

***Supply Chain Management, 6e (Chopra/Meindl)***  
**Chapter 6 Designing Global Supply Chain Networks**

**6.1 True/False Questions**

1) Decisions made during the supply chain design phase regarding significant investments in the supply chain, such as the number and size of plants to build, the number of trucks to purchase or lease, and whether to build or lease warehouse space, cannot be altered in the short term.

Answer: TRUE

Diff: 2

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

2) The degree of demand and price uncertainty has a significant influence on the appropriate portfolio of long- and short-term warehousing space that a firm should carry.

Answer: TRUE

Diff: 1

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

3) If price and demand vary over time in a global network, flexible production capacity can be reconfigured to maximize profits in the new environment.

Answer: TRUE

Diff: 2

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

4) A firm may choose to build a flexible global supply chain even in the presence of little demand or supply uncertainty if certainty exists in exchange rates or prices.

Answer: FALSE

Diff: 2

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

5) Offshoring typically lowers labor, working capital and fixed costs but increases risk and freight costs.

Answer: FALSE

Diff: 3

Topic: 6.3 Risk Management in Global Supply Chains

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

6) Appropriate flexibility is an effective approach for a global supply chain to deal with a variety of risks and uncertainties. Extra flexibility is always worth the cost.

Answer: FALSE

Diff: 1

Topic: 6.3 Risk Management in Global Supply Chains

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

7) The present value of a stream of cash flows is what that stream is worth in today's dollars.

Answer: TRUE

Diff: 1

Topic: 6.4 Discounted Cash Flows

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

8) The rate of return  $k$  is also referred to as the present value of capital.

Answer: FALSE

Diff: 1

Topic: 6.4 Discounted Cash Flows

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

9) A negative NPV for an option indicates that the option will lose money for the supply chain.

Answer: TRUE

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

10) *Discounted cash flow* (DCF) analysis evaluates the present value of any stream of future cash flows and allows management to compare two streams of cash flows in terms of their financial value.

Answer: TRUE

Diff: 1

Topic: 6.4 Discounted Cash Flows

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

11) When faced with uncertain conditions it is always best to sign long-term contracts (because they are typically cheaper) and avoid all flexible capacity (because it is more expensive).

Answer: FALSE

Diff: 3

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

12) The value of flexibility increases with an increase in uncertainty.

Answer: TRUE

Diff: 1

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

13) In reality, demand and prices are highly uncertain and are likely to fluctuate during the life of any supply chain decision.

Answer: TRUE

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

14) Long-term contracts for both warehousing and transportation requirements will be more effective if the demand and price of warehousing do not change in the future or if the price of warehousing goes up.

Answer: TRUE

Diff: 1

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

15) During network design, managers need a methodology that allows them to estimate the certainty in their forecast of demand and price and then incorporate this certainty into the decision-making process.

Answer: FALSE

Diff: 3

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

16) In a complex decision tree, there are thousands of possible paths that may result from the first period to the last.

Answer: TRUE

Diff: 1

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

17) Simulation methods are very good at evaluating a decision where the path itself is decision dependent.

Answer: FALSE

Diff: 3

Topic: 6.6 To Onshore or Offshore: Evaluation of Global Supply Chain Design Decisions Under Uncertainty

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

18) The main advantage of simulation models is that they can provide low-cost evaluations of complex situations.

Answer: FALSE

Diff: 2

Topic: 6.6 To Onshore or Offshore: Evaluation of Global Supply Chain Design Decisions Under Uncertainty

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

19) Strategic planning and financial planning should be combined during supply chain network design.

Answer: TRUE

Diff: 2

Topic: 6.7 Making Global Supply Chain Design Decisions Under Uncertainty in Practice

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

20) Financial analysis should be used as an input to decision making, not as the decision-making process.

Answer: TRUE

Diff: 2

Topic: 6.7 Making Global Supply Chain Design Decisions Under Uncertainty in Practice

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

## 6.2 Multiple Choice Questions

1) Decisions made during the supply chain design phase regarding significant investments in the supply chain, such as the number and size of plants to build, the number of trucks to purchase or lease, and whether to build or lease warehouse space,

A) can be altered in the short term.

