

**BUSI4496**

**Supply Chain Planning & Management**

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Operations Management and Information Systems

Nottingham University Business School

Lecture 10 – Self-Study Session 10

Supply Chain and Operations Performance Measurement

Exam preparation

06.12.2024



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**Outline**

1. Supply Chain Configurations
2. The Bullwhip Effect
3. Supply Chain Collaboration for Planning
  - Supply Chain Collaboration for Inventory Management
  - Supply Chain Collaboration for Planning and Forecasting
4. Blockchain solutions
- Pre-Recorded Self Study Session on Moodle**
5. Supply Chain and Operations Performance Measurement
  - Process Measures
  - Customer Service Measures
  - The SCOR model

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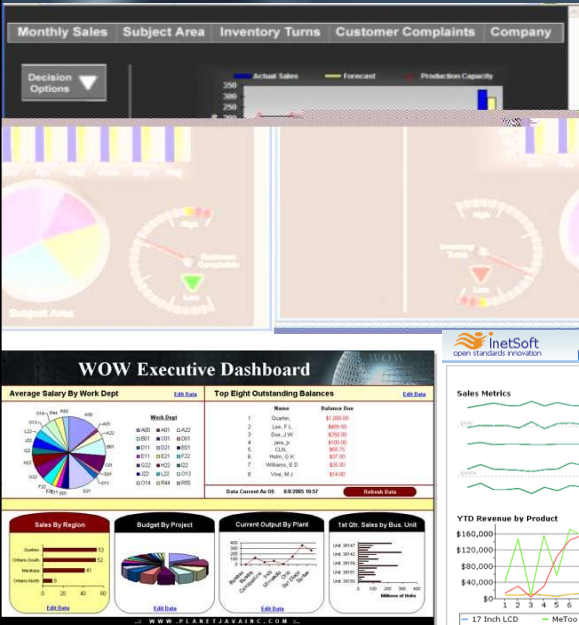
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## 5. Supply Chain and Operations Performance Measurement

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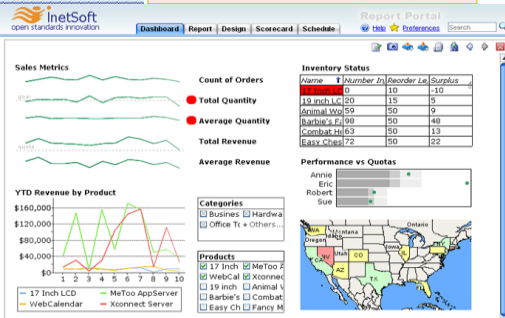
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### Performance dashboards



The dashboard includes sections for 'Monthly Sales', 'Subject Area', 'Inventory Turns', 'Customer Complaints', and 'Company'. It features a 'Decision Options' dropdown, a bar chart for 'Actual Sales', 'Forecast', and 'Production Capacity', a 'Budget Zone' pie chart, and a 'WOW Executive Dashboard' with multiple sub-charts like 'Average Salary By Work Dept', 'Top Eight Outstanding Balances', 'Sales By Region', 'Budget By Project', 'Current Output By Plant', and '1st Qtr. Sales by Bus. Unit'.

- ERP Performance 'dashboards' to monitor performance close to real time
- BUT
- **What should we measure?**



The InetSoft Report Portal shows 'Sales Metrics' with line charts for 'Total Quantity' and 'Average Quantity', 'Count of Orders', 'Total Revenue', and 'Average Revenue'. It also includes 'YTD Revenue by Product' with a line chart, 'Inventory Status' with a table, 'Performance vs Quotas' with a bar chart, and a map of the United States.

