



Construction of Sanda Teaching risk assessment index system using neutrosophic AHP method

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Abstract

To build a strong country, build strong teaching. But teaching surrounding multiple risks. So this paper aims to identify and assess risks in teaching. The assessment risks in sanda teaching is a critical task and contain multiple conflict criteria. So we use Multi-Criteria Decision Making (MCDM). In this paper, we use an Analytical Hierarchy Process (AHP) to rank and compute each criterion's weights. We use five main and twenty sub-criteria. These criteria were evaluated under a neutrosophic environment—an example provided to present the outcomes of the proposed model.

Keywords: AHP; Sanda; Teaching risk; Assessment

1. Introduction

Risk is a critical element in any society and country. So, risks need to identify and assess to gain the most benefit. The risk assessment in education identified more[1]–[6]. So the risk in the teaching process is a critical task for countries and society. So these risks need to be evaluated. The risk in sanda teaching threaten from multi-criteria like uncertainty, probability, servility, activity, knowledge and value. Assessment teaching risk can help teachers, students, countries and researchers.

The assessment of the risks in teaching has many criteria and sub-criteria. We use five main and twenty sub-criteria. So the concept of Multi-Criteria Decision Making is used in this paper. MCDM method is used in the decision making problem in different fields[7]–[15]. We use the AHP method for computing the weights of criteria and sub-criteria. The AHP method is an MCDM[15]–[17]. It is used in the decision-making process. It is

an easy tool and suitable for this problem. It builds a pairwise comparison matrix between main and sub-criteria for comparison and normalization matrix.

The AHP method integrated under neutrosophic environment. We use single Valued Neutrosophic Sets (SVNSs) for dealing with uncurtaining. Due to this problem contains incomplete and uncertain information. SVNSs provided three values truth, indeterminacy and falsity values. So the neutrosophic sets are better than the fuzzy system. Fuzzy systems can consider the truth and falsity value only and ignore the indeterminacy value in calculations[18]–[20].

This paper's main contribution is that it is the first time to propose a neutrosophic environment for assessment risk teaching and integrated with the AHP method.

This paper is organized as follows: Section 2 presents the AHP Method, Section 3 presents the results and example. Section four presents conclusions.

2. The AHP Method

The AHP method is a MCDM method used for computing the weights of criteria. In this paper used for assessment risks in teaching. The following AHP steps[21]:

Step 1: Collect criteria and sub criteria

Step 2: Collect group of decision makers.

Step 3: Let experts to build a pairwise comparison matrix between criteria then cub criteria.

Step 4: Combined pairwise comparison matrix into a one matrix by a mean value.

Step 5: normalize the combined pairwise comparison matrix

Step 6: compute the weights of criteria by average of row in normalization matrix.

3. Results and Discussion

This section proposes the outcomes of the proposed method. First, we need to assess Sanda teaching risk. Three experts were collected to assess the criteria and sub-criteria. The five main criteria and twenty sub-criteria. C1:work related stress, C1.1 lack of student motivations, C1.2: difficulty working with partner, C1.3: increased class size, C1.4: student performance objectives, C1.5: lack of control, C1.6: lack of professional recognition. C2: Risks of the workplace, C2.1: Violence student, C2.2: Violence teacher. C3: legal considerations, C3.1:releasing information requested, C3.2: family provision, C3.3: right of teacher, C3.4: access to educational opportunities, C4.5: risks law designed. C4: technical, C4.1: incomplete activity, C4.2: incomplete value, C4.3: incomplete course, C4.4: incomplete knowledge. C5: economic issue, C5.1: educational aids, C5.2: risk injuries. C5.3: risk of developing carpal tunnel syndrome. Then three experts evaluate the five main criteria to build a pairwise comparison matrix into Table 1-3. Then combined three matrices into one matrix in Table 4. Then normalize the combined pairwise comparison matrix into Table 5. Then compute the weights of criteria in Table 6. Fig 1. Present the weights of primary criteria. C5: economic issues are the highest in teaching risks, and work-related stress is the lowest in teaching assistants.

Table 1: Pairwise comparison matrix for five main criteria by first decision makers.