B) cannot be altered in the short term.

C) cannot be altered in the long term.

D) can only be altered in the short term.

Answer: B

Diff: 1

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

2) Decisions made during the supply chain design phase regarding significant investments in the supply chain, such as the number and size of plants to build, the number of trucks to purchase or lease, and whether to build or lease warehouse space,

A) are realigned every few weeks.

B) only remain in place for several years.

C) only remain in place for a few weeks.

D) often remain in place for several years.

Answer: D

Diff: 3

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

3) Decisions made during the supply chain design phase regarding significant investments in the supply chain, such as the number and size of plants to build, the number of trucks to purchase or lease, and whether to build or lease warehouse space,

A) define the boundaries within which the supply chain must compete.

B) have little impact on how the supply chain must compete.

C) are irrelevant regarding how the supply chain will compete.

D) are the only consideration regarding how the supply chain will compete.

Answer: A

Diff: 2

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

4) The opportunities from globalization are often accompanied by

A) a lack of domestic opportunities.

B) the need to eliminate the accounting function.

C) significant additional risk.

D) the need to eliminate the logistics function.

Answer: C

Diff: 2

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

5) Among the sources of risk identified in global supply chains, the lowest among these four is

A) shortage of skilled resources.

B) currency fluctuation.

C) inflexible supply chain technology.

D) terrorist infiltration of cargo.

Answer: D

Diff: 2

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

- 6) Among the sources of risk identified in global supply chains, the highest among these four is
- A) shortage of skilled resources.
  - B) natural disasters.
  - C) inflexible supply chain technology.
  - D) customs delays.

Answer: B

Diff: 2

Topic: 6.1 The Impact of Globalization on Supply Chain Networks

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

- 7) As Adam Smith put it so eloquently in the *Wealth of Nations*, "If a foreign country can supply us with a commodity cheaper than we ourselves can make it,...

- A) ...it is only right that we should learn their method of production, so that we too can master the commodity..."
- B) ...then we would be well-served to include them in our supply chain..."
- C) ...better buy it from them with some part of our own industry..."
- D) ...we should barter with them or take it by force if they prove to be unreasonable..."

Answer: C

Diff: 1

Topic: 6.2 The Offshoring Decision: Total Cost

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

- 8) A global supply chain with offshoring

- A) reduces the duration of the cash flow and reduces the length of the product flow.
- B) increases the length of the product flow and increases the duration of the information flow.
- C) increases the duration of the cash flow but reduces the duration of the information flow.
- D) reduces the length of the product flow and reduces the length of the information flow.

Answer: B

Diff: 2

Topic: 6.2 The Offshoring Decision: Total Cost

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

9) A global supply chain with offshoring would tend to see which of these performance dimensions decrease?

- A) Working capital
- B) Hidden costs
- C) Supply chain visibility
- D) Product returns

Answer: C

Diff: 2

Topic: 6.2 The Offshoring Decision: Total Cost

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

10) A global supply chain with offshoring would tend to see which of these performance dimensions increase?

- A) Labor costs
- B) On time delivery
- C) Supply chain visibility
- D) Minimum order quantity

Answer: D

Diff: 2

Topic: 6.2 The Offshoring Decision: Total Cost

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

11) Offshoring to low-cost countries is most attractive for products with

- A) large production volume.
- B) high variety.
- C) low labor content.
- D) a high ratio of transportation cost to product value.

Answer: A

Diff: 2

Topic: 6.2 The Offshoring Decision: Total Cost

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.



12) The tailored strategy "Focus on low-cost, decentralized capacity for predictable demand" follows which risk mitigation strategy?

- A) Get redundant suppliers.
- B) Increase capacity.
- C) Increase responsiveness.
- D) Increase inventory.

Answer: B

Diff: 3

Topic: 6.3 Risk Management in Global Supply Chains

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

13) A labor dispute is a risk driver to be considered during network design. What category does a "labor dispute" belong to?