Item	Number In	Reorder Le	Surplus
10 Inch LCD	20	15	5
19 inch LCD	50	2	48
20 inch LCD	50	13	37
21 inch LCD	50	22	28

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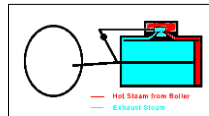
## Performance metrics



### 'Efficiency'

- Resource utilisation
- Resource efficiencies
- Inventory performance
- Yield/Conformance

**Costs-  
process  
focused**



### Delivery/Quality

- Response/ lead time
- On-time-in full
- Average flow time
- On-shelf availability
- Quality metrics



**Service level -  
customer  
focused**



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## Process-focused measures

- **Productivity** =  $\frac{\text{output}}{\text{input}}$  (total, partial or single factor)
- **Efficiency** =  $\frac{\text{actual output}}{\text{standard output}}$  (often measured against designed capacity)
- **Utilisation** =  $\frac{\text{productive time}}{\text{time available}}$  (often measured against effective capacity)
- **Yield** =  $\frac{\% \text{ conforming}}{\text{total produced}}$  (often for difficult to control continuous processes)
- **Plan/schedule stability** = some measure of deviation from prescribed plan/schedule

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## Customer-focused measures

### ▪ **Timeliness**

- lateness = actual date delivered – due date
- measures can be **average**, **maximum** or **proportion 'late'**

### ▪ **Response**

- response time/lead time
- measures can be **average** or **maximum**

### ▪ **Reliability**

OTIF = % delivered on time and in full

- **Note: Many other metrics**, particularly related to quality, inventory, process reliability/capability, e.g. **Overall Equipment Effectiveness (OEE)** combines process availability, utilisation and yield in a single percentage



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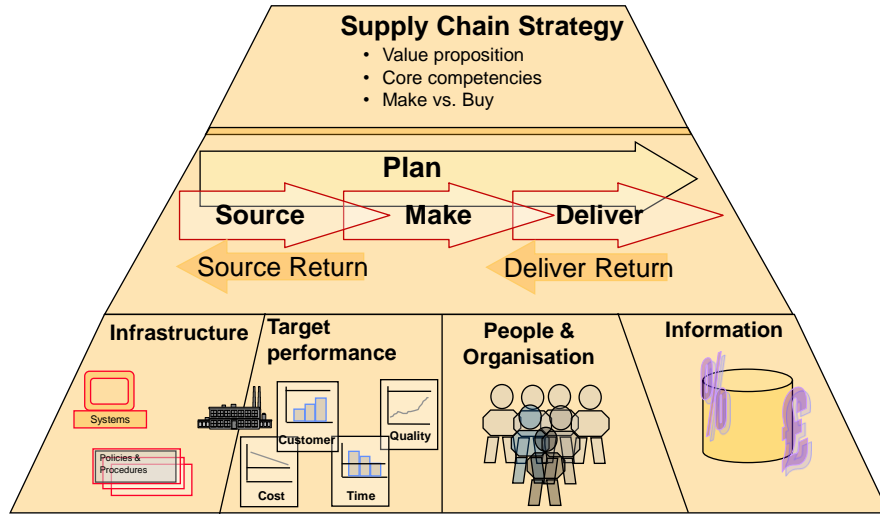
## SCOR: Supply Chain Operations Reference model

- **SCOR is a framework** for developing, monitoring and improving supply chain performance –developed by the **SC Council (US)** to enable companies to:
  - Communicate on supply-chain issues
  - Measure performance objectively
  - Influence future IT developments in SCM
- **SCOR contains**
  - Standard process description based on a view of 'best practice'
  - Supply-chain metrics to drive operational improvements
  - Mapping best practices to IT and software applications

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## A 'holistic' perspective on SCM practice and performance



[www.supply-chain.org](http://www.supply-chain.org)

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## SCOR – an integrated approach

- SCOR operates at a number of levels
  - **Describing processes**, relationships between them
  - **Standard metrics** (12), based on Plan, Source, Make and Deliver
  - Management practices
- SCOR can be used as a **SCM improvement tool**
- Appears to work best in well-coordinated supply chains e.g. retail environments, driven by major /powerful players
- May be difficult to implement for individual players in a supply chain

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## Five core management processes identified in SCOR

