

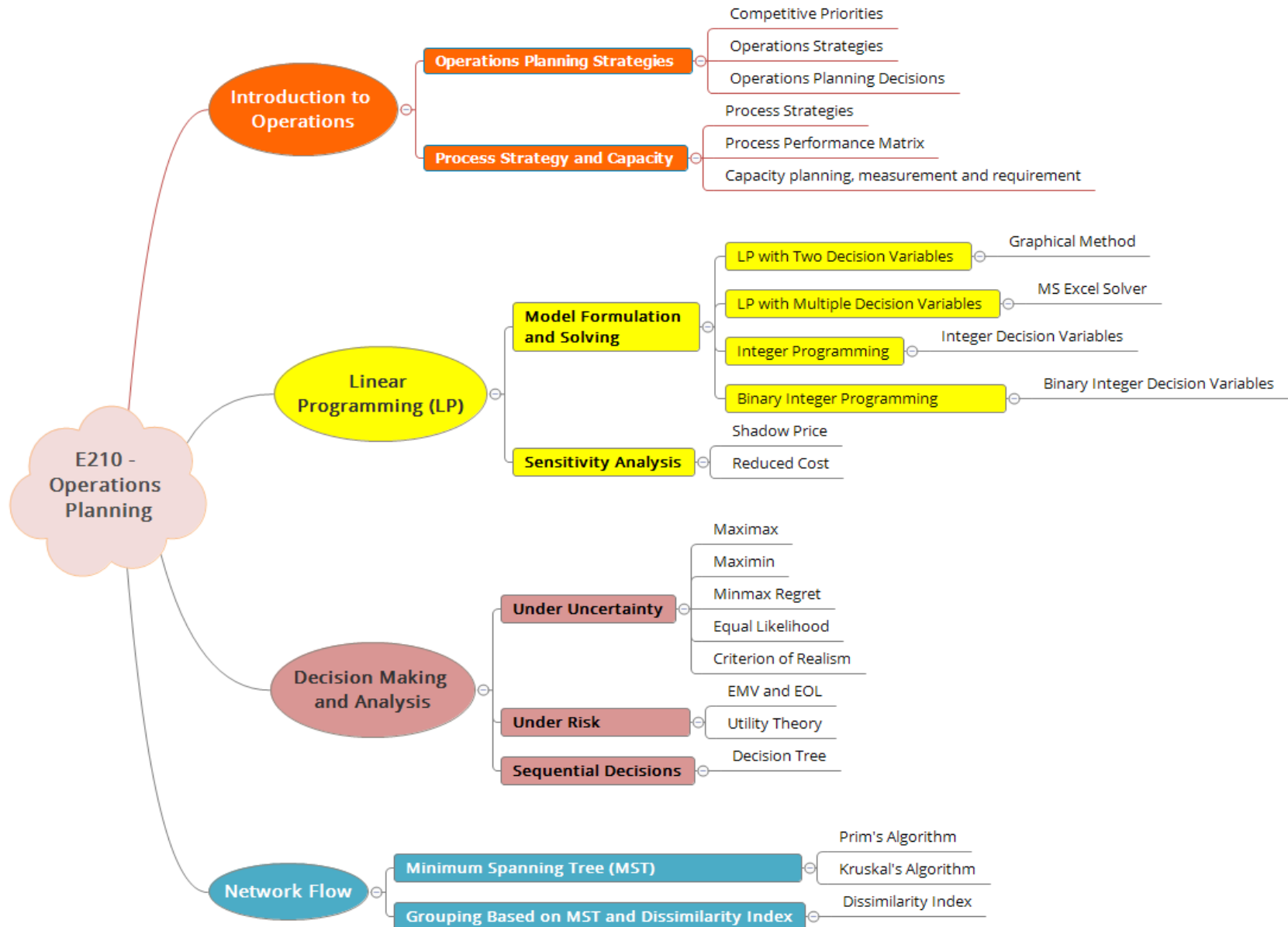
# Problem 01

## The Cupcake Business

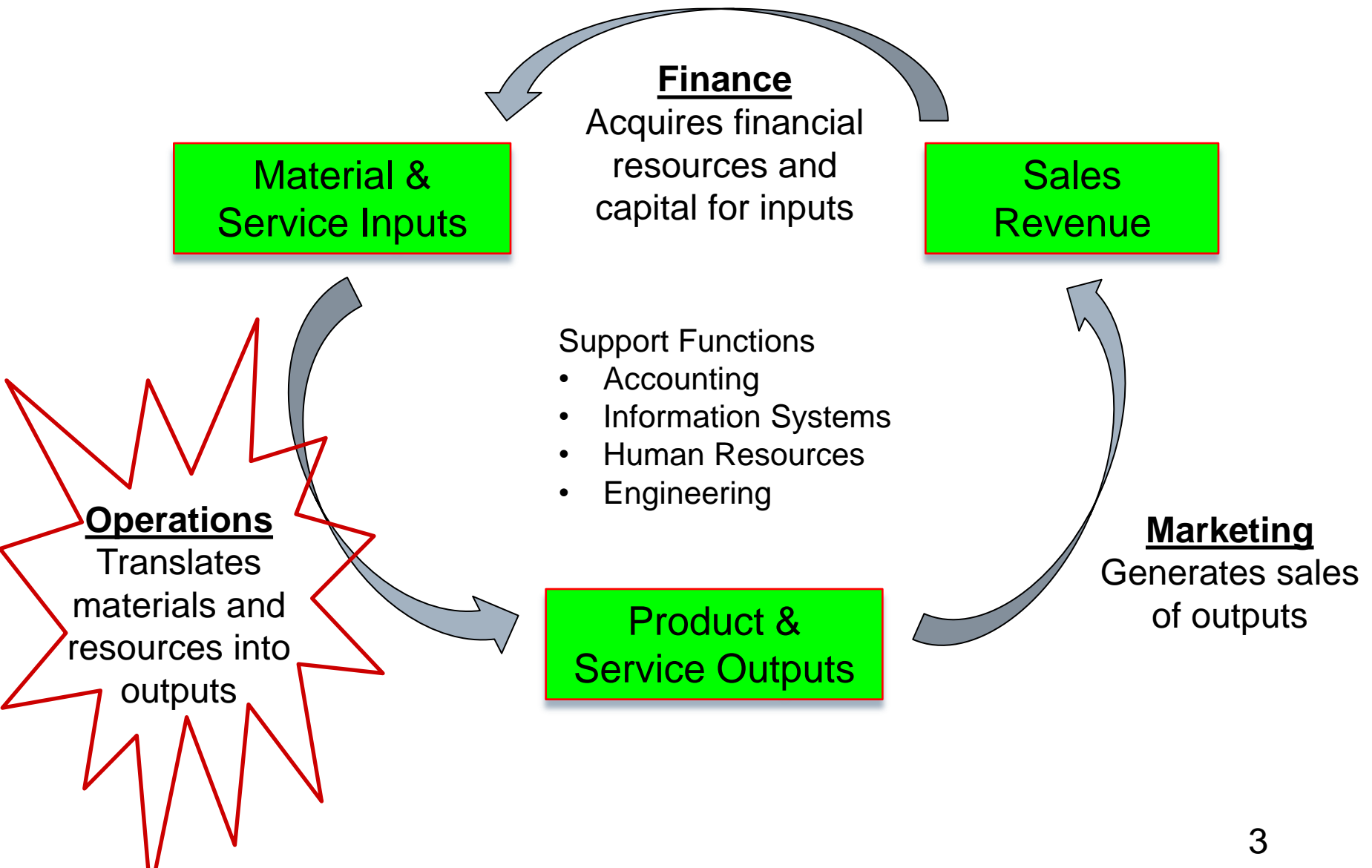
### E210 – Operations Planning

SCHOOL OF  
ENGINEERING

# E210 Operations Planning Topic Tree



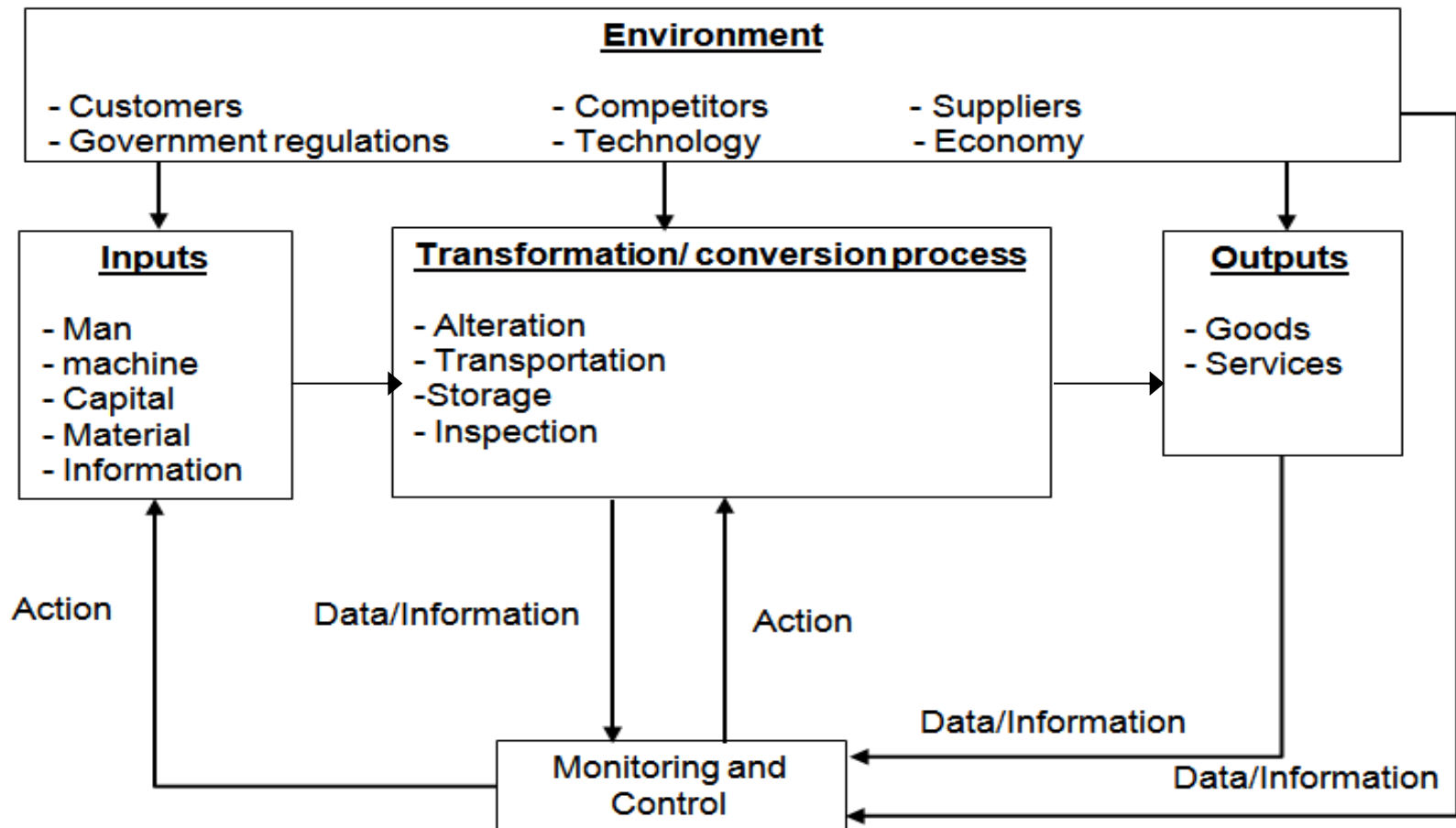
# Operations – Key Function of Organization



# Operations – Model of Transformation



- A function or system that transforms inputs into outputs of greater value for customers



# Importance of Operations

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- Operations transform resource or data inputs into desired goods or services, and create and deliver value to the customers.
- It accounts for almost 60 to 80% of the direct expenses that burden company's profit.
- It is essential to competitiveness of a company.
- It is key to running a business that's always getting better and better at what it does.

# Advantages of Effective Operations

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- Reducing costs of producing products and services by being efficient.
- Increasing revenue by increasing customer satisfaction.
- Reducing investment necessary to produce the required type and quantity of products and services by increasing the effective capacity of the operations.
- Providing the basis for future innovation with the operations skills and knowledge within the business.

# Operations Planning

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- Also known as **Operations Management**.
- Plans, coordinates and controls the direct resources that are needed in producing a company's goods and services.
- Manages the **transformation process** and its inputs such as labour, materials, equipment, technology and information.
- Adds value to the company by ensuring that outputs are achieved with competitive advantages consistent with company's long-term strategy.



