Multi-Criteria Decision Making in College Councils Using A Fuzzy Linguist Preferences

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ABSTRACT

As it is known, making a successful decisions is not an easy task, because these decisions affect by many circumstances and depend on set of factors. It is necessary that the decision-making in colleges must be subject to the voting of the members of the college council. The traditional way for issuance the decision can be computed through counting the voters. There are three options for voting: agree, disagree, or conservative. This kind of voting ignores various degrees of opinions and preferences. Some situations that require decision making are difficult because they have uncertain and fuzzy environments. This paper aims to use a new method for making the decision in the college, depending on a fuzzy decision scheme. This work uses data from four colleges to evaluate the projects that will be implemented. Data collection was accomplished by using a table of preferences and presenting it to the College Council members to give their opinions. The preferences table provides various degrees of opinions instead of the traditional method. Exploiting the Multi-Criteria Decision Making (MCDM) in a fuzzy method requires using different mechanisms for ranking the alternatives according to their importance. Evaluation of the results will determine which one of the alternatives or the criteria has more importance comparing with the others. The results prove that Fuzzy Linguist Preferences can solve many real problems. This work gives the total process about how to solve multiple alternatives decision making problems using analytic hierarchical process in fuzzy and builds a fuzzy evaluating scheme which prioritized the relative weights of the alternatives.

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1. INTRODUCTION

Multi-Criteria decision-making (MCDM) is the basic decision making problem that leads to determining the optimal alternative through taking in account more than one criterion in the choosing process [1]. The college councils at the universities attempt to choose the best decision when existing a number of alternatives. These alternatives can be determined according to several of criteria. Making the decision in the fuzzy environment, to choose one of the alternatives, may face difficulties as a result of uncertainty situation . The main objective of MCDM is to select the best solution according to a number of criteria [2]. The decision makers present their preferences about the existing alternatives due to their expertise in a specific field to obtain best decision.

Because of determining unclearly the alternatives or assigning inappropriately the criteria weights, creating and extracting the best decision may be difficult task [3]. When the decision making has downside in establishing the alternatives, it leads to deficiency in the evaluation and results. This deficiency may cause a great loss in the organizations[4]. Analytic Hierarchical Process (AHP) method have been used by researchers as the most significant method in the process of decision making problem [5,6].

Author in [11] presented a theory about the fuzzy concept to shrink the vagueness when evaluating data and extract the results. AHP scheme has been established to be applied in the fuzzy environment and vagueness problem [8]. Fuzzy AHP (FAHP) scheme presented considerable solutions by using the fuzzy set theory and hierarchical analyzed structure. This method needs to pairwise comparisons which equals to $n(n-1)/2$ for of n number of criteria or alternatives [9]. As an example, when the problem has 6 of alternatives for making the decision, FAHP requires 6*(6 - 1)/2 = 15 of pairwise comparisons. It is important to remember that increasing the alternatives lead to large number of comparisons, thus the judgments of decision makers will be unreliable.

Authors in [10] have proposed a new feature to overcome the inconsistent problem in decision making as a result of huge number of the preferences in many of conditions. The new feature is based on Additive Transitivity of Linguist Preferences Relation, hence it is called F-LinPreRa. The F-LinPreRa scheme makes the analyzing and evaluating more consistency and easier than FAHP, because it ideally avoid the deceptive results [11]. F-LinPreRa requires only $(n-1)$ pairwise comparisons instead of $n*(n-1)/2$ in FAHP. As an example, when the problem has 6 of alternatives for making the decision, F-LinpreRa requires 6 - 1 = 5 of pairwise comparisons.

Apparently, the previous mentioned about FAHP and F-LinPreRa emphasis on the decisions matrix with the crisp numerical elements. In decisions matrix, the numbers are unable to reflect the decision maker's preferences when existing the uncertainty decisions or imprecision situations. Generally, the people judgments always contain preferences that are very hard to match accurately their numerical values. In another meaning, the crisp data are inadequate for simulating the actual difficulties. For solving this kind of behavior, researchers in [12] proposed to use a fuzzy linguist assessments variable to build a fuzzy linguist preferences matrices. The decision matrices based on consistent a fuzzy preferences [13].

This work uses a new fuzzy scheme to decrease the inconsistent in FAHP. It presents a new method to evaluate the projects in different colleges through creating a fuzzy linguist assessment variables. These variables will be selected by decision makers when giving their opinions. The opinions will be used by F-LinPreRa in decision matrix then extracting the rank for each project.

2. FUZZY DECISION MAKING IN LITERATURE REVIEW

The procedure that leads to decision-making within a multiple of criteria and alternatives is described as Multi-Criteria Decision Making(MCDM). MCDM approaches have the ability to provide the experts or decision makers the tools to evaluate each criterion and select the best alternative based on private views [14].

