Journal of Physics: Conference Series

PAPER • OPEN ACCESS

Roles selection: a computational approach using ELECTRE and CFFR based on Multi Criteria Tacit Knowledge Acquisition

To cite this article: Yau’mee Hayati Hj Mohamed Yusof *et al* 2021 *J. Phys.: Conf. Ser.* **1874** 012090

Roles selection: a computational approach using ELECTRE and CFFR based on Multi Criteria Tacit Knowledge Acquisition

Yau'mee Hayati Hj Mohamed Yusof[1,2], Ruzaini Abdullah Arshah[1], Awanis Romli[1]

[1]Faculty Of Computing, UNIVERSITI MALAYSIA PAHANG, Gambang, Pahang, Malaysia

[2]Faculty of Business Management, UNIVERSITI TEKNOLOGI MARA, Shah Alam, Selangor Malaysia

*Correpondence Author:yaumee555@uitm.edu.my

Abstract. During the Talent Development Intervention programme, there is a need to provide an effective model to assess awareness, skills and experience among potential academics. To qualify as an Academic Leader or Academic Manager, there are certain characteristics and t raits necessary. However, there is a lack of research on the training of talented academicians to improve and avoid the loss of these characteristics and traits. Lack of this training would also contribute to vacancy positions of Academic Administrator without being hired. This paper aims to formulate and compare the Multi-criteria Decision-Making methods using ELECTRE (Elimination and Choice Expressing Reality) and CFPR (Consistent Fuzzy Preference Relations) based on proposed model of Multi Criteria Tacit Knowledge Acquisition (MC-TKAF). One set of empirical study based on proposed model contain seventeen (17) main criteria's and one hundred eights (108) sub criteria are used to select the best candidate to fill in academic administrator roles. In this study, our focus is to integrate MCDM using CFFR and ELECTRE into implementation of Talent Development Intervention based on MC-TKAF development criteria. This paper also highlighted previous literatures which has shown how MC TKAF is formed and the justification of MCDM technique that will be used. The finding shows that both techniques produce the same results.

1.0 Introduction

The selection of HEI (Higher Education Institution) academic staff is the method of identifying people with qualifications required to perform a given job in the best way. A few studies [1], [2] show that, the academicians who are selected during selection process are probably assessed and evaluated based on explicit assessment such as qualification, experience, and research activities. However, there is evidence of a lack of tacit expertise in the assessment that academicians have established in their institution during the process of entering any talent development intervention based on which the selection is made[3], [4]. While this pattern is important, the selection of criteria/weights for tacit assessment and tacit evaluation should be clearly defined, which will then be sufficient to make the right decisions. This paper aims to formulate and compare the Multi-criteria Decision Making (MCDM) method using ELECTRE and CFFR based on validated multi criteria tacit acquisition framework. This proposed model is able to be used as a talent performance indicator in Talent Development Intervention Program. This paper is arranged in the following manner: The first section is the discussion on phenomenon of academic administrator selection criteria. The second section discussed literature review regarding multi-criteria decision making (MCDM). Then, the third section will discuss problem formulation using CFPR and ELECTRE and the fourth section will describe result and discussions; the last section is the conclusion.

2.0 Multi-criteria Decision Making (MCDM)

The Multi-Criteria Decision-Making (MCDM) approach discusses different priorities in the decision-making process. From different quantifiable or non-quantifiable parameters, a decision-maker (DM) must choose. One of the key aims of the MCDM is to help DMs combine objective measurements with value judgments based not on people's opinions, but on collective thoughts [5]. This method gives successful decision-making in areas where the best choice is incredibly difficult. [5]. The priorities are usually incompatible, so the solution relies heavily on the decision-preferences maker's and must be a compromise. MCDM technologies have been employed to various staff selection applications and find the best solution to choose the best alternative, as shown in Table 1. Our focus in this study is to apply ELECTRE and CFPR technique as a talent performance indicator for selecting academic administrator roles.

