AHP Survey Technique

**Draft 08 - 12**

This note is to suggest how you might actually use AHP in a survey or interview. Right now, it’s just theory but I am thinking that by using the suggestions in this document you might be able to introduce it to your respondents. (See the AHP tutorial on the Milagrosoft.com site for lots more detail). This draft uses a common situation to illustrate the resolution of a multilevel decision question.

**Cut to the Chase**

Let me introduce this AHP approach by teasing apart a common decision situation. Suppose you or I are planning a party for beer drinkers. What I want to do is to choose the best beer for the party but - there are several criteria I would like to consider explicitly before I buy, namely cost as well as taste. Introducing these two criteria means I have a multi-level decision question like in the diagram below. That is, I have introduced a layer of decision between the lowest level alternatives and the top level goal. Usually, I would just choose one of the alternatives directly by intuition, but AHP allows me to explicitly consider the intermediate criteria.

![Initial Decision Structure - Choosing a Beer for the Party](Image)

O.k., say I am considering 4 beers, these are my alternatives: Budweiser, St. Pauli Girl, Mohlson, and Guiness Extra Stout - and my top goal is to choose to buy one of these for my party.

I suggest setting up an AHP survey/interview procedure in phases as follows:

**Judgments Within the Taste Context**

*Phase I: In the context of taste what are my preferences?*

Here is how I would rank them, just based on taste, not yet saying how much better one is than the other but only that it is better.

*Guiness, St. Pauli Girl, Mohlson, Budweiser.*

This says that I prefer Guiness to St.Pauli, to Mohlson, to Budweiser, as far as taste goes. Notice that I haven’t said by how much I prefer one over the other. That comes next.
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Note: for this AHP method to work, I have to compare every pair of factors, once. So, a systematic way to do this is described below. It is only necessary for a respondent to fill out the upper triangle of the table shown below, with their judgments. All the rest can be mechanically calculated. If the respondent chooses not to order the factors first, that is perfectly ok, but it will take more thinking and dealing with reciprocals.

**Phase II: Given the Preferences of Phase I, Judge the Relative Weights, Pair by Pair**

Write down these Phase I preferences, from best to worst and then use Saaty’s scale (See below “Saaty’s Judgment Scale” on page 4) to weight one over the other, pair by pair.

For example, for row one I have that Guiness compared to Guiness is unity = “1”. Comparing Guiness to St Pauli Girl, I judge Guiness to be a ‘3’. on the Saaty scale. This is interpreted, by me, to mean that Guiness is *weakly* tastier than St. Pauli Girl. For Guiness versus Mohlson I give this a “4”, so I would judge Guiness to be between *weakly* tastier and *strongly* tastier than Mohlson. Finally, for row one, I judge Guiness to be almost *absolutely* tastier than Budweiser.

Row two starts off with St Pauli versus St Pauli, an obvious “1”. Then for St. Pauli over Mohlson I give a 2, and for St Pauli over Budweiser I give a 4.

In row three I judge Mohlson against Budweiser and I give Mohlson a 6 to one taste advantage over Bud. On Saaty’s scale that translates to between strongly and very strongly tastier. That’s it. This table is all I need to determine the relative weights of all the beers in the context of *taste*.

Mechanical consistency will require that the blanks in the table be filled by the reciprocals taken from the upper part of the table. That is, if I say Guiness over Mohlson is a “4”, then I should also say that Mohlson over Guiness is 1/4, but of course the researcher can do that later.