Fuzzy AHP(FAHP) is a fuzzy decision-making method, where it is a excessively applied for ranking multi criteria and select the optimal alternative by using the decision making procedures, for examples: Ranking a significance of hazard factor [15], choosing the providers [16], and resolving the budget allocated problem [17], etc. In the FAHP approach, the decision matrices are based on the preferences of experts, through the answers from pair-wise comparisons. When the trouble contains n of the criteria; $(n*\frac{n-1}{2})$; of pair-wise comparison are needed to be assigned. Number of the pair-wise comparisons is proportionate to the whole number the alternatives/criteria or. Existence a lot of comparisons will cause disorientation for the experts that leads to discordant replies. Therefore, the questions in comparisons formula should be reconstruct for sake changing or updating several of the answers. This procedure causes time waste, effort loss, and unsuitable approaches.

For solving the previous mentioned problem, the Author [18] showed the novelty advance MCDM method namely Consistently Fuzzy Preferences Relating (CFPR). The CFPR is an able to supply the opinions of the group for criteria/alternatives within less numbers of pair-wise comparisons. The CFPR decreases numbers of pair-wise comparisons in addition to prevent the state of inconsistency. For n of criteria; just $(n-1)$ of queries have to be answered in the form of pairwise comparisons within CFPR. The aim of the procedure is to ensure consistent. In sespite of consistent is the major concept to avoid misleading solutions, but ensure the consistent 100% may be to achieve in practical. Author [19] suggested a Fuzzy Linguist Assessments variable (FLAV) to establish the decision matrix due to fuzzy Linguist preferences relation. The aim of FLAV is to reduce inconsistents and avoid the surprising results.

According to the diversity degrees, the preferences of decision makers are often ambiguous depending on the nature languages, and it is too complex to be estimation through numeric value. The linguist variable is more suitable for modeling real problemiInstead of crisp data or numerical values.

This work combines FLAV that was suggested by Ref. [19] and CFPR which was suggested by Ref. [20] to evaluate the projects in terms of the importance according to the decision makers' preferences in college councils. The scheme which combines FLAV and CFPR is called Fuzzy LinPreRa or F-LinPreRa.

3. FUZZY LINGUIST PREFERENCE RATIONAL (F-LINPRERA) METHOD

The pairwise comparisons of F-LinPreRa need to $(n-1)$ of the criteria in order to certify the consistency for every level of hierarchical structures [14]. Additionally, F-LinPreRa scheme works with ambiguity preferences to face the difficulties during data collection. The F-LinPreRa schema establishes a fuzzy relation preferences matrix $Pre = p_{ij}^{R}, p_{ij}^{M}, p_{ij}^{L}$ based on fuzzy linguist evaluation variables. Table 1 explains an example about a fuzzy linguist evaluation variables.

Table 1 : An example of Linguist V variables

Linguist variables	**Fuzzy number**
Very Weak(VM)	$(0, p_{VW}^{M}, p_{VW}^{R})$
Medium(M)	$(p_{M}^{L}, 0.5, p_{M}^{R})$
Very Strong(VS)	$(p_{vs}^{L}, p_{VS}^{M}, 1)$

F-LinPreRa requires implementing number of propositions and mathematical procedures steps over the decision matrix, to obtain the significant results. Author [7] presented two propositions as follow:

1. **Proposition 1**: When giving a number of alternatives; $A = \{x1, x2, x3, \ldots, xn\}$related to a fuzzy reciprocals linguist preferences relations $p_{ij} \in [0,1]$ assure the reciprocal additive, therefore all the next equations are equal[8]:

$$\left.\begin{aligned} p_{ji}^{R} + p_{ij}^{L} &= 1 \; when \; \forall \; i,j \; \in \{1,2,\ldots,n\} \\ p_{ij}^{M} + p_{ji}^{M} &= 1 \; when \; \forall i,j \; \in \{1,2,\ldots,n\} \\ p_{ji}^{L} + p_{ji}^{R} &= 1 \; when \; \forall i,j \; \in \{1,2,\ldots,n\} \end{aligned}\right] \ldots (1)$$

Where R, L and M referes to Right, Left and Middle of the preference values (Pij)

2. **Proposition 2:** For a fuzzy reciprocal linguist preferences relation $Pre = p_{ij} = (p_{ij}^{R}, p_{ij}^{M}, p_{ij}^{L})$ being a consistent, guarantee the consistency additive, consequently the following equations have the same results [10].

