Introduction to Operations Management

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Why Operations Management ???

- Matching supply with demand is a major problem for companies (and governments), in this ever increasing competitive landscape

- Samsung's market value came down by $22 billion in two days, due to safety issues with Galaxy 7 tab

- The OM concepts help you understand the operational trade-offs and reduce/eliminate them

Strategic Dimensions of Competition

Cost

- Value for money

Quality

- Product quality (how good?)
- Service quality (as good as promised?)

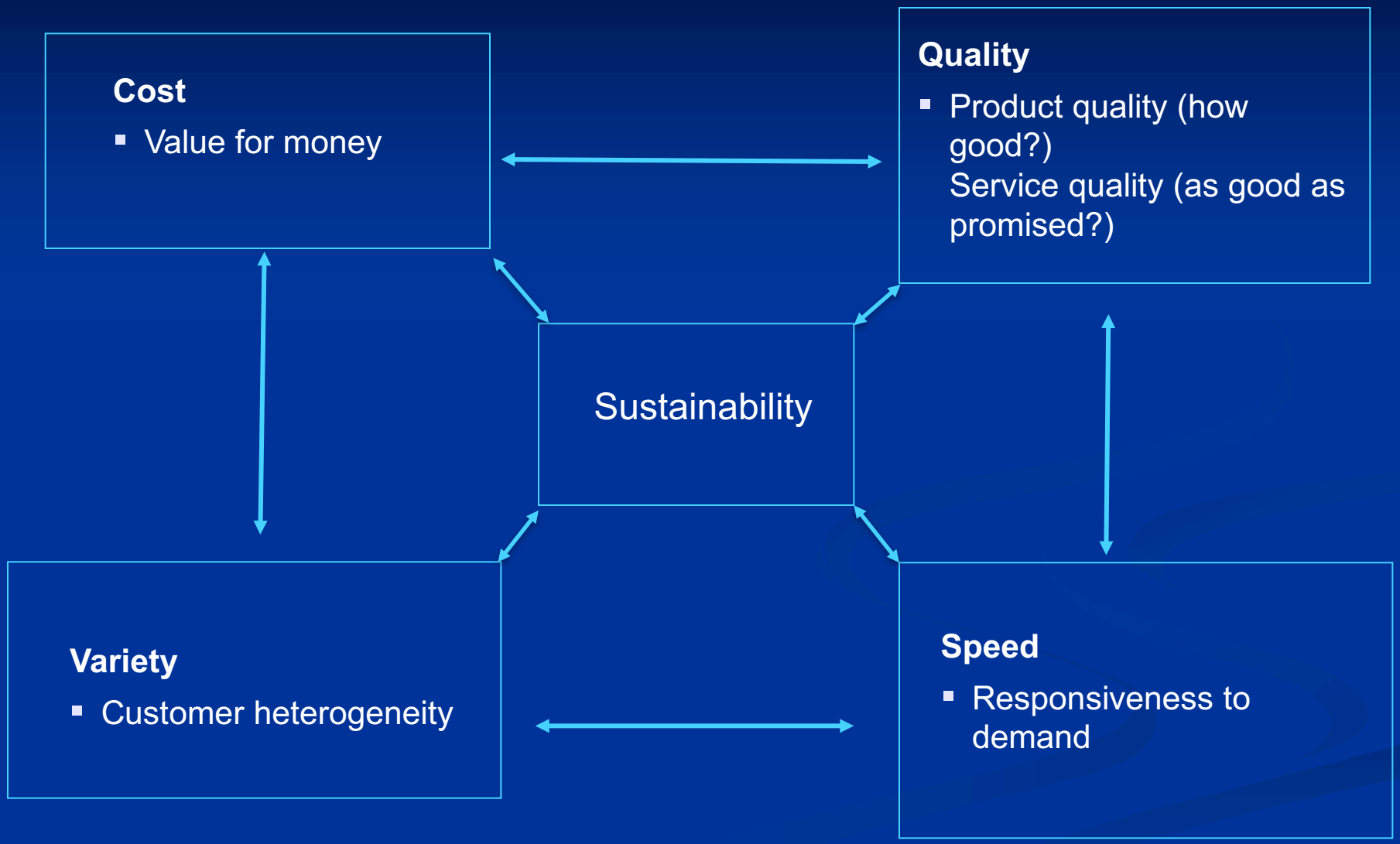
Variety

- Customer heterogeneity

Speed

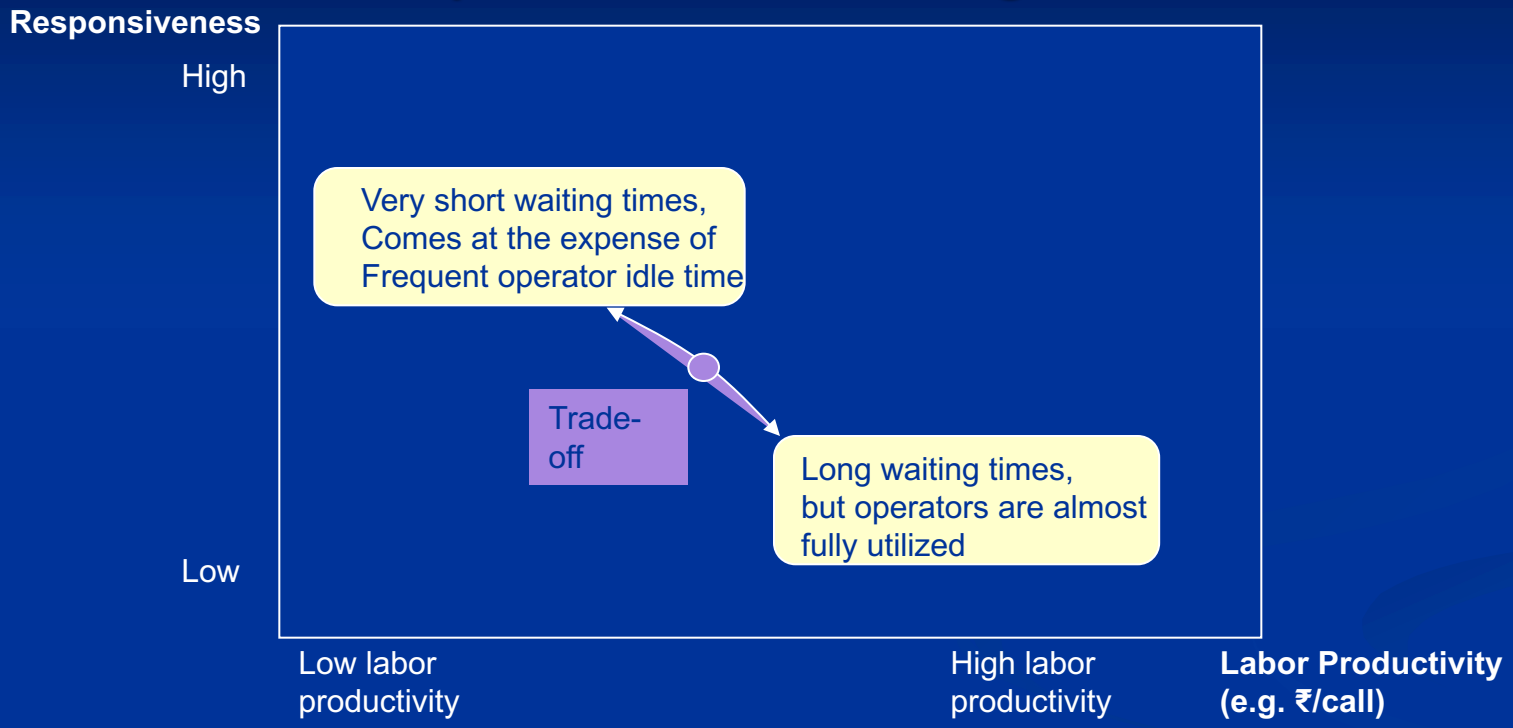
- Responsiveness to demand

Strategic Dimensions of Competition: Trade-offs



Where do these trade-offs originate from?

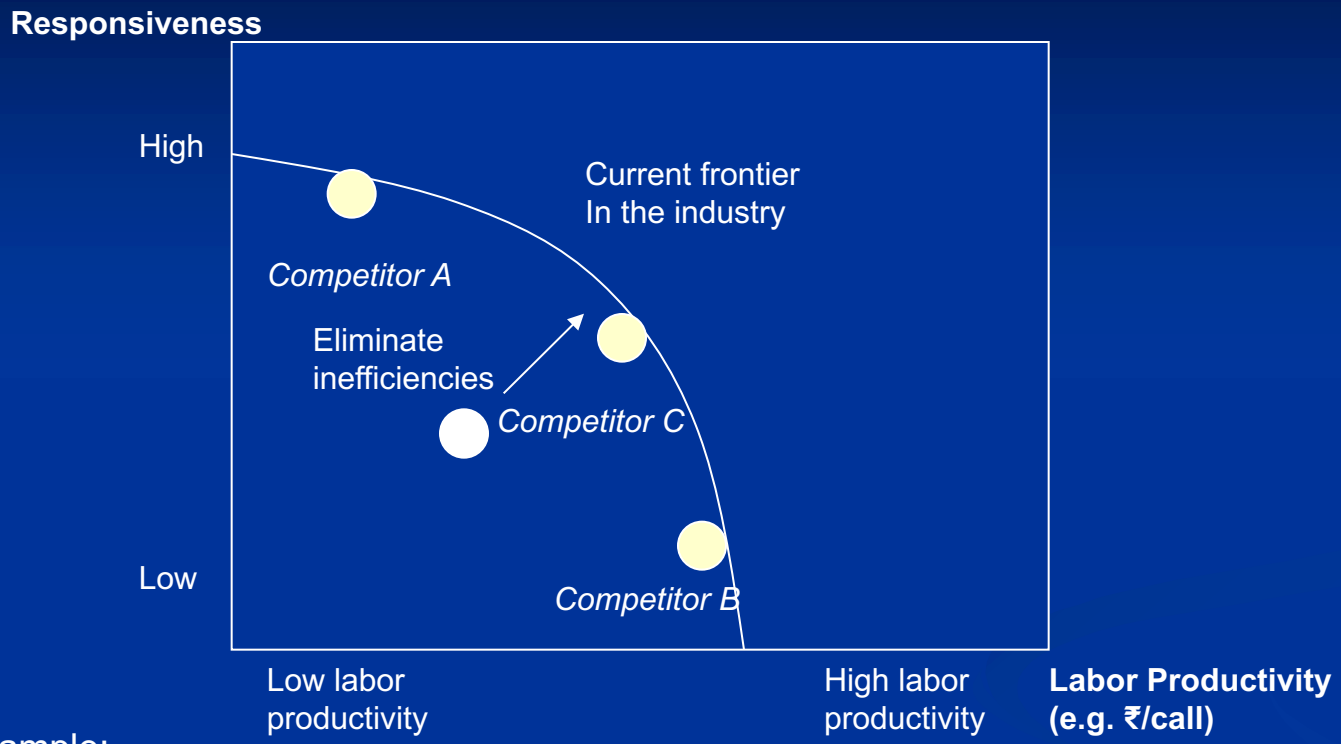
How Can OM Help?
Step 1: Helps Making Operational Trade-Offs
Example: Call center of a large bank