	C ₁	C ₂	C ₃	C ₄	C ₅
C ₁	0.5	0.9	0.383	0.8167	0.383
C ₂	1.111111	0.5	0.8167	0.383	0.283
C ₃	2.610966	1.22444	0.5	0.9	0.283
C ₄	1.22444	2.610966	1.111111	0.5	0.9
C ₅	2.610966	3.533569	3.533569	1.111111	0.5

Table 2: Pairwise comparison matrix for five main criteria by second decision makers.

	C ₁	C ₂	C ₃	C ₄	C ₅
C ₁	0.5	0.8167	0.383	0.8167	0.9
C ₂	1.22444	0.5	0.8167	0.383	0.9
C ₃	2.610966	1.22444	0.5	0.383	0.8167
C ₄	1.22444	2.610966	2.610966	0.5	0.383
C ₅	1.111111	1.111111	1.22444	2.610966	0.5

Table 3: Pairwise comparison matrix for five main criteria by third decision makers.

	C ₁	C ₂	C ₃	C ₄	C ₅
C ₁	0.5	0.383	0.9	0.2833	0.8167
C ₂	2.610966	0.5	0.8167	0.383	0.383
C ₃	1.111111	1.22444	0.5	0.9	0.283
C ₄	3.529827	2.610966	1.111111	0.5	0.9
C ₅	1.22444	2.610966	3.533569	1.111111	0.5

Table 4: Combined matrix for five main criteria.

	C ₁	C ₂	C ₃	C ₄	C ₅
C ₁	0.5	0.6999	0.555333	0.6389	0.6999
C ₂	1.648839	0.5	0.8167	0.383	0.522
C ₃	2.111014	1.22444	0.5	0.727667	0.4609
C ₄	1.992902	2.610966	1.611063	0.5	0.727667
C ₅	1.648839	2.418549	2.763859	1.611063	0.5

Table 5: Normalized combined matrix for five main criteria.

	C ₁	C ₂	C ₃	C ₄	C ₅
C ₁	0.063278	0.093898	0.088897	0.165491	0.240477
C ₂	0.208672	0.067079	0.130736	0.099207	0.179353
C ₃	0.267163	0.164269	0.080039	0.188484	0.158359
C ₄	0.252215	0.350284	0.257896	0.129513	0.250017
C ₅	0.208672	0.32447	0.442433	0.417306	0.171794

Table 6: Weights.

Weights of criteria	
C_1	0.130408
C_2	0.137009
C_3	0.171663
C_4	0.247985
C_5	0.312935