Several authors [6]–[8] have discussed each method in MCDM which has different kind of formulas and objective to be fulfilled based on the areas needs as illustrated in Table 1. Researchers make a list of parameters to select which one is the best to be used according to the field of use, due to several methods in MCDM. According to [9] MCDM approaches fit different types of decision situation. For instance, AHP is recommended in situations where individuals are unable to measure their preferences for different parameters and alternatives. While for CFPR is purposely used for simplifies the pairwise comparison[8] and ELECTRE[10] is used when binary superiority comparisons between alternative decision points for each rating factor. Many novice users have trouble determining which form of MCDM technique is most appropriate for their situation of preference. As proposed by [5], the best alternative method can also use the veto rule to select. In another word, the alternative(s) that the majority of methods rank the highest will lastly be selected.

Table 1. MCDM Approach in Personal Selection as Academician

Area/Applications	**Criteria**	**Source of Criteria's**	**SAW**	**TOPSIS**	**ELECTRE**	**CFPR**	**AHP**
Finding the Right Personnel in Academic	Qualification Marks Experience in years Salary Expectation Ability handles different subject Research Activities Technical Skill Presentation/Communication Skill	NONE	[11]	[11]			[11]
Academic Staff Selection	Individual Factor Academic Factor Work Faculty	NONE			[12]		
Evaluation of Personnel Selection	Activity Fee Education Internal Factors Business Factors	NONE				[13]	
Academic staff promotion in higher education by using Analytic Hierarchy	Teaching and Supervision Research and Publication Administration and Management Professional Contribution to Society Scholarly Recognition	NONE					

Fuzzy Analytic Hierarchy Process for Multi-criteria Academic Successor Selection.	Personal and Interpersonal Outcomes Learning and Teaching Out-comes Recognition and Reputation Financial Performance Effective Implementation	[14]					[15]

This paper aims to formulate and compare the Multi-criteria Decision-Making methods using ELECTRE (Elimination and Choice Expressing Reality) and CFPR (Consistent Fuzzy Preference Relations) based on proposed model of Multi Criteria Tacit Knowledge Acquisition(MC-TKAF).

2.1 CFPR (Consistent Fuzzy Preference Relations)

CFPR (Consistent Fuzzy Preference Relations) is widely used in solving multi-criteria group decision making problems. This technique offers greater accuracy, as decision times are reduced. The steps in CFPR [13] used in this study are as following :-

Step 1 : Risk Identification

Main criteria and sub-criteria are determined as described in Table 2.

Step 2: Degree of Preference

Linguistic terms and corresponding numbers are shown in Figure 1 is used to achieve pairwise comparisons.

Definition	Relative Importance
Equally important	1
Moderately more important	3
Strongly more important	5
Very strongly more important	7
Absolutely more important	9
Intermediate values	2,4,6,8

Figure 1

Step 3: Comparison

Among the parameters, construct pairwise comparison matrices (Ci, i=1,,n). The decision-makers include pairwise comparisons Ci i=...n for a set of n 1 preference values.

Step 4 : Transformation

Transform the preference value $a_{ij} \epsilon \left[\frac{1}{9}, 9\right]$ into $p_{ij} \in [0,1]$ through (1)

$p_{ij=\frac{1}{2}} \times \left(1 + \log_9 a_{ij}\right)$(1)

Then, calculate the remaining $p_{ij}^{k}$by using (2), (3) and (4)

$p_{ij} + p_{ji} = 1$ (2)

$p_{ji} = \frac{j-i+1}{2} - p_{i(i+1)} - p_i + 1(i+2) - \cdots - p_{j-1(j)}$(3)

$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2}$ (4)

Instead of the interval [0,1], this preference matrix will contain values included in the interval $[-a, 1, +a]$.In this case, a transformation function is used to maintain reciprocity. The conversion is obtained by (5).

$$f_{(pij)} = \frac{pij+a}{1+2a} \quad (5)$$

The absolute value of the minimum in this preference matrix is given here. Similarly, for all decision makers, the fuzzy preference relation matrices are determined.

