Multiattribute Utility (MAU) Model

Some decisions are complex, and using a decision aid is often helpful. Described here is one such aid, which involves creating a multiattribute utility model or MAU model. Despite its somewhat scary name, the process of building such a model is not a difficult one, and it can help a decision maker structure a problem or decision. Once the alternatives have been identified, the process involves determining the appropriate criteria (i.e., the attributes which give the model its name) on which to judge the alternatives, how important these criteria are in relation to each other, and how well the alternatives stack up against these criteria. The model then brings all this information together into a single score (that measures the overall utility of each alternative) so that the decision maker can make appropriate recommendations. In this way, using the model can either aid in making an initial decision or reinforce a decision that has already made.

Building the model and making the appropriate calculations can be done with pencil, paper, and calculator. However, it is recommended that you construct a spreadsheet to organize your input and perform the requisite calculations. Read through these instructions completely before proceeding so that you will have a better idea about how to set up your worksheet. The process follows these five steps:

Step 1: Define the alternatives and the attributes or criteria on which you choose to evaluate the alternatives.

For this project, the alternatives are the various health insurance plans that you can contract with. As you are dealing with a relatively small number of plans, all of which serve the geographic area in which you are located, you can evaluate all of them unless you have a reason to eliminate one or more of the plans from consideration. (If this is the case, include in your write-up which plan(s) and why.) Regarding the attributes or criteria, you will need to choose a subset of the performance indicators or measures presented in the report card as it would be too difficult and time-consuming to include the full set of items in your model. Choose 6-8 items included in the report, perhaps creating a set of items from across the major performance categories (e.g., Women's Health, Access and Service, etc.) rather than choosing all your criteria from one performance category. If the amount of the premium is important, include that as well. (Hint: It will make your task easier if you choose indicators on which all or most of the plans have been scored. However, if an indicator is important to you and a particular plan has not been scored on that indicator, you may choose to

keep the indicator and impute some value for that plan's performance. If you do so, note in your write-up how you accommodated this.)

Step 2: Evaluate each alternative separately on each attribute.

The intent of this step is to evaluate the extent to which an alternative (here, an insurance plan) "satisfies" or performs on an attribute (here, a performance indicator or measure). There are different ways to accomplish this. You can use a direct rating method to evaluate each plan on each attribute. Each plan receives a rating for each performance measure. The first step is to give 100 points to the plan with the highest rating and 0 points to the plan with the lowest score. Then you can assign points to the remaining plans that express each of these plan's performance relative to the best and worst scoring plans. Another method is to try to use the ratings in the report card that each plan receives for each performance measure. You can use either the actual performance score provided or create some proxy based, for example, on plan performance relative to statewide average. If cost is important to you, use the premium information provided and create some proxy measure to express the differences between plans. The important thing is to be consistent so that all the measures are evaluated in the same way. Whatever approach you choose, describe it in your write-up.

At this point, your worksheet (electronic or otherwise) should have the plan names as column headings across the top, the various performance indicators (your attributes) down the rows to the left, and your numerical measure of performance in each box corresponding to each plan and the attribute of interest. Go on to the next step.

Step 3: Assign relative weights to the attributes.

To complete this step, you need to assess the relative importance of each of the attributes (the performance indicators) you have included in your model. There are several methods that can be used to accomplish this. For our purposes, it is recommended you do this in two steps:

1. Rank order the performance measures in order of importance to you, from most to least important.

2. Assign a weight to each performance measure that reflects its importance relative to the others and so that the total weights sum to 100. The key is to create relative weights, so that if measure A is assigned a weight of 30, measure B a weight of 10, and measure C a weight of 10 you are saying that measure A is three times as important as measures B and C and that measure B and measure C are of equal importance. (If it's too difficult to keep the sum of the initial weights to 100, proceed with your weighting using whatever

values it's easiest for you to work with and then normalize by adding the weights together, summing them, and dividing each individual attribute weight by the sum to get a final relative weight for each attribute.)

Note these final relative weights on your worksheet for each of the attributes. These weights will apply to all the plans. If you're using a spreadsheet, insert a column to the right of the attributes, as this will facilitate completing the next step.

Step 4: Aggregate the scores from Step #2 and the importance weights from Step 3.

Now comes the math part, which should be relatively simple if you've constructed a spreadsheet for this exercise. In this step, we calculate the total weighted score for each of the plans. For each plan, we determine that score, multiply the score or a performance indicator for an attribute by the importance weight you assigned to that attribute, and aggregating these products across all attributes. Basically, you're calculating a weighted score for each plan that is represented mathematically as:

Total weighted score$_i$ = Σ $w_j u_{ij}$

where w_j is the relative weight you assigned to a performance indicator j, and u_{ij} is the performance score for plan i on indicator j. In this way you obtain an overall evaluation of each plan across the criteria by which you have chosen to evaluate the plans. If you used the direct weighting method to assign ratings to the plans as described in Step #2 above, plan scores will be out of 100 points. This may or may not hold if you used some other method to assign ratings, although whatever method you use isn't important as long as each plan's score on an indicator reflects its performance relative to the others, and the process is applied consistently. In your write-up, note which four plans you would recommend at this point and why.

Step 5: Perform sensitivity analyses and make recommendations.

Doing a sensitivity analysis-changing one or more parameter values and redoing the calculations to see whether any change in our inputs changes our recommendations-is a desirable last step for any decision modeling. For purposes of this exercise, change a couple of the weights you assigned to some of the criteria and recalculate the aggregate scores for each plan to see if these adjustments change your recommendations. However, make significant changes (i.e., adding or subtracting 10 points or more from various attributes), as you would find that the results might not be sensitive to smaller changes in the relative weights you've assigned to each attribute or criteria. Describe this sensitivity analysis and the resulting changes in your recommendations, if any.

Constructing a MAU model can be of value to managers as decision makers as an aid to decision making. It obviously can have many applications, such as choosing which candidate to fill a position (or, from another perspective, choosing which job opportunity to take); evaluating potential site locations for an organization; or deciding on marketing strategies, just to name a few. When making important decisions that may involve several alternatives and criteria against which each alternative needs to be judged, the MAU model provides a logical and well-defined process that can aid in making a decision.