

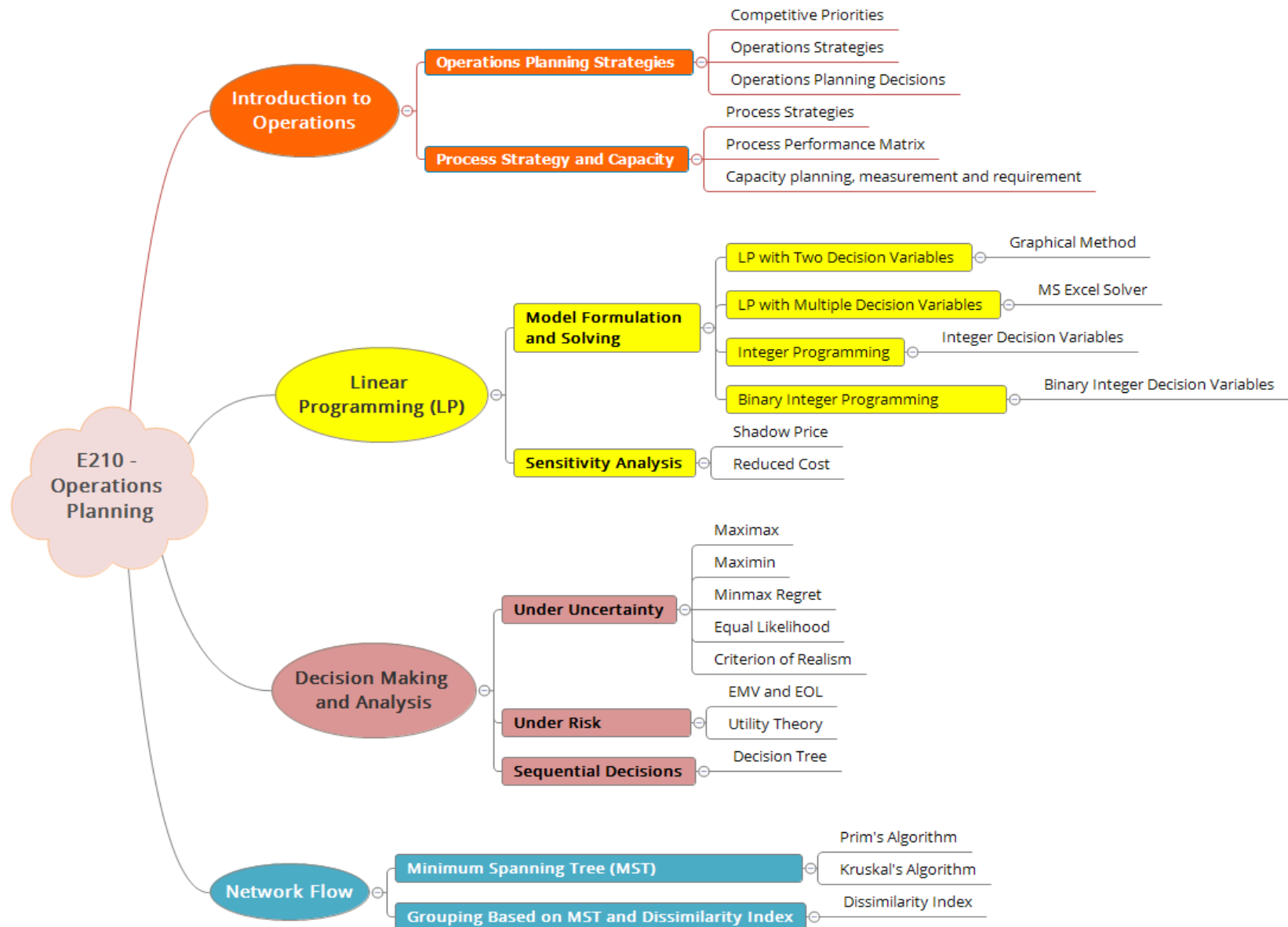
Lesson 02

The Cupcake Business Expansion Scenario Solution

E210 – Operations Planning

SCHOOL OF
ENGINEERING

E210 Operations Planning Topic Tree



Scenario – The Cupcake Business Expansion



- Amy currently runs a cupcake bakery outlet in Singapore. In addition to walk-in customers, the outlet also serves customers who order customized cupcakes (with specified designs, shapes, and sizes) through phone or online system.
- Amy's cupcake business is a huge success. She starts to receive orders from supermarkets in Singapore and Malaysia. The projected demand will be increased from 3,000 to 12,000 cupcakes per week including the additional supply to local and Malaysia supermarkets.
- With the significant increase in demand, Amy needs to expand her business through mass production of the cupcakes.