- A) Disruptions
- B) Inventory risk
- C) Systems risk
- D) Capacity risk

Answer: A

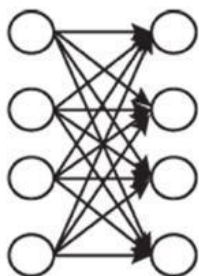
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Topic: 6.3 Risk Management in Global Supply Chains

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

14) What is the type of this network design?



- A) Dedicated network
- B) Fully flexible network
- C) Chained network with one long chain
- D) Chained network with two long chains

Answer: B

Diff: 1

Topic: 6.3 Risk Management in Global Supply Chains

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

15) The present value of a future stream of cash flows is what that stream

- A) was worth in yesterday's dollars.
- B) is worth in today's dollars.
- C) will be worth in future dollars.
- D) might be worth in future dollars.

Answer: B

Diff: 1

Topic: 6.4 Discounted Cash Flows

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

16) The process of evaluating the present value of any stream of future cash flows so that management can compare two streams of cash flows in terms of their financial value is

- A) annual cash flow (ACF) analysis.
- B) discretionary cash flow (DCF) analysis.
- C) discounted cash flow (DCF) analysis.
- D) future cash flow (FCF) analysis.

Answer: C

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

17) The present value of future cash flow is found by

- A) locating the correct factor on a z-table.
- B) using a discount factor.
- C) plotting the function on a graph.
- D) adding the total of all future cash flows.

Answer: B

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

18) The discount factor used to obtain the present value of money in the next period where  $k$  represents the rate of return is

- A)  $k$ .
- B)  $1 + k$ .
- C)  $1/(1 + k)$ .
- D)  $k/(1 + k)$ .

Answer: C

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

19) The rate of return  $k$  is also referred to as the

- A) discount rate.
- B) hurdle rate.
- C) opportunity cost of capital.
- D) all of the above

Answer: D

Diff: 1

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

20) The net present value (NPV) of a stream of cash flows is equal to

- A) the sum of all cash flows for all periods being considered.
- B) the sum of all cash flows for all periods being considered divided by the number of periods.
- C) the average of all cash flows for all periods being considered multiplied by the number of periods.
- D) the sum of all cash flows for all periods being considered discounted by the rate of return for each period.

Answer: D

Diff: 3

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

21) A negative NPV (net present value) for an option indicates that the option will

- A) gain money for the supply chain.
- B) lose money for the supply chain.
- C) maximize profit for the supply chain.
- D) minimize profit for the supply chain.

Answer: B

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

22) The decision with the highest NPV (net present value) will provide a supply chain with

- A) the highest financial return.
- B) the lowest financial return.
- C) a reasonable financial return.
- D) the least desirable financial return.

Answer: A

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

23) What rate of return results in a present value of \$23 for \$25 received one year from now?

- A) 7.8%
- B) 8.1%
- C) 8.4%
- D) 8.7%

Answer: C

Diff: 3

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

24) What rate of return results in a present value of \$432 for \$250 received one year from now and another \$250 received two years from now?

- A) 9.89%
- B) 10.32%
- C) 10.94%
- D) 11.37%

Answer: C

Diff: 3

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

25) The NPV (net present value) of a cash stream that is equal to \$100 per period for 5 periods with a rate of return of 12% per period would be

- A) \$360.48.
- B) \$382.98.
- C) \$403.73.
- D) \$416.51.

Answer: C

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

26) The NPV (net present value) of a cash stream that is equal to \$75 per period for 5 periods with a rate of return of 15% per period would be

- A) \$261.37.
- B) \$289.12.
- C) \$312.74.
- D) \$322.44.

Answer: C

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

27) In reality, demand and prices are

- A) highly certain and not likely to fluctuate during the life of any supply chain decision.
- B) highly certain and likely to fluctuate during the life of any supply chain decision.
- C) highly uncertain and not likely to fluctuate during the life of any supply chain decision.
- D) highly uncertain and likely to fluctuate during the life of any supply chain decision.

