

SYSTEM DECISION-MAKING

1.1 INTRODUCTION TO DECISIONMAKING: **Decision-making** can be regarded as the cognitive process resulting in the selection of a belief or a course of action among several alternative possibilities. Every decision-making process produces a final choice that may or may not prompt action. Decision-making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. Decision-making is one of the central activities of management and is a huge part of any process of implementation.

1.2 Overview

Human performance with regard to decisions has been the subject of active research from several perspectives:

- Psychological: examining individual decisions in the context of a set of needs, preferences and values the individual has or seeks.
- Cognitive: the decision-making process regarded as a continuous process integrated in the interaction with the environment.
- Normative: the analysis of individual decisions concerned with the logic of decision-making and rationality and the invariant choice it leads to.

Decision-making can also be regarded as a problem-solving activity terminated by a solution deemed to be satisfactory. It is, therefore, a reasoning or emotional process which can be rational or irrational and can be based on explicit assumptions or tacit assumptions. Rational choice theory encompasses the notion that people try to maximize benefits while minimizing costs.

Some have argued that most decisions are made unconsciously. Jim Nightingale states that "we simply decide without thinking much about the decision process."^[3] In a controlled environment, such as a classroom, instructors might try to encourage students to weigh pros and cons before making a decision. This strategy is known as Franklin's rule. However, because such a rule requires time, cognitive resources and full access to relevant information about the decision, this rule may not best describe how people make decisions.

Logical decision-making is an important part of all science-based professions, where specialists apply their knowledge in a given area to make informed decisions. For example, medical decision-making often involves a diagnosis and

the selection of appropriate treatment. Some research using naturalistic methods shows, however, that in situations with higher time pressure, higher stakes, or increased ambiguities, experts use intuitive decision-making rather than structured approaches – following a recognition primed decision that fits their experience – and arrive at a course of action without weighing alternatives. Recent robust decision research has formally integrated uncertainty into its decision-making model. Decision analysis recognized and included uncertainties in its theorizing since its conception in 1964.

A major part of decision-making involves the analysis of a finite set of alternatives described in terms of evaluative criteria. Information overload occurs when there is a substantial gap between the capacity of information and the ways in which people may or can adapt. The overload of information can be related to problem≠ processing and tasking, which effects decision-making. These criteria may be benefit or cost in nature. Then the problem might be to rank these alternatives in terms of how attractive they are to the decision-maker(s) when all the criteria are considered simultaneously. Another goal might be to just find the best alternative or to determine the relative total priority of each alternative (for instance, if alternatives represent projects competing for funds) when all the criteria are considered simultaneously. Solving such problems is the focus of multi-criteria decision analysis (MCDA), also known as multi-criteria decision-making (MCDM). This area of decision-making, although very old, has attracted the interest of many researchers and practitioners and is still highly debated as there are many MCDA/MCDM methods which may yield very different results when they are applied on exactly the same data. This leads to the formulation of a decision-making paradox.

In regards to management and decision-making, each level of management is responsible for different things. Top level managers look at and create strategic plans where the organization's vision, goals, and values are taken into account to create a plan that is cohesive with the mission statement. For mid-level managers, tactical plans are created with specific steps with actions that need to be executed to meet the strategic objective. Finally, the front-line managers are responsible for creating and executing operational plans. These plans include the policies, processes, and procedures of the organization. Each must take into account the overall goals and processes of the organization.

Rational and irrational decision-making

In economics, it is thought that if humans are rational and free to make their own decisions, then they would behave according to rational choice theory. This theory states that people make decisions by determining the likelihood of a potential outcome, the value of the outcome, multiplying the two, and then choosing the more positive of the two outcomes. For example, with a 50% chance of winning \$20 or a 90% chance of winning \$10, people more likely to choose the first option.

In reality, however, there are some factors that affect decision-making abilities and cause people to make irrational decisions, one of them being availability bias. Availability bias is the tendency for some items that are more readily available in memory to be judged as more frequently occurring. For example, someone who watches a lot of movies about terrorist attacks may think the frequency of terrorism to be higher than it actually is.

Information overload[edit]

Information overload is "a gap between the volume of information and the tools we need to assimilate it." It is proven in some studies that the more information overload, the worse the quality of decisions made. There are five factors:

- Personal Information Factors: personal qualifications, experiences, attitudes etc.
- Information Characteristics: information quality, quantity and frequency
- Tasks and Process: standardized procedures or methods
- Organizational Design: organizations' cooperation, processing capacity and organization relationship
- Information Technology: IT management, and general technology

Hall, Ariss & Todorov with an assistant Rashar phinyor (2007) described an illusion of knowledge, meaning that as individuals encounter too much knowledge it actually interferes with their ability to make rational decisions.

Problem analysis & decision-making

It is important to differentiate between problem analysis and decision-making. The concepts are completely separate from one another. Traditionally, it is argued that problem analysis must be done first, so that the information gathered in that process may be used towards decision-making.