<table>
<thead>
<tr>
<th>TABLE 1. Within the Context of Taste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guiness</td>
</tr>
<tr>
<td>Guiness</td>
</tr>
<tr>
<td>St. Pauli Girl</td>
</tr>
<tr>
<td>Mohlson</td>
</tr>
<tr>
<td>Budweiser</td>
</tr>
</tbody>
</table>

I have reproduced the result of a math calculation that shows the relative importance of these beers in the context of *taste*. The numbers you see are the ratios deduced from the paired comparisons made in the table. For example, Guiness is 0.5529/0.227 = 2.43 better tasting than St. Pauli Girl, while Mohlson is 0.171234/0.0486442 =3.52 better than Bud. The clear winner here is Guiness, which I knew going in, but now I have that it is 0.553/0.049 = 11.37 better than Bud (this is off the scale but is about right)!

```
Priorities
  \{ Guiness    0.552935 \}
  \{ St. Pauli  0.227188 \}
  \{ Mohlson    0.171234 \}
  \{ Bud        0.0486442 \}
```
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Judgments Within the Cost Context

*Phase I: In the context of cost what are my preferences (lower is better)?*

Note that AHP allows you to include known contexts as well as strictly judgmental contexts. In this case I can explicitly look-up the *cost per ounce* of each beer and the method can smoothly include these. In the table below I have entered some (hypothetical) cost figures. To make these judgements I have taken the reciprocal of *cost per ounce* as a measure of preference and called it *cost advantage*. For example, if Bud costs $0.13 per ounce I would convert this to a value of \( \frac{1}{0.13} = 7.69 \), a *good* thing!. If Guiness costs $0.23 per ounce then I would convert that to \( \frac{1}{0.23} = 4.35 \). Mechanically, this would translate to a Bud advantage of \( \frac{7.69}{4.35} = 1.77 \).

*Phase I Ranking the Cost Advantage of the Beers (Using the Reciprocals)*

So, let me assume I have taken each cost per ounce and inverted it to get these cost advantage values. These are my measures of ‘preference’ for each beer. As expected, Bud does very well in this category.

- Bud = 7.69
- Mohlson = 6.67
- St Pauli Girl = 5
- Guiness = 4.35

*Phase II The Paired Judgments Can Be Mechanically Filled Out.*

Now the table below can be mechanically filled out since there is no judgment involved since all the costs and their reciprocals are known. The reader probably can see that I wouldn’t need to construct this table in order to compute the relative weights of these beers, but seeing how the ratios are entered might give some insight into the process underlying other qualitative judgments.

<table>
<thead>
<tr>
<th>TABLE 2. Within the Context of Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budweiser</td>
</tr>
<tr>
<td>Mohlson</td>
</tr>
<tr>
<td>St. Pauli Girl</td>
</tr>
<tr>
<td>Guiness</td>
</tr>
<tr>
<td>Budweiser</td>
</tr>
<tr>
<td>Mohlson</td>
</tr>
<tr>
<td>St. Pauli Girl</td>
</tr>
<tr>
<td>Guiness</td>
</tr>
</tbody>
</table>

After some calculations, the priorities (relative cost advantages) of the 4 beers are:

<table>
<thead>
<tr>
<th>Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bud 0.324477</td>
</tr>
<tr>
<td>Mohlson 0.281213</td>
</tr>
<tr>
<td>St. Pauli 0.21091</td>
</tr>
<tr>
<td>Guiness 0.1834</td>
</tr>
</tbody>
</table>

As expected, Bud is the best in this category in ratios of \( 0.32/0.28 = 1.14 \) with respect to Mohlson and \( 0.32/0.18 = 1.8 \) with respect to Guiness.

*Ok, Now What?*

We now have the alternatives prioritized against each intermediate criterion, *taste* and *cost*. But
what is the relative importance of \textit{taste} to \textit{cost}? That is an unknown at this point, so we need one more comparison table. This will be very simple, so stay with me!.

\begin{table}[h]
\centering
\caption{Within the Context of Beer Buy}
\begin{tabular}{|c|c|c|}
\hline
 & Taste & Cost Advantage \\
\hline
Taste & 1 & \(\frac{1}{3}\) \\
Cost Advantage & 3 & 1 \\
\hline
\end{tabular}
\end{table}