Answer: D

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

28) For a global supply chain, exchange rates and inflation are

- A) likely to vary over time in different locations.
- B) not likely to vary over time in different locations.
- C) not likely to vary over time in any locations.
- D) likely to be stable over time in all locations.

Answer: A

Diff: 1

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

29) A *decision tree* is

- A) a graphic device used to evaluate decisions under certainty.
- B) a graphic device used to evaluate decisions under uncertainty.
- C) a tabular device used to evaluate decisions under certainty.
- D) a tabular device used to evaluate decisions under uncertainty.

Answer: B

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

30) Decision tree analysis is based on *Bellman's principle*, which states that for any choice of strategy in a given state,

A) the optimal strategy is the one that is selected if the entire analysis is assumed to begin in the first period.

B) the optimal strategy is the one that is selected if the entire analysis is assumed to begin in the last period.

C) the optimal strategy in the next period is the one that is selected if the entire analysis is assumed to begin in the last period.

D) the optimal strategy in the next period is the one that is selected if the entire analysis is assumed to begin in the next period.

Answer: D

Diff: 3

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Analytical thinking

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

31) Uncertainty in demand and economic factors should be included in the financial evaluation of supply chain design decisions, because

A) the exclusion of certainty may have a significant impact on this evaluation.

B) the exclusion of uncertainty may have a significant impact on this evaluation.

C) the inclusion of certainty may have a significant impact on this evaluation.

D) the inclusion of uncertainty may have a significant impact on this evaluation.

Answer: D

Diff: 3

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

32) Flexibility should be valued by taking into account uncertainty in demand and economic factors. In general, flexibility will tend to

A) decrease in value with a decrease in certainty.

B) increase in value with an increase in uncertainty.

C) decrease in value with an increase in uncertainty.

D) increase in value with an increase in certainty.

Answer: B

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

- 33) The appropriate discount rate used in decision tree methodology
- A) should be risk-adjusted and risk may vary by period and decision node.
  - B) should be risk-adjusted and risk may not vary by period and decision node.
  - C) should not be risk-adjusted and risk may vary by period and decision node.
  - D) should not be risk-adjusted and risk may not vary by period and decision node.

Answer: A

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

- 34) Firms should use simulation for evaluating decisions when
- A) underlying decision trees are simple and explicit solutions for the underlying decision tree are difficult to obtain.
  - B) underlying decision trees are very complex and explicit solutions for the underlying decision tree are difficult to obtain.
  - C) underlying decision trees are simple and explicit solutions for the underlying decision tree are easy to obtain.
  - D) underlying decision trees are very complex and explicit solutions for the underlying decision tree are easy to obtain.

Answer: B

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

- 35) In a complex decision tree there are
- A) only a few possible paths that may result from the first period to the last.
  - B) less than thirty possible paths that may result from the first period to the last.
  - C) thousands of possible paths that may result from the first period to the last.
  - D) an infinite number of possible paths that may result from the first period to the last.

Answer: C

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.



36) Short-term contracts for both warehousing and transportation requirements will be more effective

- A) if the demand and price of warehousing do not change in the future.
- B) if the price of warehousing goes up in the future.
- C) if either demand or the price of warehousing drops in the future.
- D) only if demand drops in the future.

Answer: C

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

37) The degree of demand and price uncertainty has

- A) no effect on the appropriate portfolio of long- and short-term warehousing space that a firm should carry.
- B) a limited influence on the appropriate portfolio of long- and short-term warehousing space that a firm should carry.
- C) a minor influence on the appropriate portfolio of long- and short-term warehousing space that a firm should carry.
- D) a significant influence on the appropriate portfolio of long- and short-term warehousing space that a firm should carry.

Answer: D

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

38) Uncertainty of demand and price

- A) drives the value of building flexible production capacity at a plant.
- B) eliminates the value of building flexible production capacity at a plant.
- C) facilitates the value of building flexible production capacity at a plant.
- D) has no effect on the value of building flexible production capacity at a plant.