$$\left.\begin{aligned} p_{ji}^{L} + p_{ij}^{L} + p_{ki}^{R} &= 1.5 \; for \; \forall i < j < k \\ p_{ji}^{M} + p_{jk}^{M} + p_{ki}^{M} &= 1.5 \; for \; \forall i < j < k \\ p_{ij}^{R} + p_{ji}^{R} + p_{ki}^{L} &= 1.5 \; for \; \forall i < j < k \end{aligned}\right] \ldots..(2)$$

$$p_{i(i+1)}^{L} + p_{i(i+1)(i+2)+\cdots+p_{i(i-1)}^{L}}^{L} + p_{ji}^{R} = \frac{j-i+1}{2} \forall i < j$$

Where R, L and M referes to Right, Left and Middle of the preference values (Pij)

When obtaining the values in the decision matrix p_{ij}within the interval $(from - c \; to \; 1 + c)$, and $0 < c$ is out of the interval [0,1]**,** the F-LinPrRa require transforming the fuzzy numerical by using transform function. To maintain reciprocal andadditive consistency for the decision matrices, the formula (3) must be applied as follow:

$$f(x^{L}) = \frac{x^{L}+c}{1+2c}, f(x^{M}) = \frac{x^{M}+c}{1+2c}, f(x^{R}) = \frac{x^{R}+c}{1+2c} \ldots\ldots..(3)$$

Where

$f(x^{L}),, f(x^{M}), f(x^{R})$: The value of preferencese when applying transformation function.

c : the value of the preference which is greater than 1 or less than 0.

According to the increase in the complexity and uncertainty of the problem, it is important to establish the set of groups, and each one of group consist of decision makers instead of single process [15]. This work is interested to exploit a one of models of the decision methods depending on a group of decision-makers to implement the evaluation of the projects through college council.

F-LinPreRa scheme requires a set of steps to be implemented. These steps are exactly similar to the FAHP except changing in pairwise comparisons. The required number for pairwise comparisons require only n-1 of alternatives. Figure [1] shows the total steps for analyzing the process of F- LinPreRa.