- She visited a famous cupcake production facility and amazed at the complex process and production line used in the production.
- There are significant differences between the mass production process and the process in her current outlet.

Scenario – Tasks of the day



Assume that you are a consultant helping Amy plan for her business expansion. Help her

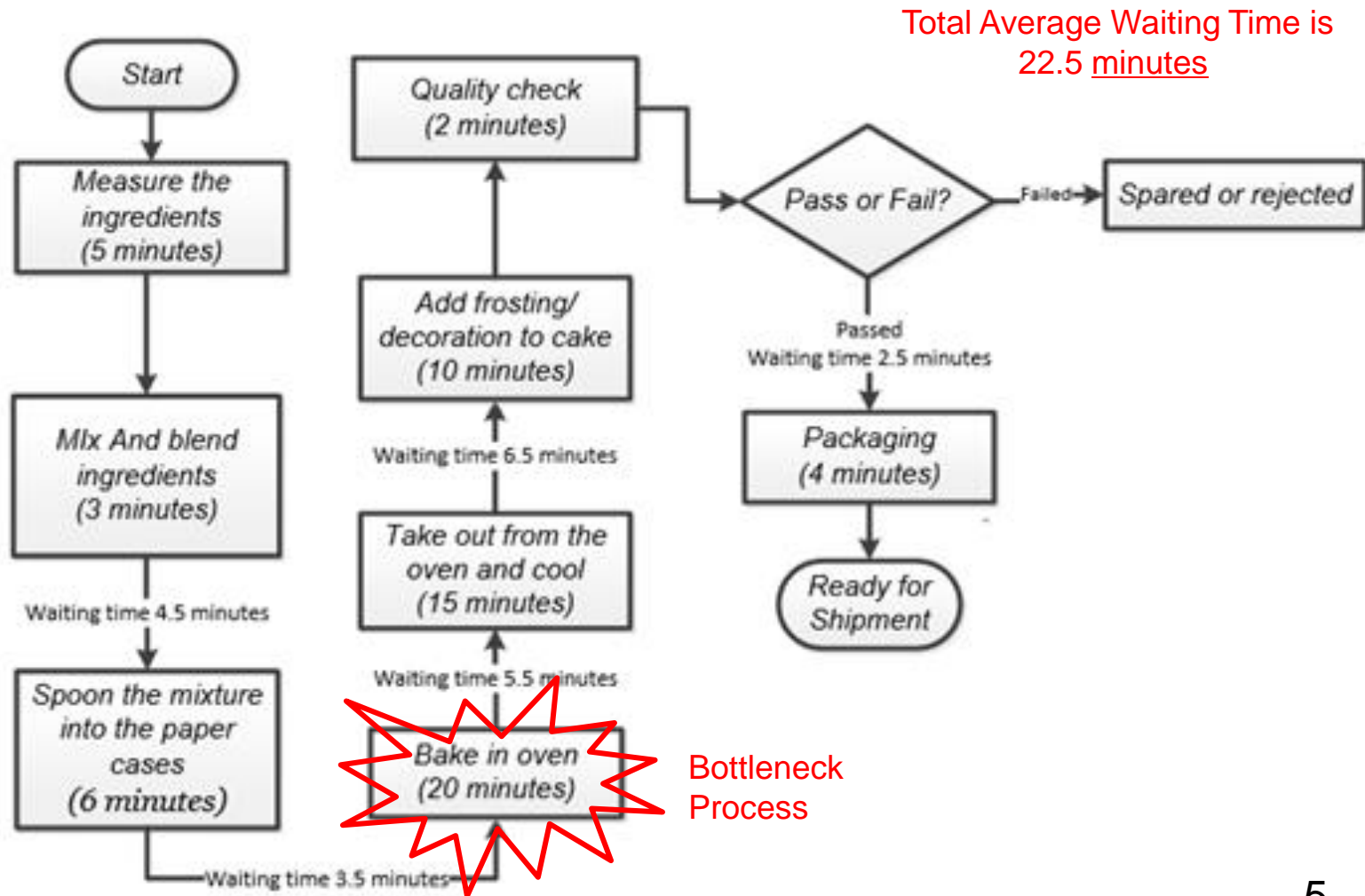
- Understand the cupcake production process and plot a simple process map.
- Identify performance metrics to measure process performance and evaluate the process performance through calculation of the performance metrics.
- Analyse the capacity utilization level and capacity utilization requirements.
- Find out more information regarding process strategies for the mass production of the cupcakes.

