

## **ORDINALITY CONSISTENCY TEST ABOUT ITEMS AND NOTATION OF A PAIRWISE COMPARISON MATRIX IN AHP**

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### **ABSTRACT**

The primary objective of this paper is to propose a consistency test for ordinality of items in a pairwise comparison matrix in the Analytic Hierarchy Process (AHP) as in a sensory test. A pairwise comparison matrix in AHP consists of elements expressed on a numerical scale. Since we can consider a numerical scale as an ordinal scale, we can transform the pairwise comparison matrix to one expressed on an ordinal scale. Additionally, we are interested whether the hypothesis that items in a pairwise comparison matrix are ranked linearly according to the transformed one is valid or not. In 1940 Kendall and Babington Smith proposed a consistency test about ordinality of items using the number of circular triads in a preference table without ties and we have used it now in a sensory test. In this paper we show how to apply their test to a pairwise comparison matrix in AHP. Difficulties have been apparent when applying it to a pairwise comparison matrix with a tie in AHP, though it is easier to do so without ties. As a consequence, we propose a method of applying it to one with a tie in AHP. Furthermore, we have researched a method of describing a pairwise comparison matrix in which relations among items can easily be observed, for instance rough-and-ready ordinality of items. A further purpose of this paper is to propose useful notation of a pairwise comparison matrix in AHP with some conditions and enumerate an example of showing its effectiveness.

Keywords: pairwise comparison matrix, consistency test, circular triad, notation