So, for my party where I expect a lot of guests, \textit{cost advantage} is (weakly) more important than taste, not overwhelmingly, but still more important. Calculating the relative weights of these two factors in the context of the top goal yields the priority vector below. Since I am having a lot of guests, cost advantage becomes important, even a little more important than taste.

\[
\text{Priorities} = \begin{pmatrix}
\text{Taste} & 0.25 \\
\text{Cost} & 0.75
\end{pmatrix}
\]

**Rolling Up the Intermediate Judgements Into the Top Goal Context.**

We now have the picture below where I have placed the priority values on the links in part (a). Once I have all these priorities I can combine them as in part (b) to get the overall priority vector (c) showing the relative importance of the alternatives. No real surprises here since the initial \textit{taste} judgement was so overwhelming in favor of Guiness! But is does show the relative improvement of Bud versus Guiness due to the importance of \textit{cost advantage} over \textit{taste}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2}
\caption{Weighted Decision Structure - Choosing a Beer for the Party}
\end{figure}

**Saaty’s Judgment Scale**

You can find this scale in all of Saaty’s books (see references).
Intuitive Features of AHP

You will need to explain to the people what they are supposed to do when they use this AHP process and how they can do a little self checking as they go along. Remember, once a person has ordered the factors from highest importance to lowest, the numbers in a judgement row can't go down, they must go up or stay equal. Here is another weights example where I show what the judgments would ideally look like.

**Phase I**

Suppose a respondent, Kim, has ranked some boxes labeled A, B, C, D with respect to their Weight. (Kim doesn't know the box weights but we do!) as below: That is, before Kim does a detailed examination, she has judged these weights in the order, most important (weighty) first as: B, A, C, and then D.

This is common in surveys: you are asked to rank, say, four factors in importance using numbers 1 through 4. Same thing here, except I am asking Kim to write the labels rather than numbers in order. O.k, here is Kim’s line-up. B is most important (weighty) followed by A then C then D. This doesn’t say how much more important one is than the other nor the overall importance priorities, nor anything about judgemental consistency. That’s phase II.

**Phase II**

If Kim had perfect judgement she would say the following:
For the first row, she would judge the importance of B over B as “1”, B over A as 100/80 = 1.25, B over C as 100/50=2 and B over D as 100/10=10. Notice that the numbers in a row can only go up (given that we have previously ranked them in importance).

For the second row, she would start with column “A” and judge A over A as “1”, A over C as 80/50= 1.6, and A over D as 8.
For row three she has, C over C= “1”, C over D = 5.

Done! She needed 6 comparisons.

Now, your task as a researcher begins..

You now fill out the complete matrix by taking reciprocals to get matrix shown. Notice that if the
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respondent had perfect judgement, they could have placed these actual weights as numerators and denominators, as shown!

\[
\text{matrix} = \{
\begin{array}{llllll}
100/100, & 100/80, & 100/50, & 100/10, \\
80/100, & 80/80, & 80/50, & 80/10, \\
50/100, & 50/80, & 50/50, & 50/10, \\
10/100, & 10/80, & 10/50, & 10/10,
\end{array}
\}
\]

Doing some math calculations (explained in the AHP main tutorial), Kim gets the priority vector of boxes with respect to weight, as follows:

\[
\text{Priorities} = \begin{bmatrix}
B & 0.416667 \\
A & 0.333333 \\
C & 0.208333 \\
D & 0.0416667
\end{bmatrix}
\]

As expected, for example, the ratio of B to A is 0.416667/0.333333 = 100/80, B to C is 100/50, and so on through the remaining priorities. So, given accurate judgments, this approach yields the relative importance of these factors (in the context of weight). Notice also that I haven’t calculated the consistency ratio since these are perfect judgements, pretty unusual I would say! All the details are below and as you can see, the consistency ratio is zero.

