

Supply Chain Management, 6e (Chopra/Meindl)
Chapter 13 Determining the Optimal Level of Product Availability

13.1 True/False Questions

1) A supply chain can use a high level of product availability to improve its responsiveness and attract customers.

Answer: TRUE

Diff: 2

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Application of knowledge

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

2) A high level of product availability requires less inventory, which will keep costs down for the supply chain.

Answer: FALSE

Diff: 2

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

3) A supply chain needs to achieve a balance between the level of availability and the cost of inventory that maximizes supply chain revenues.

Answer: FALSE

Diff: 3

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Application of knowledge

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

4) Whether the optimal level of availability is high or low depends on where a particular company believes they can maximize profits.

Answer: TRUE

Diff: 2

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Application of knowledge

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

5) The cost of overselling is denoted by C_o and is the loss incurred by a firm for each unsold unit at the end of the selling season.

Answer: FALSE

Diff: 1

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Application of knowledge

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

6) The cost of understocking is denoted by C_u and is the margin lost by a firm for each lost sale because there is no inventory on hand.

Answer: TRUE

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

7) The cost of underselling is a key factor that influences the optimal level of product availability.

Answer: FALSE

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

8) The costs of overstocking and understocking have a direct impact on both the optimal cycle service level and profitability.

Answer: TRUE

Diff: 1

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

9) As the ratio of the cost of overstocking to the cost of understocking gets smaller, the optimal level of product availability decreases.

Answer: FALSE

Diff: 3

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

10) With reduced demand uncertainty, a supply chain manager can better match supply and demand by reducing both overstocking and understocking.

Answer: TRUE

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

11) An increase in forecast accuracy increases both the overstocked and understocked quantity and decreases a firm's profits.

Answer: FALSE

Diff: 1

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

12) If quick response allows multiple orders in the season, profits increase and the overstock quantity increases.

Answer: FALSE

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

13) Quick response results in the manufacturer making a lower profit in the short term if all else is unchanged.

Answer: TRUE

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

14) Postponement is valuable for a firm that sells a large variety of products with demand that is independent and comparable in size.

Answer: TRUE

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

15) Tailored postponement allows a firm to increase its profitability by only postponing the uncertain part of the demand and producing the predictable part at a lower cost without postponement.

Answer: TRUE

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

16) Tailored sourcing may be volume-based or product-based depending on the source of uncertainty.

Answer: TRUE

Diff: 1

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

17) In volume-based tailored sourcing, the predictable part of a product's demand is produced at a flexible facility, whereas the uncertain portion is produced at an efficient facility.

Answer: FALSE

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

18) In product-based tailored sourcing, low-volume products with uncertain demand are obtained from a flexible source, while high-volume products with less demand uncertainty are obtained from an efficient source.

Answer: TRUE

Diff: 1

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

19) A supply chain can use a high level of product availability to improve its responsiveness and attract customers, thus increasing revenue for the supply chain.

Answer: TRUE

Diff: 1

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Application of knowledge

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

20) A managerial lever to increase profitability is to decrease the salvage value of each unit.

Answer: FALSE

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

13.2 Multiple Choice Questions

1) The level of product availability

A) is also referred to as the customer service level.

B) is an important component of any supply chain's responsiveness.

C) increases revenues for the supply chain by increasing sales.

D) Only A and B are true.

Answer: D

Diff: 3

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

2) A high level of product availability requires

A) large inventories and tends to raise costs for the supply chain.

B) large inventories and tends to reduce costs for the supply chain.

C) small inventories and tends to raise costs for the supply chain.

D) small inventories and tends to reduce costs for the supply chain.

Answer: A

Diff: 1

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

3) A high level of product availability requires _____, which raises supply chain costs.

A) large inventories

B) increased revenues

C) reduced costs

D) understocking the product

Answer: A

Diff: 2

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

4) A supply chain needs to achieve a balance between the level of availability and the cost of inventory that

- A) maximizes supply chain revenues.
- B) minimizes supply chain costs.
- C) maximizes supply chain profitability.
- D) maximizes supply chain availability.

Answer: C

Diff: 3

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

5) The level of product availability, also referred to as the _____, is one of the primary measures of a supply chain's responsiveness.