Step 5: Aggregation

To obtain the significance weights of the selection criterion, sum the fuzzy preference relationship matrices. Let p_{ij}^k denote the k^{-th} decision maker's transformed fuzzy ij preference value for criteria i and criteria j . In order to incorporate the decisions of decision makers, the average value approach (6) is used. The total number of decision makers is labelled as m.

$$p_{ij} = \frac{1}{m}\left(p_{ij}^1 + p_{ij}^2 + \cdots p_{ij}^m\right),\ k = 1,2,\ldots\ldots,m \quad (6)$$

Step 6: Normalization

Normalize the matrices of aggregated fuzzy preference relations. hi is used in (7) to show the standardized fuzzy preference value of each criterion and to obtain the standardized fuzzy preference relationship matrix.

$$h_{ij} = \frac{p_{ij}}{\sum_{i=1}^{n} p_{ij}}\ i,j = 1,2,\ldots\ldots\ldots,n \quad (7)$$

Step 7 : Prioritization

Calculate the importance weight of each criteria (8).

$$w = \frac{1}{n}\sum_{j=1}^{n} h_{ij} \quad (8)$$

2.2 ELECTRE ((Elimination and Choice Expressing Reality)

The ELECTRE (Elimination and Choice Reflecting Reality) approach is a multi-decision approach first implemented in 1966 by Benayoun and Roy.[10] The steps in ELECTRE [13] are as following :-

Step 1: Decision Matrix
Step 2: Normalized Decision Matrix
Step 3: Weighted Normalized Decision Matrix

All of three mentioned steps (Step 1-3) can be seen from table 3,4,5,6. The next step is Step 4. Concordance and discordance indexes are described in the ELECTRE method as measures of satisfaction and dissatisfaction for decision-makers when choosing one alternative over another. [10].

Step 4 : Concordance to Discordance set

The y matrix is used in evaluating the concordance set. The evaluation factor decision points are compared with one another and the sets are calculated using the relationship shown in the formula below (9);

$c_{kl} = \{J, y_{kj} \geq \ y_{lj}\} \ j = 1,2,3, \dots \dots n(9)$

Basically, the formula is based on comparing the line elements' sizes relative to each other. Every (Ckl) concordance set corresponds to the set of discordances (Dkl). The discordance set elements consist of J values which do not belong to the concordance set. The discordance interval set (Dkl) is obtained by complementation of (Ckl) using (10);

$D_{kl} = \{J, y_{kj} < y_{lj} = J - C_{kl} \ \ j = 1,2,3, \dots \dots n\}$ (10)

By means of the concordance index, the relative value of the elements in the concordance matrix C is determined. The Ckl concordance index is the sum of the weights relevant to the parameters found in the set of concordances. That is;

$$c_{kl} = \sum_{j \in c_{kl}} w_j \qquad\qquad c = \begin{bmatrix} \overline{c_{21}} & \underline{c_{12}} & \vdots & c_{1m} \\ \vdots & \vdots & \vdots & c_{2m} \\ & & & \vdots \\ c_{m1} & c_{m2} & \vdots & c_{mn} \end{bmatrix} (11)$$

Elements of the discordance matrix Dkl are defined by the formula (12).

$$D_{kl} = \frac{\max\limits_{j \in D_{kl}} |y_{kj} - y_{ij}|}{\max\limits_{j} |y_{kj} - y_{ij}|} (12) \qquad\qquad D = \begin{bmatrix} \overline{d_{21}} & \underline{d_{12}} & \vdots & d_{1m} \\ \vdots & \vdots & \vdots & d_{2m} \\ & & & \vdots \\ d_{m1} & d_{m2} & \vdots & d_{mn} \end{bmatrix} (13)$$

Step 5 : Corcordance to DiscordanceMatrix

For finding matrix (F), it is needed to compute threshold value (¯c¯) as follow where m is dimension matrix:

$$\dot{c} = \frac{1}{m(m-1)} \sum_{k=1}^{m} c_{kl} \qquad\qquad \begin{cases} f_{kl=1.if \ c_{kl \geq \bar{c}}} \\ f_{kl=0,if \ c_{kl<\bar{c}}} \end{cases} (14)$$

To determine discordance dominance matrix, we calculate matrix of (G).

$$\dot{d} = \frac{1}{m(m-1)} \sum_{k=1}^{m} \ \sum_{l}^{m} d_{kl} \qquad\qquad \begin{cases} g_{kl=1.if \ d_{kl \geq \bar{d}}} \\ g_{kl=0,if \ d_{kl<\bar{d}}} \end{cases} (15)$$

Step 6 : Concordance (F) to Discordance Dominance (G) Matrix

Matrix E is performed by the multiplication of the corresponding F and G elements

$$e_{kl} = f_{kl} \cdot g_{kl} (16)$$

The (E) matrix is dimensioned in accordance with the (F) and (G) matrixes and consists of values 0 and 1.

