

COMBINING OF AHP WITH GOAL PROGRAMMING IN DECISION MAKING

Ying Pan
Siyang Science and Technology Center
Fengtai, Beijing, China

Abstract: An organization gets a fixed yearly fund in the future five years. The fund will be used to purchase equipment for 20 service teams. A five-year procurement and allocation plan is needed with the purpose that the demand for equipment of all teams be met as much as possible.

The plan is devised by combining the two approaches of Analytic Hierarchy Process(AHP) and Goal Programming (GP).

After the quantity and types of equipment are determined the plan is shaped in four working steps as shown in figure 1.

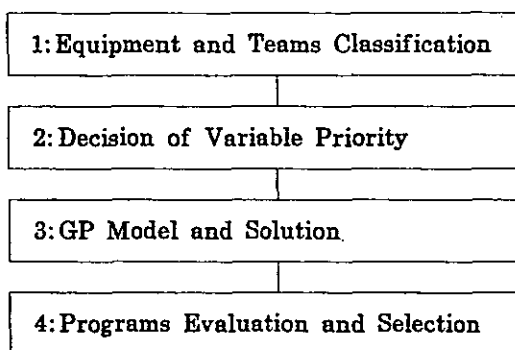


Fig. 1 Working Steps

Step 1: Equipment and Teams Classification

In order to reduce the number of variables in the GP model, the selected equipment is classified into several grades according to the cost and utilization ratios. The teams are classified into three levels according to the task of each team. Then AHP is applied to this step. After step 1, the number of variables in the GP model is reduced to less than 100.

Step 2: Decision of Variable Priority

In GP each important variable should be appointed a priority so GP could come up with the optimal program. Any change in the priority of variables may cause some changes in the outcome. Although some variables can be easily assigned priorities, such as high grade equipment of high level teams or low grade equipment of low level teams, most variables are difficult to set. Hence AHP approach, which has been proved to be highly effective in solving similar problems, is employed in this step. After AHP method is used in priority decision, the GP model generates more reliable and flexible programs than is possible without AHP.

Step 3: GP Model and Solution

(GP model omit)

Following programs are available:

- a. The teams are equipped in order of their levels. The higher the team's level, the more privilegedly it is equipped.
- b. 60% of equipment needed by each team is purchased according to its grades. Namely, the money available will cover the cost of the highest grades of equipment which takes up 60% of all the equipment needed by each team. The rest of the equipment will be considered after all teams get their 60% of equipment if the budget still allows.
- c. The equipment needed by all teams is purchased in order of its grades while the team level factor is considered secondary.

Step 4: Programs Evaluation and Selection

Several programs are generated in step 3, which are evaluated and selected by using AHP approach just in the manner that many successful instances of evaluation and selection have been carried out.