- A) no stock out level
- B) reliability level
- C) customer service level
- D) logistics measure

Answer: C

Diff: 3

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Application of knowledge

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

6) Whether the optimal level of product availability is high or low depends on where a particular company believes they can

- A) minimize cost.
- B) maximize revenue.
- C) maximize profits.
- D) maximize product availability.

Answer: C

Diff: 2

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Application of knowledge

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

7) The level of product availability, also referred to as the _____, is one of the primary measures of a supply chain's responsiveness.

- A) no stock out level
- B) reliability level
- C) customer service level
- D) logistics measure

Answer: C

Diff: 3

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

8) A high level of product availability requires _____, which raises supply chain costs.

- A) large inventories
- B) increased revenues
- C) reduced costs
- D) understocking the product

Answer: A

Diff: 2

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

9) The loss incurred by a firm for each unsold unit at the end of the selling season is

- A) the cost of overstocking the product.
- B) the cost of stocking the product.
- C) the cost of understocking the product.
- D) the cost of overselling the product.

Answer: A

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

10) The margin lost by a firm for each lost sale because there is no inventory on hand is

- A) the cost of overstocking the product.
- B) the cost of stocking the product.
- C) the cost of understocking the product.
- D) the cost of overselling the product.

Answer: C

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

11) The margin lost from current as well as future sales if the customer does not return should be included in

- A) the cost of overstocking the product.
- B) the cost of stocking the product.
- C) the cost of understocking the product.
- D) the cost of overselling the product.

Answer: C

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

Scenario 13.1 - Nefarious

The tenured professor routinely led student groups on factory tours in exotic locales, and one popular destination was an island south of Miami. The students enjoyed this happy little island and the professor liked it because he could supplement his income by bringing back a few boxes souvenirs he could sell to his friends. The souvenirs cost the professor \$125 a box and he sells them for \$290 a box. Souvenirs that dry out due to age can be sold for \$80. Experience has shown that the demand for boxes of these souvenirs has a mean of 80 with a standard deviation of 20.

12) The professor's suitcase has room for 50 boxes of souvenirs. How many boxes does he expect to have left once his friends have bought what they want?

- A) 0
- B) 1
- C) 2
- D) 3

Answer: B

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

13) The professor's suitcase has room for 50 boxes of souvenirs. What is his expected profit?

- A) \$10,241
- B) \$11,975
- C) \$9,863
- D) \$8,127

Answer: D

Diff: 3

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

14) What is the optimal quantity of boxes for the professor to bring back home to sell to his friends?

- A) 88
- B) 74
- C) 96
- D) 82

Answer: C

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

15) Naturally, the professor will purchase the optimal number of boxes. (He's had a course or two in supply chain management and knows this model well.) What is his expected profit from purchasing the optimal number of boxes?

- A) \$11,975
- B) \$11,455
- C) \$11,165
- D) \$10,835

Answer: A

Diff: 3

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

16) Naturally, the professor will purchase the optimal number of boxes. (He's had a course or two in supply chain management and knows this model well.) What is the expected number of boxes that he doesn't sell?

- A) 5
- B) 18
- C) 13
- D) 7

Answer: B

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

17) Naturally, the professor will purchase the optimal number of boxes. (He's had a course or two in supply chain management and knows this model well.) If each of his friends purchases only one box, how many friends will he turn away because he runs out of boxes of souvenirs?

- A) 5
- B) 3
- C) 2
- D) 1

Answer: C

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

18) The costs of overstocking and understocking have a direct impact on

- A) the optimal cycle service level but not profitability.
- B) profitability but not the optimal cycle service level.
- C) both the optimal cycle service level and profitability.
- D) neither the optimal cycle service level nor profitability.

Answer: C

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

19) Which of the following would be a strategy to decrease the margin lost in a stockout?

- A) Arranging for backup sourcing
- B) Discarding the unused material
- C) Selling unsold product to an outlet store
- D) Reducing the level of cycle inventory

Answer: A

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

20) As the ratio of the cost of overstocking to the cost of understocking gets smaller,

- A) the optimal level of product availability becomes irrelevant.
- B) the optimal level of product availability decreases.
- C) the optimal level of product availability remains stable.
- D) the optimal level of product availability increases.

Answer: D

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

21) A company with multiple products that chooses to delay product differentiation until closer to the point of sale is using

- A) tailored sourcing.
- B) quick response.
- C) postponement.
- D) improved forecasting.