Step 7 : Aggregate Dominance Matrix

Referring to the steps and formula from 3.2, result of Table 10 is produced.

Step 8 : Eliminate Less Favourable alternative and rank

The next section will discuss on research methodology used in this study.

3.0 RESEARCH METHODOLOGY

There are three phases in this study, such as Phase 1: Need Analysis, Phase 2: Design and Development, and Phase 3: Model Evaluation, as shown in Figure 2. The main aim of this analysis is to find the best candidate, based on the proposed model, for ALM's academic role. This paper will only focus on the Phase 3 which is Model Evaluation. In support of the Talent Development Intervention Program, the goal is to test the practicality of the Tacit Knowledge Acquisition System (TKAF) using Multi Criteria Decision Making Technique (SAW, WPM, TOPSIS, ELECTRE and CFPR).

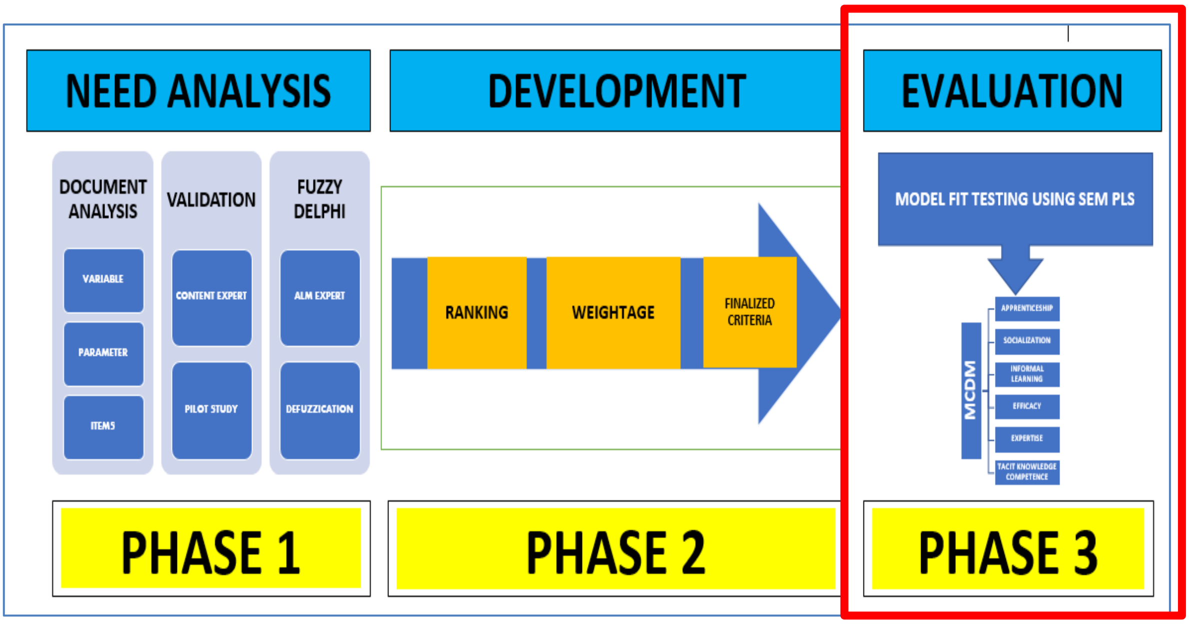

Figure 2. Research Methodology

This list of criteria in Table 2 has been gone through the process of Fuzzy Delphi [16] by 10 scholars from Public University. Thus, list of validated criteria in Table 2 will be used throughout this study.