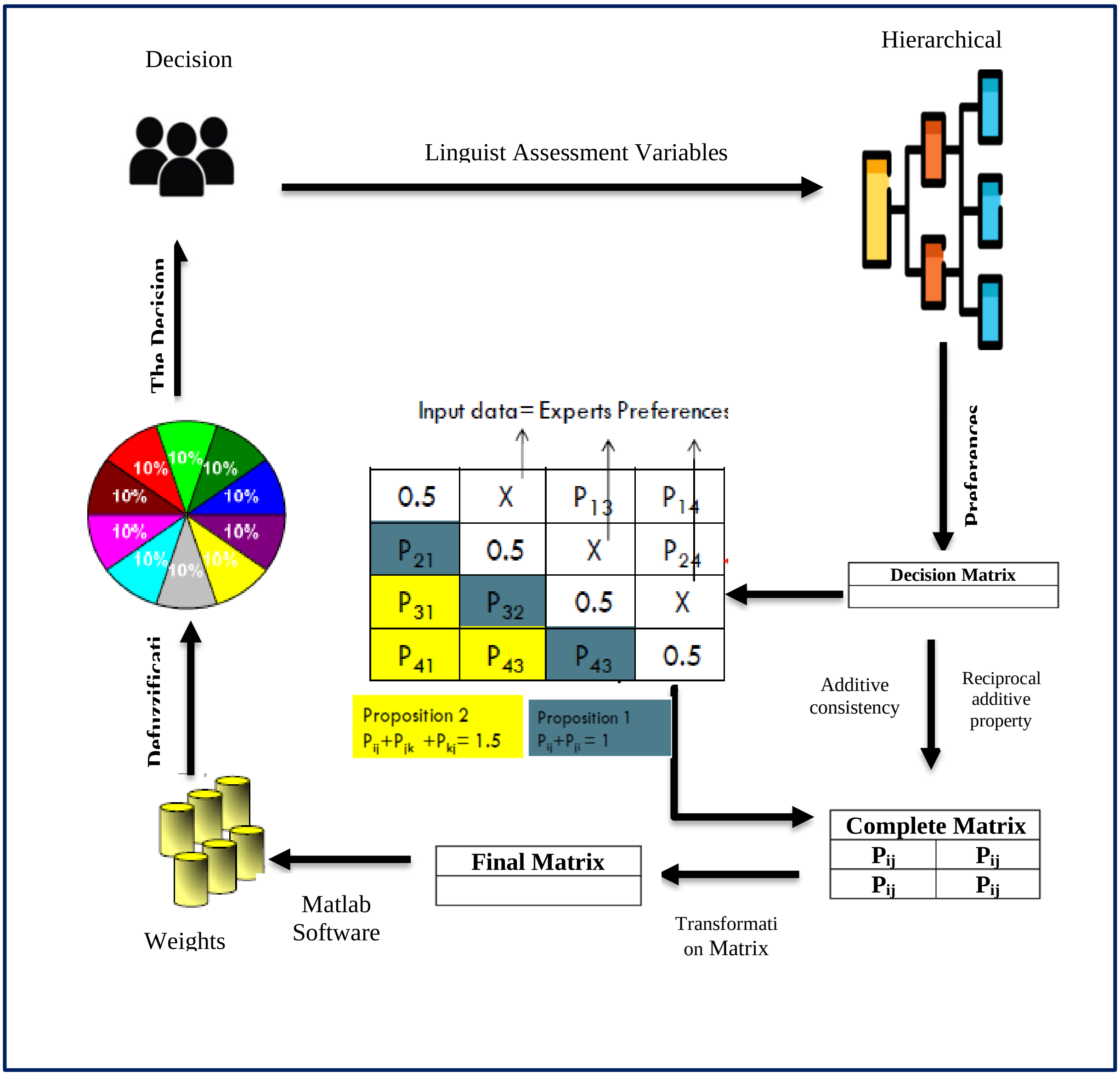

Figure 1. Total steps of F-LinPreRa

The following steps gives clear idea about implementing F-LinPreRa :

1. *Preparing the hierarchical structure to represent goal, criteria and alternatives.*
2. *Establishing the fuzzy preferences matrix.*
3. *Computing the weights for every criteria*
4. *sequencing the Hierarchical layer*
5. *Finding the ranks of the alternatives.*

Both F-LinPreRa and CFBR will be combined to evaluate the projects in terms of the importance and obtain the consistency. According to the case study, the pseudo algorithm 1, 2, and 3 are provided to implement the evaluation of the projects in terms of the importance in college council.

Algorithm1 Establishing Decision Matrix

Input: Linguist Pairwise Comparisons between P_i *and* $Pj+1$ *, no of alternatives*

Output: Consistency matrx{C_matrix(j,i)}

Begin:

Suppose $P(j,i)$ *matrx with elements preferences*

Function C_matrx(i,j :number)

For $i \leftarrow 1$*: no_alternatives Do*

For $j \leftarrow 1$*: no _alternatives Do*

If$(i = j)$ *then C_matrx*$(i,j) = 1/2$

If$(j = 1 + i)$ *then*

C_matrx(i,j)*=1-P(i, j)*

EndFor

EndFor {proposition 1}

For $i \leftarrow 1$*: no_alternatives* Do

For $j \leftarrow 1$: *no_alternatives* Do

For $k \leftarrow 1$: *no_alternatives* Do

If $(i < j)$ AND $(j < k)$Then C_matrx$(k,i) = 3/2 - P(i,j) - P(j,k)$

If $(j > i)$ AND $P(i,j) \neq Null$ Then C_matrix$(i,j) = 1 - P(j,i)$

EndFor {proposition-2}

EndFor

EndFor

EndFunction

EndBegin

Algorithm 2: Building A Transform Matrx

Input: Consistency and Completing Matrx {C_matrx(i,j)}

Output: Transform Matrx {T_matrx(i,j)}

Begin

suppose *x* referes to constant, represents the maximum violency in C_matrx(j,i)

Function T_matrx(*i*: number, *j*: number)

For $i \leftarrow 1$*: no_ alternatives* Do

For $j \leftarrow 1$: *no_alternatives* Do

T_matrx(j,i)= (C_matrx(j,i)+ *x*)/(2**x*)+1)

EndFor

EndFor

EndFunction

Algorithm 3: Assign the Weight every elternative through F- LinPreRa

Input: Transform Matrx {T_mat(i,j)
Output: weights Fuzziness
Begin
suppose $AvgRows(i)$ *represent an averages for the elements in row* (i) *in matrx T_m(j,i)*
For $i \leftarrow 1$*: no_alternatives Do*
For $j \leftarrow 1$*: no_alternatives Do*
$AvgRows(i) \leftarrow \sum T\_mat(j,i)]/no\_of\_alternatives$ *// computing Averages for every row in* $matrix$
End For
End For
For $i \leftarrow 1$ *To no_alternatives Do*
W_i*=* $AvgRows(i)$*/ Summation for whole elements of* $AvgRows(i)$
End For
EndBegin

4. RESULTS AND DISCUSSION FOR APPLYING F-LINPRERA ON COLLEGE COUNCIL

This work provides the College Councils at the University of Sulaimani the ranking and evaluating the projects in terms of the importance, according to decision makers (members in every college). At the beginning, it is important to determine the three elements of F-LinPrRa: *Goal*, *Criteria*, and *Alternatives*.

