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## 1. Learning Outcomes

After studying this module, you shall be able to:

- Define decision making
- Understand when and why decision making is accurate
- State how alternatives, beliefs and consequences influence decision making
- Summarize the heuristics for decision making

## 2. Introduction

In the previous module you studied that cognitive psychology investigate various dimensions of thinking in terms of internal cognitive processes such as reasoning, logic, problem solving, memory and language. A large portion of the study of thinking also deals with how people make decisions and choice and how decision making is an integral part of thinking. You also got acquainted with different types of thinking and stages of creative thinking. In this module we will focus the discussion on decision making and how it is closely related to thinking, logic and reasoning. Let us first try to define what is meant is decision making.

## 3. Define

Take a pause and think of all the decisions and choices you made yesterday. Your everyday routine requires you to take a number of decisions, some that which we may not be even conscious of. The seemingly mundane questions of when to wake up in the morning; how to ensure that one will wake up on time; how to time oneself and what all to do before one leaves home for college or work; what all to carry to college; what to wear; how to reach college; which route and means of travel would be optimum; what to do in the free time at college; when to return home; what plans to make with friends; which calls are urgent and to be returned immediately; what to share with other people and what not to share; what and how much to eat; from where to procure food; what to prepare for examination and so forth; the list is non-exhaustive. In all fields of human endeavors such as business, economics, politics, teaching and otherwise everyday business, people are making decisions at almost all times. In fact at each step of daily life, we are making decisions about the course of action. Decision making is so integral a part of our lives that we seldom 'think' about 'decision making' really!

Decision making can be regarded as the cognitive process resulting in the selection of a belief or a course of action among several possible alternatives. It involves identifying and choosing alternatives based in values and preferences of the decision maker. Decision making is inseparably intertwined with problem solving. When faced with a problem, one makes an estimate about the situation and decides what the solution of the problem is and how one would like to solve the problem. Subsequently one looks for the possible strategies to achieve the goal or end state.

#### 4. ABCs of decision making: Alternatives, beliefs and consequences

While solving any problem we come across a number of possible **alternatives**. For choosing among the alternatives, one has to think about all the likely outcomes. This is not a simple and straightforward task. It involves much deliberation and a number of cognitive processes such as attention, perception, encoding, decoding, remembering, recalling, memory, problem solving, strategizing and so forth make it happen. Think about a topic that you discussed with your teacher in the class or any personal aspect that you might have been worrying about. In both the cases you may have reasons for your opinion and arguments formed. The ability to reason is responsible for your cognitive process of decision making and choosing among alternatives. You may have also noticed that in economics or in mathematical computation, decision making is more calculated and one can predict outcomes with much more certainty. These decisions turn out to be more rational.

In reality, however, there are certain factors that affect decision making abilities and cause people to make irrational decisions. Decision making in the real world is not always a straightforward task. Think of a real life problem and try to solve it using deductive reasoning. Deductive thinking involves drawing conclusions by applying logic and reasoning from the general to the particular. Suppose, you have to take admission in a college and you have the option of going to a private college, a large private university, a small state university or a large state university. Make a choice and also enlist the criteria for your choice. Try to give grades/marks to each of the choices on the indicators that you have formulated. Did you rank and give equal weightage to all the indicators that you mentioned? The point to make here is that in many situations the nature of problem is not compatible with mathematical analysis. According to Tversky (1972), while making decisions, we select alternatives by gradually eliminating less attractive choices. He called this **elimination by aspects** since in this a person eliminates the less attractive alternatives by making a sequential evaluation of the attributes or aspects of the situation. If some of the alternatives do not meet the minimum criteria then those aspects are eliminated.

According to Tversky and Kahneman (1981), a decision maker's "conception of the acts, outcomes, and contingencies associated with a particular choice" constitute a decision frame. This frame adopted by someone while making a decision is controlled on the one hand by the norms, beliefs, habits and personal characteristics of an individual and on the other hand by the formulation of the problem and its consequences. The figure below helps us understand that alternatives, beliefs and consequences interplay to shape our decisions and choices.