- starting point: 30% of incoming calls wait less than 20 seconds
- objective: 80% of incoming calls wait less than 20 seconds

OM helps: Provides tools to support strategic trade-offs

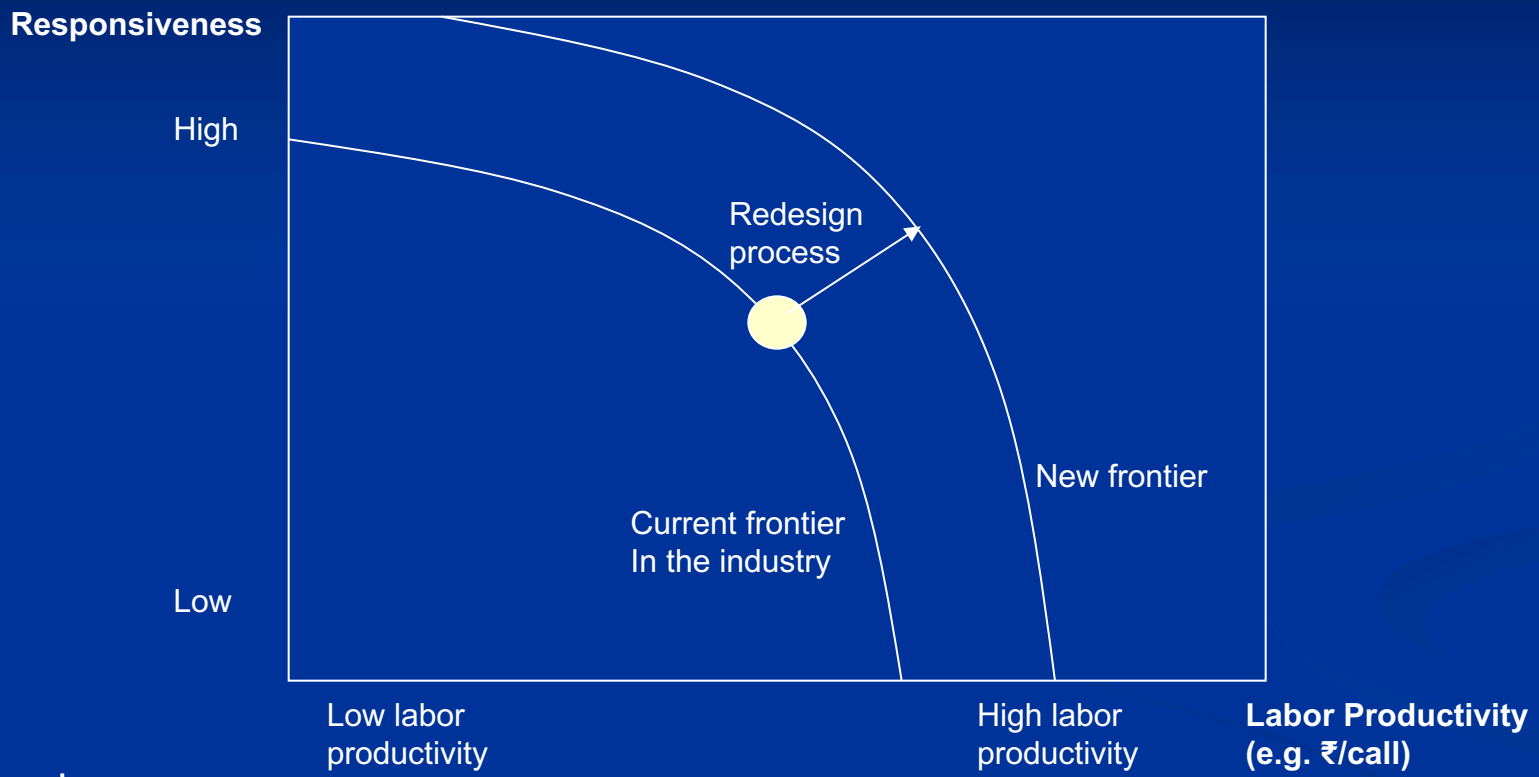
Step 2: Identify and Overcome Inefficiencies



Example:
- Benchmarking shows the pattern above
- Don't just manage the current system… Change it!

OM provides tools to identify and eliminate inefficiencies => Define Efficient Frontier
Types of inefficiencies:
-Poor process design
- Inconsistencies in activity network

Step 3: Evaluate Proposed Redesigns/New Technologies



Example:

- What will happen if we develop / purchase technology X?
- Better technologies are always (?) nice to have, but will they pay?

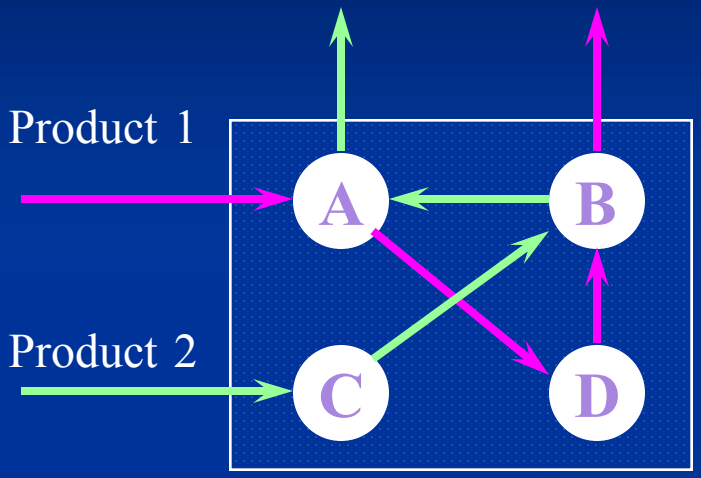
OM helps evaluate system designs before they occur