## Introduction to Operation Management

<https://d1a2y8pfnfh44t.cloudfront.net/0e992e3054d311e48a507186e15e34eb/full/540p/index.mp4>



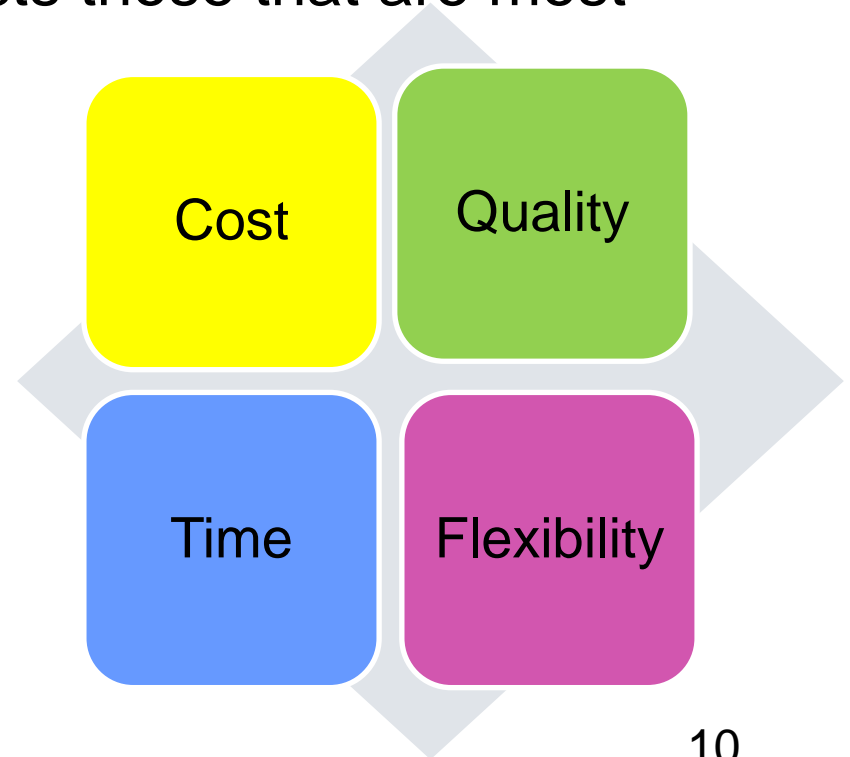


- **Operations Strategy** is the total pattern of decisions which shape the long-term capabilities of any operations and their contribution to overall strategy.
- It defines how to produce and deliver the products or services to customers.
- It serves as a means to execute similar strategies better than competitors in order to achieve **competitive advantages(priorities)**.
  - Example: BMW, seeks to attract those who prefer higher quality – in terms of performance, appearance, or features – than the available in competing products and services, even though accompanied by a higher price.

# Competitive Priorities



- To be efficient and sustainable, a company needs to prioritize on these factors to achieve unique advantage over its competitors.
- Not all competitive priorities are critical for a given process; management selects those that are most important.
- Four common dimensions:
  - Cost or Price
  - Quality
  - Time or Speed
  - Flexibility



# Competitive Priority – COST



Priority	Definition	Operations Strategy	Example
Low-cost operations	Deliver a service or product at the lowest possible cost to the satisfaction of the customer	<ul style="list-style-type: none"><li>- Efficient process</li><li>- Reduction of defective outputs</li><li>- Automated facilities</li><li>- Investment in new technologies</li></ul>	<b>-Daiso</b> , they keep prices low by purchasing directly from manufacturers in very high volume.

# Competitive Priority – QUALITY



Priority	Definition	Operations Strategy	Example
Top quality	Deliver an outstanding service or product	<ul style="list-style-type: none"><li>- High level of customer contact</li><li>- Availability of service</li><li>- Good reliability</li></ul>	<b>-Ferrari's</b> processes deal with providing superior product features and more demanding performance requirements.

# Competitive Priority – QUALITY



Priority	Definition	Operations Strategy	Example
Consistent quality	Produce services or products that meet design specifications on a consistent basis	- Monitoring of processes to reduce errors, prevent defects and achieve consistent outputs	- <b>McDonald's</b> standardizes work methods, staff training processes, and procurement of raw materials to achieve the same consistent product and process quality from one store to another.

# Competitive Priority – TIME



Priority	Definition	Operations Strategy	Example
Delivery speed	Quickly filling a customer order	<ul style="list-style-type: none"><li>- Reduction of lead time</li><li>- Have backup capacity</li><li>- Keep sufficient inventory</li><li>- Use premier transportation options</li></ul>	- <b>Dell</b> engineered its customers relationship, order fulfillment and supplier relationship processes to create an integrated and agile supply chain. Customers receive reliable and inexpensive products with short lead time.

