

# Supply Chain Management

## SC Metrics, Collaboration Models and Innovation Imperatives

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# SCM Challenges



Describe the process of Price Discovery in your firm . Or do you aspire to be the lowest cost producer at all times ?

How are customers segmented ?

How do you track customer preferences ? Validate segmentation ?

How do you track the accuracy of sales forecast ? What is the forecast periodicity ? When is it frozen in a planning cycle ?

State how you measure and keep track of lost sales . What information is extracted out of this data and how is it used ?

How can competitive equilibrium ( of market share ) be altered ?  
Does SCM have a role ?

# The Quaker Oats Story

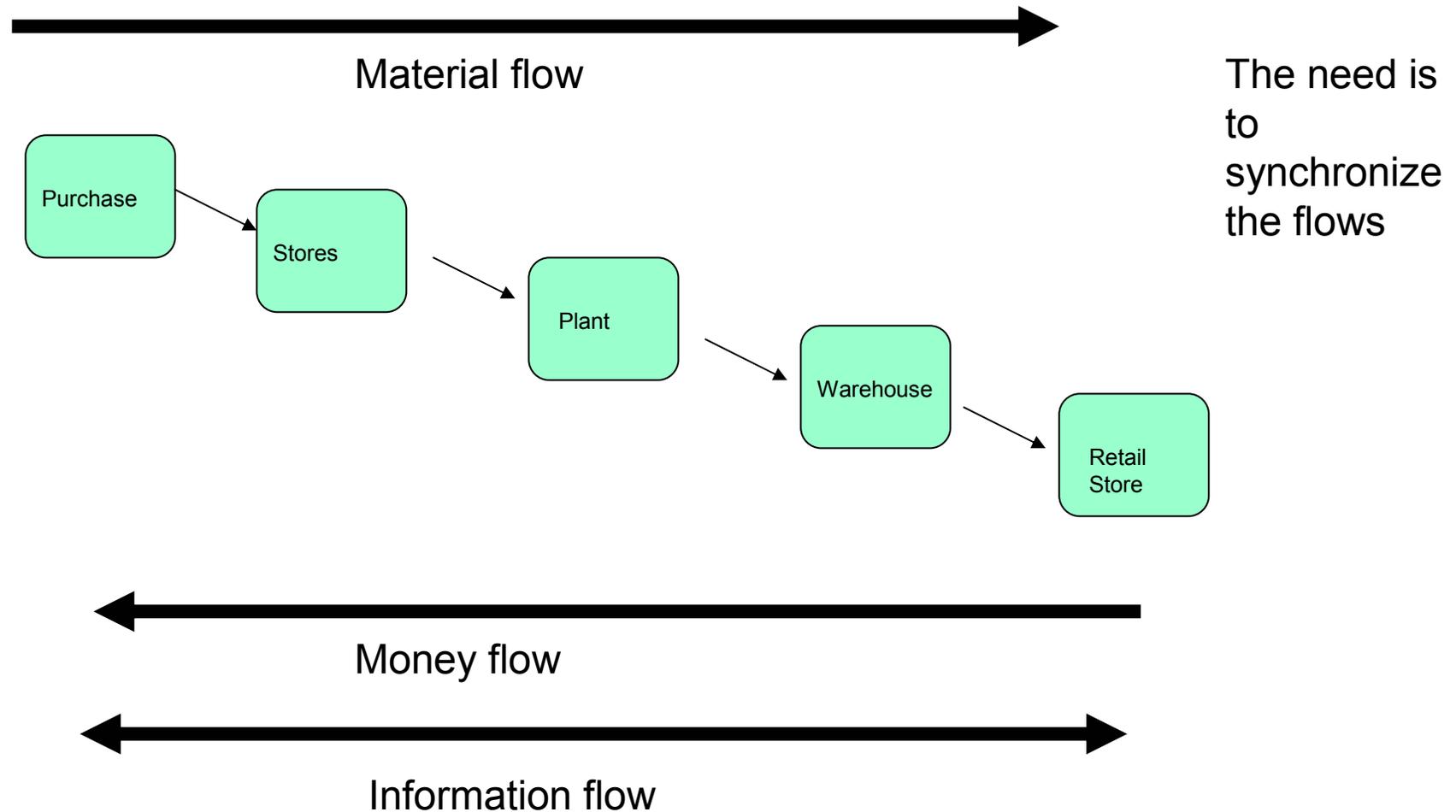
- QO was a successful sports drinks firm with products like Gatorade
- It bought Snapple in 1994 for 1.7 billion US dollars
- Snapple was a bottled drinks firm selling tea etc
- QO was strong in South and SW markets in US while Snapple was strong in North and West . The acquisition was done to exploit synergy and penetrate .
- 3 years later , unable to generate SC synergies, QO sold Snapple for 300 m USD



- QO Sold through Super markets : Snapple through Retailers
- QO produced goods in own plants : Snapple had outsourced production

# Overview of Supply Chain Management

## The Flow Concept



# Overview of Supply Chain Management

## Demand Forecasting and Demand Variability

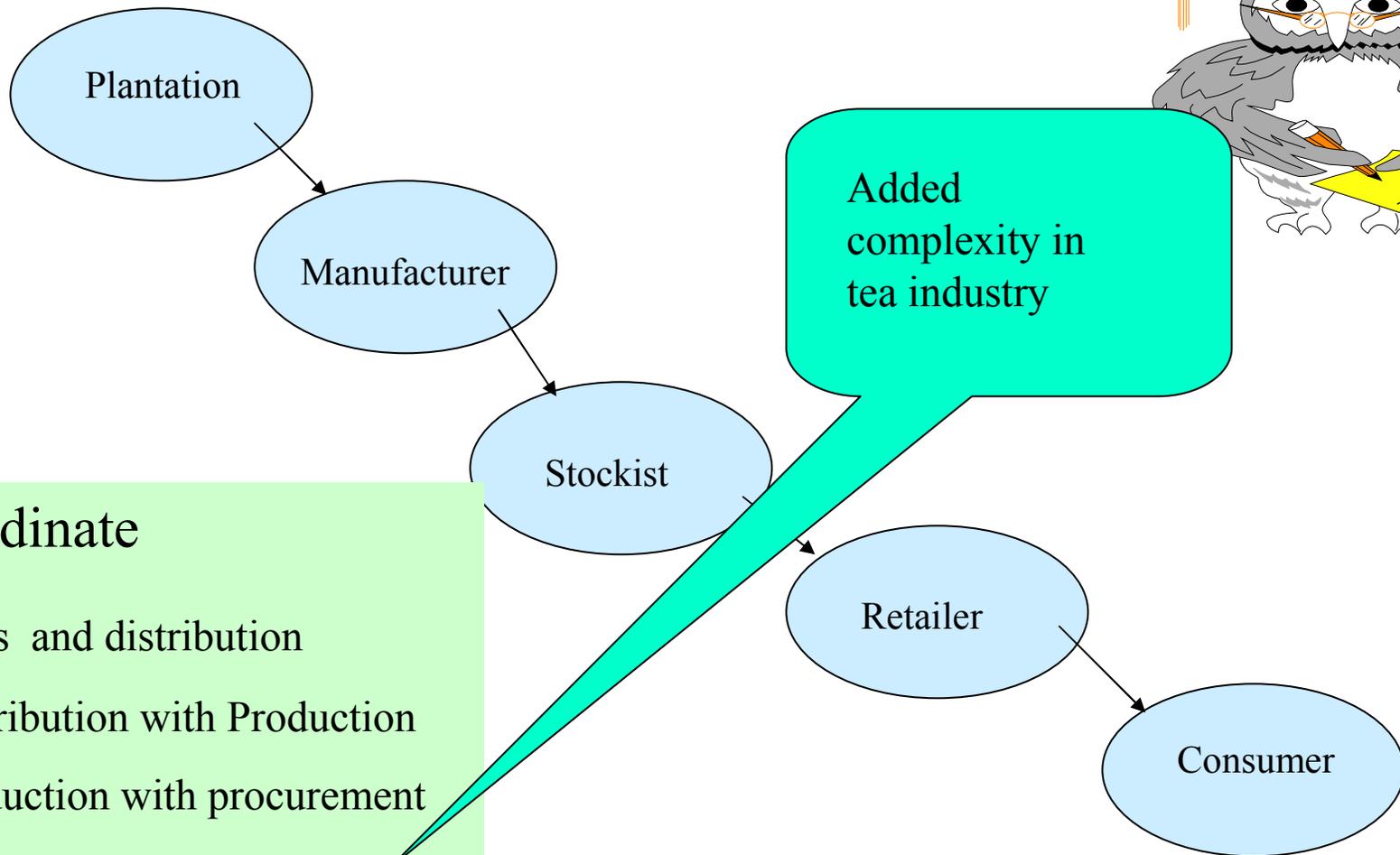
1. In a competitive environment demand is not known with certainty.
2. When a product is offered in multiple SKUs or with varying features demand variability is high.
3. Demand also varies based on type : essential versus style goods
4. Demand in a particular period is also affected by competitor strategies
5. Product variety for segment markets adds to this complexity.  
(Premium, Popular, Economy)