- ***The goal*****:** evaluating and ranking the different projects in different colleges in terms of the priority to be implemented.
- ***The Criteria*****:** refers to the four colleges in University of Sulaimani: Dentistry (C1), Nursing (C2), Medicine (C3), and Pharmacy (C4).
- ***Alternatives:*** refers to the four main projects that the college council want to determine their importance. These projects are :
  1. Developing the college library (A1).
  2. Maintenance the laboratories (A2).
  3. Training the employees (A3).
  4. Building new halls (A4).

According to the three elements that have mentioned, it is a good idea to build the hierarchical structure. This hierarchical structure explains the relations between criteria and the alternatives that will realize the goal. Figure [2] illustrates the three elements of hierarchical structure: Goal, Criteria and Alternatives. In this case, each criterion has four alternatives (projects). These alternatives or projects will be selected according to their importance by the members in college council. Every project has the highest score, according to the evaluation, will get the importance of implementation before the rest of the projects.

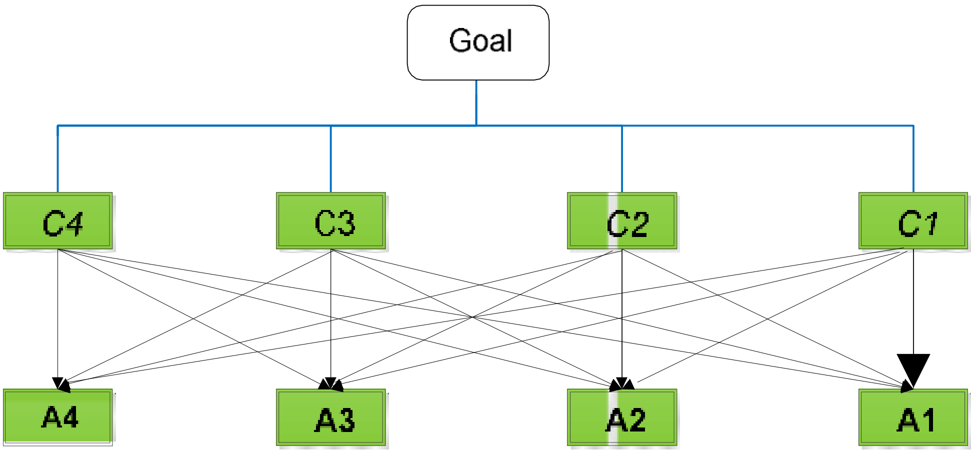

Figure 2. The hierarchical structure of the problem

The college council consists of five members (decision makers) $m_k (k = 1, 2...5)$, who have the final decision to provide the opinions based on Table 2**.**

Table 3 show the original members (decision makers) opinions (their preferences) for evaluating each alternative regarding the four criteria. Table 3 explains the initial opinions of decision makers.

Table 2. Fuzzy Linguists with values of fuzzy

Linguist variable	**Triangular Fuzzy umber TFN)**
Very Poorly (VP)	(0,0,0.1)
Poorly (P)	(0,0.1,0.3)
Middle-Poorly (MP)	(0.1,0.3,0.5)
Middle (M)	(0.3,0.5,0.7)
Middle-Good(MG)	(0.5,0.7,0.9)
Good(G)	(0.7,0.9,1.0)
Very-Good(VG)	(0.9,1.0,1.0)

Table 3. The judgments of the decision makers

C1	Ex1	Ex2	Ex3	Ex4	Ex5	
ALT1	VG	P	M	MG	G	ALT2
ALT2	MP	VG	P	G	MG	ALT3
ALT3	G	G	VP	M	G	ALT4
C2	Ex1	Ex2	Ex3	Ex4	Ex5	
ALT1	MP	VG	VG	G	VG	ALT2
ALT2	G	M	VG	VP	M	ALT3
ALT3	VG	MG	MG	MG	G	ALT4
C3	Ex1	Ex2	Ex3	Ex4	Ex5	
ALT1	M	G	MG	G	MG	ALT2
ALT2	MP	P	P	P	MG	ALT3
ALT3	G	M	G	M	MP	ALT4
C4	Ex1	Ex2	Ex3	Ex4	Ex5	
ALT1	VP	MG	MG	MG	G	ALT2
ALT2	M	P	M	MG	M	ALT3

ALT3	M	M	P	MG	MG	ALT4

Where :

ALT : Referes to the i alternative, Ex: referes to the experts.

With regard to the initial criterion (C1), Table 4 explains decision matrix for the **5** decision maker's preferences.

