

Unit 4

DECISION ANALYSIS

Lesson 33

Learning Objective:

- In this lesson you will study about the steps of Decision Process and about Decision Environment.

Hello students,

Firstly we have;

The steps that you should follow to make a good decision are:-

DECISION PROCESS

Step 1:

You, the decision maker, clearly define the problem at hand.

Step 2:

List the possible alternatives (courses of action), which are available to you for making the decision. The number of possible alternatives may be large in some case, but in most of the situations only a reasonable number of alternatives will be required.

Step 3:

After you choose an alternative, a state of nature occurs that is beyond your control. You should take care to include all possible future events that might occur.

Here, at this point of time you are likely to be unsure as of which specific event will occur.

Step 4:

Determine and list the payoff for each combination of alternatives and outcomes. Present these payoffs in a payoff table. You can express these payoffs in terms of profits, losses, revenues, costs, utilities, or any other appropriate parameter of measurement.

Step 5:

Select one of the mathematical decision theory models to choose the best alternative from the given list on the basis of some criterion that results in the desired payoff.

Now in general what do you think about general what do you after determining the payoff table for making the best decision.

- You, select one of the alternative (course of action). Suppose you have selected A1
- A state of nature occurs that is beyond your control. Suppose that state E2 occurs.
- You receive a certain return that can be determined from payoff table.
Since you choose A1 and state of nature E2 occurred, the return is a_{21} .
- Again you choose an alternative and then are of the states of nature occurs.

Examine that once the alternative is selected, it can't be changed after the state of nature occurs. So, in general terms the question is, which of the alternatives should you select?

What are your views on this?

Let me share my personal feelings with you as regards this.

You would like to have as large a return as possible, that is, the largest possible value of a_{ij} where i represent the state of nature that occurs and j represents the alternative selected.

It is obvious that the action you may select will depend on your belief concerning what nature will do, i.e., which state of nature will occur. If you believe state 1 will occur, you select the alternative associated with the largest number corresponding to state 1. If you believe state 2 is more likely to occur, choose the decision corresponding to the largest payoff with it and so on.

Let us view all this with the help of an interesting example:

You are the founder and president of Ken Manufacturing, Inc., a reputed firm located in Mumbai.

- The problem that you identify is whether or not to build more manufacturing plants for expansion.
- You decide that your alternatives are to construct
 - (1) A large new plant manufacturing the product
 - (2) A small plant, or
 - (3) No plant at all
- You determine that there are only two possible out comes of the various alternatives.
 - The market for your product could be favorable, meaning that there is a high demand for the product, or
 - The market could be unfavorable, meaning that there is a low demand for your product.
- Nextly, you express the payoff resulting from each possible combination of alternatives and out comes. As you are interested in maximizing your profits, you can use 'profit' to evaluate each consequence. Of course, not every alternative can be based on money alone so any appropriate means of measuring benefit is acceptable.
- You have already evaluated the potential profits associated with the various outcomes.

With a favorable market, you think a large plant would result in a net profit of Rs. 2,00,000 to your firm. This return is conditional upon both building a large plant and having a good market, so it is a conditional value.

The conditional value if the market is unfavorable would be a Rs, 1,80,000 net loss.

Similarly,

a small plant would result in a net profit of Rs, 1,00,000 in a favorable market, but a net loss of Rs. 20,000 would occur if the market is unfavorable.

Finally, doing nothing would result in Rs. 0 profit in either market.

The easiest way to present these value in by constructing a payoff table.

- You apply decision theory to take the appropriate decision.

This involves selecting a decision model depending on the environment in which you are operating and the amount of risk and uncertainty involved

So this requires to know about **DECISION MAKING ENVIRONMENTS**

Decisions are made based upon the data available about the occurrence of events as well as the decision situation or environment. Basically, there are four different states of decision environment: **certainty, risk, uncertainty and conflict.**

We shall discuss each decision environment in greater detail.

Type 1: **Decision making under certainty**

In this case, you (the decision maker) have all the information of the consequence of every alternative or decision choice with certainty. In other words, under certainty we can predict the outcome of each alternative course of action exactly.