Hence Forecasting demand becomes a complex task for most organizations

The variability in demand plays havoc in SCM

**Time series and Regression Models are used for forecasting**

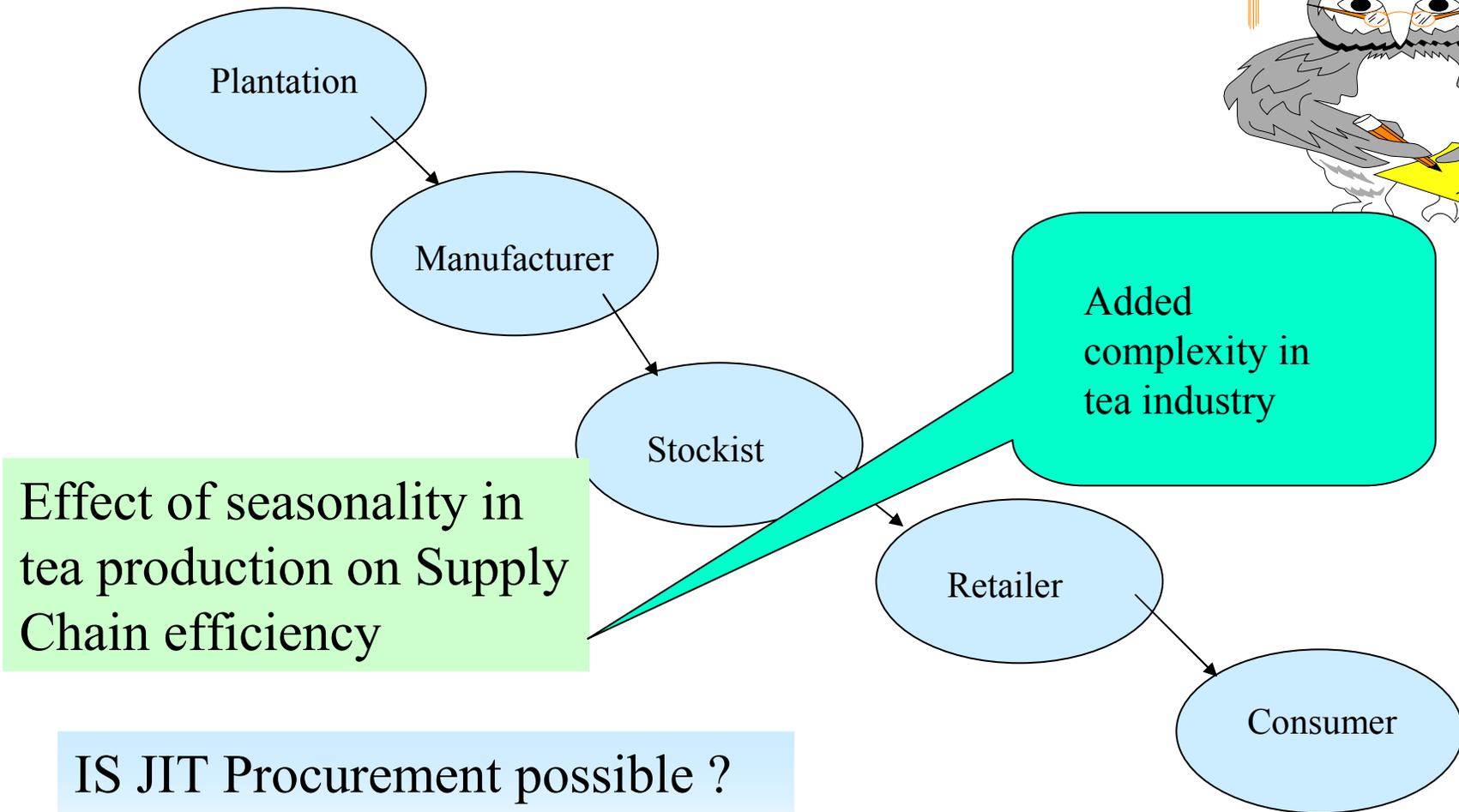
# Overview of Supply Chain Management



## Coordinate

- Sales and distribution
- Distribution with Production
- Production with procurement
- Procurement with Planting

# Overview of Supply Chain Management



IS JIT Procurement possible ?

What about JIT Production ?