Answer: C

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

22) A company that uses a more expensive short lead time supplier as a backup for a low cost, long lead time supplier is using

- A) tailored sourcing.
- B) quick response.
- C) postponement.
- D) improved forecasting.

Answer: A

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

23) An increase in forecast accuracy

- A) decreases both the overstocked and understocked quantity and decreases a firm's profits.
- B) decreases both the overstocked and understocked quantity and increases a firm's profits.
- C) increases both the overstocked and understocked quantity and decreases a firm's profits.
- D) increases both the overstocked and understocked quantity and increases a firm's profits.

Answer: B

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

24) Supply chain managers are able to

- A) increase their forecast accuracy as lead times increase.
- B) increase their forecast accuracy as lead times decrease.
- C) decrease their forecast accuracy as lead times decrease.
- D) decrease their forecast accuracy as lead times increase.

Answer: B

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

25) As lead times decrease, supply chain managers are able to

- A) better match supply with demand.
- B) better match demand with supply.
- C) increase supply chain cost.
- D) decrease product availability.

Answer: A

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

26) As the total quantity for the season is broken up into multiple smaller orders, the buyer is better able to

- A) match supply and demand and increase cost.
- B) match supply and demand and increase profitability.
- C) match supply and demand and decrease profitability.
- D) match supply and demand and decrease product availability.

Answer: B

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

27) If quick response allows multiple orders in the season,

- A) profits decrease and the overstock quantity decreases.
- B) profits decrease and the overstock quantity increases.
- C) profits increase and the overstock quantity decreases.
- D) profits increase and the overstock quantity increases.

Answer: C

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Analytical thinking

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

28) Quick response is clearly advantageous to

- A) a distributor in the supply chain.
- B) a retailer in the supply chain.
- C) a manufacturer in the supply chain.
- D) every step in the supply chain.

Answer: B

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

29) Quick response results in

- A) the manufacturer making a lower profit in the long term if all else is unchanged.
- B) the manufacturer making a lower profit in the short term if all else is unchanged.
- C) the retailer making a lower profit in the short term if all else is unchanged.
- D) the distributor making a lower profit in the short term if all else is unchanged.

Answer: B

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

30) There is a cost associated with postponement because the production cost using postponement is typically

- A) higher than the production cost without it.
- B) lower than the production cost without it.
- C) very stable.
- D) equal to the production cost without it.

Answer: A

Diff: 1

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

31) Postponement is valuable for a firm that

- A) sells a large variety of products with demand that is dependent and comparable in size.
- B) sells a large variety of products with demand that is independent and comparable in size.
- C) sells a small variety of products with demand that is dependent and comparable in size.
- D) sells a small variety of products with demand that is independent and comparable in size.

Answer: B

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

32) Postponement is

- A) not very effective if a large fraction of demand comes from multiple products.
- B) not very effective if a small fraction of demand comes from a single product.
- C) only effective if a large fraction of demand comes from a single product.
- D) effective even if a large fraction of demand comes from a single product.

Answer: B

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

33) When a firm uses production with postponement to satisfy a part of its demand with the rest being satisfied without postponement, it is using

- A) adjustable postponement.
- B) flexible postponement.
- C) managed postponement.
- D) tailored postponement.

Answer: D

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

34) Under tailored postponement, a firm produces the amount that is very likely to sell using
A) the lower cost production method with postponement and produces the portion of demand that is uncertain using postponement.

B) the lower cost production method without postponement and produces the portion of demand that is uncertain using postponement.

C) the higher cost production method with postponement and produces the portion of demand that is uncertain using postponement.

D) the higher cost production method without postponement and produces the portion of demand that is uncertain using postponement.

Answer: B

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

35) In tailored sourcing, firms use a combination of two supply sources,

A) one focusing on cost but unable to handle uncertainty well, and the other focusing on flexibility to handle uncertainty, but at a higher cost.

B) one focusing on cost and able to handle uncertainty well, and the other focusing on flexibility to handle uncertainty, but at a higher cost.

C) one focusing on cost but unable to handle uncertainty well, and the other focusing on flexibility to handle uncertainty at a lower cost.

D) one focusing on cost and able to handle uncertainty well, and the other focusing on flexibility to handle uncertainty at a lower cost.