# Competitive Priority – TIME



Priority	Definition	Operations Strategy	Example
On-time delivery	Meeting delivery-time promises	<ul style="list-style-type: none"><li>- Proper process planning (forecasting, scheduling, capacity planning) to reduce lead time and meet delivery dates</li></ul>	<ul style="list-style-type: none"><li>- <b>DHL</b> Delivers large volume of shipments on-time across the globe.</li></ul>

# Competitive Priority – TIME



Priority	Definition	Operations Strategy	Example
Development speed	Quickly introduce a new service or product	<ul style="list-style-type: none"><li>- Enable cross-functional integration</li><li>- Collaborate closely with critical suppliers</li></ul>	<b>Li &amp; Fung #</b> - Can get a new product idea from the customer, transmit the design to HK and South East Asia where it is produced, ship the product back to USA, and put the product on the store shelves within a few weeks.

# <http://www.lifung.com/about-us/lf-at-a-glance/>



# Competitive Priority – FLEXIBILITY



Priority	Definition	Operations Strategy	Example
Customization	Satisfy unique needs of customers in service delivery or product design	<ul style="list-style-type: none"><li>- Keep output volume low and close customer contact</li><li>- Able to reconfigure processes easily</li></ul>	<b>-Ritz Carlton</b> customizes services to individual guest preferences.

# Competitive Priority – FLEXIBILITY



Priority	Definition	Operations Strategy	Example
Variety	Handle a wide variety of services or products efficiently	<ul style="list-style-type: none"><li>- Have flexible manufacturing facilities or processes to support larger volumes and higher varieties</li></ul>	<b>Amazon.com</b> – uses IT and streamlined customer relationship and order fulfillment processes to reliably deliver vast variety of items to its customers.

# Competitive Priority – FLEXIBILITY



Priority	Definition	Operations Strategy	Example
Volume flexibility	Scale up or down the rate of production of services or products quickly to handle large fluctuations in demand	<ul style="list-style-type: none"><li>- Have excess capacity and inventory</li><li>- Ensure vendor support</li><li>- Able to outsource during demand surge</li></ul>	<b>Singapore Post</b> – Processes are flexibly designed for receiving, sorting, and dispatching mails during severe demand peak fluctuations.

# Operations Planning Decisions



- **Strategic Decisions**

- Set for entire company
- Broad in scope and long-term in nature (e.g. 5-10 years)

- **Tactical Decisions**

- Specific issues and short-term (e.g. 3 months to 2 years)
- Bound by strategic decisions

Types of Decision	Operations Management Topic
Strategic ↑ ↓ Tactical	Operations Strategy Product Design and Process Selection Supply Chain Management Total Quality Management Just-in-Time and Lean Systems Forecasting Capacity Planning and Location Analysis Facility Layout Work System Design Inventory and Resource Planning Scheduling Issues

# Operations Planning Decisions



Decision Area	Example Decision
Operations Strategy	<ul style="list-style-type: none"><li>- What strategy should be followed?</li><li>- What are the priority choices needed to remain competitive?</li></ul>
Process Design	<ul style="list-style-type: none"><li>- What process and what capacity will these products required?</li><li>- How do we configure the process that will deliver our service to customers?</li><li>- How do we design the service delivery process?</li><li>- What equipment and technology are necessary for these processes?</li></ul>
Location Strategy	<ul style="list-style-type: none"><li>- Where is the location of our operation facilities?</li><li>- On what criteria should we base the location decision?</li></ul>
Layout Strategy	<ul style="list-style-type: none"><li>- How should we arrange the facility?</li><li>- How large must the facility be to meet our plan?</li><li>- How do we organize the physical layout of our facilities and people?</li></ul>

# Operations Planning Decisions



Decision Area	Example Decision
<b>Scheduling</b>	<ul style="list-style-type: none"><li>- Which job do we perform next?</li><li>- Where and when should we go next?</li></ul>
<b>Maintenance</b>	<ul style="list-style-type: none"><li>- Who is responsible for the maintenance?</li><li>- When do we do the maintenance?</li></ul>
<b>Product and Service Design</b>	<ul style="list-style-type: none"><li>- What products and services should we provide?</li><li>- How should we design these products?</li></ul>
<b>Supply-Chain Management</b>	<ul style="list-style-type: none"><li>- Should we make or buy this component?</li><li>- Who are our suppliers and who can we integrate into our- e-commerce programme?</li><li>- What benefits could e-procurement bring to our operations?</li></ul>
<b>Inventory, Materials requirements planning</b>	<ul style="list-style-type: none"><li>- How do we keep track of the inventory?</li><li>- How much inventory of each item should we have?</li><li>- When do we reorder?</li></ul>