**Figure 1:** ABCs of decision making-Alternatives, Beliefs and Consequences interplay to influence and shape our decisions

The role played by an individual's beliefs and meanings associated with words and tasks lie at the core of human thinking. At a wide range of reasoning and decision making tasks, people are biased and fail to answer using correct logic and probability theory (Evans and Over, 1996). **Belief bias** refers to people accepting conclusions that happen to fit with their system of beliefs (Henle, 1962). We might reject valid conclusions if they do not match or correspond with what we believe to be true and predictable about the world (Luria, 1976). Belief bias is especially powerful when reasons are based on conclusions only (Evans, Barston, & Pollard, 1983). It states that people tend to judge syllogisms with believable conclusions as valid, while they tend to judge syllogisms with not believable conclusions as invalid.

All decisions makers are faced with alternatives and subsequent course of actions. Depending upon the environment in which these actions are carried out, each action will lead to one or more outcomes and these outcomes further feed into future thought and action. Individuals evaluate the utility of each action and its possible **consequences**. According to **utility theory**, people make decisions by choosing one course of action from among the possible alternatives that yields the greatest benefit or is the most desirable overall. As per this theory, people assign a utility to all possible outcomes or consequences, weigh these utilities, predict their probability of occurrence and then choose the best possible course of action. This is the one that is likely to yield largest benefits.

But are you always able to predict the consequences of situations with certainty? People normally have only a restricted view of the consequences their actions may produce. Think if decisions made involve risk or are they always risk-free. The chances are that your answer is that many a times we are involved in making decisions about issues that involve certain amount of risk. Take a practical problem of which stream to pursue after school. This involves making decisions about the stream, which course to pursue, which College to apply at, whether to choose a course over college or vice-a-versa and so forth. The choice of any of these involves some risk, and all conditions and future prospects cannot be fully calculated beforehand. In some of the other matters such as choice of medicine/hospital or whether to undergo a life threatening operation or not may involve larger risks. Most decisions of consequences are made under risk and uncertainty.

How do then people make decisions when under risk and uncertainty, where the probability of outcomes is not fully known. Reasoning under uncertainty requires an assessment of probability, so decisions get influenced by how we judge subjective probability. According to **decision theory**, solution to any problem can be calculated by weighing the expected utility of each course of action by probability that it will occur.

In addition to these, how a problem is framed, known as the **framing effect** affects our decisions. The framing effect states that the framing of the question of a problem, even though the probabilities are identical in a context, leads to different choices. A problem can be described in different ways and therefore evoke different decision strategies. Whether a problem is identified in terms of losses or profits, will affect how we see the consequences. This definitely affects our decisions over the alternatives and finally which alternative will we choose. In general, choices that involves losses as compared to those that incur profits, are perceived as risk taking. In case a problem is specified in terms of gains, people tend to use risk-aversion strategy. When the description of the problem is done in terms of losses, people tend to apply risk-taking strategy. Simply put, most people avoid the risk when they see a sure gain and take the risk when they have an almost equal chance of loss and gain.

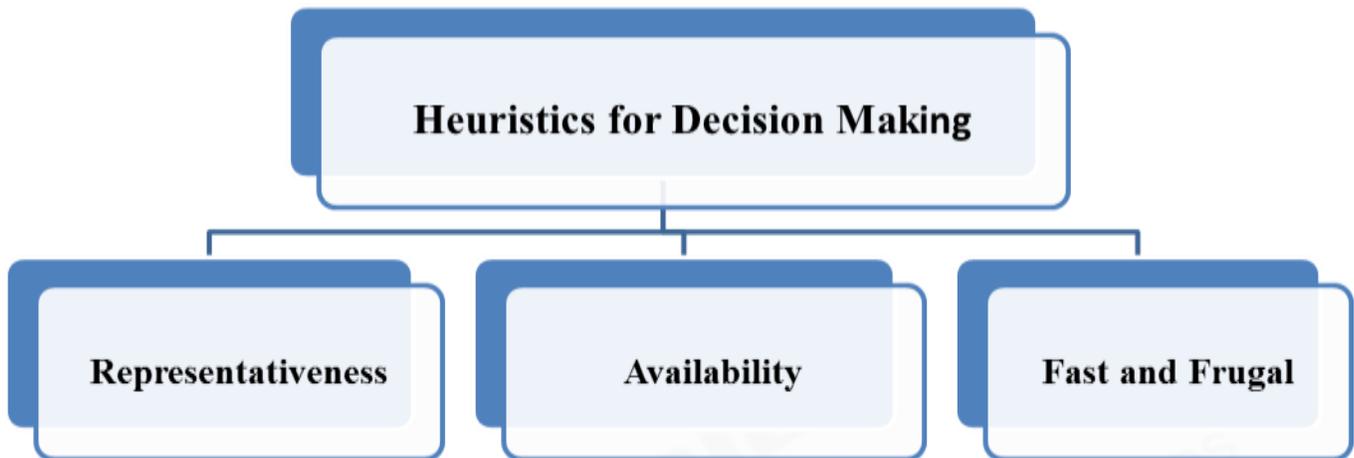
Hall, Ariss and Todorov (2007) described that when individuals encounter too much knowledge, it may interfere and impede their ability to make rational decisions. This is termed as **illusion of knowledge**. Moreover, people seem to over-rely on intuition and gut feeling instead of more demanding deliberative reasoning when making decisions.

