Relative Measurement

Relative measurement consists of pairwise comparisons of two elements with respect to some higher level element in the hierarchy.

For example, a judgment can be made about the relative importance of two objectives with respect to the goal, or the relative importance of two sub-objectives with respect to their parent objective. Each element in a cluster is compared to every other element in the cluster. (In some cases, not all of the possible pairwise comparisons need be made -- saving time at the expense of accuracy.)

If there are n elements in a cluster, there will be $(n*(n-1))/2$ comparisons or judgments since each element is assumed to be equal to itself, and the judgment of elements b to a is assumed to be the inverse of the judgment of a to b.

Since AHP hierarchies are generally structured with at most 7 plus or minus 2 elements in any cluster, there would, for example, be 10 pairwise comparisons or judgments for a cluster with 5 elements, 21 for a cluster with 7 elements, 28 for a cluster of 8 elements, and 36 for a cluster of 9 elements.

The nonlinear increase in the number of judgments as a function of cluster size is one reason for avoiding clusters with too many elements. However, since some of the $(n*(n-1))/2$ judgments are "redundant," in the sense that priorities can be computed with a minimum of just $(n-1)$ judgments, it is not a paramount consideration.

The "redundant" judgments serve an important purpose in that, in general, the more pairwise comparisons, the more accurate the derived priorities will be. In fact, the computed priorities can be fairly accurate even when some or many of the judgments are themselves not very accurate (for example with verbal judgments translated to ordinal numbers, as explained below). This is analogous to computing the average of a sample – the larger the sample, the closer the average is likely to be to the population mean.

One interpretation of the eigenvector computation is that it is equivalent to taking the average of an infinite number of paths of lengths 1, 2, 3, … involving the pairwise comparisons between the elements in a cluster. For example, the ratio of two elements a to b can be computed as the average of the direct comparison of a to b, and the comparisons of a to c to b, and a to c to d to b, and a to d to c to b, and so on.