Answer: A

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

36) In product-based tailored sourcing,

- A) low-volume products with uncertain demand are obtained from a flexible source.
- B) high-volume products with less demand uncertainty are obtained from an efficient source.
- C) high-volume products with less demand uncertainty are obtained from a flexible source.
- D) A and B only

Answer: D

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

37) _____ allows a firm to increase profits and better match supply and demand if the firm produces a large variety of products whose demand is unpredictable, not positively correlated, and is of about the same size.

- A) Shortened forecasting window
- B) Quick response
- C) Postponement
- D) Tailored sourcing

Answer: C

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

38) _____ may reduce overall profits for a firm if a single product contributes the majority of the demand.

- A) Shortened forecasting window
- B) Quick response
- C) Postponement
- D) Tailored sourcing

Answer: C

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

39) In volume-based tailored sourcing,

- A) the predictable part of a product's demand is produced at an efficient facility.
- B) the uncertain portion is produced at an efficient facility.
- C) the predictable part of a product's demand is produced at a flexible facility.
- D) the predictable part of a product's demand is outsourced.

Answer: A

Diff: 1

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

40) _____ allows a firm to increase profits and better match supply and demand if the firm produces a large variety of products whose demand is unpredictable, not positively correlated, and is of about the same size.

- A) Shortened forecasting window
- B) Quick response
- C) Postponement
- D) Tailored sourcing

Answer: C

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

41) _____ may reduce overall profits for a firm if a single product contributes the majority of the demand.

- A) Shortened forecasting window
- B) Quick response
- C) Postponement
- D) Tailored sourcing

Answer: C

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

42) In volume-based tailored sourcing,

- A) the predictable part of a product's demand is produced at an efficient facility.
- B) the uncertain portion is produced at an efficient facility.
- C) the predictable part of a product's demand is produced at a flexible facility.
- D) the predictable part of a product's demand is outsourced.

Answer: A

Diff: 1

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

43) When ordering a single product, it is optimal for the buyer to order the minimum of the available capacity and the optimal order quantity. When ordering multiple products,

- A) the buyer should treat each product as a unique purchase and optimize each on an individual basis.
- B) the buyer must consider trade-offs between ordering more of one product than another.
- C) the buyer should average the cost, procurement, and holding parameters and create a basket product that consists of equal ratios of all items.
- D) the buyer should construct a weighted average based on all individual item demands and optimize this quantity.

Answer: B

Diff: 2

Topic: 13.4 Setting Product Availability for Multiple Products Under Capacity Constraints

AACSB: Application of knowledge

Objective: LO 13.4: Allocate limited supply capacity among multiple products to maximize expected profits.

Scenario 13.2 - Fish or Chicken

The taco stand in the atrium of the new College of Business building carried two items, fish tacos and chicken tacos. The fish tacos sell for \$15 and are made out of \$5 of ingredients and the chicken tacos sell for \$10 and are made out of \$4 of ingredients. Some days the taco stand owner has only chicken at his disposal, so he makes nothing but chicken tacos, and some days the opposite is true and he makes only fish tacos. Thus, he is able to estimate demand for chicken tacos at 2500 per day with a standard deviation of 600 and the demand for fish tacos at 2000 per day with a standard deviation of 500. Any fish or chicken tacos that do not sell at the end of the day can be sold for \$1 each as bait. On days when both proteins are available, the taco stand manager prefers to make a few of each kind. All tacos are made in his home kitchen and then transported to campus. Due to time constraints and the capacity of his pickup truck bed, he is limited to beginning each day with only 3000 tacos.

44) Suppose the taco stand manager could wake up a little earlier and borrow his buddy's full size pickup to transport tacos to campus. If time and capacity were not an issue, how many total tacos should he bring to campus each day?

- A) 2500
- B) 3000
- C) 5041
- D) 5500

Answer: C

Diff: 3

Topic: 13.4 Setting Product Availability for Multiple Products Under Capacity Constraints

AACSB: Analytical thinking

Objective: LO 13.4: Allocate limited supply capacity among multiple products to maximize expected profits.

45) Suppose the taco stand manager could wake up a little earlier and borrow his buddy's full size pickup to transport tacos to campus. If time and capacity were not an issue, what would the expected profit be per day?

- A) \$29,443
- B) \$31,382
- C) \$35,000
- D) \$30,657

Answer: D

Diff: 3

Topic: 13.4 Setting Product Availability for Multiple Products Under Capacity Constraints

AACSB: Analytical thinking

Objective: LO 13.4: Allocate limited supply capacity among multiple products to maximize expected profits.