In the process of reasoning and decision making, people often make use of certain heuristics which lead to quick conclusions. These heuristics are discussed in the section below-

## 5. Heuristics for Decision Making

During 1970s and 1980s, there was a growing body of research that pointed out the fallacies of applying normative statistical theories to human judgments for decision making under uncertainty. Representative and availability are heuristics that distort our ability to make decisions in fully rational ways, as described by normative models of statistical reasoning. According to Kahneman and Tversky (1973), “In making predictions and judgments under uncertainty, people do not appear to follow the calculus of chance or the statistical theory of prediction. Instead, they rely on a limited number of heuristics which sometimes yield reasonable judgments and sometimes lead to severe and systematic errors.” Daniel Kahneman and Amos

Tversky thus introduced some heuristics, which are quick and easy solutions to complex problems.



**Figure 2:** Heuristics for Decision Making

### 5.1 Representativeness of Heuristics

To explain the first important heuristic, Kahneman and Tversky state that people assign a high probability of occurrence to events that are representative or typical of a class. A representative event is the one that is highly similar to most of the others in a population or class of events. In addition to that, if an event is highly similar to the process that generates it, then it is considered representative.

Gamblers often fall prey to the use of representativeness heuristic. The gambler's fallacy refers to the mistaken belief that future tosses of a coin, drops of the ball in roulette or rolls of dice in crap are not independent of past events. If you witness 4 rolled on the dice five times in a row, then you are likely to bet against 4 coming up again on the next roll. Gamblers and other people expect events to even out in a short run, however, events even out in the long run.

In another experiment, Tversky and Kahneman presented their participants with the picture of a man chosen randomly from the population of the U.S., who wears glasses, speaks and reads a lot. Is he more likely to be librarian or a farmer? More of the participants answered that he is a librarian, which is again an effect of the representativeness heuristic.

### 5.2 Availability Heuristics

The second heuristic used to estimate probabilities is based on the ease with which our mind can recall relevant examples. When deciding whether to buy a particular product, for instance, washing machine, television or stocks of a company, you might recall what you have heard on

television or print advertisements or business news. You are most likely to buy that product or stock which you have heard more or simply which can be readily available from your memory. The availability heuristic suggests that if relevant examples can be readily retrieved from memory, then the class of events must occur with high probability.

In a series of studies conducted by Tversky and Kahneman (1973, 1981), subjects were asked to read a list of names of men and women and tell whether the list contained the names of more men or women. The subjects overestimated the frequency of the gender that was more famous. The reason for such a choice was the fact that the names of the famous people were readily available to the mind. Also, Tversky and Kahneman found that sometimes people arrive at poor conclusions when their decisions are based on past experiences.

There are other research studies that support the availability hypothesis to account for errors in estimates of “everyday” knowledge. In a study by Slovic, Fischhoff and Lichtenstein (1977) the participants were asked to estimate the relative probability of causes of deaths from the two given causes. The participants judged causes like homicide and tornado to cause more deaths than others like asthma. The most misjudged causes of death were those that were most publicized and on which more information were available, that is on homicide and tornado, than deaths caused by natural diseases and illness. The authors reasoned that because the lethal events such as accidents, cancer and tornado receive wider media coverage, they appeared as more available causes of deaths.