Match Process Competencies with Product Attributes

Product Attributes		Process Competencies
• Cost	→	Low cost process
• Quality	→	High quality process
• Variety	→	Flexible process
• Delivery Speed	→	Faster process
• Sustainable Product/Service	→	Sustainable Process

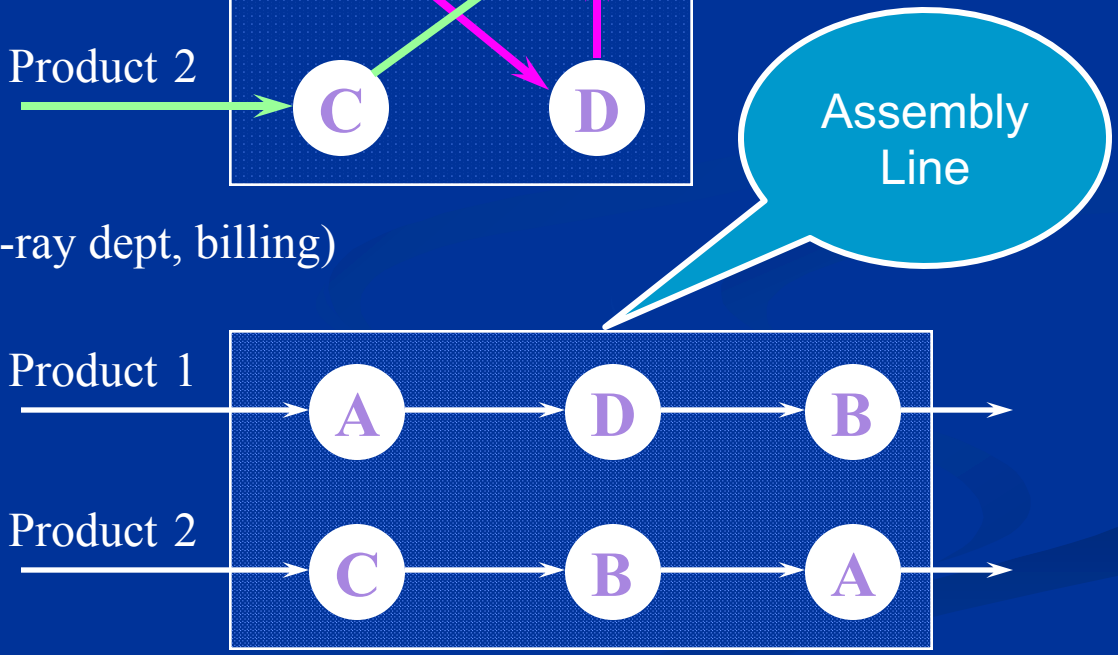
Process Architecture

- Functional Layout



● = resource pool (*e.g.*, X-ray dept, billing)

- Product Layout



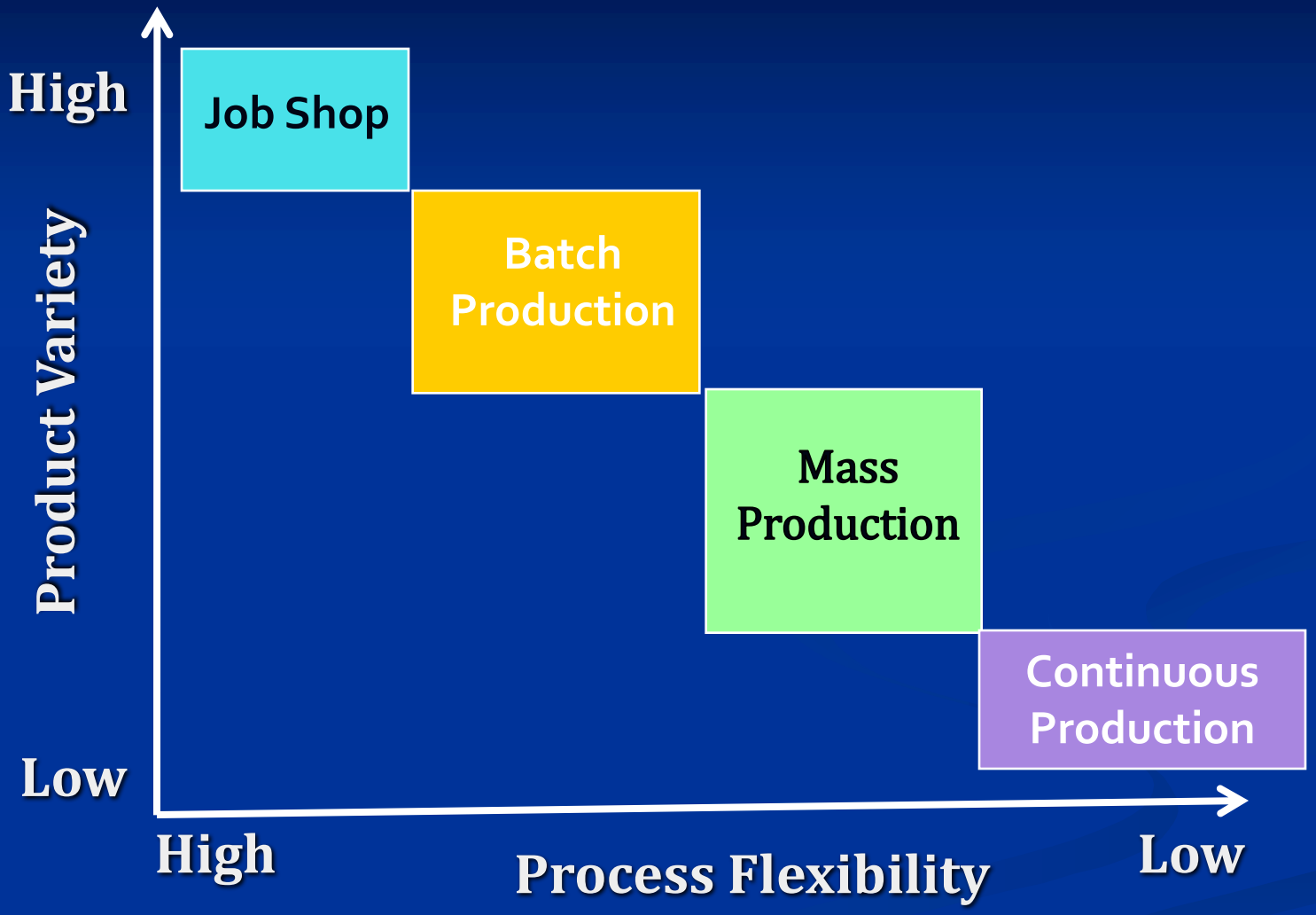
Use the right process architecture to match the product/service…

