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A COMPARISON STUDY OF FUZZY AHP-BASED MCDM METHODS ON GREEN CONCEPT SELECTION PROBLEM

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Abstract

The demand for green products has dramatically increased because the importance and public awareness of the preservation of natural environment was taken into consideration much more last two decades. As a result of this, manufacturing companies especially have been forced to design more green products, resulting in a problem of how they incorporate environmental issues into their design and evaluate concept options. The need for practical decision-making tools to address this problem is rapidly evolving since the problem turns into a multiple-criteria decision making (MCDM) problem in the presence of a set of green concept alternatives and criteria. Therefore, in this paper, the three popular MCDM methods in fuzzy environment are

utilized to reflect the vagueness and uncertainty on the judgments of DMs, because the crisp pairwise comparison in these conventional MCDM methods seems to be insufficient and imprecise to capture the right judgments of DMs. Of these methods; as F-AHP is used to calculate criteria weights, the other methods; F-TOPSIS, and F-GRA are used to rank alternatives in the two different ways for a comparative study. Furthermore, the incorporation of fuzzy set theory into these methods is discussed on a real-life case study, and a comparative analysis is done by using its numerical results in which the two fuzzy-based methods reveal the same outcomes (or rankings), while F-GRA requires less computational steps.