\[
\text{Eigenvector} = \{10., 8., 5., 1.\}
\]
\[
\text{Eigenvalue} = 4.
\]
\[
\text{Priorities} = \begin{bmatrix}
B & 0.416667 \\
A & 0.333333 \\
C & 0.208333 \\
D & 0.0416667
\end{bmatrix}
\]
\[
\text{Consistency Index} = 0.
\]
\[
\text{Random Consistency Index} = 0.9
\]
\[
\text{Consistency Ratio} = 0.
\]

**Note**: A Consistency Ratio of less than 0.10 is considered acceptable.

**Quality Insulation Example**

Just to set up another simple example, suppose you are tasked with choosing insulation material for a building in a very remote location. Suppose further that you are on-site and have only a limited choice of insulation materials. You must choose from three possible samples of insulation left by the previous contractor. The samples are packed in three similar boxes and you can see a cost marked on each box, but no weights are indicated. You don’t have a scale and so will have to guess at the weights.
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The weight of each box relates to its *quality* (heavier is better for your purposes). Cost of course, will differ between the materials and is another factor you need to consider. That is, one cubic foot of one material might weigh 10 pounds while a cubic foot of another material might weigh 20 pounds and so suggest higher quality but will also have a higher cost. Your task is to balance cost versus quality (the usual dilemma)!

This exercise is to determine the *Best Overall Material* of the three insulation materials, taking into account both Cost and Weight, as represented by the three boxes, that’s your *top level goal*.

Notice that AHP allows you assess the importance/impact of a bottom level set of alternatives on a top level goal, *taking into account any number of intermediate goals/factors*. Plus, you get information on the consistency of all judgements made thus allowing you to improve them. I don’t know any other method that is designed to do this.

The figure below is suggestive of the box densities - lighter shade means less dense

![FIGURE 3. Three same-sized boxes of Insulation material, differing in Cost and Weight](image)

So, the situation here is that there is a top level goal, *Best Overall Material*, which has an intermediate set of criteria, Quality (Weight) and Cost, and a bottom set of alternatives, {Material I, Material II, Material III}, represented by the three boxes. What I am asking is that you explicitly and publicly take into consideration the intermediate layer as you make your ultimate judgement on the best material to use for insulation.

You will be asked to judge the weights and the costs, using paired comparisons. In the case of the weights, I will ask you (if in a group, then geometric average the estimates) to make paired comparisons by picking up pairs of boxes and recording which seems heavier to you, and by what ratio or importance. See “Judgement Table” on page 13).
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Setting up the questionnaire or interview for the general respondent

To make this AHP process work we need to guide the user to answer the AHP questions in an understandable and simple manner.

So, ask each AHP question in two phases. The first phase asks only that they rank the factors in a given context, while the follow-on phase asks for a pairwise ratio/importance response for each of those ranked factors. Let me continue on with the insulation decision introduced above.

**Phase I: Rank the factors so that subsequent pair comparisons will be greater or equal to “1”**

If you can get the respondent to initially rank the alternatives in order of preference that will make the subsequent judgments easier.

Given the context that you are going to choose some insulating materials, that is, the goal is “Best-Material”, ask the user to write the two factors at the next level down, left to right, by order of importance. For example, they might write:

Cost Advantage, Weight

This means that they consider Cost Advantage (here I will use the reciprocal of Cost as a measure of positive importance), more or equally heavier/importance than Weight (what they don’t say is how much more important Cost Advantage is than Weight, that’s phase II)!

**Context: Best-Buy**

Cost Advantage, Weight

**FIGURE 5. Phase I Response, Rank in Importance, Left to Right.**

**Phase II: Pair compare the ranked factors using Saaty’s Scale**

Now, under the line containing Cost, Weight ask them to assess Cost vs. Weight using Saaty’s
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scale of 1-9. Remember, the dominant factor is to the left which means that its importance will be one or more relative to the factor to its’ right. So, the question is: how much more important is Cost than Weight? If they say ‘4’, they mean Cost is between weakly and strongly more important than Weight. (See “Saaty’s Judgment Scale” on page 4).