Here you recall the linear programming problems.

In linear programming problems you know exactly how much of each of the different resources are required to produce a particular product, thus you can accurately predict that product's unit profit.

Many of the decision problems you face daily are under certainty.

Where to have lunch – McDonald's, Pizza hut or one of the many fine food outlets in nearby area?

You know exactly how much a meal costs at each of the locations, and you know the quality you will receive for your money.

Consider another sort of example, let's say

You have Rs 10,000 to invest for a year you have two alternatives to select from:- either you open saving A/c Paying a 4% Interest or invest in fixed deposits paying 6% interest. As both investments are secure and guaranteed.

Obviously, Fixed deposits will pay a higher return. (i.e. Rs. 600 of interest)

In this decision model, only one possible state of nature exists.

Type 2: **Decision making under Risk.**

In this case, you (decision maker) knows the probability of occurrence of each outcome.

For example,

Suppose that you are manager of a computer store and considering stocking a new personal computer (PC) just introduced into the market. Your immediate concern is to decide how many units of the PC to stock.

The PC costs Rs 2,5,000 and the suggested retail price is Rs. 32,000. Any unsold PC can be sold to the local high school for Rs 20,000.

After a discussion with the manufacturers representative and analysis of past sales records of new PCs, you arrive at the following estimate of sales for the next month:

PCs	Probability
2	0.10
3	0.25
4	0.30
5	0.25
6	0.10
	<u>1.00</u>

With this data, you will be able to determine the number of PCs to purchase for the next month.

The solution is not guaranteed to be the best possible under all conditions that could occur, but it will be the best solution on average.

Clearly, you have examined that in decision making under risk, you attempt to maximize your expected gains.

Decision theory models for business problems in this environment typically employ two equivalent criteria.

- Maximization of expected monetary value
- Minimization of expected loss.

Type 3: **Decision making under uncertainty**

Uncertainty refers to the situation in which you do not have any knowledge about the probability of occurrence of any of occurrence any state of nature.

Under uncertainty, it is impossible to estimate the probabilities of the various possible outcomes.

In the microcomputer case, for example, sales may be totally unpredictable because too many factors affect sales – reputation of the manufacturer, software availability, price, warranty, service and other similar factors.

Here, you may think of it as a hopeless case. Isn't it?
Although this sounds like a hopeless case, in reality, decision making under uncertainty is perhaps the most common situation humans have to deal with.

Obviously, we cannot just give up making decisions because uncertainty exists.

You must find ways to reduce uncertainty and there are several approaches suggested by different personalities for decision-making under uncertainty.

The first approach is to obtain additional information about the problem. This process may yield at least partial probabilities of consequences.

Then the problem is no longer a “shot in the dark” but rather a “Shot in the fog”.

Although additional information can make the problem more clearly understood, the question of the cost of obtaining the additional information is important.

So, what do you say for the relation between the benefit with the additional information and the cost of additional information???

In my view,

The benefit derived from additional information should exceed the cost of obtaining this information.

Now

Let’s take up another approach for handling decision – making under uncertainty. Can you reduce it to a problem under risk?

..... of course, yes.

You can do this by incorporating your own subjective feelings or estimates as probabilities.

There are several strategies that can be employed for this purpose.

Type 4: **Decision Making under conflict.**

A condition of conflict exists when the interest of two or more decision makers compete.

For example,

If decision maker A benefits from a course of action, it is possible only because decision maker B has also taken a certain course of action. Hence in decision analysis, the decision makers are interested not only in what they do individually but also in what other do.

Such situations are common, when firms are involved in competitive market strategies, new product development, recruitment of experienced executives, or advertising campaigns.

Although, decision making under conflict may sound simple;
In reality it is extremely complex.

We may have a decision – making problem under uncertainty that is further compounded by fierce opponents or competitors.

Game theory has been suggested as a theoretical approach to decision making under conflict.

So, now let us summarize today's discussion:

Summary

We have discussed brief concepts of

- Steps followed in a decisions process.
- Decision making under certainty.
- Decision making under uncertainty.
- Decision making under risk.
- Decision making under conflict.