Has it ever happened that after an event someone claims that he/she knew it all along, under the conditions observed, that the particular event will happen. The availability heuristic also helps to explain another common bias in human risk perception. Once event X happens, it is easy to believe that Event X was inevitably going to happen (Fischhoff, 1975, 1977; Hell, Gigerenzer, Gauggal, Mall and Muller, 1998). **Hindsight bias** refers to the fact that people confidently judge that they knew an event would occur after it occurs. After the event, the person is highly likely to say, ‘I knew it all along’. It is so because, once the critical information about an outcome is known, one cannot put it aside or ignore it. It overrides in our mind and collection of memories and sometimes also imagination about similar situations at hand may even distort our confidence in future judgments that we make. Also, by choosing only the most obvious aspects while making a certain decision as in availability heuristics, we often tend to neglect some really important aspects and consequently their outcomes.

### 5.3 Fast and Frugal Heuristics

Consider if human thought processes find a good solution to problems in their environment rather quickly and with little information, then they are well adapted to that environment. Here, instead of comparing human thinking with logic and normative rationality, an alternative view of thinking and decision making is floated, where one looks for optimal solution which demands a minimum of investment of time and cognitive resources and highlights highly adaptive modes of thought (Gigerenzer, 2006). A **fast and frugal heuristic** is a cognitive process that searches for minimal information and consists of building blocks that exploit evolved abilities and structures in the environment.

For example, the visual system has evolved to track objects in space. We are aware that the visual environment is structured with respect to the relations of objects-their distance as measured by visual angle and is also receptive to the changes that take place in those relations over time. How does then a fielder, catches a cricket ball once it is hit by the batsman and is bound for a particular trajectory and direction. From a normative view of mathematical calculations, the fielder will solve a set of differential equations to compute the trajectory of the ball, taking account of the ball's initial velocity, angle and distance from the batsman. These facts will then be supplemented with air resistance and wind speed that particular day/moment. This is a complex cognitive exercise that requires a reasonable time for computation. From the perspective of fast and frugal heuristics, the fielder does not need all this information and computation. Instead, the fielder can exploit his capacity for object tracking and the information inherent in the environment by using the gaze heuristic that is, fixate the gaze on the ball, start running in the direction of the hit and adjust the running speed so that the angle of the gaze remains constant. In this entire task, the singular piece of information that is most significant for the brain in order to catch the ball is to attend to the angle of the gaze between the eye and the ball. All this will be relative to the ground.

Consider another example, if you are trying to decide between which one of the two ice-creams flavors or brands of chocolate to purchase; you are more likely to buy a familiar flavor or a familiar brand. Choosing the most recognizable name is an excellent fast and frugal heuristic. According to Gigerenzer (2006), in decision making tasks, it can be advantageous to pick the alternative that is recognized rather than picking a completely unfamiliar one.

Another example of fast and frugal heuristics relies on finding one good reason to make a decision and then stopping the search. The “**take the best**” heuristic searches for cues in the order of their validity-those at the top of the list are most predictive of the best source of action to take between two alternatives. This heuristic starts with the most valid cue and determines whether it distinguishes between the two alternatives. If it does, the search is stopped and the best option chosen. If it does not, then the second most valid cue is assessed. The essence of the take the best heuristic is to stop the search upon finding the first discriminatory cue.

## 6. Summary

- Decision making can be regarded as the cognitive process resulting in the selection of a belief or a course of action among several possible alternatives.
- While solving any problem we come across a number of possible alternatives; which are affected by our beliefs and likely consequences.
- In *elimination by aspects*, a person eliminates the less attractive alternatives by making a sequential evaluation of the attributes or aspects of the situation.
- Belief bias refers to people accepting conclusions that happen to fit with their system of beliefs.

- **Utility theory**, states that people assign a utility to all possible outcomes or consequences, weigh these utilities, predict their probability of occurrence and then choose the best possible course of action.
- The **framing effect** states that the framing of a problem, even though the probabilities are identical in a context, leads to different choices.
- When individuals encounter too much knowledge, it may interfere and impede their ability to make rational decisions. This is termed as **illusion of knowledge**.
- Representativeness Heuristics means that people assign a high probability of occurrence to events that are representative or typical of a class.
- The availability heuristic suggests that if relevant examples can be readily retrieved from memory, then people tend to believe that the particular class of events must occur with high probability.
- A fast and frugal heuristic is a cognitive process that searches for minimal information and consists of building blocks that exploit evolved abilities and structures in the environment.