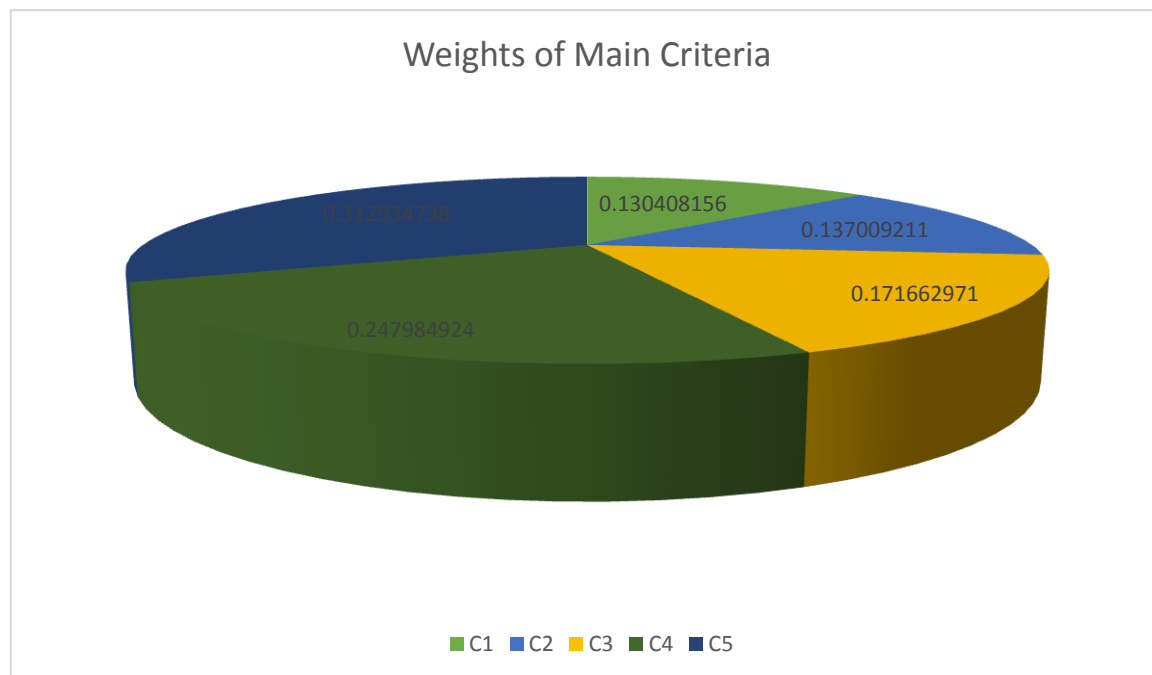


Figure 1:Weights of main criteria.

Then compute weights of sub-criteria C1. Then three experts evaluate the five main criteria to build a pairwise comparison matrix into Table 7-9. Then combined three matrices into one matrix in Table 10. Then normalize the combined pairwise comparison matrix into Table 11. Then compute the weights of criteria in Table 12. Fig 2. Present the weights of Sub criteria. C1: lack of professional recognition is the highest weight in teaching risks, and lack of student motivation is the lowest in teaching assistants.

Table 7 :Pairwise comparison matrix for five main criteria by first decision makers.

	$C_{1.1}$	$C_{1.2}$	$C_{1.3}$	$C_{1.4}$	$C_{1.5}$	$C_{1.6}$
$C_{1.1}$	0.5	0.8167	0.383	0.283	0.8167	0.9
$C_{1.2}$	1.22444	0.5	0.383	0.9	0.9	0.8167
$C_{1.3}$	2.610966	2.610966	0.5	0.383	0.8167	0.383
$C_{1.4}$	3.533569	1.111111	2.610966	0.5	0.383	0.283
$C_{1.5}$	1.22444	1.111111	1.22444	2.610966	0.5	0.383
$C_{1.6}$	1.111111	1.22444	2.610966	3.533569	2.610966	0.5

Table 8: Pairwise comparison matrix for five main criteria by second decision makers.

	C _{1.1}	C _{1.2}	C _{1.3}	C _{1.4}	C _{1.5}	C _{1.6}
C _{1.1}	0.5	0.383	0.283	0.8167	0.9	0.8167
C _{1.2}	2.610966	0.5	0.8167	0.9	0.283	0.9
C _{1.3}	3.533569	1.22444	0.5	0.9	0.383	0.283
C _{1.4}	1.22444	1.111111	1.111111	0.5	0.9	0.383
C _{1.5}	1.111111	3.533569	2.610966	1.111111	0.5	0.8167
C _{1.6}	1.22444	1.111111	3.533569	2.610966	1.22444	0.5

Table 9: Pairwise comparison matrix for five main criteria by third decision makers.

	C _{1.1}	C _{1.2}	C _{1.3}	C _{1.4}	C _{1.5}	C _{1.6}
C _{1.1}	0.5	0.9	0.8167	0.383	0.9	0.283
C _{1.2}	1.111111	0.5	0.9	0.283	0.283	0.383
C _{1.3}	1.22444	1.111111	0.5	0.8167	0.9	0.283
C _{1.4}	2.610966	3.533569	1.22444	0.5	0.8167	0.9
C _{1.5}	1.111111	3.533569	1.111111	1.22444	0.5	0.8167
C _{1.6}	3.533569	2.610966	3.533569	1.111111	1.22444	0.5

Table 10: Combined matrix for five main criteria.

	C _{1.1}	C _{1.2}	C _{1.3}	C _{1.4}	C _{1.5}	C _{1.6}
C _{1.1}	0.5	0.6999	0.494233	0.494233	0.872233	0.666567
C _{1.2}	1.648839	0.5	0.6999	0.694333	0.488667	0.6999
C _{1.3}	2.456325	1.648839	0.5	0.6999	0.6999	0.316333
C _{1.4}	2.456325	1.918597	1.648839	0.5	0.6999	0.522
C _{1.5}	1.148887	2.726083	1.648839	1.648839	0.5	0.672133
C _{1.6}	1.956373	1.648839	3.226035	2.418549	1.686615	0.5

Table 11: Normalized combined matrix for five main criteria.

