**Decision Analysis**

**Knowledge Check**

**Weekly Learning Objectives**

* Steps of decision-making process
* Types of decision-making environments
* Make decisions under conditions of certainty, risk, and uncertainty
* Develop decision trees
* Apply the utility theory in making decisions

**Key Concepts:**

**1. Managers’ challenge:** Dealing with uncertainty. Operations managers are not gamblers, but they are decision makers. To a great extent, the success or failure of their organizations depends on the quality of their organizations.

**2. A good decision:** Is based on logic, uses analytics decision making, and considers all available data and possible alternatives.

**3. Steps in the decision-making:**

a. clearly defines the problem and the factors that influence it

b. develops specific and measurable objectives

c. develops a model-that is, a relationship between objectives

and variables

d. evaluates each alternative solution

e. selects the best alternative

f. implement decision

g. evaluates results

**4.** **Alternative:** A course of action or strategy that must be chosen by a decision-

maker.

**5. State of nature:** An occurrence or a situation over which the decision maker has little or no control.

**6. Outcomes:** Consequences of our decisions, usually expressed as a monetary value, called a conditional value.

**7. Decision table:** A tabular means of analyzing decision alternatives and states of nature. A table that lists the alternatives, states of nature, and payoffs in a decision-making situation.

**8. Decision tree:** A graphical means of analyzing decision alternatives and states of nature. Suitable when there is a sequential decision-making pattern. A graphical representation of a decision-making situation.

**9. Decision-tree build up process:**

a. defines the problem

b. structure a decision tree (from left to right)

c. assign probabilities to the states of nature

d. estimate payoffs for each possible combination of decision alternatives

and states of nature

e. solves the problem by computing the Expected Monetary Values (EMV)-

from right to left.

This is a useful tool to aid ethical corporate decision-making.

**10. Decision making environments:** uncertainty, risk, certainty

**11. Uncertainty:** When there is complete uncertainty as to which state of nature in a decision environment may occur, we rely on these decision models: Maximax, Maximin, Laplace, Criterion of Realism (Hurwicz), and Minimax regret.

**12. Maximax:** A criterion that finds an alternative that maximizes the maximum outcome. An optimistic decision-making criterion. This selects the alternative with the highest possible returns.

**13. Maximin:** A criterion that finds an alternative that maximizes the minimum outcome. A pessimistic decision-making criterion. This selects the alternative with the best of the worst possible outcomes.

**14. Equally likely (Laplace):** A criterion that assigns equal probability to each state of nature.

**15. Hurwicz criterion:** Assigns weight to probabilities of outcomes based on the “criterion of realism”.

**16. Coefficient of realism:** A number from 0 to 1. When the coefficient is close to 1, the decision criterion is optimistic. When the coefficient is close to zero, the decision criterion is pessimistic. Criterion of realism: a decision-making criterion that uses a weighted average of the best and worst possible payoffs for each alternative.

**17. Minimax regret:** A criterion that minimizes the maximum opportunity loss.

Opportunity loss: the amount you would lose by nit picking the best alternative. For any state of nature, this is the difference between the consequences of any alternative and the best possible alternative.

**18. Regret:** Opportunity loss.

**19. Decisions under risk:** Is more common and relies on probabilities. Several possible states of nature may occur, each with and assumed probability. The process consists of calculating the expected monetary value for each alternative. The probabilities of outcomes or states are known.

**20. Expected monetary value:** The expected payout or value of a variable that has different possible states of nature, each with associated probability. This is good application for the decision tree method.

**21. Decision-making under certainty:** An assumed state of nature. Never exists, but is a good analytical framework to move from more risk to less risk environment. It is a decision-making environment in which the future outcomes or states of nature are known.

**22. Expected value of perfect information (EVPI):** The difference between the payoff under perfect information and the payoff under risk.

**23. Expected value with perfect information:** The expected average return if perfect information is available.

**24. Decision-making under risk:** A decision-making environment in which several outcomes or states of nature may occur. The probabilities of these outcomes or states of nature are not known.

**25. Utility theory:** A theory that allows decision makers to incorporate their risk preferences and other factors into decision making process.

**26. Utility:** The overall value of the results of the decision is called utility. This method is used in place of the EMV. There are three utility profiles: risk takers, risk avoiders, and risk neutral. The overall value or worth of a particular outcome.

**27. Risk seeker:** A person who seeks risk. On the utility curve, as the monetary value increases, the utility increases at an increasing rate. This decision maker gets more pleasure from taking a greater risk in exchange for higher potential results.

**28. Risk avoider:** A person who avoids risks. On the utility curve, as the monetary value increase, the utility increase at a decreasing rate. The decision maker gets less utility from taking a greater risk in exchange for higher potential returns.

**29. Standard gamble:** A process used to determine utility values.

Utility assessment: the process of determining the utility of various outcomes. This is normally done using standard gamble between any outcome for sure and a gamble between the worst and best outcomes.

**30. Utility curve:** A graph or curve that reveals the relationship between utility and monetary values. When this curve has been constructed, utility values from the curve can be used in the decision-making process.