# Operations Planning Decisions



Decision Area	Example Decision
<b>Quality</b>	<ul style="list-style-type: none"><li>- How can we implement a Total Quality Management (TQM) programme?</li><li>- How do we implement the lean operations?</li><li>- What role could continuous improvement have in our operations?</li></ul>
<b>Human Resources and Job Design</b>	<ul style="list-style-type: none"><li>- How do we provide a reasonable work environment?</li><li>- How much can we expect our employees to produce?</li><li>- How do we motivate our employees?</li></ul>

# Decision Making Approach

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- Models
  - Physical models: e.g. scaled-down warehouse in RP
  - Schematic models: graphs, charts, drawings, etc
  - Mathematical models: Linear Programming, inventory models, forecasting techniques, etc
- Trade-off analysis:
  - Weighing the increase in cost against value of increased output



# Decision Making Approach

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- Systems Perspective
  - Evaluate decisions in terms of larger framework, objectives of the organization take precedence
- Establishing Priorities
  - Pareto principles – focus on critical issues, risk & impact analysis
- Ethics
  - Safety, community, environment

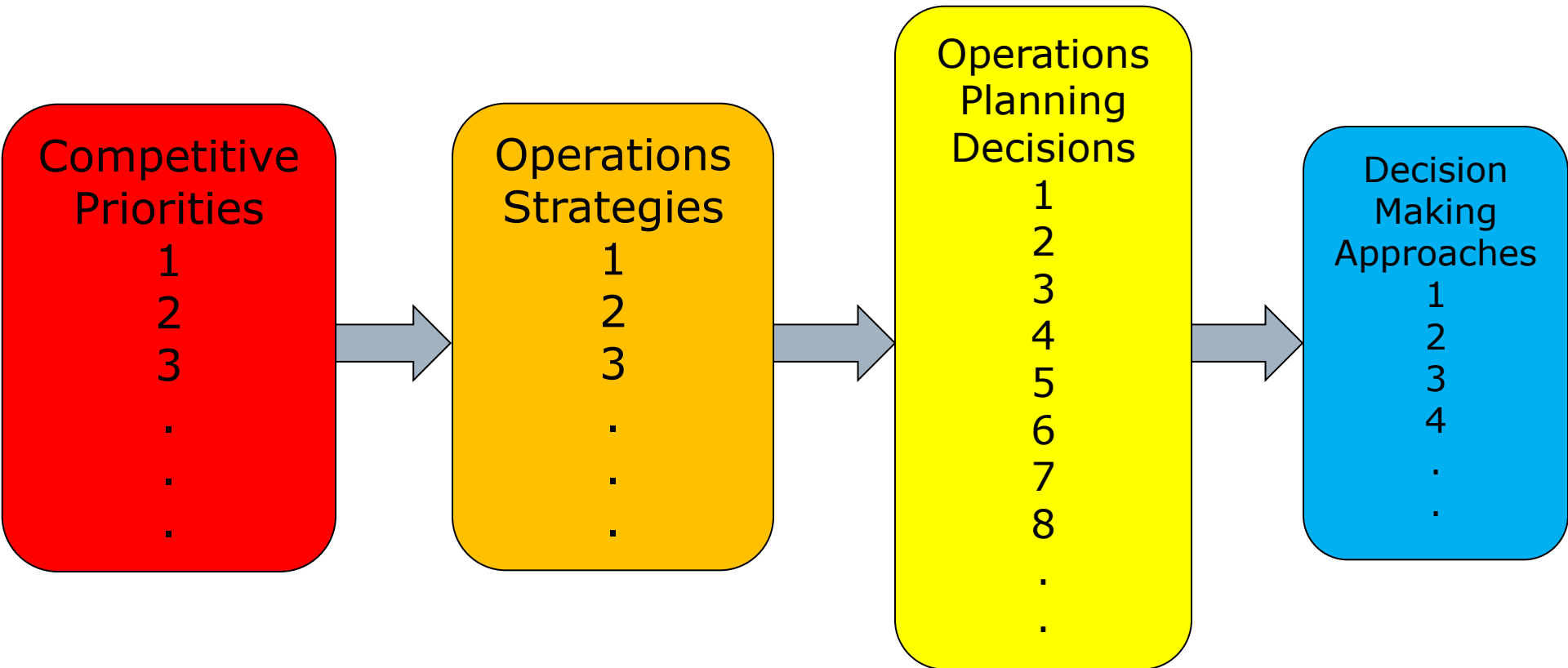
# Some Quantitative Methods...