	C _{1.1}	C _{1.2}	C _{1.3}	C _{1.4}	C _{1.5}	C _{1.6}
C _{1.1}	0.04918	0.076557	0.060141	0.076556	0.176304	0.197388
C _{1.2}	0.16218	0.054691	0.085168	0.107551	0.098774	0.207259
C _{1.3}	0.241604	0.180354	0.060843	0.108413	0.141471	0.093675
C _{1.4}	0.241604	0.20986	0.200641	0.077449	0.141471	0.154578
C _{1.5}	0.113004	0.298185	0.200641	0.255402	0.101065	0.199037
C _{1.6}	0.192429	0.180354	0.392565	0.374629	0.340915	0.148063

Table 12: Weights of sub criteria C1.

Weights of criteria	
C _{1.1}	0.106021
C _{1.2}	0.119271
C _{1.3}	0.137727

$C_{1.4}$	0.170934
$C_{1.5}$	0.194556
$C_{1.6}$	0.271492

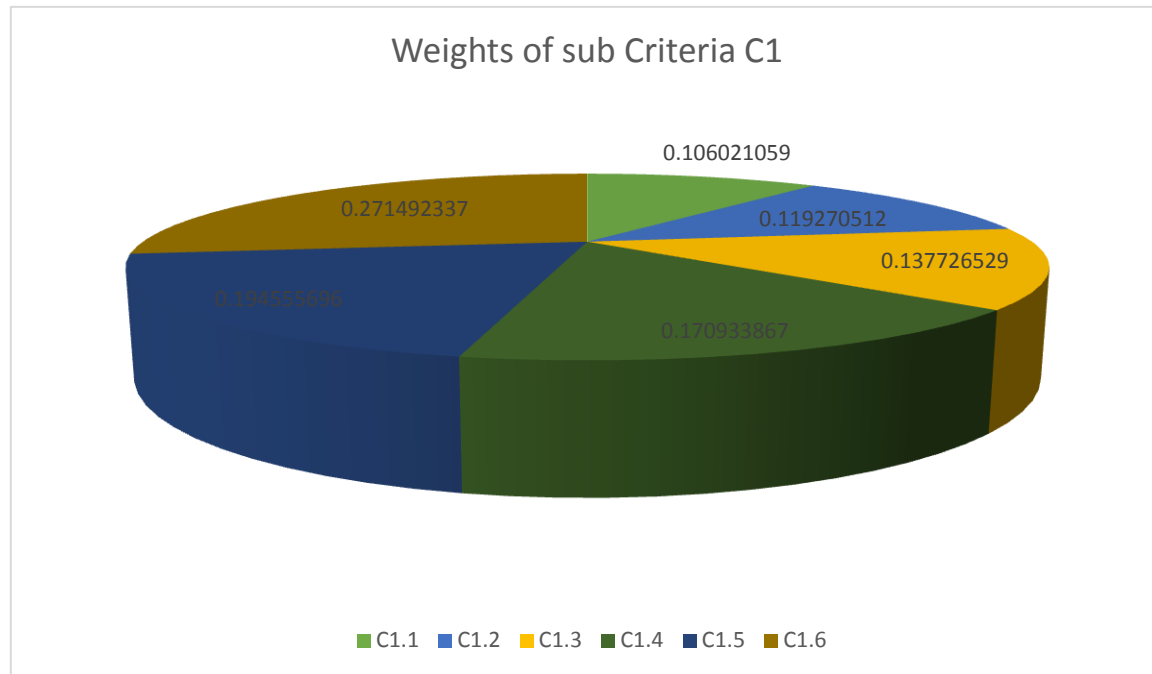


Figure 2: Weights of sub criteria C1.

Then compute weights of sub-criteria C2. Then three experts evaluate the five main criteria to build a pairwise comparison matrix into Table 13-15. Then combined three matrices into one matrix in Table 16. Then normalize the combined pairwise comparison matrix into Table 17. Then compute the weights of criteria in Table 18. Fig 3. Present the weights of Sub criteria. C2: violence teachers are the highest weight in teaching risks, and violent students are the lowest in teaching assistants.

Table 13: Pairwise comparison matrix for five main criteria by first decision makers.