Process Map for Cupcake Production Process

(For one batch of cupcakes)



- Process map will be useful in Amy's planning
 - ✓ Allocation of resources, such as manpower, space, equipment.
 - ✓ Planning of the process flow and layout.



Suggested Performance Metrics



Cupcake Production

Flow time – how long it takes to produce one batch of the cupcakes

Cycle time - Average time between completion of the batches

Throughput rate – number of batches of the cupcakes produced within a time period

Utilization of production equipment

Utilization of production workers

Efficiency of process – the actual throughput of the cupcake making process compared with the theoretical achievable throughput.

- ❖ Amy also needs to benchmark her own process performance against competitors' performance metrics!

Performance Metrics

(For one batch of cupcakes)



- Flow time (Passed Quality Check) = $5+3+4.5+6+3.5+20+5.5+15+6.5+10+2+2.5+4 = 87.5$ minutes.
- Cycle time = 20 minutes
- Throughput rate = $(1/20) = 0.05$ batch per minute = 3 batches per hour
- Efficiency = $3/4 = 0.75 = 75\%$ (*assuming the theoretical output is 4 batches per hour*)
- Bottleneck is at the “Bake in Oven” process step as the process time is the longest.

Performance Metrics



- Productivity = output/input.
Examples are throughput per month per labour hour, throughput per month per labour
- Utilization
Currently, Amy's outlet uses cupcake making machines to make the cupcakes. Assume that there are 10 hours available each day, and each of the machines operates 8 hours on average. Calculate the capacity utilization of each machine. State the type of measure of capacity used.

Utilization = $8/10 = 80\%$; input measure.

Capacity Issues



- As Amy's business in the current cupcake bakery outlet is more service oriented, suitable measures of capacity include:
 - Number of customers visiting the outlet (output measure of capacity);
 - Number of each type of resources available, number of workers available (input measure of capacity)
- Amy is facing shortage of output capacity in her current outlet in view of the projected increase in demand.
- Depending on Amy's priority, she could adopt the capacity lead (or expansionist) strategy to keep up with the competitive situation.

Capacity Requirement



To determine the number of machines Amy needs to invest to meet the projected demands as in worksheet Question 4:

Capacity requirement

=Processing hours required per week/ hours available per week

$$=200 / (10 \times 7 \times 0.80)$$

$$= 3.57 \sim 4 \text{ machines}$$

$$\text{Number of additional machines needed} = (4 \times (12,000 / 3,000) - 4) = 12 \text{ machines}$$

Considerations for the Business Expansion



- ❑ There are several processes that will require proper planning in Amy's business expansion idea to mass produce the cupcake. They are:
 - ❑ Cupcake Production (Today's focus)
 - ❑ Order Taking and Fulfillment
 - ❑ Raw Material Order and Receipt
 - ❑ Cupcake Delivery and Distribution, etc.
- ❑ To determine the process strategies, Amy first needs to determine the competitive priorities for the new business.