# Supply Chain Design Considerations

Efficient

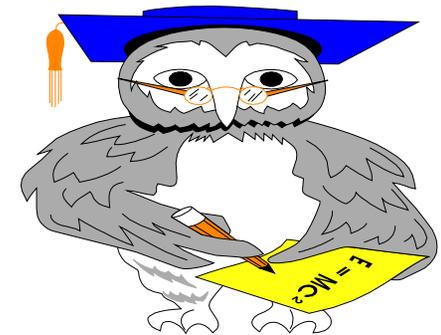
Vs

Responsive

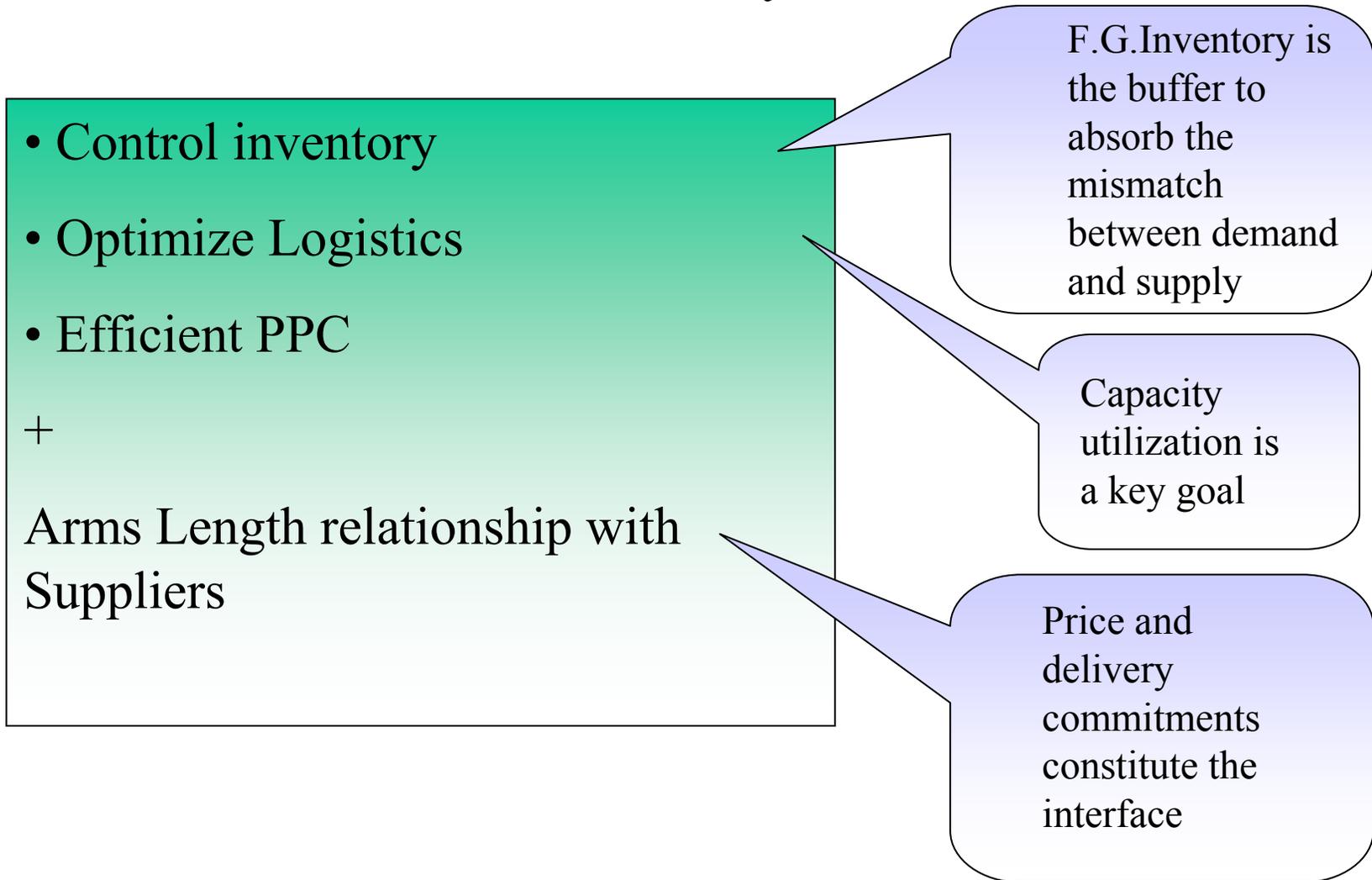
- Stable Demand
- Price Sensitive market
- Minimize Inventory

- Demand fluctuation is considerable
- Availability Sensitive market
- Hold Stock

Demand variability + Bull Whip Effect



## SCM in earlier years



Prior to computer to computer connectivity era : till 1970s

# Inventory levels governed by banking credit norms

Tandon ( 1975) and Chore Committees ( 1979), set up by RBI, evolved norms for Inventory and set the limits for bank credit extended to firms to meet Working Capital Requirements.

Goods pledged as collaterals

R.M., WIP and FG carried different inventory norms; They varied from one industry to another

SC Metrics were primarily inventory focused

Software industry had no collaterals to offer; hence ineligible to get working capital loans



# Inventory: Boon or Bane ?

## Two ends of the spectrum

Tandon ( 1975) and Chore Committees ( 1979), set up by RBI, evolved norms for Inventory and set the limits for bank credit extended to firms to meet Working Capital Requirements.

Inventory is a must for any enterprise; but needs to be contained

The Japanese concept of MUDA : Consider Inventory of any form as a Waste.

Shun Inventory



Post 1980s concept giving rise to JIT ; MTO;ATO

# New Paradigms since the 90s

- Globalization of industries
- Focus on Core Competence
- Emergence of Internet

Supply Chains have become complex.  
Customer expectations have exploded.  
Competition has been intense.

# New Industry types have emerged

Make to Stock

Demand Risk carried fully

Conversion cost and capacity utilization management

Make to Order

Integration, Quality and Delivery challenges

Assemble to Order

Market Grip

Engineer to Order

# Industry types

Make to Stock

Traditional Manufacturing and Retail industries

MRF

Infosys

( I.T.)Services Industry is akin to this; capacity utilization is the issue

Make to Order

Design Expertise and Market knowledge kept in-house (Nike has no factory of its own)