Answer: A

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

## Scenario 6.1 - The Big Box

Bahouth Ltd. is planning for the next two years of production and debating whether to construct a large cross-dock facility with 40 truck bays or a smaller one with 20 truck bays. The cost to build the large facility is \$2 million and the cost to build the small one is \$1.2 million. If they construct a large facility and demand is as high as they hope, then operating costs are \$450,000 annually. If they construct a large facility and demand is low, then operating costs are \$300,000. If they construct a small facility and demand is low, the operating costs are \$275,000 but if they experience high demand, the operating cost of a small facility increases to \$600,000. After having conducted some market research, they feel that the likelihood of high demand is 0.7 and the likelihood of small demand is 0.3.

39) Use the information from Scenario 6.1 to determine the expected cost of operating a large facility for two years.

- A) \$810,000
- B) \$450,000
- C) \$405,000
- D) \$2,810,000

Answer: A

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Analytical thinking

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

40) Use the information from Scenario 6.1 to determine the expected cost of operating a small facility for a period of two years.

- A) \$1,102,500
- B) \$1,005,500
- C) \$502,500
- D) \$2,205,000

Answer: B

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Analytical thinking

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

41) Use the information from Scenario 6.1 to determine the cost of the best alternative for a two year period.

- A) \$2,000,000
- B) \$1,200,000
- C) \$2,205,000
- D) \$2,810,000

Answer: C

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Analytical thinking

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

42) Use the information from Scenario 6.1 to determine the likelihood of high demand that would make the decision maker indifferent between the two alternatives for a two year operating time.

- A) 0.86
- B) 0.72
- C) 0.28
- D) 0.14

Answer: D

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Analytical thinking

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

43) Suppose the contractor has found some materials on Craigslist that can drop the construction cost of a large facility to \$1,500,000. These materials cannot be used in the construction of the small facility, so its price remains as indicated in Scenario 6.1. Determine the likelihood of high demand that would make the decision maker indifferent between the two alternatives for a two year time period.

- A) 1.0
- B) 0.72
- C) 0.92
- D) 0.86

Answer: A

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Analytical thinking

Objective: LO 6.2: Define uncertainties that are particularly relevant when designing global supply chains.

- 44) If price and demand do vary over time in a global network,  
A) flexible production capacity should not be used in the new environment.  
B) flexible production capacity will be ineffective in the new environment.  
C) flexible production capacity can be reconfigured to maximize profits in the new environment.  
D) flexible production capacity should never be used in an uncertain environment.

Answer: C

Diff: 2

Topic: 6.6 To Onshore or Offshore: Evaluation of Global Supply Chain Design Decisions Under Uncertainty

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

- 45) A firm may choose to build a flexible global supply chain even in the presence of little demand or supply uncertainty if

- A) certainty exists in both exchange rates and prices.
- B) certainty exists in exchange rates or prices.
- C) uncertainty exists in both exchange rates and prices.
- D) uncertainty exists in exchange rates or prices.

Answer: D

Diff: 2

Topic: 6.6 To Onshore or Offshore: Evaluation of Global Supply Chain Design Decisions Under Uncertainty

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

- 46) Simulation models

- A) require a higher setup cost to start and operate compared to decision tree tools.
- B) require a lower setup cost to start and operate compared to decision tree tools.
- C) require a higher setup cost to start but less to operate compared to decision tree tools.
- D) require a lower setup cost to start but more to operate compared to decision tree tools.

Answer: A

Diff: 3

Topic: 6.6 To Onshore or Offshore: Evaluation of Global Supply Chain Design Decisions Under Uncertainty

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

47) Simulation methods are very good at evaluating decisions when

- A) the paths are decision dependent.
- B) the decision rules are simple.
- C) there are different forms of uncertainty.
- D) implicit solutions are needed for analysis.

Answer: C

Diff: 3

Topic: 6.6 To Onshore or Offshore: Evaluation of Global Supply Chain Design Decisions Under Uncertainty

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.

48) Strategic planning and financial planning

- A) should be performed independently during supply chain network design.
- B) should be performed sequentially during supply chain network design.
- C) should be performed concurrently during supply chain network design.
- D) should be combined during supply chain network design.