**Two Factors Only Need One Pair Comparison**

Suppose you mark in the numbers below. Note that the number under Cost has to be a “1” since Cost compared with Cost is equality: I have bolded this judgement.

<table>
<thead>
<tr>
<th>Context: Best-Buy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Advantage</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

As far as the user goes, they’re done! You can take it from there. Now moving down a level let me compare the three materials first in the context of Weight. You will see that Cost Advantage can be done mechanically, all within the AHP process.

**Three Factors Only Need Three Pair Comparisons (Note the ‘anchoring “1” in the Diagonal)**

Phase I: Rank the three materials in importance (importance here is an actual physical ratio judgement) in the context of **Weight**.

Phase II: Pair compare using Saaty’s scale.

This result is shown in the next figure. The interpretation goes like this:

First line shows Material II is perceived as 3 times the weight of Material III

First line shows Material II is perceived as 6 times the weight of Material III

Second line shows Material II is perceived as 2 times as heavy as Material I

<table>
<thead>
<tr>
<th>Context: Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material II, Material.III, Material I</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

**Four Factor Comparisons (Need Six Paired Comparisons)**

Suppose I wanted to also assess a fourth material, say Material IV.

Phase I: Rank the four materials, write them out on a line, left to right in order of importance.

Phase 2. Make the six paired comparisons as in the diagram below.
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So, anchoring on Material II, judge Material II against Material III, then judge Material II against Material IV, and finally judge Material II against Material I. (Each of these judgments should be greater or equal to one). This last judgement on line 1 says that Material II is 5 times as weighty as Material I.

Moving down a line, and anchoring on Material III, this says Material III is 3 times as weighty as Material IV and 6 times as weighty as Material I. Finally, Material IV is twice as weighty as Material I.

Five Factor Comparisons (Need 10 Paired Comparisons)

This last discussion will illustrate how you might handle 5 factors. After five factors things get more tedious although, that depends on the importance to you. For example, 6 factors would need 15 comparisons while 7 factors would need 21 paired comparisons. I might as well use the materials example and add one more, say Material V. Suppose the ranking has resulted in the ordered list shown in the diagram below. (Note that I have simply copied the previous diagram and added a Material V entry at the end).

<table>
<thead>
<tr>
<th>Material II, Material III, Material IV, Material I</th>
<th>Material V</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Step By Step Calculations for Priority and Consistency

This section is for those who don’t have access to a computer package or just want to work things out for themselves! The math is shown in the AHP tutorial on this site or by referring to Saaty’s works.

Step 1. Construct a table for the Best Buy context and insert the two subgoals as below. Use the numbers in the judgement table (see “Judgement Table” on page 13). In the context of Best Buy, judge the importance of quality versus cost (using weight as a surrogate measure for quality). You should get a number from 1 to 9, or its reciprocal. Note that “1” is automatic for every diagonal since this represents the ratio of importance of a factor with itself, which is equal or “1”.

<table>
<thead>
<tr>
<th>Material II, Material III, Material IV, Material I</th>
<th>Material V</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Step By Step Calculations for Priority and AHP Survey Technique

**TABLE 4.**

<table>
<thead>
<tr>
<th>Best Buy (context)</th>
<th>Quality (weight)</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality (weight)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*Best Buy priority vector =*

*Consistency Index =*

*Consistency Ratio =*

Step 2. Construct a table for Cost, (this is the easy one to do, why?) and place the three choices in it. Make the comparisons, (you only need to make 3 comparisons). Calculate the priority vector and place those priorities on the lines from cost to the choices. I will give you the prices as follows (this means you don’t have to do any paired comparisons, just use these values directly.):

- Box I, cost = $20
- Box II cost = $30
- Box III cost = $60

**TABLE 5. Comparison of Boxes in Context of Cost**

<table>
<thead>
<tr>
<th>Cost (context)</th>
<th>Box I</th>
<th>Box II</th>
<th>Box III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box II</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Box II</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Box III</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