	$C_{2.1}$	$C_{2.2}$
$C_{2.1}$	0.5	0.8167
$C_{2.2}$	1.22444	0.5

Table 14: Pairwise comparison matrix for five main criteria by second decision makers.

	$C_{2.1}$	$C_{2.2}$
$C_{2.1}$	0.5	0.9
$C_{2.2}$	1.111111	0.5

Table 15: Pairwise comparison matrix for five main criteria by third decision makers.

	$C_{2.1}$	$C_{2.2}$
$C_{2.1}$	0.5	0.283

$C_{2.2}$	3.533569	0.5
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Table 16: Combined matrix for five main criteria.

	$C_{2.1}$	$C_{2.2}$
$C_{2.1}$	0.5	0.666567
$C_{2.2}$	1.956373	0.5

Table 17: Normalized combined matrix for five main criteria.

	$C_{2.1}$	$C_{2.2}$
$C_{2.1}$	0.203552	0.571392
$C_{2.2}$	0.796448	0.428608

Table 12: Weights of sub criteria C2.

	Weights of criteria
$C_{2.1}$	0.387472
$C_{2.2}$	0.612528

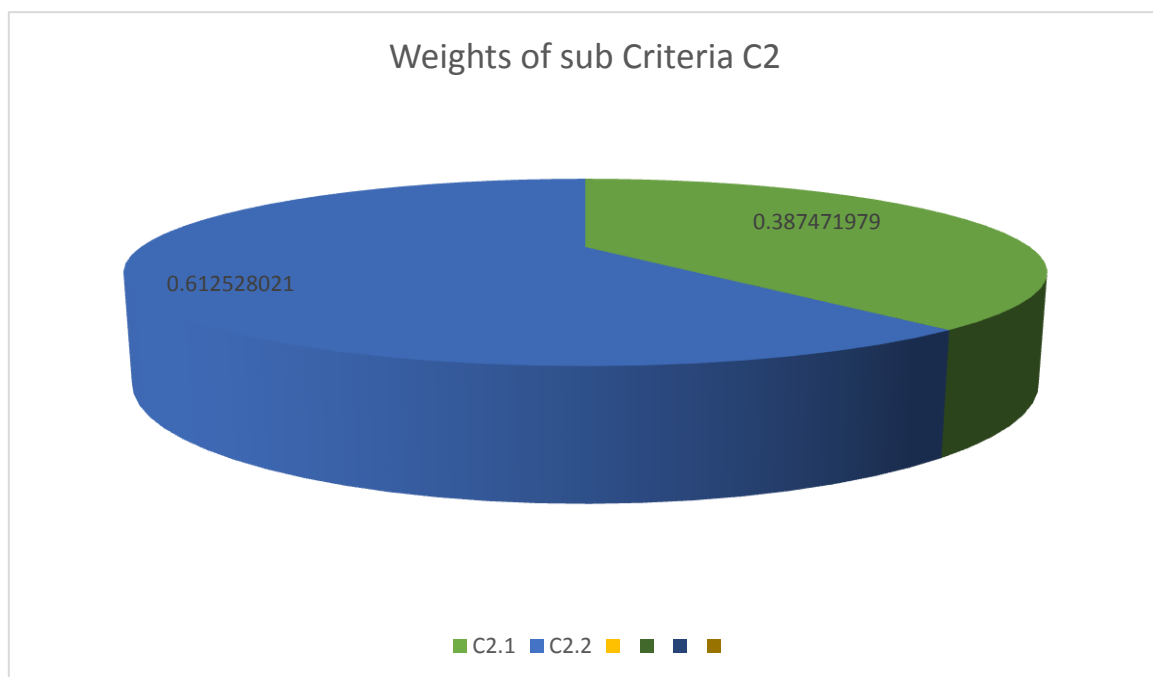


Figure 3:Weights of sub criteria C2.

Fig 4. Present the weights of Sub criteria. C3: risk laws designed are the highest weight in teaching risks, and releasing the information requested is the lowest in teaching assistants. Fig 5. Present the weights of Sub criteria. C4: incomplete knowledge is the highest in teaching risks, and incomplete activity is the lowest in teaching assistants. Fig 6. Present the weights of Sub criteria. C5: The risk of developing carpal tunnel syndrome is the highest in teaching risks, and educational aids are the lowest in teaching assistants.