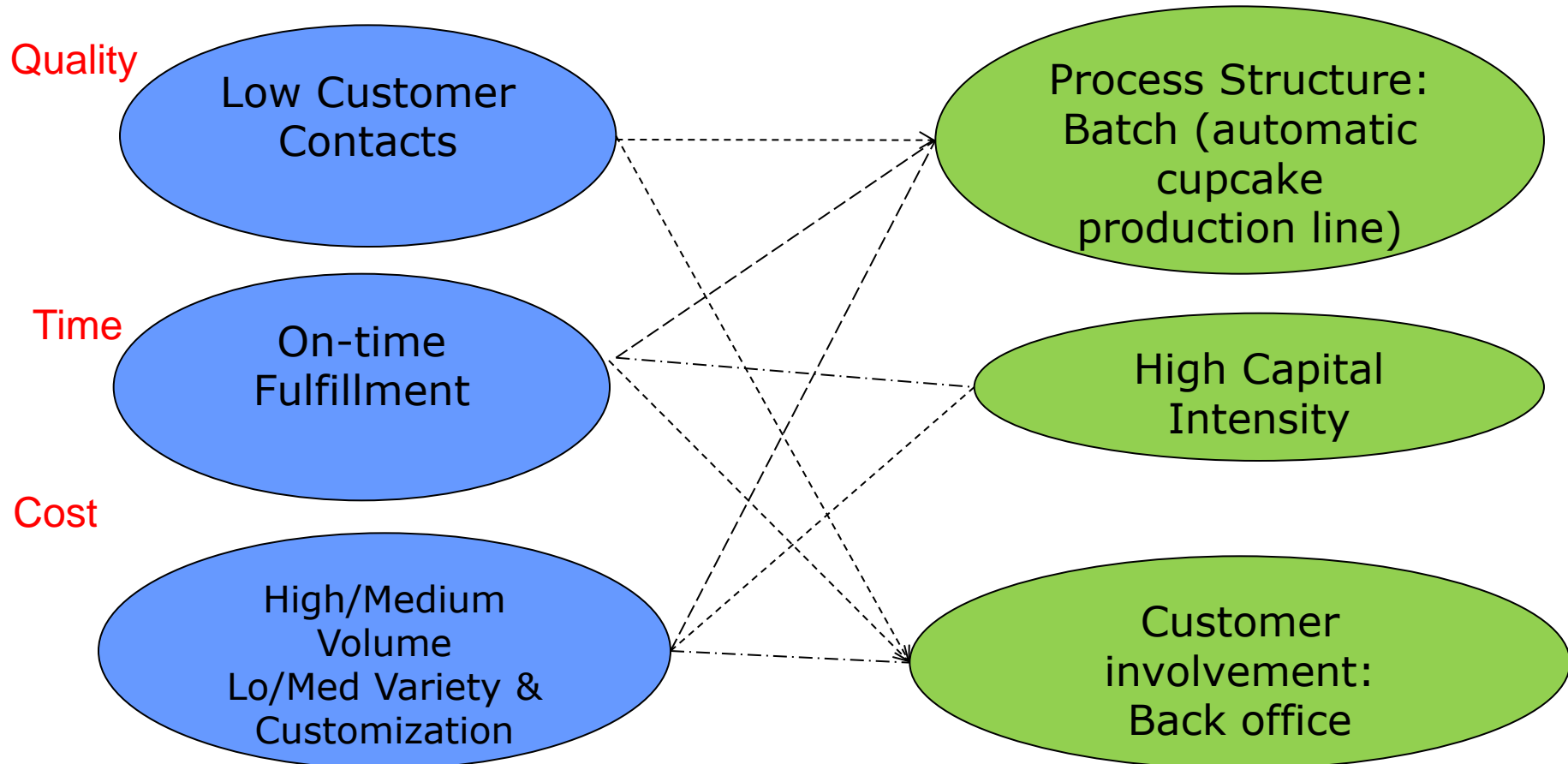
Considerations for the Business Expansion

- Competitive Priorities and Process Strategy Decisions



Competitive Priorities

Process Strategy Decisions



Considerations for the Business Expansion

- Cupcake Production Process Strategy



Process Strategy	Decisions for Amy's Current outlet	Decisions for Cupcake Mass Production
Process Structure	Batch set-up to meet demands from walk-in customers and customers who order through phone or on-line system. The orders might be in low volume and low standardization.	Automatic cupcake production line set up to batch produce the cupcakes due to high volume and limited customization of orders.
Customer Involvement	Provide sufficient flexibility in process for customized orders. Design according to customers' requirements and preferences.	Back office setup for order fulfillment. Low direct customer contact and involvement.
Resource Flexibility	Specialized equipment for cupcake making to cater to different designs and sizes; special skills needed for cupcake menu design; training needed in all aspects of cupcake making and processes.	Specialized machinery is used in automatic production line process. Flexible (or programmable) automation will allow for some degree of customization in the output (different flavours)
Capital Intensity	Low investment for smaller scale operations.	High investment for automation and equipment for high volume production,

Conclusion



- Processes have to be designed in a manner that it will deliver the competitive priorities of an organization.
- The decisions to make for process strategy are process structure, customer involvement, resource flexibility and capital intensity (level of automation).
- A process map enables a process to be analysed and used for process improvement initiatives.
- The performance of a process should be measured with appropriate metrics.
- Capacity planning and change strategy ensure that the resources are in place to achieve the output level needed.
- Capacity requirement for the future needs to be planned in accordance to forecasted demand, usage time and desired utilization level.

Learning Objectives



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

- Define the four process strategy decisions and describe the considerations behind each decision.
- Identify and describe the differences between manufacturing and service processes and the way capacity planning is done.
- Define and measure the common process matrices.
- Define and measure capacity.
- Calculate the capacity utilization and capacity requirement.
- Explain capacity change strategies with respect to timing and size of expansion by organizations.

Overview of E210 Operation Planning Module