Table 2 MC TKAF Main and Sub Criteria

Main Criteria	Sub criteria	
A1: Mentoring Outcome	A1a	Professional development
	A1e	Sense of belonging
	A1f	Mentor and mentee expectations
	A1h	Mentee ALM self-efficacy
	A1i	Mentee ALM self-efficacy
	A1j	Culturally responsive
A2:Job Rotation Outcome	A2a	Social Communication
	A2b	Productivity
	A2c	knowledge type
	A2d	knowledge distance
	A2e	Motivation

A3:On Job Training Outcome	A3a	Reaction
	A3b	Behaviour
	A3d	Learning
	A3e	Results
A4: Coaching Outcome	A4a	Organisational Commitment
	A4d	Organisational Citizenship Behaviour
	A4i	Performance
B: Efficacy	B1	Affective Processes
	B2	Selection Processes
	B3	Cognitive Processes
	B4a	Motivational Processes
C: Expertise	C1a	Novice

	C2a	Advanced beginner
	C3a	Competent
	C4a	Proficient
	C5a	Expert
D: Tacit Knowledge Competence	D1a	Know What
	D2a	Know Why
	D3a	Know Who
	D4a	Know How

In phase 3, the validated model has followed the steps as described in Figure 2. In previous paper [17], we have already incorporated the usage of SAW,WPM,AHP and TOPSIS. From the result of three prior techniques shows all three techniques have same result consistency. Thus, this paper, will anticipate the technique of ELECTRE and CFPR either they will produce the same consistency. The next section will discuss Result in section 4.

4.0 RESULT

This paper used the empirical set of choosing Deputy Rector for an institution in Malaysia Public University. Ten (10) decision maker among scholar has made their selection to produce Table 5 and 6 (Weighted Normalized Decision Matrix). Scale used for this table is based on Figure 1: Scale of Attributes.

Problem Formulation
Base Data
Referring to the steps and formula from 2.2, Step 1, the result of Table 3 is produced.
Normalized Data
Referring to the steps and formula from 2.2, Step 2, the result of Table 4 is produced.

Table 3 Base Data

Base Data																	
	50	25	25	45	30	10	15	16	25	25	25	25	25	55	85	20	50
CANDIDATE/CRITERIA	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3	D4
UITM1	10	5	25	1	28	9	14	18	1	1	10	9	5	51	78	19	46
UITM2	37	5	5	9	28	9	14	18	1	5	5	5	5	51	78	19	46
UITM3	37	5	5	9	28	9	14	18	1	5	5	5	5	51	78	19	46

Table 4 Normalized Data

Normalized data																	
	50	25	25	45	30	10	15	16	25	25	25	25	25	55	85	20	50
CANDIDATE/CRITERIA	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3	D4
UITM1	0.20	0.20	1.00	0.02	0.93	0.90	0.93	0.90	0.04	0.04	0.40	0.36	0.20	0.93	0.92	0.95	0.92
UITM2	0.74	0.20	0.20	0.20	0.93	0.90	0.93	0.90	0.04	0.20	0.20	0.20	0.20	0.93	0.92	0.95	0.92
UITM3	0.74	0.20	0.20	0.20	0.93	0.90	0.93	0.90	0.04	0.20	0.20	0.20	0.20	0.93	0.92	0.95	0.92

Weight Each Attributes
Referring to the steps and formula from 2.2, Step 3, the result of Table 5 is produced.
Weight Normalized Data
Referring to the steps and formula from 2.2, Step 3, the result of Table 6 is produced.

Table 5 Weight Each Attributes

WEIGHT FOR EACH ATTRIBUTE																
A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3	D4
1.65	0.74	0.94	0.94	6.00	2.00	3.00	4.00	5.00	3.00	5.00	3.00	3.00	11.00	17.00	4.00	10.00

Table 6 Weight Normalized Data

	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3	D4
UITM1	0.33	0.15	0.94	0.02	5.60	1.80	2.80	3.60	0.20	0.12	2.00	1.08	0.60	10.20	15.60	3.80	9.20
UITM2	1.22	0.15	0.19	0.19	5.60	1.80	2.80	3.60	0.20	0.60	1.00	0.60	0.60	10.20	15.60	3.80	9.20
UITM3	1.22	0.15	0.19	0.19	5.60	1.80	2.80	3.60	0.20	0.60	1.00	0.60	0.60	10.20	15.60	3.80	9.20

Global versus Local Weight
108 sub-criteria were specified in order to offer priority and 10 experts from academia were identified under 17 main criteria, as can be seen from Table 7. Both experts were asked to determine the importance of the different main criteria and sub-criteria on the basis of Table 2. Formula (6) in 2.1 is used to combine the decisions of 10 decision-makers, and the aggregate pair-wise matrices for the main and sub-criteria are shown in Table 7, respectively.