Assemble to Order

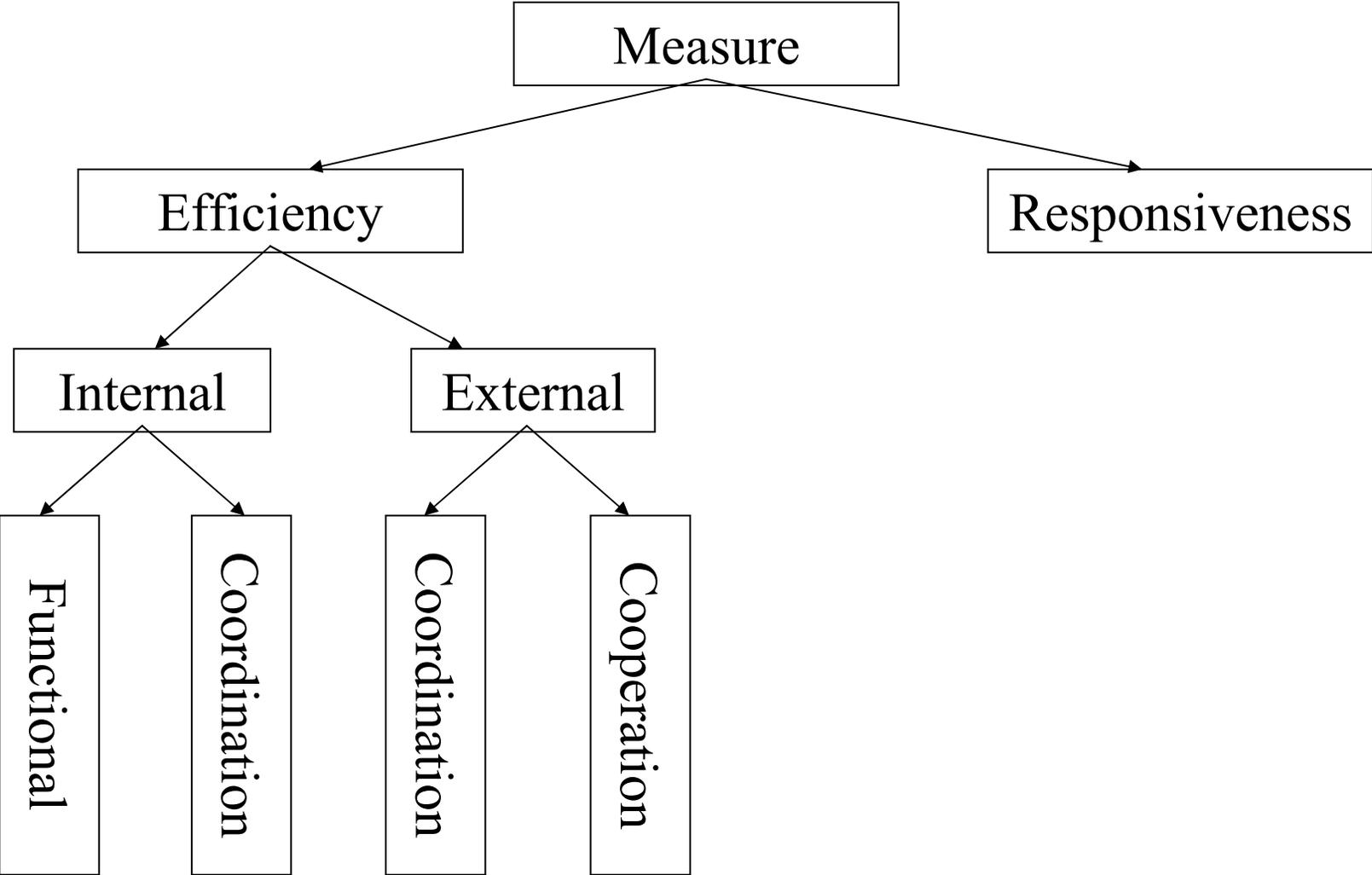
ABB

Project Services industry is akin to this ; Integration, Quality and Delivery challenges