46) The taco stand manager decides to make exactly the same quantity of fish tacos as chicken tacos. If time and capacity are not an issue, and none of the other parameters in the scenario are changed, what would the retail price of chicken tacos need to be to make the optimal order quantities identical?

- A) \$6.00
- B) \$6.50
- C) \$7.00
- D) \$7.50

Answer: A

Diff: 3

Topic: 13.4 Setting Product Availability for Multiple Products Under Capacity Constraints

AACSB: Analytical thinking

Objective: LO 13.4: Allocate limited supply capacity among multiple products to maximize expected profits.

47) Faced with a 3000 taco capacity constraint, what is the optimal number of fish tacos to prepare?

- A) 2283
- B) 1736
- C) 1868
- D) 2000

Answer: B

Diff: 3

Topic: 13.4 Setting Product Availability for Multiple Products Under Capacity Constraints

AACSB: Application of knowledge

Objective: LO 13.4: Allocate limited supply capacity among multiple products to maximize expected profits.

48) Faced with a 3000 taco capacity constraint, what is the optimal number of chicken tacos to prepare?

- A) 2758
- B) 1736
- C) 1264
- D) 2500

Answer: C

Diff: 3

Topic: 13.4 Setting Product Availability for Multiple Products Under Capacity Constraints

AACSB: Application of knowledge

Objective: LO 13.4: Allocate limited supply capacity among multiple products to maximize expected profits.

49) Faced with a 3000 taco capacity constraint, what is the profit resulting from an optimal mix of fish and chicken tacos?

- A) \$22,577
- B) \$25,619
- C) \$24,667
- D) \$23,580

Answer: D

Diff: 3

Topic: 13.4 Setting Product Availability for Multiple Products Under Capacity Constraints

AACSB: Application of knowledge

Objective: LO 13.4: Allocate limited supply capacity among multiple products to maximize expected profits.

50) When setting optimal levels of product availability in practice, it is important to

- A) obtain a reasonable estimate of the cost of stocking out.
- B) obtain a very precise estimate of the cost of stocking out.
- C) focus on the most responsive production method, even if it is not low cost.
- D) develop a preset target of product availability.

Answer: A

Diff: 2

Topic: 13.5 Setting Optimal Levels of Product Availability in Practice

AACSB: Application of knowledge

Objective: LO 13.4: Allocate limited supply capacity among multiple products to maximize expected profits.

13.3 Essay Questions

1) Explain the relationship between product availability and supply chain profitability.

Answer: The level of product availability is measured using the cycle service level or the fill rate, which are metrics for the amount of customer demand satisfied from available inventory. The level of product availability is also referred to as the customer service level. The level of product availability is an important component of any supply chain's responsiveness. A supply chain can use a high level of product availability to improve its responsiveness and attract customers. This increases revenues for the supply chain by increasing sales through high product availability when customers come to make a purchase. However, a high level of product availability requires large inventories, and large inventories tend to raise costs for the supply chain. Therefore, a supply chain needs to achieve a balance between the level of availability and the cost of inventory. This optimal level of product availability is one that maximizes supply chain profitability. Whether the optimal level of availability is high or low depends on where a particular company believes they can maximize profits.

Diff: 2

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

2) Describe the two key factors that influence the optimal level of product availability within a supply chain.

Answer: The two key factors that influence the optimal level of product availability are:

- Cost of overstocking the product
- Cost of understocking the product

The cost of overstocking is denoted by C_o and is the loss incurred by a firm for each unsold unit at the end of the selling season. The cost of understocking is denoted by C_u and is the margin lost by a firm for each lost sale because there is no inventory on hand. The cost of understocking should include the margin lost from current as well as future sales if the customer does not return. The costs of overstocking and understocking have a direct impact on both the optimal cycle service level and profitability.

Diff: 1

Topic: 13.1 The Importance of the Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

3) A manufacturer of lawn care equipment has introduced a new product. The anticipated demand is normally distributed with a mean of $\mu = 100$ and a standard deviation of $\sigma = 50$. Each unit costs \$75 to manufacture and the introductory price is to be \$125 to achieve this level of sales. Any unsold units at the end of the season are unlikely to be very valuable and will be disposed of in a fire sale for \$25 each. It costs \$10 to hold a unit in inventory for the entire season. What is the cost of overstocking? What is the cost of understocking? What is the optimal cycle service level? How many units should be manufactured for sale?