Table 7 Global versus Local Weight

		ID	Local weight
MAIN CRITERIA	Global weight	SUB CRITERIA	
A1	1.65	A1a	2.03
		A1b	0.73
		A1c	0.57
		A1d	0.75
		A1e	1.02
		A1f	1.02
		A1g	1.02
		A1h	1.02
		A1i	0.95
		A1j	0.89
A2	0.74	A2a	2.30
		A2b	0.22
		A2c	0.46
		A2d	0.78
		A2e	1.25
A3	0.94	A3a	1.63
		A3b	0.81
		A3c	0.69
		A3d	1.06
		A3e	0.81
A4	0.94	A4a	1.64
		A4b	0.49
		A4c	0.77
		A4d	0.68
		A4e	0.79
		A4f	0.92
		A4g	1.06
		A4h	1.23
		A4i	1.42
B1	6.00	B1a	1.28
		B1b	0.28
		B1c	0.49
		B1d	1.13
		B1e	1.13
		B1f	1.68
B2	2.00	B2a	1.67
		B2b	0.33
B3	3.00	B3a	1.47
		B3b	0.59
		B3c	0.94
B4	4.00	B4a	1.55
		B4b	0.56
		B4c	0.79
		B4d	1.10
C1	5.00	C1a	1.60
		C1b	0.54
		C1c	0.72
		C1d	0.93
		C1e	1.21
C2	3.00	C2a	1.04
		C2b	0.26
		C2c	0.33
		C2d	0.54
		C2e	0.82
C3	5.00	C3a	1.60
		C3b	0.54
		C3c	0.72

		C3d	0.93
		C3e	1.21
C4	3.00	C4a	1.04
		C4b	0.26
		C4c	0.33
		C4d	0.54
		C4e	0.82
C5	3.00	C5a	1.04
		C5b	0.26
		C5c	0.33
		C5d	0.54
		C5e	0.82
D1	11.00	D1a	0.94
		D1b	0.54
		D1c	0.48
		D1d	0.58
		D1e	0.82
		D1f	0.92

		D1g	1.04
		D1h	1.17
		D1i	1.32
		D1j	1.49
		D1k	1.70
D2	17.00	D2a	1.42
		D2b	0.40
		D2c	0.34
		D2d	1.07
		D2e	0.46
		D2f	0.55
		D2g	1.79
		D2h	0.86
		D2i	0.76
		D2j	0.92
		D2k	0.98
		D2l	1.04
		D2m	1.11

		D2n	1.18
		D2o	1.27
		D2p	1.37
		D2q	1.48
D3	4.00	D3a	1.55
		D3b	0.56
		D3c	0.79
		D3d	1.10
D4	10.00	D4a	1.71
		D4b	0.50
		D4c	0.58
		D4d	0.67
		D4e	0.77
		D4f	0.87
		D4g	0.99
		D4h	1.13
		D4i	1.29
		D4j	1.48

CFPR (Consistent Fuzzy Preference Relations)

Referring to the steps and formula from 2.1, result of Table 8, Step 4-7 is produced.

Table 8

	WEIGHTED NORMALIZED MATRIX																		
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3	D4	PERFORMANCE SCORE	RANK
UITM1	0.33	0.15	0.94	0.02	5.60	1.80	2.80	3.60	0.20	0.12	2.00	1.08	0.60	10.20	15.60	3.80	9.20	58.04	1
UITM2	1.22	0.15	0.19	0.19	5.60	1.80	2.80	3.60	0.20	0.60	1.00	0.60	0.60	10.20	15.60	3.80	9.20	57.35	2
UITM3	1.22	0.15	0.19	0.19	5.60	1.80	2.80	3.60	0.20	0.60	1.00	0.60	0.60	10.20	15.60	3.80	9.20	57.35	3

In this case UITM1 is the best personnel for the position of Deputy Rector followed by UITM2, and UITM3. The next section will elaborate the result produced using ELECTRE ((Elimination and Choice Expressing Reality) based on base data in Table 3.