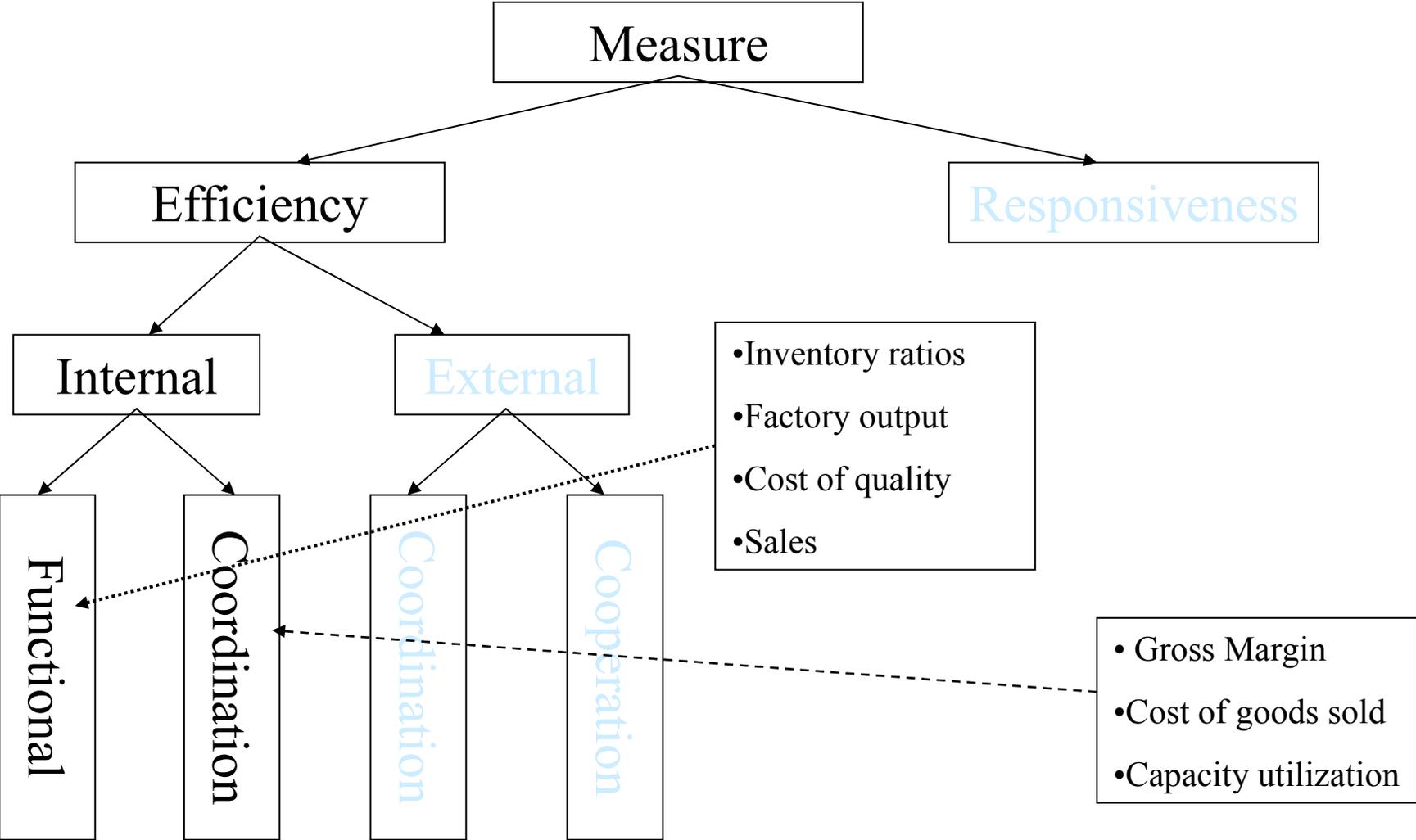
Engineer to Order

Colourplus

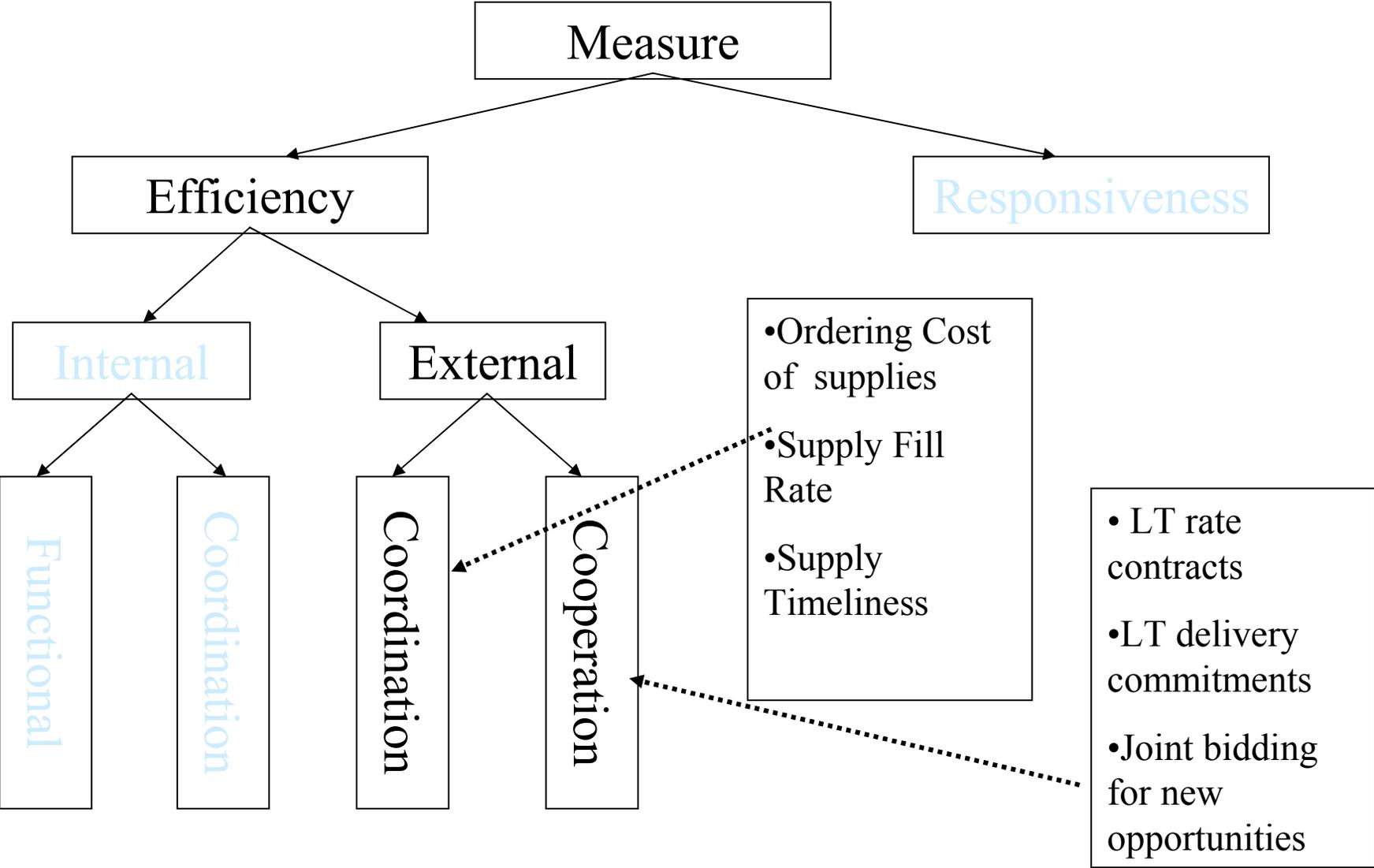
# SCM Metrics

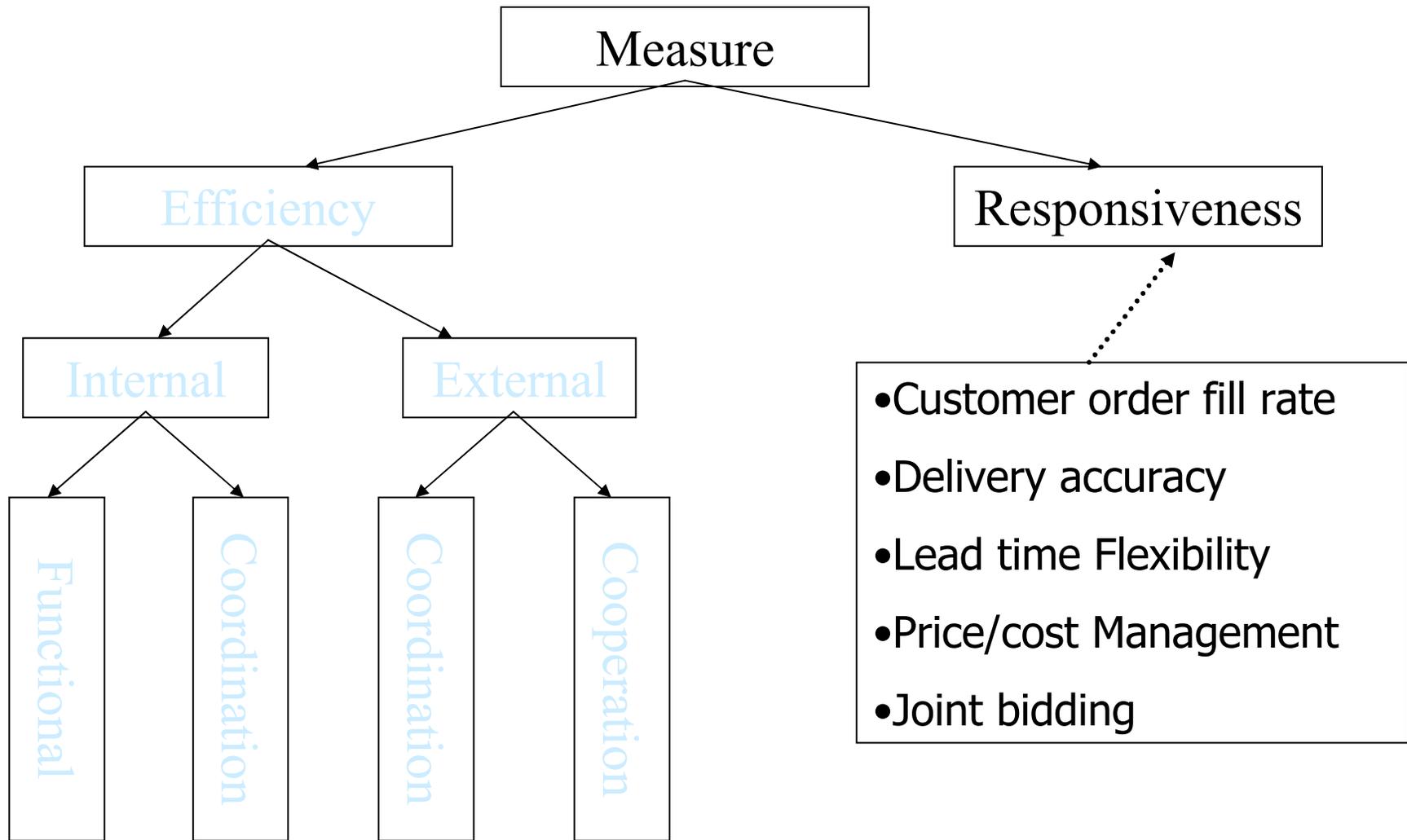


# SCM Metrics

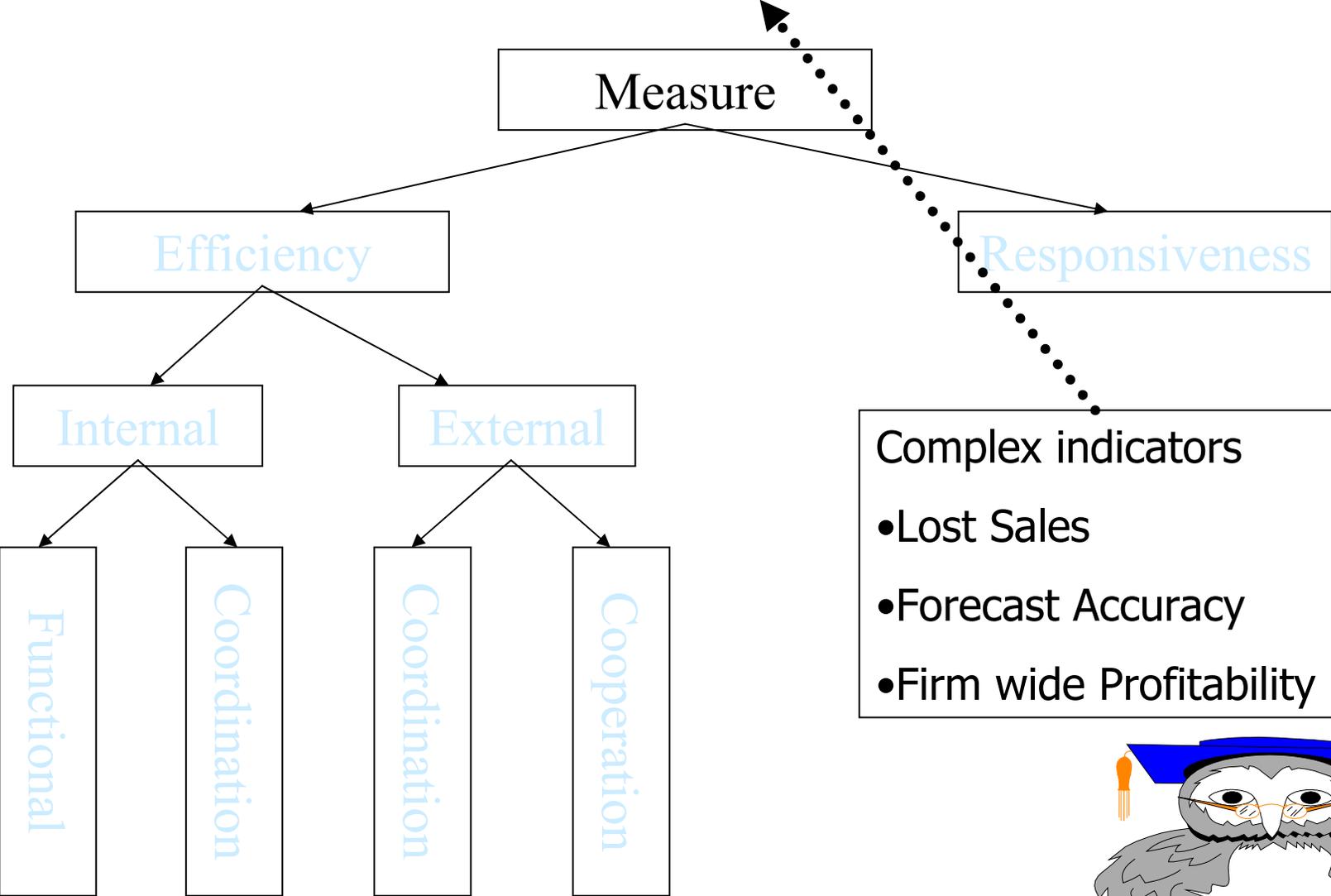


# SCM Metrics





# SCM Metrics



- Complex indicators
- Lost Sales
  - Forecast Accuracy
  - Firm wide Profitability



# Cost and Value Dimensions

**The Performance Indicators have been multiple and varied in units of measurement.**

**Financial Analysts believe that cost is the unifying dimension; hence need to express all issues /tasks in cost terms**

**Any process or stage where cost added internally exceeds the cost of getting it done from outside needs to be dropped ;and a decision in favour of “buy” instead of “make” to be taken.**

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# Cost stack

Distribution cost

Transportation cost

Finished goods inv  
carrying cost +  
Storage Cost

Conversion cost +  
WIP Inv.cost

Inventory carrying  
cost+ storage cost

Transport. +  
Inspection cost

r.m.cost+  
Ordering cost



Inspection +  
rework cost

Still  
inadequate  
as Cost of  
lost sales  
and process  
inefficiency  
are not  
tracked

Also add Costs of  
administration, sales  
promotion , returns  
etc

# Tea Industry : Rupees/Kg

Nilagiri

Assam

Darjiling

40+

60 +

70+

Cost

Loose  
Tea

Package  
Tea

Tea  
Bags

Instant  
Tea

Realization

70+

120+

180+

240+

Quantity exported in  
2003 m.kgs

130

35

4

3

# What does the research reveal ?

**Current research by AMR reveals that the critical success factors of a firm ( in relation to SCM ) are**

- demand forecast accuracy
- perfect order fulfillment (perfect means complete, accurate, and on-time)
- supply chain cost
- cash-to-cash cycle time
  
- Even though metrics at detailed level are needed at functional level, These are the best indicators of firms' overall supply chain performance

# SCM Metrics for sample set of firms in India

Firm	Cash to Cash cycle	Inventory (days)	Asset turnover ratio	ROCE
Madura Coats	93.57	98.06	1.25	0.54
TISCO	44.01	93.09	0.53	9.13
Siemens	4.72	64.97	2.80	36.45
Aventis Pharma	72.99	84.54	2.22	35.62
Cadbury India	12.25	65.91	2.50	33.24
Whirlpool	13.18	53.61	1.69	9.74
Hero Honda	-16.80	13.84	7.64	90.42

# Metrics Measurement Issues

- Data accuracy;reliability;timeliness
- Inadequate system support
- No process in place to collect data

Causes

- Inadequate Org structure  
(roles,responsibilities,appraisals,incentives)
- Ineffective Processes
- Policy issues

Root Causes



# New Paradigms since the 90s

- Globalization of industries
- Focus on Core Competence
- Emergence of Internet

Supply Chains have become complex.  
Customer expectations have exploded.  
Competition has been intense.

# Collaboration imperatives

- Globalization of purchase and sales

“ Look under the hood of a Toyota Camry being sold in USA.”

“ A Singaporean purchases a book online from Amazon.com. ”

- Many firms have shed non core activities.

IBM has sold the PC Business to Lenovo of China

Bharati Tele-Ventures has outsourced its entire IT infrastructure and tasks for 10 years to IBM

- This strategic posture has created the challenge of coordinating effectively the entire supply chain, from upstream to downstream activities.