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- **Mathematical models** – e.g. Linear Programming
- **Optimization** – e.g. Linear Programming
- **Algorithms** – e.g. Kruskal, Prim's algorithm
- **Heuristics** – e.g. The nearest-neighbour method
- **Decision trees** – e.g. Expected Monetary Value
- **Process mapping** – e.g. Process flow diagram
- **Sensitivity Analysis** – e.g. Reduced cost, Shadow price
- **What-if Analysis** – e.g. Simulations
- **Data mining** – e.g. Decision trees

# Overview of Decision Making Process



# Problem 01 – The Cupcake Business

## Suggested Solution

# Application of Transformation Model



## What will be transformed?

- Raw materials/Ingredients
  - Flour, egg, water, sugar, milk, butter, etc.
  - Fresh fruits and others
  - Creative recipes and cake designs
- Customers

## Who/what will do the transforming?

- Equipment
- Staff
- Facility
- Capital
- Websites

- Making of cakes
  - Blending, flavoring, kneading
  - Molding, baking
- Layout/Display
- Outlet design
- Menu design

## Products

- Different Types of cakes

## Services

- Hygiene
- Creative options
- Professional Services
- Unique experience

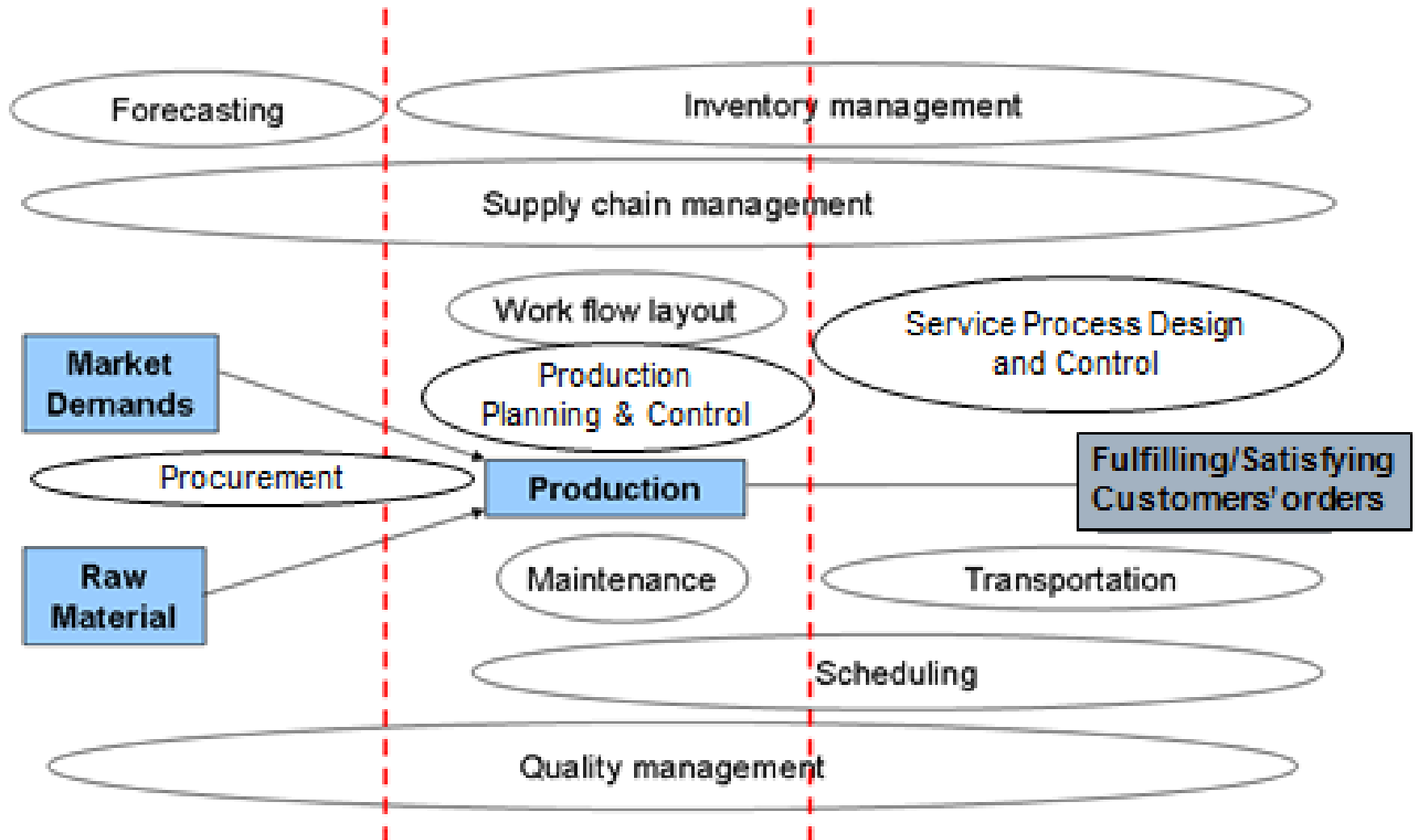
# Competitive Priorities



- We can assume that Amy's competitive priorities are quality, customization and possibly fast serving time.

Competitive Priorities	Operations Planning Strategies/ Issues
Consistent Quality	Material input → Supplier management Quality of food → Process control and monitoring → procurement of raw materials to achieve the same consistent product and process quality throughout time <b>(Taste and look)</b>
Time (Fast serving)	Standardizes work methods, staff training processes to shorten customer waiting time. Capacity planning → Resource planning to meet demand forecast.
Customization(Flexibility)	Allow customization → Enabled by service process design <b>(Customized options)</b> Process flexibility → Process can be configured to handle customized request

# Overview of Operation Planning





- **Workflow Layout / Service Process Design**

- Oversee the design, development and construction of the outlet
- Collect competitive bids for the build-out of the outlet and for the equipment needed for the outlet. Select contractors and equipment suppliers to complete the outlet.
- Determine the type of service process to design to allow for customization of orders (Process Strategy)



# Application to Amy's Cupcake Business

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- **Market Demand / Forecasting.**

- Plan, coordinate and execute merchandising and promotion of the outlet, including Grand Opening activities, and a year-round calendar of holidays, special events and numerous other promotional activities.
- Make reasonably accurate forecasts of demand. (Forecasting errors)
- Quantitative methods require historical data. Determine which forecasting model to use. (Forecasting methods)