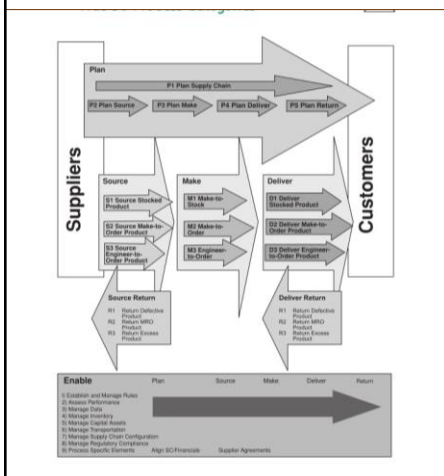
Process	Definitions
<b>Plan</b>	Processes that balance aggregate demand and supply to develop a course of action which best meets the established business rules
<b>Source</b>	Processes that procure goods and services to meet planned or actual demand
<b>Make</b>	Processes that transform goods to a finished state to meet planned or actual demand
<b>Deliver</b>	Processes that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management
<b>Returns</b>	Return of Raw Materials (to Supplier) and Receipt of Returns of Finished Goods (from Customer), including Defective Products, MRO Products, and Excess Products

[www.supply-chain.org](http://www.supply-chain.org)

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## SCOR measures performance across processes



Performance Attribute	Strategic Metric	Current Performance
Reliability	Perfect Order Fulfillment	79%
Responsiveness	Order Fulfillment Cycle Time	9 days
Agility	Upside Flexibility	110 days
Cost	Total Cost to Serve	89%
Assets	Cash-to-Cash Cycle Time	164 days

Once metrics are defined at the supply chain level (level-1), then operational metrics should be selected or derived from this baseline. (See diagram below)

Taken from: the Supply Chain and Operations Reference Model Revision 11.0, by The Supply Chain Council, 2012.

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## 6. Review questions for Session 10

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### Review questions for Session 10

These questions and answers should help you to think about, revise and consolidate the material covered in the lecture.

- 1. How does the configuration of the supply chain affect supply chain planning and control?**
- 2. Explain what the Bullwhip Effect is and outline its possible causes.**
- 3. Why are partnerships needed for effective supply chain collaboration and what are the important factors that need to be considered in a partnership?**
- 4. Explain the key principles in Vendor Managed Inventory (VMI).**
- 5. What is Collaborative Planning, Forecasting and Replenishment (CPFR)?**
- 6. Explain why both process focused measures and customer service measure are needed in supply chain performance measurement and give an example of each type of measure.**
- 7. What processes does SCOR recommend should be measured in any supply chain?**

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## Q4. Sample answer

### 4. Explain the **key principles** in **Vendor Managed Inventory (VMI)**.

In VMI the supplier (or vendor) takes on the responsibility of managing the supply of one or more items for the customer. The customer assists in the process by providing full visibility of demand data so that the supplier can decide when and how much to replenish inventory to ensure the customer does not run out or is not over-supplied.

VMI avoids the customer having to send purchase orders to the supplier. VMI requires agreements between the supplier and the customer. First, the supplier must agree to take on the responsibility to manage supply for the customer. Second, the customer must be able to facilitate the process by giving the supplier access to data on real demand and real inventory levels. In some cases the customer may limit the replenishment quantity and/or frequency, e.g. the customer may stipulate a maximum amount that the supplier can supply per week.

A diagram could be used to support your answer.

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**Now try some of the questions for yourself, for instance Q3 on supply chain partnerships**

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## Key Learning points 1

- **Supply chain management requires integration and coordination of the supply chain**
- **What happens when you don't collaborate?**
- **The Bullwhip Effect** occurs when supply chains are not integrated or coordinated
- **Supply Chain partnerships** are needed to agree how partners should work together
- **Many approaches to collaboration** but collaboration is difficult!
- Collaboration on **inventory management**
  - **Continuous Replenishment**
  - **Vendor Managed Inventory (VMI)**
- Collaboration on **planning, forecasting and replenishment (CPFR)**
  - care needed on what information is shared

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## Key Learning Points 2

- In the future **Blockchain technology** may provide a means for effective collaboration based on **trust**
- **Performance measurement** in supply chain and operations planning and control is important
- It needs **process-focused metrics (e.g. utilisation)** and **customer-focused metrics (e.g. on-time delivery)** to ensure demand is met cost effectively
- **SCOR is an integrated** supply chain performance measurement **framework**
- **SCOR measures performance across** each of the key processes **PLAN, MAKE, SOURCE, DELIVER**

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