## Collaboration imperatives

1. In parallel, demand for tighter integration has arisen side by side with the advancement in information technology.
2. Ever-decreasing cost of computing and communication, proliferation of user-friendly PCs and spread of the internet have had a major effect on capability to integrate at different levels, and hence implicitly have enhanced the demand for integration.

	Interaction level	Data	Process	Policy
Coordination	Many to Many buyer seller scenario	Purchase Orders; Deliveries; Payments	Interfaced processes	At Arms Length
Cooperation	Chosen few	Demand data; Inventory and Production	Synchronized processes	Loose Coupling
Collaboration	The Go to Market partner	Sale Prospect; Costs; Market Potential	Common processes	Loose Coupling
Integration	One to one relationship	Investment levels	Shared processes	Tight Coupling

# Vendor Relationship at Ashok Leyland

1. Strategic Sourcing is central to the integrated Materials Management function. Ashok Leyland's policy is to develop a vendor base committed to continuous improvement to meet quality, cost and delivery standards.
2. Ashok Leyland considers its vendors as **partners in progress** and believes in establishing mutually beneficial relationships. Ashok Leyland provides necessary technical assistance in the form of Project and Production Engineering, to maintain quality levels. In addition, where required, Ashok Leyland also helps vendors financially

Source; Ashok Leyland Website

# Vendor Relationship at Mahindra & Mahindra Ltd

manufacturer of General purpose Utility Vehicles, Tractors,LCVs and Farm Equipment

1. Launched a supplier website in 2000 to **share information** with 600 of them (PO, Delivery Schedules, Inspection Reports, Payments)
2. Data inconsistencies between this website and the SAP based ERP system due to batch transfer of data
3. Felt the need for **online** system between M&M and suppliers
4. mySAP SRM solution went live in 6 months; integrated with SAP R/3
5. **Processes integrated**

Better control over incoming materials.

Accelerated procurement processes.

Reduction in communication errors.

Fewer order/delivery mismatches

Reduced warehousing costs

Real time data transfer and document exchange facilitated

# Supply Chain at HLL

1. Exchange of relevant data with suppliers
2. More stockists collaborate with HLL ; receive web based information on promotions ,replenish stocks , find order status and billing status
3. Optimizes transportation of FG to just in time warehouses from factories and leverages greater logistics synergy
4. Key operational performance metrics are tracked and published daily

# The Data and Process Dimensions

1. When both the firms are computerized, the data codification, structure and the data base on which it resides can vary between them .
2. Interfacing the systems is an easier solution but synchronizing them on real time basis is a major issue.
3. Creating common /shared systems is a possible solution but needs to be governed by cost and policy consideration
4. Also what data to be shared is determined by the business posture of the firms which is dictated by their policies
5. Similar issues prevail for process interfacing between the firms.