Process Types

- Job Shop (Project)
  - One-time production of product to customer order
- Batch production
  - Process many jobs at same time in a batch
- Mass production
  - Produce large volumes of standard product for mass market
- Continuous production
  - Very high volume commodity product

Process Type	Examples	No. of product variants	Product Volume (units/year)
Job Shop	• Design company • Commercial Printer • Formula 1 race car	High (100+)	Low (1 – 100)
Batch Process	• Apparel sewing • Bakery • Semi Conductor	Medium (10 – 100)	Medium (100 – 100,000)
Worker paced line flow	• Auto assembly • Computer assembly	Medium (10 – 50)	High (10k – 1M)
Machine paced line flow	• Large auto assembly	Low (1 – 10)	High (10k – 1M)
Continuous Process	• Paper Mill • Oil Refinery • Food processing	Low (1 – 10)	Very High

Product-Process Matrix



Production Systems

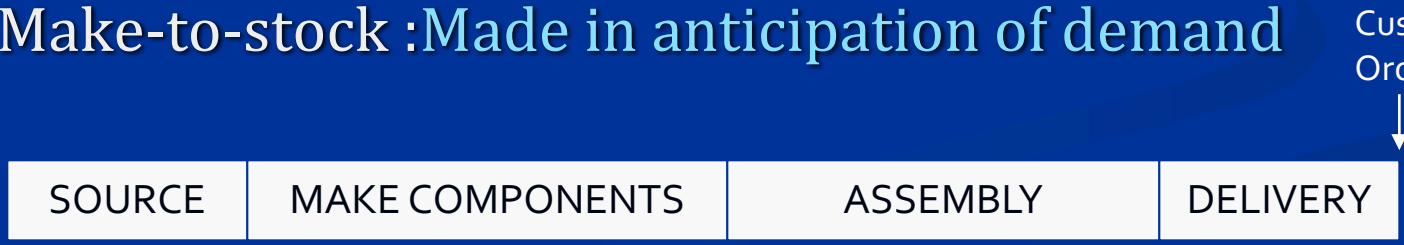
- Make-to-order: Made to customer specifications after receiving the order

