Muomah Chinedum Frederick

MULTI-CRITERIAL METHOD. ANALYTIC HIERARCHY PROCESS.

The analytic hierarchy process (AHP) is a structured technique for organizing and analyzing complex decisions, based on mathematics and psychology. It was developed by Thomas L. Saaty in the 1970s and has been extensively studied and refined since then.

INTRODUCTION

Multiple-criteria decision-making (MCDM) or multiple-criteria decision analysis (MCDA) is a sub-discipline of operations research that explicitly evaluates multiple conflicting criteria in decision making (both in daily life and in professional settings). Conflicting criteria are typical in evaluating options: cost or price is usually one of the main criteria, and some measure of quality is typically another criterion, easily in conflict with the cost.

I. Analytic Hierarchy Process

AHP is a form of multi-criteria analysis. The approach involves decomposing a decision problem into a hierarchy of sub-problems. As shown in Figure 1, the hierarchy contains the decision goal, the objectives or criteria to be achieved, and the alternatives to be evaluated using the criteria. Once the hierarchy is built, the various elements of the hierarchy are evaluated, typically using paired comparison. AHP provides methods for quantifying the elements of the hierarchy and for evaluating the alternatives. Some project portfolio management (PPM) tools use AHP for project prioritization. There are many variations of AHP and how it is applied, making it difficult to provide general statements about AHP's effectiveness for prioritizing projects. AHP involves the mathematical synthesis of numerous judgments about the decision problem at hand. It is not uncommon for these judgments to number in the dozens or even the hundreds. While the math can be done by hand or with a calculator, it is far more common to use one of several computerized methods for entering and synthesizing the judgments. The simplest of these involve standard spreadsheet software, while the most complex use custom software, often augmented by special devices for acquiring the judgments of decision makers gathered in a meeting room.

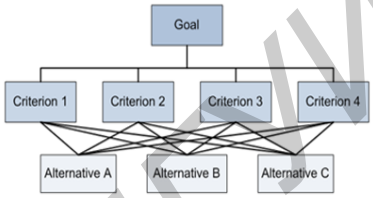

Figure 1 – AHP decomposed form

The procedure for using the AHP can be summarized as:

1. Model the problem as a hierarchy containing the decision goal, the alternatives for reaching it, and the criteria for evaluating the alternatives.
2. Establish priorities among the elements of the hierarchy by making a series of judgments based on pairwise comparisons of the elements. For example, when comparing potential purchases of commercial real estate, the investors might say they prefer location over price and price over timing.
3. Synthesize these judgments to yield a set of overall priorities for the hierarchy. This would combine the investors' judgments about location, price and timing for properties A, B, C, and D into overall priorities for each property.
4. Check the consistency of the judgments.
5. Come to a final decision based on the results of this process.

Bibliography

1. Saaty, Thomas L.; Peniwati, Kirti (2008). Group Decision Making: Drawing out and Reconciling Differences.

Муомах Чинедум Фредерик, студент 5 курса факультета информационных технологий и управления БГУИР, avogador@yahoo.com.

Научный руководитель: Батин Николай Владимирович, старший преподаватель кафедры информационных технологий автоматизированных систем Белорусского государственного университета информатики и радиоэлектроники+, batin@bsuir.by.