**Hence it comes ultimately to be a Policy issue**



# The at arms length model

1. Firms do well when they act on enlightened self interest mode
2. Competition forces firms to offer high quality products at best possible prices
3. Firms prefer to service multiple customers to minimize business risk
4. Firms with a high degree of autonomy tend to innovate
5. This results in the entire supply chain being very efficient and effective

**Under this model, the supply chain is managed by**  
**(a) building adequate buffers at appropriate stages**  
**(b) objective selection and management of vendors.**



# The at arms length model

1. It calls for the simplest form of interfacing two firms
2. Facilitate data transfer at boundary level transactions.
3. Data on purchase orders, shipment and deliveries can be moved electronically
4. Processes are automated to bring in interface efficiency
5. Sophisticated forecasting models are used

**This model works best when there are multiple suppliers and many customers ; no information asymmetry**



# The Tightly Coupled model

1. Competition now is not between firm to firm but between one supply chain to the other.
2. Supply Chain as a whole has to be cost effective /responsive
3. Inventory across the entire chain can be minimized and yet high level of customer service can be maintained only with partners in supply chain are tightly coupled across corporate boundaries..
4. The tight coupling is effected by sharing data on Customer Demand , Inventory and Production .
5. Supplier quality and cost need to be tightly managed.

**Under this model, the supply chain is managed by**

- (a) Eliminating /minimizing inventory**
- (b) Selecting a few vendors and managing the relationship tightly.**



# The Tightly coupled model

1. In the tightly coupled world, SCM and CRM systems have been designed to enmesh firms at both ends with the ERP systems of the manufacturing firm.
2. The move has been towards "Made to Order" from "Made to Stock"
3. Firms endeavor to synchronize the production and purchase decisions across the supply chain partners.

**This model works best when the customer and supplier firm commit to share the market risk and willingly work with the other as a preferred partner.**



# VMI and CPFR

## Vendor Managed Inventory

1. The buyer firm does not place any order on the supplier
2. Instead it agrees with the vendor on stock levels
3. Allows the vendor to monitor stock and replenish periodically

**Falls in the coordination space. Supplier may not need to do any forecasting but still needs to have nimble manufacturing facilities and to manage costs**



# VMI and CPFR

## Collaborative Planning, Forecasting and Replenishment (CPFR)

1. Both firms have access to Sales, Inventories, Purchases and Production data .
2. The sales and promotion activities are planned jointly.
3. Forecasting is a joint initiative and so is the replenishment decision

**Falls in the collaboration space. Works with tight coupling of data, processes and policies. Both firms share business risk. Make a commitment to each other.**



# The Loosely coupled model

1. Calls for a highly flexible approach in terms of data and process interface and a flexible policy framework
2. Seeks a modular approach to facilitate quick reconfiguration
3. Focuses on defining standardized interfaces
4. Low interdependency leads to high re-combinability and facilitates product and process variety
5. Also known as Orchestration Model

**Under this model, the supply chain is actually a supply network to be optimized; It recognizes the many to many relationship across the tiers but provides for tight coupling in specific situations if needed.**



# The Loosely coupled model

1. In the loosely coupled world, systems interface are standardized .
2. The processes follow a common template but with sufficient autonomy to tailor them to suit specific situations.
3. Firms endeavor to optimize the production and purchase decisions across each link of the supply chain in the network

**This is the model best suited for dynamic supply networks of many tiers. It allows for both arms length relationship and tight coupling based on given situation. SCOR from SCC has emerged to fulfill this need**





**“ The Supply-Chain Council (SCC) has developed and endorsed the Supply Chain Operations Reference-model (SCOR) as the cross-industry standard for supply-chain management”**

**SCOR is primarily a process reference model**

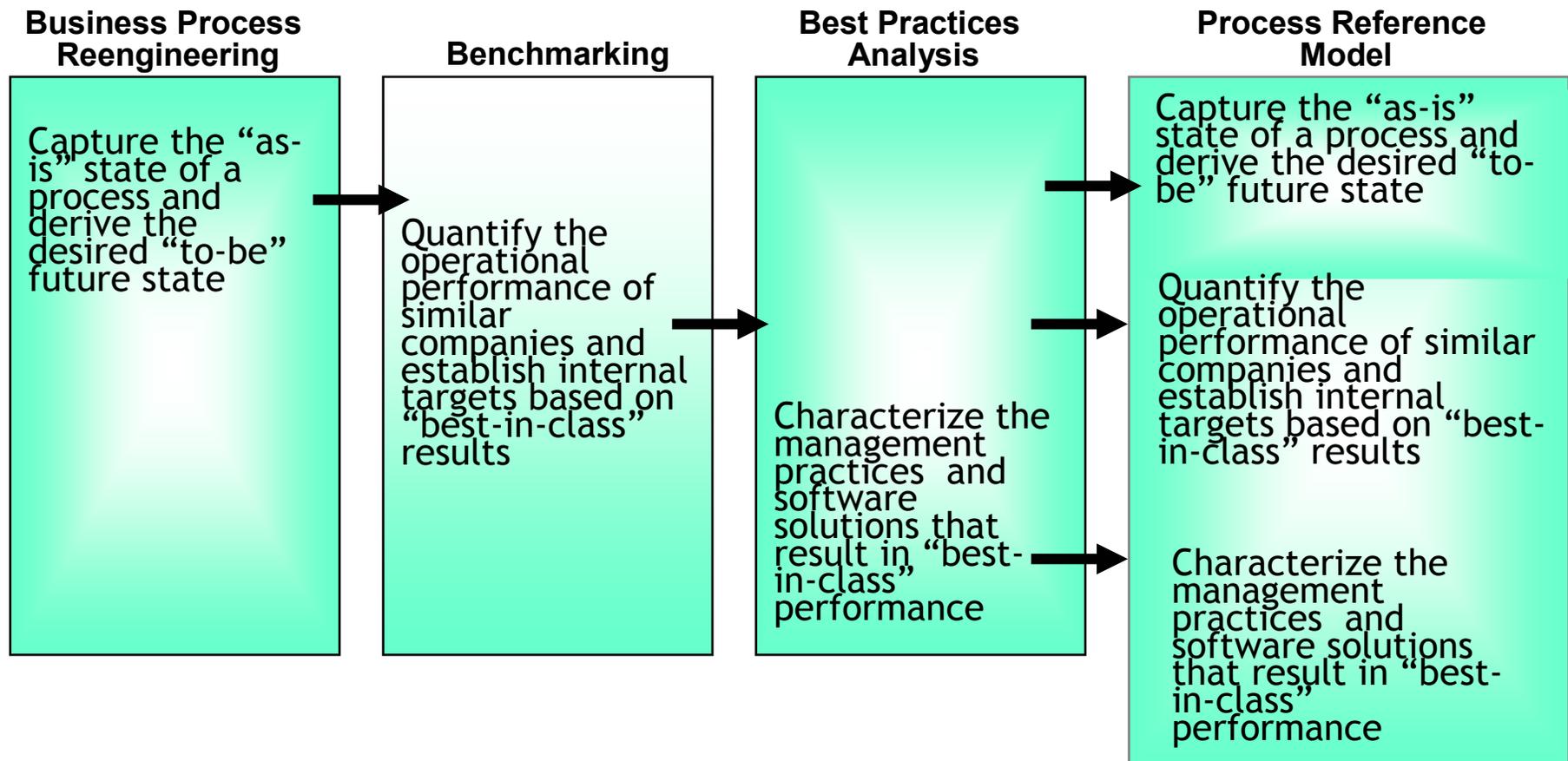


## **SCOR focuses on**

- **Use of standard terminology**
- **Promoting standard process reference model**
- **Facilitating the design and evaluation of Supply Chains**
- **Provides metrics for performance measurement**
- **Benchmark best practices**
- **Facilitating best fit identification of software**