Answer:

$$\begin{aligned}C_o &= c - s \\&= \$75 - \$15 \\&= \$60\end{aligned}$$

$$\begin{aligned}C_u &= p - c \\&= \$125 - \$75 \\&= \$50\end{aligned}$$

$$\begin{aligned}\text{CSL}^* &= C_u / (C_u + C_o) \\&= 50 / (50 + 60) \\&= .4545 \approx .45\end{aligned}$$

$$\begin{aligned}O^* &= \text{NORMINV}(\text{CSL}^*, \mu, \sigma) \\&= \text{NORMINV}(0.45, 100, 50) \\&= 93.71693 \approx 94\end{aligned}$$

Diff: 2

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

4) In the previous problem, the manufacturer performs additional market research. Based on this research, they determine that they can increase the price to \$150 and are able to reduce the standard deviation of the forecast to $\sigma = 30$. At the same time, they have made an arrangement with an outlet store that will purchase unsold equipment for \$60 each. How will these changes affect the cost of overstocking, cost of understocking, optimal cycle service level and optimal order size?

Answer:

$$\begin{aligned} C_o &= c - s \\ &= \$75 - \$50 \\ &= \$25 \end{aligned}$$

$$\begin{aligned} C_u &= p - c \\ &= \$150 - \$75 \\ &= \$75 \end{aligned}$$

$$\begin{aligned} \text{CSL}^* &= C_u / (C_u + C_o) \\ &= 75 / (75 + 25) \\ &= .75 \end{aligned}$$

$$\begin{aligned} O^* &= \text{NORMINV}(\text{CSL}^*, \mu, \sigma) \\ &= \text{NORMINV}(0.75, 100, 30) \\ &= 120.2347 \approx 120 \end{aligned}$$

The change in price increases the cost of understocking. The increase in the salvage value reduces the cost of overstocking. Both of these changes will make it more profitable to increase product availability, which is seen in the increase in the optimal cycle service level. The reduction in standard deviation is the result of a more accurate forecast, which means that less excess inventory is needed to maintain the optimal cycle service level.

Diff: 3

Topic: 13.2 Factors Affecting Optimal Level of Product Availability

AACSB: Analytical thinking

Objective: LO 13.1: Identify factors affecting the optimal level of product availability and evaluate the optimal cycle service level.

5) Describe managerial levers to increase profitability within a supply chain.

Answer: Three managerial levers to increase profitability are:

1. Increasing the salvage value of each unit increases profitability (as well as the optimal cycle service level).
2. Decreasing the margin lost from a stockout increases profitability.
3. Reducing demand uncertainty.

One strategy to increase the salvage value of an unsold product would be selling unsold product to an outlet store.

Strategies to decrease the margin lost in a stockout include arranging for backup sourcing (that may be more expensive) so customers are not lost forever and purchasing product from a competitor on the open market.

As the ratio of the cost of overstocking to the cost of understocking gets smaller, the optimal level of product availability increases. This fact explains the difference in the level of product availability between a high-end store and a discount store. The high-end store has higher margins and thus a higher cost of understocking. It should thus provide a higher level of product availability than a discount store with lower margins, and as a result, a lower cost of stocking out.

The reduction of demand uncertainty is a significant managerial lever to improve supply chain profitability. With reduced demand uncertainty, a supply chain manager can better match supply and demand by reducing both overstocking and understocking. A manager can reduce demand uncertainty via the following means:

1. Improved forecasting: Use better market intelligence and collaboration to reduce demand uncertainty.
2. Quick response: Reduce replenishment lead time so that multiple orders may be placed in the selling season.
3. Postponement: In a multiproduct setting, postpone product differentiation until closer to the point of sale.
4. Tailored sourcing: Use a more expensive short lead time supplier as a backup for a low cost, long lead time supplier.

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

6) Describe the approaches a manager can use to reduce demand uncertainty.

Answer: An **increase in forecast accuracy** decreases both the overstocked and understocked quantity and increases a firm's profits.