Answer: D

Diff: 3

Topic: 6.7 Making Global Supply Chain Design Decisions Under Uncertainty in Practice

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

49) The evaluation of supply chain networks

- A) should use only one metric.
- B) should use multiple metrics.
- C) should not use more than one metric.
- D) should be subjective.

Answer: B

Diff: 2

Topic: 6.7 Making Global Supply Chain Design Decisions Under Uncertainty in Practice

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

50) One of the best ways to speed up the process of financial analysis and arrive at a good decision is to

- A) use estimates of inputs when it appears that finding a very accurate input would take an inordinate amount of time.
- B) use estimates backed up by sensitivity analysis when it appears that finding a very accurate input would take an inordinate amount of time.
- C) use estimates of inputs except when it appears that finding a very accurate input would take an inordinate amount of time.
- D) make sure that every detail is very accurate.

Answer: B

Diff: 3

Topic: 6.7 Making Global Supply Chain Design Decisions Under Uncertainty in Practice

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

### 6.3 Essay Questions

1) Pretzle Wagon is evaluating the possibility of offshoring part of his operation and developing a spreadsheet to help assess the total cost of the decision. What elements should be included in the evaluation?

Answer:

1. Supplier price: should link to costs from direct materials, direct labor, indirect labor, management, overhead, capital amortization, local taxes, manufacturing costs, and local regulatory compliance costs.
2. Terms: costs are affected by net payment terms and any volume discounts.
3. Delivery costs: include in-country transportation, ocean/air freight, destination transport, and packaging.
4. Inventory and warehousing: include in-plant inventories, in-plant handling, plant warehouse costs, supply chain inventories, and supply chain warehousing costs.
5. Cost of quality: includes cost of validation, cost of performance drop due to poorer quality, and cost of incremental remedies to combat quality drop.
6. Customer duties, value-added taxes, local tax incentives.
7. Cost of risk, procurement staff, broker fees, infrastructure (IT and facilities), and tooling and mold costs.
8. Exchange rate trends and their impact on cost.

Diff: 2

Topic: 6.2 The Offshoring Decision: Total Cost

AACSB: Application of knowledge

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

2) Briefly describe the three primary risk mitigation strategies based on the idea of flexibility that supply chain managers can use.

Answer: Flexibility plays an important role in mitigating different risks and uncertainties faced by a global supply chain. Flexibility can be divided into three broad categories—new product flexibility, mix flexibility, and volume flexibility.

*New product flexibility* refers to a firm's ability to introduce new products into the market at a rapid rate. New product flexibility is critical in a competitive environment wherein technology is evolving and customer demand is fickle. New product flexibility may result from the use of common architectures and product platforms with the goal of providing a large number of distinct models using as few unique platforms as possible. Only once the product takes off is it moved to a dedicated capacity with lower variable costs.

*Mix flexibility* refers to the ability to produce a variety of products within a short period of time. Mix flexibility is critical in an environment in which demand for individual products is small or highly unpredictable, supply of raw materials is uncertain, and technology is evolving rapidly.

*Volume flexibility* refers to a firm's ability to operate profitably at different levels of output. Volume flexibility is critical in cyclical industries.

Diff: 2

Topic: 6.3 Risk Management in Global Supply Chains

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.

3) The XYZ Company has a choice between two warehouses. A lease at location A costs \$1000 per month with a payment of \$2000 up front to guarantee the 3 year lease. Location B would cost \$1200 per month and would be leased from month to month. The anticipated revenue in either location is \$1500 per month. The estimated rate of return is 10% per year. Using net present value, determine which location would be the better choice.

Answer: Location A

Expected annual profit =  $12 \times (\$1500 - \$1000) = \$6000$

NPV =  $\$6000 + (\$6000/1.1) + (\$6000/1.1^2) - \$2000 = \$14,413.22$

Location B

Expected annual profit =  $12 \times (\$1500 - \$1200) = \$3600$

NPV =  $\$3600 + (\$3600/1.1) + (\$3600/1.1^2) = \$9847.93$

Location A is the better choice.