Table 4. Total judgments for the decision makers

		A1	A2	A3	A4
$E1$=	**ALT1**	**(0.5,0.5,0.5)**	**(0.7,0.9,1)**	**PRE13**	**PRE1**
	ALT2	**PRE21**	**(0.5,0.5,0.5)**	**(0,0.1,0.3)**	**PRE24**
	ALT3	**PRE31**	**PRE32**	**(0.5,0.5,0.5)**	**(0.5,0.7,0.9)**
	ALT4	**PRE41**	**PRE42**	**PRE43**	**(0.5,0.5,0.5)**
$E2$=		**ALT1**	**ALT2**	**ALT3**	**ALT4**
	ALT1	**(0.5,0.5,0.5)**	**(0.7,0.9,1)**	**PRE13**	**PRE14**
	ALT2	**PRE21**	**(0.5,0.5,0.5)**	**(0.3,0.5,0.7)**	**PRE24**
	ALT3	**PRE31**	**PRE32**	**(0.5,0.5,0.5)**	**(0.7,0.9, 1)**
	ALT4	**PRE41**	**PRE42**	**PRE43**	**(0.5,0.5,0.5)**
$E3$=		**ALT1**	**ALT2**	**ALT3**	**ALT4**
	ALT1	**(0.5,0.5,0.5)**	**(0,0,0.1)**	**PRE13**	**PRE14**
	ALT2	**PRE21**	**(0.5,0.5,0.5)**	**(0.7,0.9,1)**	**PRE24**
	ALT3	**PRE31**	**PRE32**	**(0.5,0.5,0.5)**	**(0.9,1,1)**
	ALT4	**PRE41**	**PRE42**	**PRE43**	**(0.5,0.5,0.5)**
$E4$=		**ALT1**	**ALT2**	**ALT3**	**ALT4**
	ALT1	**(0.5,0.5,0.5)**	**(0.7,0.9,1)**	**PRE13**	**PRE14**
	ALT2	**PRE21**	**(0.5,0.5,0.5)**	**(0.5,0.7,0.9)**	**PRE24**
	ALT3	**PRE31**	**PRE32**	**(0.5,0.5,0.5)**	**(0.3,0.5,0.7)**
	ALT4	**PRE41**	**PRE42**	**PRE43**	**(0.5,0.5,0.5)**
$E5$=		**ALT1**	**ALT2**	**ALT3**	**ALT4**
	ALT1	**(0.5,0.5,0.5)**	**(0.3,0.5,0.7)**	**PRE13**	**PRE14**
	ALT2	**PRE21**	**(0.5,0.5,0.5)**	**(0.5,0.7,0.9)**	**PRE24**
	ALT3	**PRE31**	**PRE32**	**(0.5,0.5,0.5)**	**(0.5,0.7,0.9)**
	ALT4	**PRE41**	**PRE42**	**PRE43**	**(0.5,0.5,0.5)**

Where:

ALT: referes to an alternative , PRE referes to the preferences of Experts

For obtaining the aggregation decision maker's preferences, in a singular decision matrix, a Linguist Average Factor (LAF) must be computed. LAF can be computed by the following formula:

$$LAF(p_{ji}) = \frac{\sum_{k=1}^{m} pij}{m} \; for\ all\ j\ and\ i \ldots\ldots\ldots (4)$$

$LAF(p_{ji})$: Refere to average of linguist factor of the preferences.

Table 5 presents the inconsistent singular decision matrix for the whole alternatives that have determined to C1 after aggregating the preferences by decision makers using LAF according to formula(4).

Table 5. Inconsistent decision matrix of C1

ALT1	(0.5,0.5,0.5)	(0.57,0.77,0.89)	PRE13	PRE14
ALT2	PRE21	(0.5,0.5,0.5)	(0.8,0.89,0.97)	PRE24
ALT3	PRE31	PRE32	(0.5,0.5,0.5)	(0.16,0.31,0.45)
ALT4	PRE41	PRE42	PRE43	(0.5,0.5,0.5)

Where:

ALT: referes to an alternative, PRE referes to the preferences of Experts

Due to the proposition 1 and 2, the decision matrix can be captured through computing the additive consistent and reciprocal additive property. The following formulas explain the two properties (additive consistent and additive reciprocal).

$p_{21}^{L} = 1 - p_{12}^{R} = 1 - 0.88 = 0.22, p_{21}^{M} = 0.22, p_{21}^{R} = 0.24$

$p_{31}^{L} = 1.5 - p_{12}^{R} - p_{23}^{R} = 1.5 - 0.88 - 0.98 = -0.36, p_{31}^{M} = -0.26, p_{31}^{R} = 0.22$

$p_{41}^{L} = 2 - p_{12}^{R} - p_{23}^{R} - p_{34}^{R} = 2 - 0.94 - 0.98 = -0.44, p_{31}^{M} = -0.23, p_{31}^{R} = 0.02, p_{41}^{R} = 0.54$

Likewise, the remaining values of matrix are computed from above formulas that are implemented on the decision matrix elements : $p_{42}^{L,M,R}, p_{32}^{L,M,R}, p_{43}^{L,M,R}$.