ELECTRE ((Elimination and Choice Expressing Reality)

Referring to the steps and formula from 2.2, Step 4-5 , the result of Table 9 is produced.

Table 9

	Concordance to Discordance set															
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D4
	1.65	0.74	0.94	0.94	1.00	1.00	1.14	1.00	1.00	0.6	1.00	0.60	0.60	1.00	1.00	1.00
S1,2	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1

S1,3	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1
	Concordance to Discordance set															
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D4
	1.65	0.74	0.94	0.94	1.00	1.00	1.14	1.00	1.00	0.6	1.00	0.60	0.60	1.00	1.00	1.00

	Concordances to Discordance set	S2,3	S2,1
A1		1	1
A2		1	1
A3		1	0
A4		1	1
B1		1	1
B2		1	1
B3		1	1
B4		1	1
C1		1	1
C2		1	1
C3		1	0
C4		1	0
C5		1	1
D1		1	1
D2		1	1
D4		1	1

S3,2	S3,1	
1	1	1.65
1	1	0.74
1	0	0.94
1	1	0.94
1	1	1.00
1	1	1.00
1	1	1.14
1	1	1.00
1	1	1.00
1	1	0.6
1	0	1.00
1	0	0.60
1	1	0.60
1	1	1.00
1	1	1.00
1	1	1.00

Referring to the steps and formula from 2.2, following step 6-7, the result of Table 10 and 11 are produced.

Table 10

Corcordance Matrix			
	S1	S2	S3
S1	-	12.67	12.67
S2	12.02	-	15.21
S3	12.02	15.21	-

Table 11

Corcordance Dominance Matrix					Discordance Dominance Matrix			
	S1	S2	S3			S1	S2	S3
S1	1	1	0	X	S1	1	1	0
S2	0	0	1		S2	1	0	1
S3	0	1	0		S3	1	1	0
Threshold value			13.30		Threshold value			0.54

Table 12 Aggregate Dominance Matrix

	UITM1	UITM2	UITM3	TOTAL
UITM1	1	1	1	1
UITM2	0	1	1	2
UITM3	0	0	1	3

The matrix line (E), which has the highest score, should be chosen as the best. So in this case, by using ELECTRE formula, UITM1 is the best personnel for the position of Deputy Rector followed by UITM2, and UITM3.

5.0 Discussion

From the results of Table 10 and Table 12, the solution for the academic administrator roles selection for majority methods [4] is consistent for candidate UITM 1 (CFPR and ELECTRE) as the first choice. Thus, to enable decision makers to make decision, researcher of MCDM can use the recommendation of [6] and [4] to choose which result is the best suit with the case. In this paper, by using CFPR and ELECTRE, UITM1 has fulfilled the criteria, followed by UITM2 and UITM3. Also, all of these prioritized criteria can be used for selecting the ALM and will give better understanding for decision maker on which criterias are more important for their selection based on the roles. Managers/human resources teams can easily foresee how they can assess workers according to these requirements.

6.0 Conclusion

The goal of this study is to provide an adequate criterion for academic role selection in HEI using the Multi Criteria Tacit Knowledge Acquisition Framework. It is clear from the finding that the MCDM technique is practically capable of evaluating the selection of ALM roles among academics. In this study, our focus is to integrate MCDM into implementation of Talent Development Intervention based on MC-TKAF development criteria. For future research, we will evaluate all of MCDM techniques such as SAW, WPM, AHP,TOPSIS,ELECTRE and CFPR to be evaluated using proof of concept based on decision support system to measure its effectiveness towards ALM selections

7.0 Acknowledgment

This research has been supported by University Malaysia Pahang (UMP) for Research University Grant Scheme (REFERENCE NUMBER: RDU1803190).

References

[1] J. Matoskova *et al.*, 'Facilitating Leader Tacit Knowledge Acquisition', *Journal of Competitiveness*, vol. 5, no. 1, pp. 3–15, 2013.