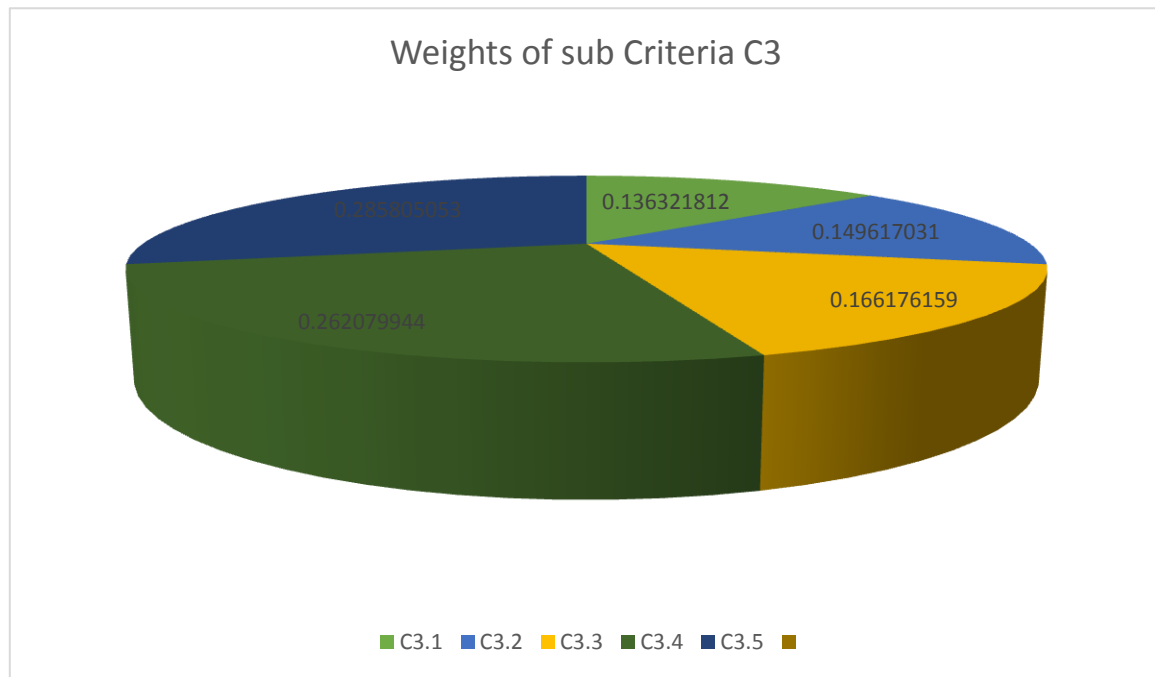


Figure4: Weights of sub criteria C3.