- May require customer feedback/ expert opinion as forecast consideration.

# Application to Amy's Cupcake Business



- **Inventory / Supply Chain Management**

- Prepare all products to be sold, sourcing the most cost effective suppliers on ingredients.
- Maintain appropriate levels of inventory while maximizing inventory turns and minimizing lost sales. Too much inventory → higher cost and risk of wastage; Too little inventory → risk of stock-out
- What inventory model to adopt? (Inventory Evaluation, eg. FIFO, LIFO, weighted average.)
- Establish supplier selection criteria (Suppliers' Evaluation). Should cost be the only factor? What about criteria that ensure stable and reliable supply? (Analytical Hierarchical Process, AHP)

Examples are: supplier's market share, customer base, timely delivery and price stability.

# Application to Amy's Cupcake Business

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- **Production Planning & Control / Scheduling**

- Determine the resources needed (Optimisation / Sensitivity Analysis); Automation or manual process? (What-if Analysis with simulation)
- Ensure resources flexible enough to meet the customization requirements
- Ensure sufficient capacity to meet potential demand surges (Capacity Planning)
- Effective Scheduling of manpower (Optimization)
- Schedule the maintenance required for the equipment (Quality Management)
- Planning and scheduling of staff to assignments
- Staff's preferences versus customers' demands
- Staff training and progression



# Application to Amy's Cupcake Business

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- **Production Process**

- Variety of menu options to have (Product design)
- Type of process to implement to produce the cakes and preparation needed to ensure quality, efficiency and hygiene (Process Strategy)
- Process being able to handle customization of orders (Process Strategy)

- **Quality Management**

- Ensure that standards of product quality control and shop cleanliness (required by the regulatory authority) are maintained on a daily basis.

# Application to Amy's Cupcake Business



- **Transportation**

- If Amy is to serve customized orders placed through phone or online system, she needs to provide delivery services to her customers.

- **Routing – Network Optimisation**

- ✓ Delivers food to customers on time
- ✓ Which location to deliver first and who's the next?  
(Customer valuation, service standards)



# Learning Objectives

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At the end of the lesson, students should be able to:

- Explain and identify the basic principles of operations planning.
- Identify different competitive priorities in relation to the various aspects of operations in an organisation.
- Describe the importance of operations in enabling competitive priorities for organizations.
- Explain what operations planning is and state the relevant operations planning decisions.

# Overview of E210 Operation Planning Module

