TODA:
Software for Multiple-Criteria Decisions

Cida Sanches, Administration Master’s Program, FACCAMP, Araçariguama, Brazil
Samuel Ferreira Jr, SENAC University Center, Jundiaí, Brazil
Givaldo Santos, UFScar: University Federal Sao Carlos, Campinas, Brazil
Marisa Regina Paixão, UNIP: University Paulista, São Paulo, Brazil
Manuel Meireles, Administration Master’s Program, FACCAMP, Araçariguama, Brazil

ABSTRACT

This paper describes the use and application of the TODA (Trade-off Decision Analysis) method through a case study. The method uses the concept of trade-off applied to a prioritization matrix and, to define the weights, it takes the concept of causality into account. Studies have shown that the TODA achieves the same results as the competing AHP method. However, it is easier to operate. The methodology used is a case study concerning the choice of the type of car for a fleet of vehicles to be driven by salespeople. Together with the software application process, the methods that aided the weighting of the criteria are described and how the values of the alternatives are converted into coefficients of the objective function. The results clearly show that the method is easily applied, but the limitations of the case study method preclude forming generalizations.

KEYWORDS


INTRODUCTION

The decision-making process is recurrent in any organization, no matter its size or type. A decision is “a course of action chosen by the decision maker as the most effective available to achieve a goal or goals to solve a problem that worries him” (Jones, 1964, p. 23). Deciding is an action in the daily routine of companies of any size, to such an extent that authors such as Ansoff (1965) and Simon (1976) view it as the essence of managerial activities and, fundamentally, a decision-making process, which in turn is an eminently human activity.

The end of the decision-making process results in a decision that, according to Drucker (1967), is a systematic process of clearly defined elements that follow the following steps:

1. Classifying the problem;
2. Defining the problem;
3. Specifying the answer to the problem;

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4. Deciding what is right rather than acceptable in order to meet the boundary conditions;
5. Building into the decision the action to carry it out; and
6. Testing the validity and effectiveness of the decision against the actual course of events.

The purpose of this paper is to describe the use and application of the TODA (Trade-off Decision Analysis) method by comparing it with the AHP method through a case study. According to Robbins and Coulter (2015, p.123), as the decision maker does not have all the information necessary for the decision, his rationality is bounded and the result is that “managers satisfy rather than maximize.” That is, they accept decisions that are ‘good enough’.

In the classical theory of management, linked to the positivist tradition of social science, rationality is defined as “the adequate choice from among alternatives and the suitable choice of a means of achieving set goals” (Oliveira, 1993, p.21). According to this concept, every decision should be made rationally, based on complete information on the company’s goals, plausible alternatives, the probable results of these alternatives and the importance of these results to the organization (Cho, 2003).

According to Etzioni (1964), decision theory, which is fundamentally prescriptive, prescribes the steps to a rational decision. There has been growing interest in linking it to descriptive theories, which register and analyze how and under which conditions decisions are made. For a choice to be rational from an economic viewpoint, it is necessary for it to have the following characteristics:

1. Be complete, meaning that an individual must be capable of choosing from alternatives, e.g., should be able to say whether he prefers A or B;
2. Be transitive, meaning that if an individual is capable of perceiving that he prefers A to B, and B to C, then he must prefer A to C: \( A > B > C \rightarrow A > C \).

Decision-making can also be viewed as an effort to resolve the dilemma of conflicting objectives, which impedes the existence of the “optimum solution” and leads to a search for the “best solution that can be arranged” (Schmidt, 2003).

A decision may contain one, two, or more criteria for choosing. When there is only one criterion, the rational choice is to maximize the criterion variable (lowest price, maximum deadline, lowest cost, etc.). When there are two or more criteria, the decision is referred to as a multiple-criteria decision and the problem of choice has to take the relative importance of each criterion into account. Making decisions based on a set of actions based on potentially conflicting criteria is known as multiple-criteria decision-making (MCDM) (Yoon & Hwang, 1995).

To aid decision makers facing this type of decision, some multiple-criteria support methods have been created. Multiple-criteria methods give decision makers the help they need to arrive at the best solution for their requirements. These methods allow criteria that cannot be transformed into financial values to be evaluated. They are useful for comparing alternative projects, policies, and courses of action and for analyzing specific projects, identifying their level of global impact, the most effective actions and those that require modifications (Stirling, 1997).

MCDM aid methods can be divided into two main schools: the French and the American.

According to Belton and Stewart (2002), the methods developed in Europe are jointly referred to as the French School of Multiple-Criteria Decision Aid (MCDA). These methods enable the preparation of a more flexible model of the problem, not considering the comparison of alternatives compulsory and not requiring the decision analyst to rank the criteria in a hierarchical structure. Ehrlich (1996) explains that these methods, instead of considering the intensity of a preference, consider the attractiveness or lack thereof (indifference), ranking sets of decision components. The most well-known methods of the French School are:
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