Quick response is the set of actions a supply chain takes that lead to a reduction in the replenishment lead time. Supply chain managers are able to increase their forecast accuracy as lead times decrease, which allows them to better match supply with demand and increase supply chain profitability. If quick response allows multiple orders in the season, profits increase and the overstock quantity decreases.

Postponement allows a firm to increase profits and better match supply and demand if the firm produces a large variety of products whose demand is not positively correlated and is of about the same size. There is a cost associated with postponement because the production cost using postponement is typically higher than the production cost without it.

In **tailored sourcing**, firms use a combination of two supply sources, one focusing on cost but unable to handle uncertainty well, and the other focusing on flexibility to handle uncertainty, but at a higher cost. For tailored sourcing to be effective, having supply sources where one serves as the backup to the other is not sufficient.

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

7) Discuss the advantages and disadvantages of quick response.

Answer: There are three important consequences of being able to place a second order in the season.

1. The expected total quantity ordered during the season with two orders is less than that with a single order for the same cycle service level. In other words, it is possible to provide the same level of product availability to the customer with less inventory if a second follow-up order is allowed in the sales season.
2. The average overstock to be disposed of at the end of the sales season is less if two orders are allowed.
3. The profits are higher when a second order is allowed during the sales season.

In other words, as the total quantity for the season is broken up into multiple smaller orders, the buyer is better able to match supply and demand and increase profitability. If quick response allows multiple orders in the season, profits increase and the overstock quantity decreases.

Quick response is clearly advantageous to a retailer in the supply chain, □ with one caveat. As the manufacturer reduces replenishment lead times, allowing for a second order, we have seen that the retailer's order size drops. In effect, the manufacturer sells less to the retailer. Thus, quick response results in the manufacturer making a lower profit in the short term if all else is unchanged. This is an important point to consider, because decreasing replenishment lead times requires tremendous effort from the manufacturer, yet seems to benefit the retailer at the expense of the manufacturer. The benefits resulting from quick response should be shared appropriately across the supply chain.

Diff: 3

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.

8) Explain how tailored postponement can improve profitability.

Answer: In tailored postponement, a firm uses production with postponement to satisfy a part of its demand, with the rest being satisfied without postponement. Tailored postponement produces higher profits than when no postponement is used or all products are manufactured using postponement. Under tailored postponement, a firm produces the amount that is very likely to sell using the lower cost production method without postponement. The firm produces the portion of demand that is uncertain using postponement. On the portion of the demand that is certain, postponement provides little value in terms of increased forecast accuracy. The firm thus produces it using the lower cost method to lower manufacturing cost. On the portion of demand that is uncertain, postponement significantly improves forecast accuracy. The firm is thus willing to incur the increased production cost to achieve the benefit from the improved matching of supply and demand. Tailored postponement allows a firm to increase its profitability by only postponing the uncertain part of the demand and producing the predictable part at a lower cost without postponement.

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.3: Understand conditions under which postponement is valuable in a supply chain.

9) Explain how tailored sourcing can be used to improve profitability.

Answer: In tailored sourcing, firms use a combination of two supply sources, one focusing on cost but unable to handle uncertainty well, and the other focusing on flexibility to handle uncertainty, but at a higher cost. For tailored sourcing to be effective, having supply sources where one serves as the backup to the other is not sufficient. The two sources must focus on different capabilities. The low-cost source must focus on being efficient and should only be required to supply the predictable portion of the demand. The flexible source should focus on being responsive and be required to supply the uncertain portion of the demand. As a result, tailored sourcing allows a firm to increase its profits and better match supply and demand. The value of tailored sourcing depends on the reduction in cost that can be achieved as a result of one source facing no variability. If this benefit is small, tailored sourcing may not be ideal because of the added complexity of implementation. Tailored sourcing may be volume-based or product-based depending on the source of uncertainty.

In volume-based tailored sourcing, the predictable part of a product's demand is produced at an efficient facility, whereas the uncertain portion is produced at a flexible facility.

In product-based tailored sourcing, low-volume products with uncertain demand are obtained from a flexible source, while high-volume products with less demand uncertainty are obtained from an efficient source. Product-based tailored sourcing may be implemented with a flexible facility focusing on new products, and efficient facilities focusing on the well-established products.

Diff: 2

Topic: 13.3 Managerial Levers to Improve Supply Chain Profitability

AACSB: Application of knowledge

Objective: LO 13.2: Use managerial levers that improve supply chain profitability.