MTO

- Assemble-to-order: Add options according to customer specification

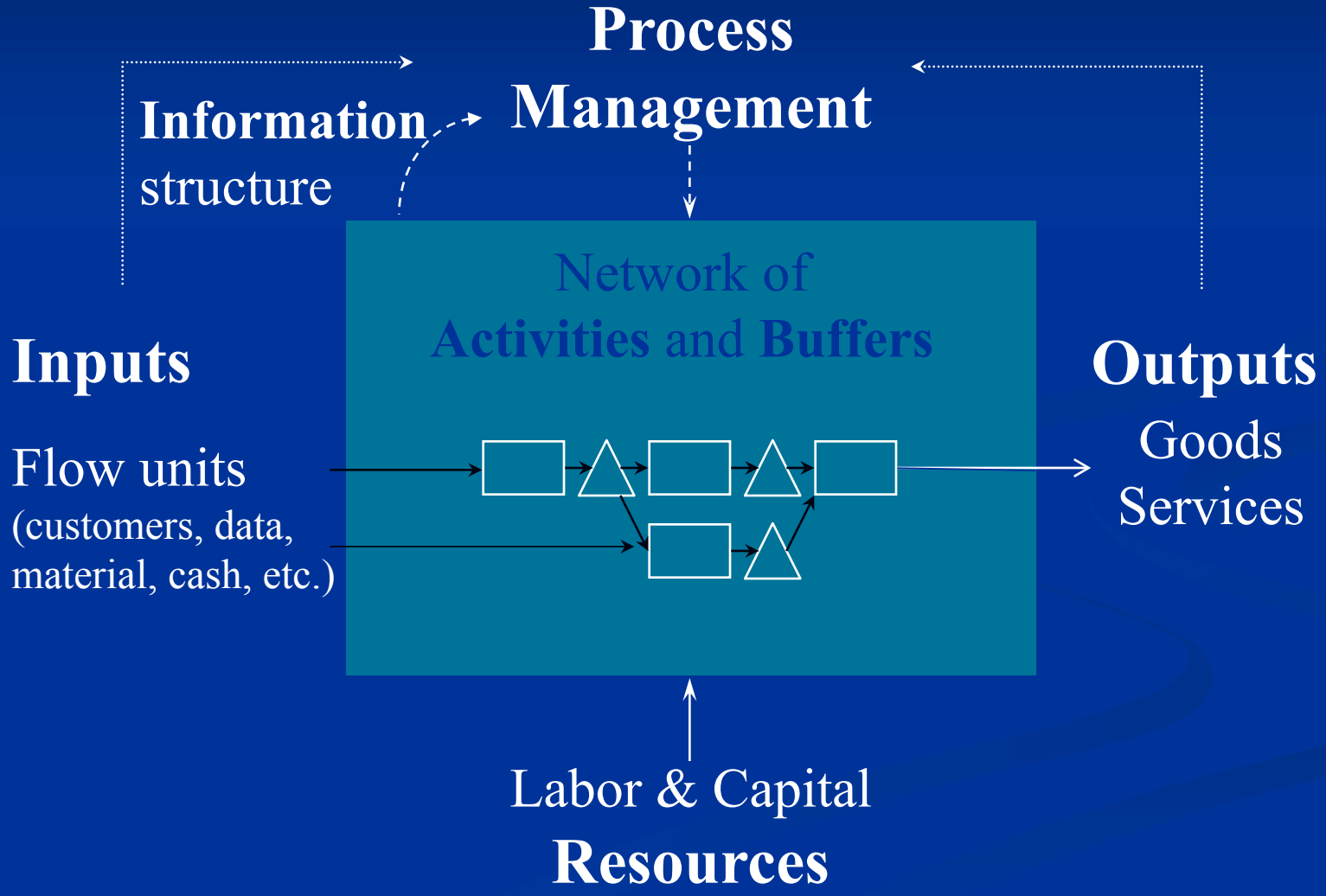
ATO
Or
CTO

- Make-to-stock :Made in anticipation of demand



MTS

Process view of operations



Processes: The Three Basic Measures

- **Flow Unit**
  - Customer or product being manufactured

- **Flow Time**
  - time it takes a flow unit to go from the beginning to the end of the process (& includes waiting time)

- **Flow rate / Throughput rate**
  - number of flow units going through the process per unit of time

- **Inventory**
  - the number of flow units in the process at a given moment in time

Process Analysis: The Three Measures

	Hospital	Champagne	MBA program	Auto company
Flow Unit	➢Patients	➢Bottle of champagne	➢Student	➢Car
Flow Rate	➢Patients served per day	➢Bottles sold per year	➢Graduating class	➢Sales per year
Flow Time	➢Duration of stay in the hospital	➢Time in the cellar	➢2 years	➢60 days
Inventory	➢Total number of patients in the hospital	➢Content of cellar	➢Total campus population	➢No. of cars in the pipeline

Little's law

Little's Law: Inventory (I) = Flow Rate (R) * Flow Time (T)

Implications:

- Out of the three fundamental performance measures (I,R,T), two can be chosen by management, the other is GIVEN by nature
- Hold throughput (Flow) Rate constant: Reducing Inventory = reducing Flow Time
- Given two of the three measures, you can solve for the third.
- Flow time is also called 'Manufacturing Lead Time' in the manufacturing context

Basic Process Vocabulary

- **Processing time**: how long does the worker spend on the activity?
- **Cycle time of the activity** = process time/no. of resources
- **Bottleneck**: The slowest activity, or the activity with the largest cycle time
- **Activity Capacity** = (1/ cycle time of the activity)
- **Process capacity:** capacity of the bottleneck activity
- **Flow rate** =Minimum{Demand, Process Capacity)
- **Flow time** = The time it takes flow unit to get through the process
- **Utilization** =Flow Rate / Capacity
- **Actual Cycle Time** = Average time between successive units as they output from the process = 1/ Flow Rate

