Chapter 10
Single-Valued Neutrosophic ARAS Based on Multi-Criteria Group Decision-Making for a School Selection

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ABSTRACT

Education is a crucial aspect in determining the progress of a nation. However, selecting a good school is a challenge. Therefore, the chapter offers a solution by applying the theories of single-valued neutrosophic numbers (S-VNNs) and the additive ratio assessment (ARAS) method for a school evaluation. This performance evaluation is viewed as a process involving a committee of school performance judgments and a list of senior high schools. The committee gives professional assessments of the school's performance by using S-VNNs. To conquer this, the chapter first presents the basic theory of S-VNNs with some of their mathematical operations and their two Einstein aggregation operators. The chapter then proposes an improved

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ARAS method based on S-VNNs to handle a multi-criteria group decision-making problem. Next, the chapter demonstrates an illustrative example using the improved ARAS method to select the favorite school. Finally, comparison analysis with other decision-making methods is presented to prove the feasibility and capability of the proposed ARAS method.

1. INTRODUCTION

According to Slot *et al.* (2020), schools are made up of groups of people that are coordinated and managed to work toward shared goals. Academic directors oversee, supervise, and set the direction for the schools. Academic directors make decisions regularly while organizing, carrying out, and reviewing routine tasks. To promote student learning, academic directors should have a clear vision, align the curriculum, learning, and assessment, and pay attention to staff and working environment needs (Alm *et al.*, 2019).

The most crucial component and core duty in managing any school is to make judgments by considering other significant aspects into account. For instance, a high concentration of "small" schools may provide several difficulties. Fewer students in each school suggest higher per-student spending. In addition, when focusing on financial constraints, a profusion of "small" schools may indicate that each one lacks fundamental facilities and instructional materials (Dongre and Tewary, 2020).

A school's performance can be investigated based on a variety of aspects. These include teaching atmosphere, academic staff performance, student bullying, and infrastructure quality. However, it is difficult for evaluators to deliver accurate information because of the complexities of the external influences, uncertainty, and limitations of human intervention. It is necessary to have an instrument for proper, realistic, and efficient school assessment in the factual decision-making system (Irvanizam and Zahara, 2023). People commonly rank a particular index or item using natural language terms like "great," "good," "weak," and "bad" when making decisions. A decision-making process that transforms both qualitative and quantitative data is necessary to address the assessment difficulty.

Zadeh (1965) first exhibited the concept of fuzzy set (FS) to express uncertain information by presenting a membership function. The values of its membership value should be in a range between zero and one. Further, Atanassov (1986) revolutionized this theory by introducing an Intuitionistic fuzzy set (IFS) in which he added a non-membership function for each element of the universe of discourse and included a condition the sum of membership and non-membership values should be less than or equal to one. As a result, this extension of FS can handle not only incomplete but also uncertain conditions of data representation (Son *et al.*, 2020). Nevertheless,

Improved MABAC Method for Multicriteria Group Decision Making With Trapezoidal Fuzzy Neutrosophic Numbers

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