In this moment, the final decision matrix is a ready when conducting the total calculations on a fuzzy preferences matrix relations through the equations in (1) and (2). Table 6 presents the final decision matrix including entirely the values.

Table 6. Final decision matrix

ALT1	(0.5,0.5,0.5)	(0.06,0.22,,0.42)	(0.52,1.48,0.37)	(1.36,0.72,1.57)
ALT2	(0.5,0.68,0.82)	(0.5,0.5,0.5)	(0.66,0.79,0.78)	(0.12,0.3,0.62)
ALT3	(0.18,0.32,0.5)	(0.15,0.36,0.76)	(0.5,0.5,0.5)	(0.42,-0.16,-0.22)
ALT4	(0.45,0.14,-0.66)	(-0.38,-0.7,0.88)	(-0.58,0.78,0.94)	(0.5,0.5,0.5)

As it appears in table 6, some fuzzy values of the final decision matrix are out of period [0 - 1], thus Transform Function (TF) is a necessary to be computed. Table 7 presents the TF by applying the equations 3.

Table7. Transformation matrix(TF)

ALT1	(0.5,0.5,0.5)	(0.54,0.65,0.74)	(0.48,0.76,0.95)	(0.5,0.6,0.67)
ALT2	(0.61,0.71,0.76)	(0.5, 0.5, 0.5)	(0.26, 0.35,0.46)	(0.05,0.24,0.52)
ALT3	(-0.0, 0.29, 0.44)	(0.65, 0.37, 0.18)	(0.5, 0.5, 0.5)	(0.29,0.39,0.57)
ALT4	(0.43,0.61,0.71)	(-0.33, 0.4, 0.5)	(0.65, 0.86,1)	(0.5,0.5,0.5)

In Table 8, an average (A_i) is a computed according to the following formula:

$$A_i = \frac{1}{n}(\sum_{j=1}^{n} p_{ij} \ldots\ldots\ldots(5)$$

Where

A_i: An average of the values in decision matrix.

n : Number of fuzzy values.

Pij: Preferences values.

The alternative weights can be computed by the following equation: $W_i = A_i / \sum_j^n A_i$. Lastly, the Centeric of Gravity (CoG) is used for obtaining the defuzzified for the evaluation. However, weights of defuzzified weights are computed by the following equation:

$$D_i = \frac{w_i^R + w_i^M + W_i^L}{3} \quad ..(6).$$

Where

D_i : the value of difuzzifcation.

w_i^R, w_i^M and w_i^M : weights of decision maker's preferencses.

Table 8 presents the last values of the whole alternatives that belongs to the first criterion(C1) including defuzzified values and weights according to formula (6).

Table8. : Final results for Cretrion1

(CRE1)	Average(Ai)	Weight(Wi)	(Di)

ALT1	(0.652,0.453,0.913)	(0.335, 0.417,0.501)	0.469
ALT2	(0.612, 0.369, 0.781)	(0.224,0.356,0.441)	0.312
ALT3	(0.391, 0.451, 0.587)	(0.224,0.522,0.311)	0.201
ALT4	(0.442, 0.367, 0.711)	(0.266, 0.711, 0.198)	0.143

Where:

ALT: referes to an alternative, D_i : the value of difuzzifcation, CRE: referes to criterion

Likewise to the former procedures, iterate the points to obtain all the alternative weights of CRE2, CRE3 and CRE4. Table 9 shows the final decision matrix of C2, C3 and C4 including the evaluations of the alternatives. Tables 9 shows the final decision matrices including the evaluation of the whole alternatives.

Figure 9. The last results of Creterion 2, 3 and 4

Alternative	Average(Ai)	Weight(Wi)	Defuzzfied(Di)
C2			
ALT1	(0.47 , 0.649, 0.81)	(0.255, 0.432, 0.619)	0.439
ALT2	(0.23, 0.314, 0.456)	(0.085,0.156,0.321)	0.186
ALT3	(0.618, 0.691, 0.414)	(0.174, 0.287, 0.484)	0.319
ALT4	(0.284, 0.486, 0.679)	(0.239, 0.241, 0.478)	0.241
C3			
ALT1	(0.461,0.60,0.759)	(0.186, 0.303, 0.504)	0.337
ALT2	(0.384,0.459,0.58	(0.227, 0.319, 0.911)	0.456
ALT3	(0.410,0.518,0.623)	(0.224, 0.512, 0.622)	0.424
ALT4	(0.388, 0.611,0.534)	(0.298, 0.117, 0.621)	0.283
C4			
ALT1	(0.399,0.591,0,77)	(0.175,0.291,0.519)	0.131
ALT2	(0.246,0.359,0.51)	(0.211,0.312,0.477)	0.415
ALT3	(0.459,0.58,0.707	(0.151,0.295,0.561)	0.326
ALT4	(0.266,0.464,0.67	(0.101,0.232,0.487)	0.274