Strategic Positioning of the firm

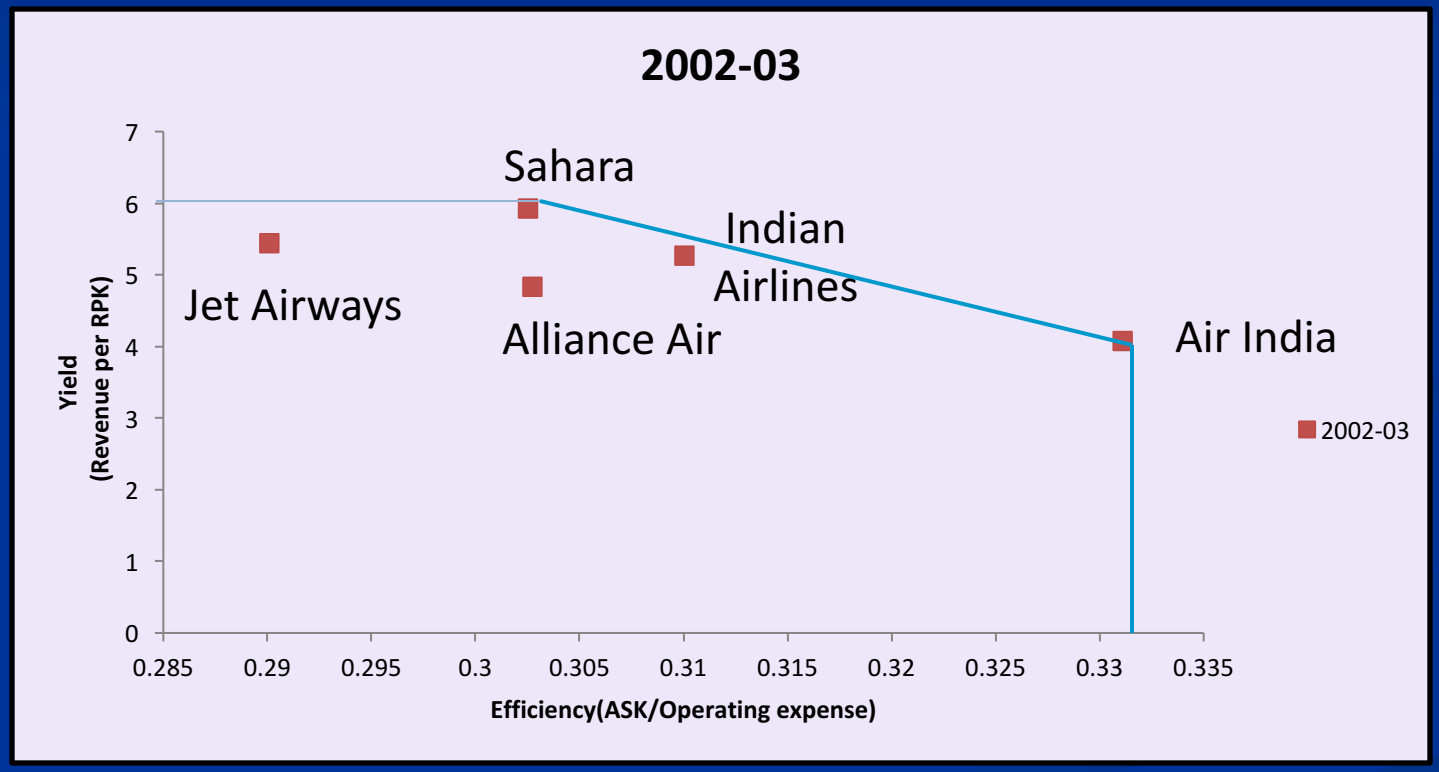
- Firms
  - have to make strategic choices
  - need to choose one or two important strategic dimensions and focus on them
  - need to align their operational processes with their business strategy
- An effective positioning strategy considers the needs of the marketplace, strengths/weaknesses of the firm, and position of competitors & impact on environment

SSCM Course Outline

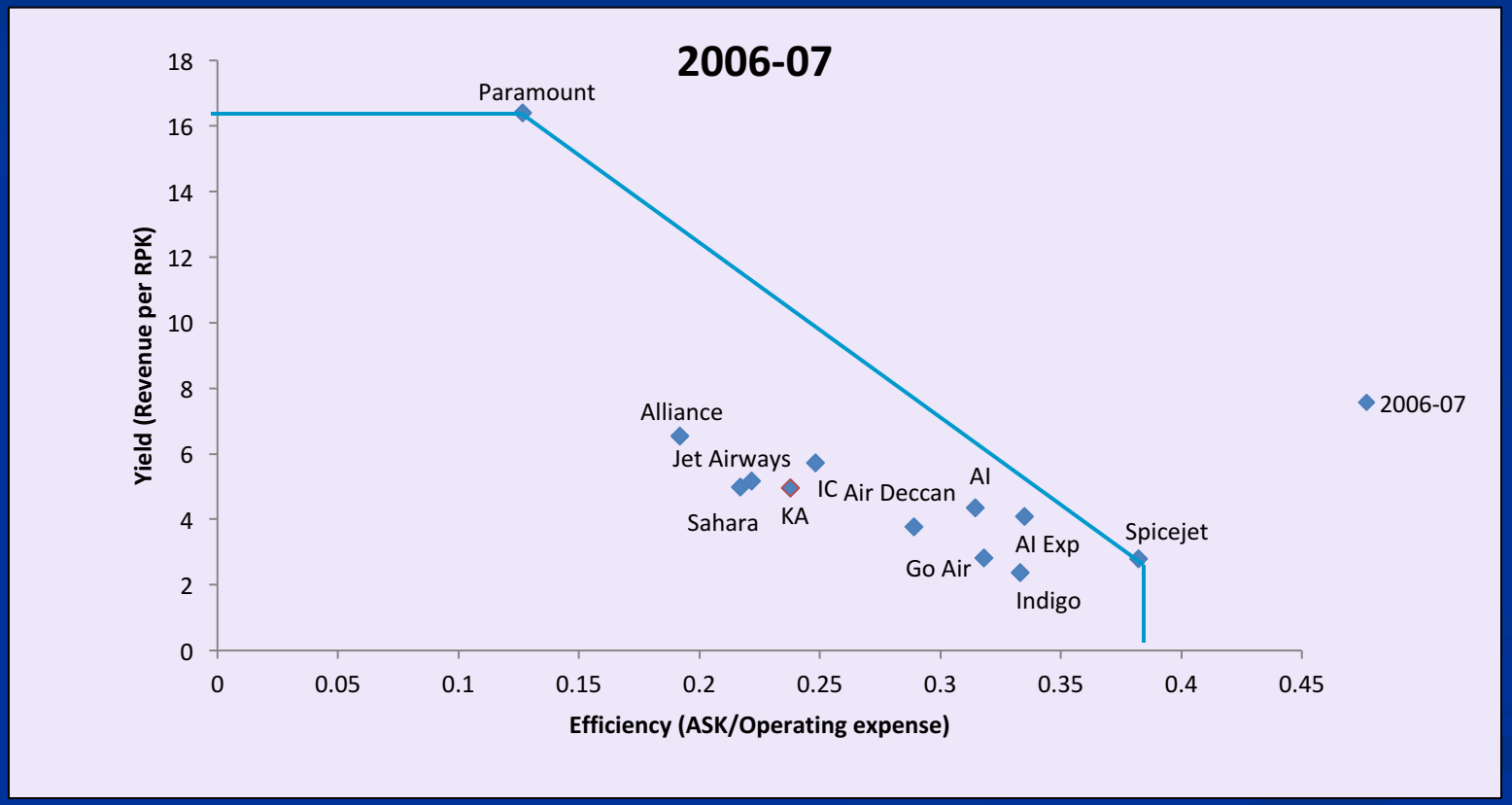
- ***Module 1: Business Process Fundamentals***
  - Introduction to operational processes & trade-offs between various performance measures
- ***Module 2: Performance Measurement Frameworks and Improvement methodologies***
  - Balanced Scorecard, TQM, SPC, Six Sigma
- ***Module 3*: Process Improvement from a *Sustainability angle***
  - Concept of Sustainability and its linkages to operations
- ***Module 4:* Designing and implementing operations improvement strategies**

Thank You!