Diff: 2

Topic: 6.4 Discounted Cash Flows

AACSB: Analytical thinking

Objective: LO 6.1: Identify factors that need to be included in total cost when making global sourcing decisions.

4) Summarize the steps in the decision tree analysis methodology.

Answer: The decision tree analysis methodology is summarized as follows:

1. Identify the duration of each period (month, quarter, etc.) and the number of periods  $T$  over which the decision is to be evaluated.
2. Identify factors such as demand, price, and exchange rate, whose fluctuation will be considered over the next  $T$  periods.
3. Identify representations of uncertainty for each factor; that is, determine what distribution to use to model the uncertainty.
4. Identify the periodic discount rate  $k$  for each period.
5. Represent the decision tree with defined states in each period, as well as the transition probabilities between states in successive periods.
6. Starting at period  $T$ , work back to Period 0, identifying the optimal decision and the expected cash flows at each step. Expected cash flows at each step in a given period should be discounted back when included in the previous period.

Diff: 2

Topic: 6.5 Evaluating Network Design Decisions Using Decision Trees

AACSB: Application of knowledge

Objective: LO 6.4: Understand decision tree methodologies used to evaluate supply chain design decisions under uncertainty.



5) Discuss the ideas that managers should consider to make better supply chain network design decisions under uncertainty.

Answer: Managers should consider the following ideas to help them make better network design decisions under uncertainty:

1. *Combine strategic planning and financial planning during network design.* In most organizations, financial planning and strategic planning are performed independently. Strategic planning tries to prepare for future uncertainties but often without rigorous quantitative analysis, whereas financial planning performs quantitative analysis but assumes a predictable or well-defined future. Decision makers should design supply chain networks considering a portfolio of strategic options—the option to wait, build excess capacity, build flexible capacity, sign long-term contracts, purchase from the spot market, and so forth. The various options should be evaluated in the context of future uncertainty.

2. *Use multiple metrics to evaluate supply chain networks.* As one metric can only give part of the picture, it is beneficial to examine network design decisions using multiple metrics such as firm profits, supply chain profits, customer service levels, and response times. Often, different metrics will recommend different decisions and by using multiple metrics, the differences between the strategic choices will become clearer. The best decisions can be made when a multitude of metrics are available, because each metric enhances the overall view of the alternatives being considered.

3. *Use financial analysis as an input to decision making, not as the decision-making process.* Financial analysis is a great tool in the decision-making process, as it often produces an answer and an abundance of quantitative data to back up that answer. However appealing this may be, management should not rely solely on financial analysis to make decisions. Use of this analysis as a large part of the decision-making process is fine, but other inputs into the decision process that are difficult to quantify should be included in the analysis as well. Financial methodologies alone do not provide a complete picture of the alternatives. These impacts should be considered in addition to the raw financial analysis. In the final analysis, management must use other inputs beyond financial analysis in the decision-making process to get the most complete view of the alternatives possible.

4. *Use estimates along with sensitivity analysis.* Many of the inputs into financial analysis can be difficult, if not impossible, to nail down in a very accurate fashion. This can cause financial analysis to be a long and drawn out process. One of the best ways to speed the process along and arrive at a good decision is to use estimates of inputs when it appears that finding a very accurate input would take an inordinate amount of time. Using estimates is fine when the estimates are backed up by sensitivity analysis. By performing sensitivity analysis on the input's range, managers can often show that no matter where the true input lies within the range, the outcome remains the same. When this is not the case, they have highlighted a key variable to making the decision and it likely deserves more attention to arrive at a more accurate answer. In summary, to effectively make supply chain design decisions, managers need to make estimates of inputs and then test all recommendations with sensitivity analysis.

Diff: 2

Topic: 6.7 Making Global Supply Chain Design Decisions Under Uncertainty in Practice

AACSB: Application of knowledge

Objective: LO 6.3: Explain different strategies that may be used to mitigate risk in global supply chains.