Based on the difuzzification numbers of Table 8 and Table 9, the real values for evaluating all the projects (to be implemented due to their importance) that were suggested by the different college councils in University of Sulaimani are available in Table 10. The rank of the four projects according to their importance in Dentistry college (CRE1) is A1>A4>A2>A3. In concern to Nursing college (CRE2), the rank according to the importance is A1>A3>A4>A2. For medicine college (CRE3), the rank according to importance is A2>A3>A1>A4. Finally, the rank of the projects according to the importance in pharmacy college is A2> A3>A4>A1. Table 10 shows the final evaluation of the projects according to the importance for each college. It is important to remember that the values in table 8 and 9 refer to the decision maker's preferences or opinions of for all members in college councils.

Table 10. Rank the projects in the college

College	project	Rank
Dentistry	Developing the college library	0.357
	Maintenance the laboratory	0.279
	Training the employees	0.183
	Building new halls	0.280
Nursing	Developing the college library	0.355
	Maintenance the laboratory	0.186
	Training the employees	0.314
	Building new halls	0.244
Medicine	Developing the college library	0.330
	Maintenance the laboratory	0.254
	Training the employees	0.280
	Building new halls	0.222
Pharmacy	Developing the college library	0.336
	Maintenance the laboratory	0.213

	Training the employees	0.329
	Building new halls	0.272

Finally, the final evaluating and ranking of the projects according to their importance is shown in figure 3. In this figure, it is noticed that the decision maker's judgments seems different from college to another. For instance, in Nursing College, the first project (Developing the library) has the highest importance comparing to the second project (Maintenance the laboratory). In this case, the Nursing College give the priority to implement the first project. This is very useful when the budget is limited and the Nursing College must prefer one project over the others.

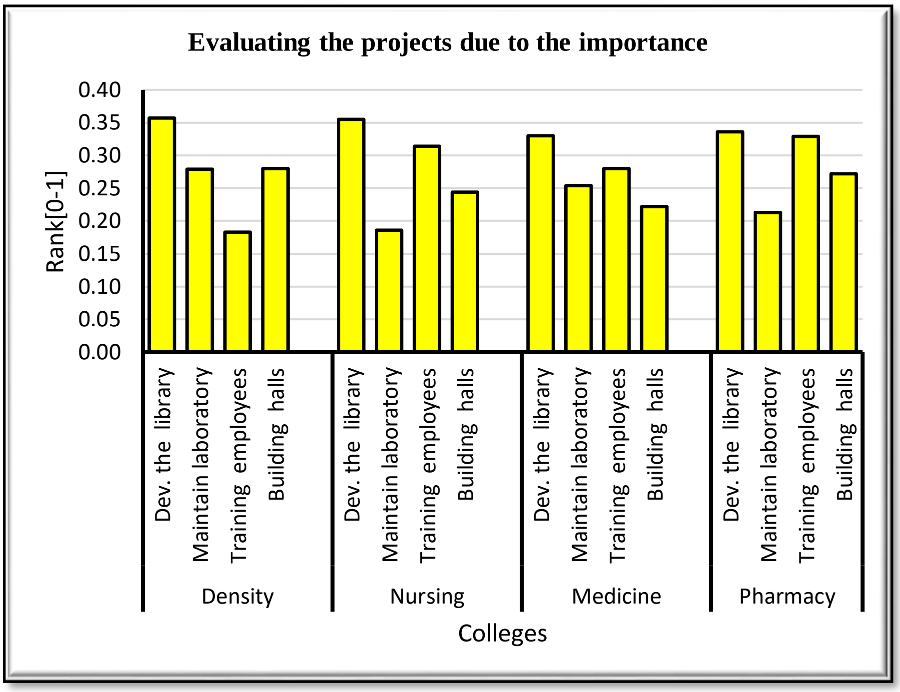

Figure 3. The final ranking of the projects according to their importance

5. CONCLUSION

This work focused unambiguously on using Multi Criteria Decision Making to fix the real problems and evaluate the alternatives due to specific criterion. This work depends on F-LinPreRa scheme to ensure the consistency and overcome the challenges in the FAHP, and avoid the incorrect solutions. This work is very important for the technology experts that confront the hard processes to choose a certain field as a result of overgrowth of information management technology. This paper confirms that using F-LinPreRa scheme on the problems which confront the organizations, firm, and government offices in different fields including the managing of the project or information systems. The suggested scheme of this work has the ability to be achieved over various fields, includes business managingt, resources human for evaluating the priority and make the decision for the real world challenges. This kind of work is able to develop the method to make the decision instead of the tradition method that unable to handle the problem in fuzzy and uncertainty environment.

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