# What is a process reference model?

- Process reference models integrate the well-known concepts of business process reengineering, benchmarking, and process measurement into a cross-functional framework



# SCOR Benchmarks (Example) Data as of 02/05

	<b>Discrete Industries</b>		<b>Process Industries</b>	
	<b>Median</b>	<b>Average</b>	<b>Median</b>	<b>Average</b>
Delivery Performance by Commit Date	91.5%	87.7%	92.1%	89.3%
Delivery Performance by Request Date	85.0%	81.2%	81.8%	80.6%
Perfect Order Fulfillment	81.1%	73.4%	81.0%	74.3%
Fill Rate by Line Item – Stocked Items	97.2%	84.4%	88.0%	74.1%
Order Fulfillment Lead Time - Days (Make-To-Order Items)	29.5	38.2	18.5	27.7
Production Flexibility – Days (20% upside)	42.0	63.9	95.0	199.2
Total Supply Chain Management Costs % Revenue	10.2%	10.2%	10.1%	10.3%

# Supply Chain Innovators

1. Dell, with close to \$1M in revenue per employee, dwarfing the industry average
2. Wal-Mart, whose size exceeds the Gross Domestic Product (GDP) of most countries
3. Toyota, which is now the second largest global automaker
4. Cisco, which dominates the networking market

MTO: Mass Customization :  
No Accounts Receivable

Tight Coupling with key  
suppliers to drive down  
costs continuously

Established the new  
paradigm of High  
Quality and Low Cost

Engineer to Order : No  
warehouse, No Inventory  
and No paper invoices

# Supply Chain Innovators : Indian Industries

## Maruti Udyog Limited

1. Rationalized and tiered its vendor base
2. Created a layer of subassemblies and stopped buying components
3. Invested in developing vendor capabilities

## TISCO

- 1. Reorganized the Sales and Distribution function to focus on high value customers**
- 2. Interacts with customers like ALL,L&T to identify usage improvements**
- 3. Reduced the retail layers for the benefit of small customers**
- 4. Co branded products with downstream manufacturers to retain the low end segment**

# Supply Chain Innovators : Indian Industries

Aravind Eye Hospital :  
Madurai

1. Process Mapping and Reengineering
2. Task specialization
3. Assembly Line set up
4. Young rural women recruited as paramedics
5. Rural Eye Camp is the source (1500)

	Aravind	US/UK Hospitals
Cost Per Operation in USD	50 to 100	2500 to 3000
Cost of IOL in USD	5	200
No.of operations per day average	800	?
Capsule rupture & Vitreous loss	2.0 %	4.4 %
Corneal edema	8.0 %	9.0 %
Profitability	Very good	anemic

## IIT comes up with Instant Tea Technology

*Kolkata, 18 August 2005:* IIT Kharagpur's (KGP) food and agriculture department has come up with a new Instant (Soluble) Tea Technology. With this process, a kilo of fresh tea leaves would yield 25 to 30 grams of soluble tea powder and 230 grams of black tea. Interestingly, in this technology, only 40 mg of tea powder is required to make a cup of tea while otherwise 2.5 gram tea leaves is needed to make a cup of tea. This soluble tea powder is made from fresh tea leaves, thus imparting richer flavour and colour to the tea. Also the tea pulp left after extracting the juice can again be used for making normal tea. If this technology is adopted it ensures the manufacturers to produce an extra 100 cups of tea. The only limitation of this technology may be its price factor that would be high. Companies would be required to invest about Rs.1 lakh for setting up a grinder, a temperature controlled chamber and a fridge dryer. IIT KGP has already obtained a patent for this invention and is in the process of transferring the technology to two Bangalore based tea companies. \_

# Altering Competitive Equilibrium

Customer insight on attributes of product value

Clarity in product overlap and cannibalization ; quantify

Market segmentation rationalization

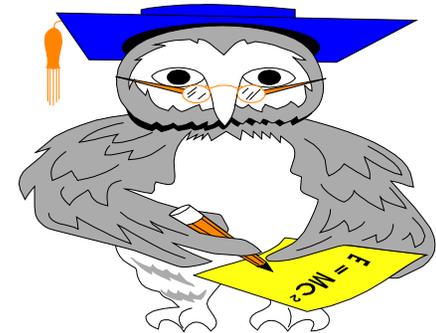
Product market optimization strategy ; deeper understanding of cost and value components

Appropriate SC Design for each product

Forecast accuracy ; Eliminate need for forecasting where possible

Track lost sales and optimize inventory

Innovate products, markets, distribution and promotion



Market battles  
are won only  
by creating and  
articulating true  
product value:

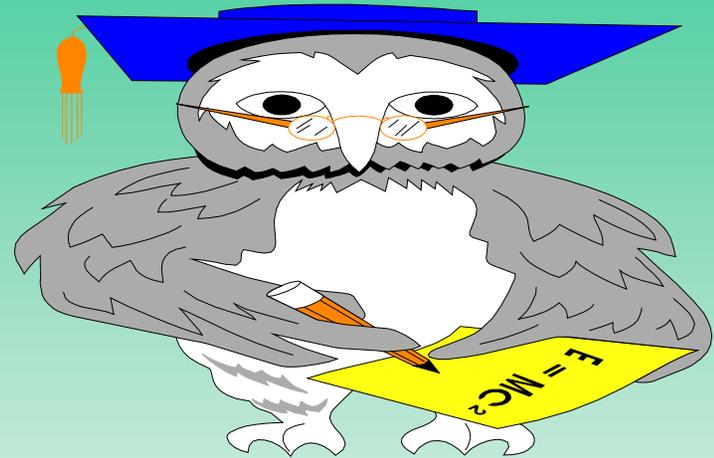
( Competition gives  
it a reality check)

Supply Chain Management  
SC Metrics, Collaboration  
Models and Innovation  
Imperatives

Presented at the Tata Tea Executive  
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TWA



*Thank you and  
best wishes*

## **Assets related**

**Cash to Cash Cycle time:** Inventory days of Supply + Days of Sales outstanding - average payment period for materials (time it takes for a dollar to flow back into a company after it has been spent for raw materials)

**Inventory days of Supply:** Total gross value of inventory at standard cost before reserves for excess and obsolescence divided by COGS and multiplied by 365 days

**Asset turns:** Total Net product revenue divided by Total net assets

## Costs related

**Cost of Goods Sold:** The cost related with buying raw materials and producing finished goods. This cost includes direct costs (labor, materials) and indirect costs (overhead)

**Supply Chain Management cost:** The costs associated with the supply chain including execution, administration and planning

**Value added productivity:** Total product revenue less material purchases divided by total employment in full time equivalents

**Warranty cost:** Warranty costs include materials,

## Customer Service related

**Fill rates:** The percentage of ship from dock orders shipped within 24 hours of order receipt. For services, this metric is the proportion for services that are filled so that the service is completed within 24 hours

**Perfect Order fulfillment:** The percentage of orders that are delivered complete, on time, with complete documentation and in perfect condition

**Delivery performance to Customer commit date:** The percentage of orders that are fulfilled on or before the original scheduled or committed date

**Responsiveness lead-time:** The average elapsed time, including all delays, to receive a customer order and transform resources into goods and services, through to the point of customer receipt. (assuming zero inventories in the system)

**Production flexibility:** Number of days required to achieve an unplanned sustainable 20% increase in deliveries