Problem analysis

- Analyze performance, what should the results be against what they actually are
- Problems are merely deviations from performance standards
- Problem must be precisely identified and described
- Problems are caused by a change from a distinctive feature
- Something can always be used to distinguish between what has and hasn't been affected by a cause
- Causes to problems can be deducted from relevant changes found in analyzing the problem
- Most likely cause to a problem is the one that exactly explains all the facts

Decision-making

- Objectives must first be established
- Objectives must be classified and placed in order of importance
- Alternative actions must be developed
- The alternative must be evaluated against all the objectives
- The alternative that is able to achieve all the objectives is the tentative decision
- The tentative decision is evaluated for more possible consequences
- The decisive actions are taken, and additional actions are taken to prevent any adverse consequences from becoming problems and starting both systems (problem analysis and decision-making) all over again
- There are steps that are generally followed that result in a decision model that can be used to determine an optimal production plan.
- In a situation featuring conflict, role-playing may be helpful for predicting decisions to be made by involved parties.

Decision planning

Making a decision without planning is fairly common, but does not often end well. Planning allows for decisions to be made comfortably and in a smart way. Planning makes decision-making a lot more simple than it is.

Decision will get four benefits out of planning: 1. Planning give chance to the establishment of independent goals. It is a conscious and directed series of choices. 2. Planning provides a standard of measurement. It is a measurement of whether you are going towards or further away from your goal. 3. Planning converts values to action. You think twice about the plan and decide what will help advance your

plan best. 4. Planning allows for limited resources to be committed in an orderly way. Always govern the use of what is limited to you. (e.g. money, time, etc.)^[12]

Analysis paralysis

Analysis paralysis is the state of over-analyzing (or over-thinking) a situation, or citing sources, so that a decision or action is never taken, in effect paralyzing the outcome.

Everyday techniques

Decision-making techniques can be separated into two broad categories: Group decision-making and individual decision-making techniques.

Group decision-making techniques

- Consensus decision-making tries to avoid "winners" and "losers". Consensus requires that a majority approve a given course of action, but that the minority agree to go along with the course of action. In other words, if the minority opposes the course of action, consensus requires that the course of action be modified to remove objectionable features.
- Voting-based methods.
 - Range voting lets each member score one or more of the available options. The option with the highest average is chosen. This method has experimentally been shown to produce the lowest Bayesian regret among common voting methods, even when voters are strategic.^[citation needed]
 - Majority requires support from more than 50% of the members of the group. Thus, the bar for action is lower than with unanimity and a group of "losers" is implicit to this rule.^[citation needed]
 - Plurality, where the largest block in a group decides, even if it falls short of a majority.
- Delphi method is structured communication technique for groups, originally developed for collaborative forecasting but has also been used for policy making.
- Dotmocracy is a facilitation method that relies on the use of special forms called Dotmocracy Sheets to allow large groups to collectively brainstorm and recognize agreement on an unlimited number of ideas they have authored.

Individual decision-making techniques

- Pros and cons: listing the advantages and disadvantages of each option, popularized by Plato and Benjamin Franklin.^{[13][14]} Contrast the costs and benefits of all alternatives. Also called "rational decision-making".
- Simple prioritization: choosing the alternative with the highest probability-weighted utility for each alternative (see Decision analysis).
- Satisficing: examining alternatives only until an acceptable one is found. Contrasted with maximizing, in which many or all alternatives are examined in order to find the best option.
- Elimination by aspects: choosing between alternatives using Mathematical psychology. The technique was introduced by Amos Tversky in 1972. It is a covert elimination process that involves comparing all available alternatives by aspects. The decision-maker chooses an aspect; any alternatives without that aspect are then eliminated. The decision-maker repeats this process with as many aspects as needed until there remains only one alternative^[16]
- Preference trees: In 1979, Tversky and Shmuel Sattach updated the elimination by aspects technique by presenting a more ordered and structured way of comparing the available alternatives. This technique compared the alternatives by presenting the aspects in a decided and sequential order. It became a more hierarchical system in which the aspects are ordered from general to specific
- Acquiesce to a person in authority or an "expert"; "just following orders".
- Flipism: flipping a coin, cutting a deck of playing cards, and other random or coincidence methods
- Prayer, tarot cards, astrology, augurs, revelation, or other forms of divination.
- Taking the most opposite action compared to the advice of mistrusted authorities (parents, police officers, partners...)
- Opportunity cost: calculating the opportunity cost of each options and decide the decision.
- Bureaucratic: set up criteria for automated decisions.
- Political: negotiate choices among interest groups.
- Participative decision-making (PDM): a methodology in which a single decision-maker, in order to take advantage of additional input, opens up the decision-making process to a group for a collaborative effort.
- Use of a structured decision-making method.

Individual decision-making techniques can often be applied by a group as part of a group decision-making technique.

A need to use software for a decision-making process is emerging for individuals and businesses. This is due to increasing decision complexity and an increase in the need to consider additional stakeholders, categories, elements or other factors that effect decisions