[2] F. Khalid, 'The Choreography of Talent Development in Higher Education', *Higher Education Studies*, vol. 9, no. 1, pp. 40–52, 2019.

[3] P. Akhavan, A. Shahabipour, and R. Hosnavi, 'A model for assessment of uncertainty in tacit knowledge acquisition', *Journal of Knowledge Management*, 2018.

[4] M. Jafari, P. Akhavan, and M. Nourizadeh, 'Classification of human resources based on measurement of tacit knowledge', *Journal of Management Development*, vol. 32, no. 4, pp. 376–403, 2013.

[5] M. Aruldoss, T. M. Lakshmi, and V. P. Venkatesan, 'A Survey on Multi Criteria Decision Making Methods and Its Applications', *American Journal of Information Systems*, vol. 1, no. 1, pp. 31–43, 2013.

[6] A. Afshari, M. Mojahed, and R. Yusuff, 'Simple additive weighting approach to personnel selection problem', *International Journal of Innovation, Management and Technology*, vol. 1, no. 5, pp. 511–515, 2010.

[7] A. Kolios, V. Mytilinou, E. Lozano-Minguez, and K. Salonitis, 'A comparative study of multiple-criteria decision-making methods under stochastic inputs', *Energies*, vol. 9, no. 7, pp. 1–21, 2016.

[8] F. Mimi, A. Alias, and L. Abdullah, 'Consistent Fuzzy Preference Relation Method and Its Application to Criteria Assessment of Quality of Life Among Population of Setiu Wetlands', *Discovering Mathematics*, vol. 39, no. 2, pp. 52–60, 2017.

[9] K. Eldrandaly, H. A. Ahmed, and N. AbdelAziz, 'AN EXPERT SYSTEM FOR CHOOSING THE SUITABLE MCDM METHOD FOR SOLVING A SPATIAL DECISION PROBLEM', in *9th International conference on production engineering , design and control*, 2009, no. February 2009, p. 12.

[10] B. Şenel, M. Şenel, and G. Aydemir, 'Use And Comparison of Topis And Electre Methods In Personnel Selection', *ITM Web of Conferences*, vol. 22, p. 01021, 2018.

[11] D. S. Kumar, S. Radhika, and K. N. S. Suman, 'MADM Methods for Finding The Right Personnel in Academic Institutions', *International Journal of u- and e service ,science and technology*, vol. 6, no. 5, pp. 133–144, 2013.

[12] B. D. Rouyendegh and T. E. Erkan, 'Selection of academic staff using the fuzzy Analytic Hierarchy Process (FAHP): A pilot study', *Tehnički vjesnik*, vol. 4, no. December 2012, pp. 923–929, 2012.

[13] Y. Ozdemir, K. G. Nalbant, and H. Basligil, 'Evaluation of Personnel Selection Criteria Using Consistent Fuzzy Preference Relations', *Internation Journal of Management Science*, vol. 4, no. 6, pp. 76–81, 2017.

[14] G. Scott, H. Coates, and M. Anderson, *Learning leadership in times of change: Academic Leadership Capabilities for Australian Higher Education*, no. May. 2008.

[15] H. Jantan, Y. H. M. Yusof, and S. N. H. Ishak, 'Fuzzy analytic hierarchy process for multi-criteria academic successor selection', *Advances in Intelligent Systems and Computing*, vol. 854, pp. 392–404, 2019.

[16] Y. H. H. M. Yusof, R. A. Arshah, and A. Romli, 'Multi Criteria Tacit Knowledge Acquisition Framework (MC-TKAF) using Fuzzy Delphi Method for supporting Talent Development Intervention Program in Malaysian Higher Education Institution', *Journal of Physics:*

Conference Series, vol. 1529, no. 5, 2020.

[17] Y. H. H. M. Yusof, R. A. Arshah, and A. Romli, 'Using SAW, WPM, TOPSIS, AHP for selection of academic administrator roles in public university in Malaysia', *Journal of Advanced Research in Dynamical and Control Systems*, vol. 12, no. 4 Special Issue, pp. 1594–1606, 2020.