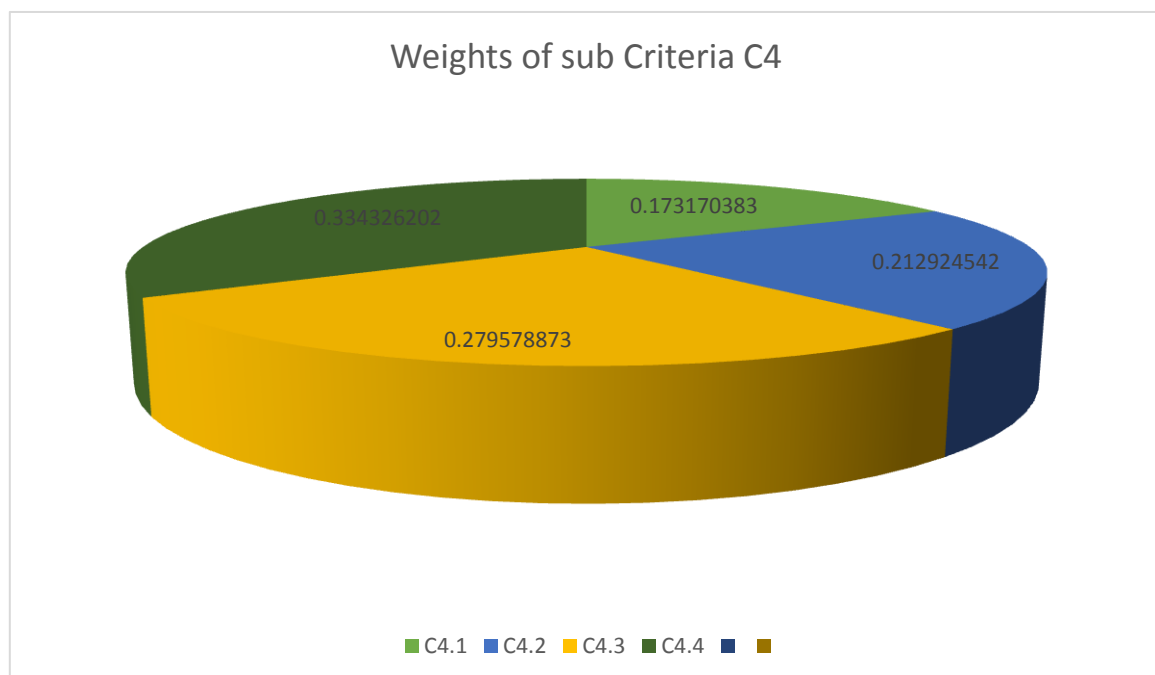


Figure 5: Weights of sub criteria C4.

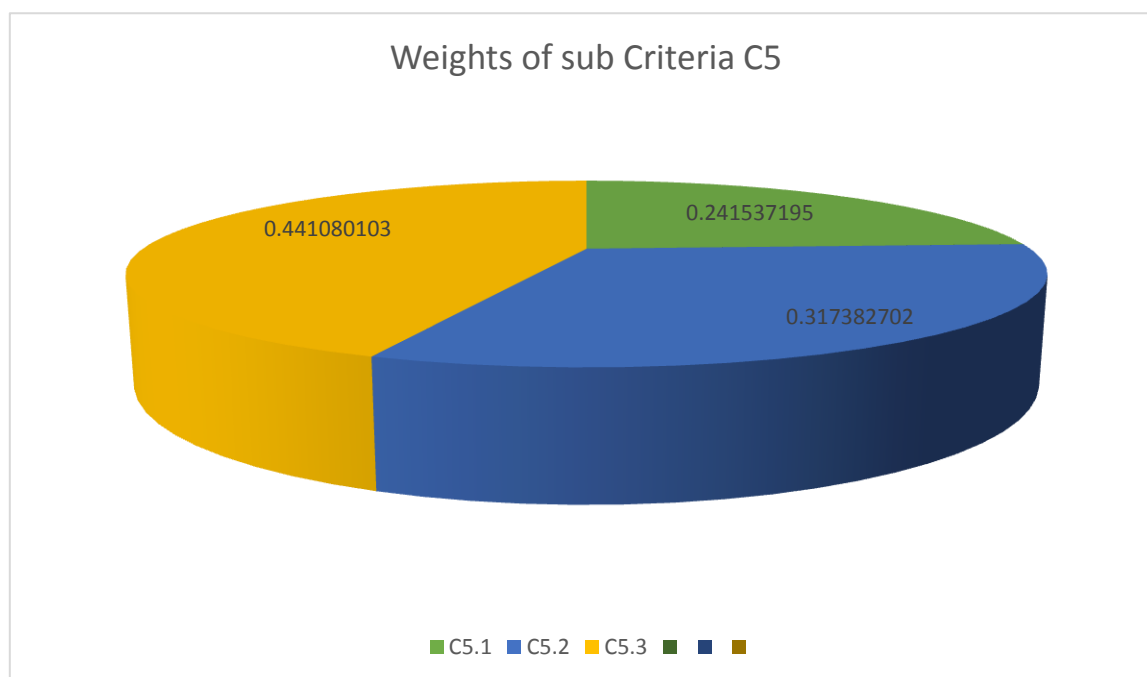


Figure 6:Weights of sub criteria C6.

4. Conclusions

In this paper, we propose the AHP method integrated with the neutrosophic sets to assess teaching assistants' risks. A teaching assistant is a critical task. It contains several criteria and sub-criteria. So we used the multi-criteria decision making for dealing with five main criteria and twenty sub-criteria.

In the future study, apply other MCDM methods integrated with another scale of neutrosophic for assessment teaching risks.

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