*Cost priority vector =*

*Consistency index =*

*Consistency ratio =*

**Step 3. Fill out the Weight Table Below, using Paired Comparisons!**

**TABLE 6. Comparison of Boxes in Context of Weight**

<table>
<thead>
<tr>
<th>Weight (context)</th>
<th>Box I</th>
<th>Box II</th>
<th>Box III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box I</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Box II</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Box III</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Step By Step Calculations for Priority and AHP Survey Technique

Cost priority vector =
Consistency Index =
Consistency Ratio =

Calculating any Priority Vector

Here is a rough and ready way to calculate any priority vector, given that you have filled out the paired comparisons table. (Adapted from Saaty’s examples)

1. Normalize each column, that is:
   - Sum the values in each column
   - Divide each element in that column by its sum. This causes the total of a column to be one, and so is called Normalized. Do that for every column.

2. Sum each row and divide by the number of columns.

3. The resulting vector is (an estimate of) the priority vector. The numbers in this vector are ratios and allow you to assess the ratio importance of the associated factors.

4. Call this resultant vector the priority vector and denote it as $p$, it will be used in the next step.

Calculating the Eigenvalue

1. Matrix multiply your paired comparisons matrix with the priority vector $p$, call this result the vector $V$.

2. Divide $V$ by $p$, component by component.

3. Average the components of the result of step 2, that is the approximate eigenvalue

4. The eigenvalue is just a number, like 3.28

5. Call this resultant value the eigenvalue and denote it by $ev$.

Calculating How Consistent Your Judgments Are

1. From the eigenvalue step above, calculate the consistency index $= CI$ as $(ev - 1)/(\text{number of columns} - 1)$

2. Divide CI by the random consistency value from the table “Random Consistency Matrix Values”

3. The result of step 2 is called a consistency ratio, $CR$ and if less that about 0.10, is considered ‘good enough’. If much higher, then you need to go back and look at the matrix entries and calculate again.

Now Combine the Three Priority Vectors You Have Calculated

This assumes the Best-Buy exercise with Weight and Cost as the intermediate level goals and Material I, Material II and Material III as the lowest alternatives.

1. Call the weight vector $w = \{w_1, w_2, w_3\}$

2. Call the cost vector $c = \{c_1, c_2, c_3\}$
3. Call the best buy vector \( b = \{b_1, b_2\} \)
The final priority vector of materials in the context of Best-Buy is calculated as:

\[
\text{materialPriorityVector} = b_1 \times w + b_2 \times c
\]

**Random Consistency Matrix Values**

This is Saaty’s matrix of random consistency indices. You can compare yours against these to see if you have improved beyond random judgments!

<table>
<thead>
<tr>
<th>Dimension of (Square) Comparison Matrix</th>
<th>Random Consistency Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0.58</td>
</tr>
<tr>
<td>4</td>
<td>0.9</td>
</tr>
<tr>
<td>5</td>
<td>1.12</td>
</tr>
<tr>
<td>6</td>
<td>1.24</td>
</tr>
<tr>
<td>7</td>
<td>1.32</td>
</tr>
<tr>
<td>8</td>
<td>1.41</td>
</tr>
<tr>
<td>9</td>
<td>1.45</td>
</tr>
<tr>
<td>10</td>
<td>1.49</td>
</tr>
</tbody>
</table>

**Saaty Suggested Questionnaire Layout for Four - Factor Comparisons**

This is a layout suggested by Saaty and is an alternative to the approach I have presented earlier. The layout below lets the user come in from either side to assess the other factor. On the other hand, in my approach I use the first phase of a question to determine which is the dominant factor and so set up to have that dominant factor on the left so that all comparisons are greater than or equal to one.
Summary

This exercise and its explanations might go some way to encouraging you to include some AHP in your own questionnaires.

References


Saaty, Thomas,(1980) *The AHP Process*

Saaty, Thomas (1993) *Decision Making for Leaders*