexibility
  - Technical services

- Transaction elements
  - Setting stock levels
  - Selecting transportation mode
  - Elements of order cycle
  - Delivery time
  - Transship
  - System accuracy
  - Order conveniences
  - Substitution

- Post transaction elements
  - Installation
  - Warranty
  - Repairs
  - Alterations
  - Product tracking
  - Customer claims
  - Complaints
  - Product packaging
• 6 physical distribution service elements by product type
• 1. In Stock Performance
• 2. Lead time
• 3. Consistency of delivery
• 4. Order progress information
• Protective packaging
• Cooperation in handling shipping problems
Rate them in order of preference
• Primary elements of customer service are captured within the concept of order cycle time

• Order cycle time is ‘the elapsed time between when a customer order, purchase order or service request is placed and when product or service is received by customer

Total order cycle time = order transmittal to customer retail outlet (order consolidation and transmission of orders to warehouse) + order processing and assembly (bill of lading preparation, credit clearance, order assembly in warehouse) + additional stock acquisition time (if stock out, additional time to acquire stock from plant) + delivery time from factory (shipping time from warehouse and customer shipment processing)
• Frequency distribution for total order cycle time when out of stock situation occurs
Order entry and order filling at plants and warehouses are consuming 50 per cent of order cycle time and it should be targeted for order cycle time reduction.

- Order entry and production/warehousing processing: 36 days
- Transport to consolidation point: 2 days
- Freight consolidation: 7 days
- Freight pick up: 1 day
- Transport to port vessel waiting: 2 days
- Ocean transit: 18 days
- Deconsolidation: 4 days
- Customs clearance: 2 days
- Inland transport to inventory point: 1 day
• Defining a sales service relationship
• Threshold
• Diminishing returns
• Decline
• See the curve on page 108 in the textbook and discuss
- Measuring service
- **Order entry**
  - Minimum, maximum and average time for order handling
  - Percent of orders handled within target time
  - **Order documentation accuracy**
  - Percent of order documents with errors
- **Transportation**
  - Percent of delivery on time
  - Percent of orders delivered by customer request date
  - Damage and loss claims as a percent of freight costs
- **Inventory and product availability**
  - Stockout percentage
  - Percent of orders filled complete
  - Order fill rate and weighted average fill rate
  - Average percent of items on backorder
  - Items fill rate
- **Product damage**
  - Number of returns to total orders
  - Value of return to total sales
- **Production / warehouse processing time**
  - Minimum, maximum and average time to process orders
Three fundamental dimensions of customer service are Availability, performance and reliability. Some Definitions

- **Availability** --- Availability is the capacity to have inventory when it is desired by a customer. The 3 measures are stockout frequency, fill rate, order shipped complete.

- **Stock out frequency** --- Stock out frequency is a measure of how many times demand for a specific product exceeds availability. Stock out frequency is a starting point in measuring inventory availability.

- **Fill Rate** --- Fill rate measures the magnitude or impact of stock out over time. If a customer orders 50 units and only 47 units are available, the order fill rate is 94 per cent. (47/50)

- **Order shipped complete** --- order shipped complete is a measure of times that a firm has all the inventory ordered by a customer. Order shipped complete establishes the potential times that customers will receive perfect orders.

- **Base stock** --- determined by forecast variance requirements and held to support basic availability.

- **Safety stock** --- To cover demand that exceeds forecasted volumes and to accommodate unexpected operational eventualities. Safety stock exists to accommodate forecasted and cushion delivery delays during base stock replenishment.
• Operational performance---

Speed---Performance cycle speed is the elapsed time from when an order is placed until shipment arrival viewed from customer’s perspective.

Typically faster the planned performance, the lower the level of inventory investment required by customers.

Consistency----Consistency refers to a firm’s ability to perform at the expected delivery time over a large number of performance cycles.

Flexibility---Operational flexibility refers to a firm’s ability to handle extraordinary customer service requests such as product modification or customizations for specific markets or customers, new product introduction. A firm’s overall logistical competency depends on the capability to ‘go extra yard’.

Mal function/Recovery – During service failures, capability to have contingency plans and to anticipate the service breakdowns and have recovery

Reliability---Logistics quality is all about reliability. Ability to comply to levels of planned inventory availability and operational performance is key to provide reliable service. A major part of service quality is continuous improvement