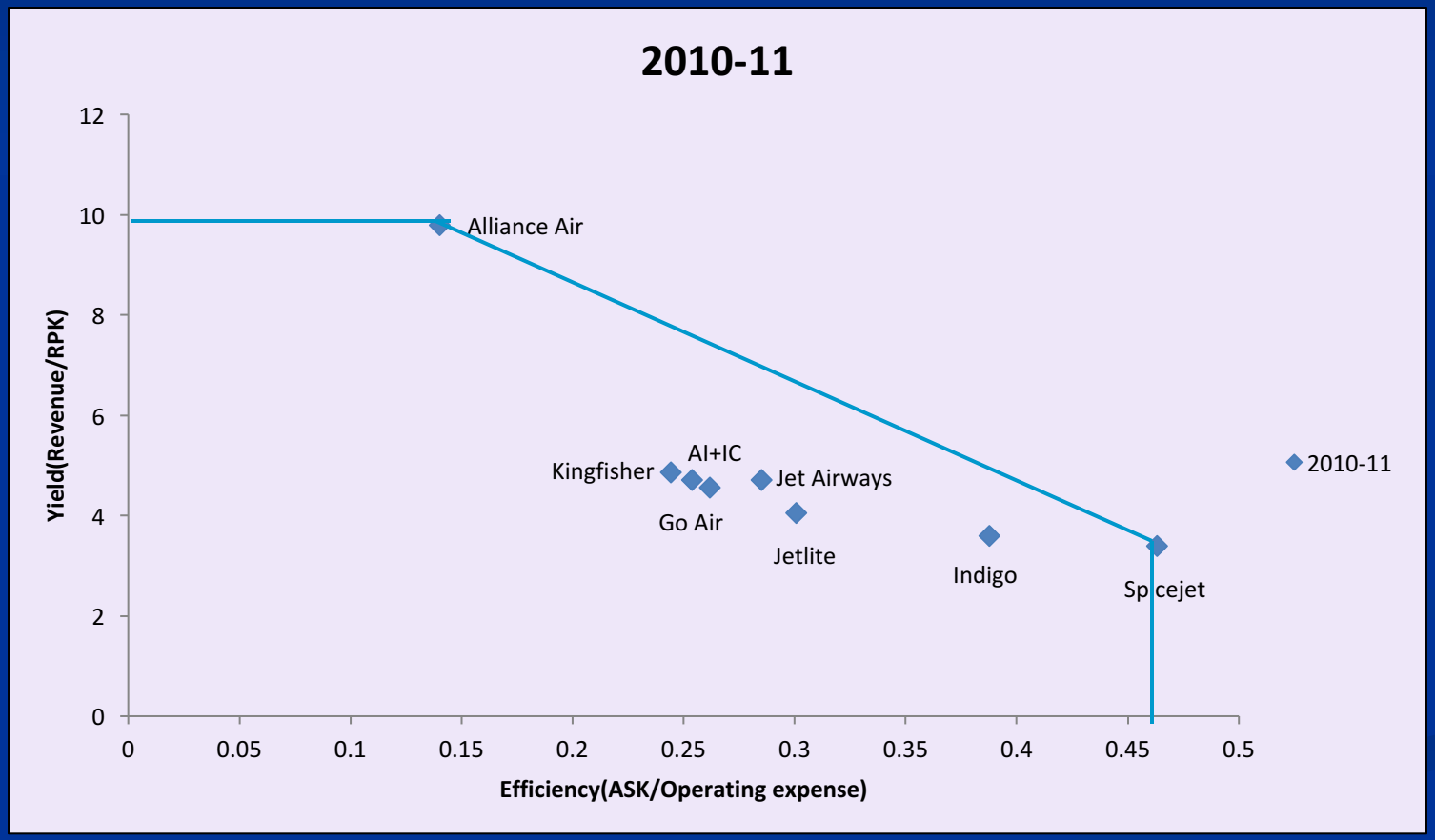
The Yield and Cost efficiency of Airlines in India during 2002-03



The Yield and Cost efficiency of Airlines in India during 2006-07



The Yield and Cost efficiency of Airlines in India during 2010-11



Learnings from Kristen's Cookie Case

- **Processing times**: how long does the worker spend on the task?
- **Capacity** = 1/processing time (how many units can the worker make per unit of time)
    - If there are m workers at the activity: **Capacity**=m/processing time
- **Bottleneck**: process step with the lowest capacity
- **Process capacity:** capacity of the bottleneck
- **Cycle Time** = time between successive units as they output from the process
- = 1/process capacity
- **Flow rate** =Minimum{Demand rate, Process Capacity)
- **Utilization** =Flow Rate / Capacity

Learnings from Kristen's Cookie Case

- How to draw a process flow diagram
- How to draw a Gantt Chart
- How to compute various process performance measures
- What are 'set up' and 'run' times
- How to account for 'labor content'
- Understanding of how order size, setups and product diversity affect throughput rate