A Hybrid MCDM Model for Roles Selection in Supporting Talent Development Intervention Programme in Malaysia Public Higher Education Institution

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Abstract: The process of retaining leadership succession at higher education institutions (HEI) is crucial since it has entailed the process of selecting the ideal candidate. The goal is to guide universities toward maintaining organizations' excellence for their academic leadership and management (ALM) position. Due to the lack of established standards for assessing the competency of possible successors at their home institutions, many ALM of Malaysia HEIs are difficult to identify the proper replacement for their posts. This study aims to propose a multi criteria tacit knowledge acquisition framework (MC-TKAF) for supporting talent development intervention program in Malaysia HEIs. It will be based on cognitive apprenticeship, socialization and informal learning theory which mostly used in acquiring knowledge from expertise to overcome talent bottleneck among novice. Fuzzy Delphi will be used as the primary methodology in this study to gather agreement regarding the appropriate indicator to measure tacit knowledge competency among ALM at Malaysian HEIs. There are three phases: Phase 1 involves analyzing the current tacit knowledge acquisition (TKA) and identifying the appropriate parameters to build the intended framework. Phase 2 involves using the results of Phase 1 to create a new framework of tacit knowledge acquisition (TKAF) that is appropriate for the HEI environment. Phase 3's final objective is to assess the viability of the Talent Development Intervention Program's (TDIP) Tacit Knowledge Acquisition Framework (TKAF) utilising the Multi Criteria Decision Making (MCDM) approach. This paper's goal is to offer the hybrid MCDM approach as a talent performance indicator for the multi-criteria tacit acquisition framework. The final Phase 3 of the study design will essentially be the subject of this paper. The built-in indicators in this document may be utilised as a guide for the HEI sectors to create talent performance metrics that are appropriate for each TKA applied.

Keywords: Hybrid, MCDM, MC-TKAF, HEI, TDIP

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Introduction

Succession planning and executive transition management have emerged as pressing issues in today's universities and colleges. (Ku, Akmal, & Kamil, 2016; Varhegyi & Denise, 2017). These issues are a direct outcome of the retirement or death of prominent academics in the past. Most of them are from the baby boomer age and will retire and leave the business at some point. Proven abilities and knowledge in academic leadership and management (ALM) at HEIs may benefit the entire institution, not just their assigned departments. Some people in most organizations still don't understand the processes behind the development of intellectual capital and the sharing of tacit knowledge among workers..(do Rosário, Kipper, Frozza, & Mariani, 2015).

For some reason, nevertheless, the ingrained expertise and knowledge of ALM's forerunner cannot be shaped by a targeted acquisition formulation. The transfer of tacit information can be more successful and, in some cases, saved if the underlying cause is identified and addressed through the selection of an appropriate transfer channel. Lack of efficient evaluation of tacit knowledge acquisition, which should be incorporated in the HEI environment as an interpersonal accelerator in Talent Development Intervention (TDI) Program., is a contributing element to this situation. (Khalid, 2019)

In Malaysian HEIs, rules have been established to ensure that faculty members' work is evaluated not just in terms of academic success, but also in terms of their ability and potential, with the goal of fostering growth through an appropriate talent development intervention programme. Academic staff selection at universities and colleges refers to the practise of hiring qualified individuals for teaching and other academic positions A few studies (Khalid, 2019; Matoskova et al., 2013) demonstrate that academics who are picked underwent explicit evaluations, including qualification, experience, and research activities, in the selection process. Academics are not evaluated when they participate in talent development programmes at their university.

Literature Review

Selection Process Scenario For ALM Roles in Malaysia HEI

According to Orange Book (Ministry of Education Malaysia (MoE), 2016), in Malaysia, only 9% of faculty at public universities considered themselves to be transformational leaders. That's fewer than the predicted ratios that would have been required in (Ministry of Education Malaysia (MoE), 2016) which is ten (10%) to twenty percent (20%) of faculty members should be qualified to serve as ALMs. The study's readiness factor for several types of professional paths shows that schools of higher education are not yet prepared for these options.

There will be fewer qualified candidates for ALM positions if proactive measures are not taken to intervene in the selection and development of potential candidates at the appropriate time. Having access to a pool of qualified candidates for available ALM roles in HEI is crucial for making important personnel decisions including recruiting, firing, and evaluating employee performance. Both assessments are often done

independently. Both of these situations need for a trustworthy system to evaluate skill and experience levels. The term talent excellence refers to a community of academicians who are inspiring educators, accomplished researchers, entrepreneurial personalities, and transformative thought leaders. These are committed individuals who strive ceaselessly to raise quality standards, embrace professional development, instigate innovative teaching and learning, and excel in research and innovation. They are supported by well-trained, dedicated, and qualified administrative, technical, and support personnel. This academic community will enhance the international stature of the institutions it serves. Institutions are able to consistently recruit high-quality international students, faculty, funding, and research grants due to their global prominence.

The significance of an academic leader's talent development role is comparable to his or her teaching and research duties. Each academic leader is responsible for fostering the character and skills of their students, motivating them on a personal and professional level, and ensuring that their knowledge, skills, and resources are fully utilised and developed. It is their institutional duty to cultivate a pool of academic leaders who will continue to fuel development and enhance the quality of Malaysian HLIs in order to produce exceptional academic outcomes. Each academic administrator is also obligated to cultivate exceptional Malaysians capable of advancing the nation's mission and Vision 2020 objectives.Thus, there is currently no established methodology for evaluating the tacit knowledge competency that academics insist upon possessing in order to function effectively as academic leaders or managers. In the next section, we'll discuss in greater depth the reasoning behind this proposed model: The next section will presents the Multi-Criteria Model for the Acquisition of Tacit Knowledge.

Multi Criteria Tacit Knowledge Acquisition Framework (MC-TKAF)

Competency is one of the required elements in evaluating potential ALM in an academic setting background such as managerial competence (Potgieter, Basson, & Coetzee, 2011) and leadership competence (Scott, Coates, & Anderson, 2008a). However, the skill and experience can only be gained from the process of acquisition and elicitation (Yau'Mee Hayati Hj Mohamed Yusof, Ruzaini, & Awanis, 2019) which is known as the tacit knowledge competence. Assessing tacit evaluation is crucial for establishing the level of tacit knowledge competence in novices, but it requires the use of intuition, judgement, and emotion. More thought needs to go into this kind of evaluation. However, this is the type of assessment that is most likely to measure how successfully employees apply tacit knowledge in their work.

We propose a method based on five theoretical frameworks for selecting the most appropriate indicator of ALM applicants' progress in developing tacit knowledge. Table 1 provides explanations of the terms used in Cognitive Apprenticeship Model (CAM), Socialization: SECI, Informal Learning, Self-Efficacy Theory, and Dreyfus Model. The elaboration about this framework was explained in details in (Yau'Mee Hayati Hj Mohamed Yusof et al., 2019). The next section will discuss on the method that was used to verify the criteria to evaluate proposed model by using Fuzzy Delphi Method in next section.

Table 4. MC-TKAF Underlying Theory

Author	Theory/Model	Parameter
(Collins, Brown, & Holum, 1991)	Apprenticeship (CAM)	Coaching
(Nonaka & Toyama, 2003)	Socialization (SECI)	Mentoring Job rotation
(Kirkpatrick & Kirkpatrick, 2009)	Informal Learning	On Job Training (OJT)
(Dreyfus, 2004)	Expertise	Novice Advanced beginner Competent Proficient Expert
(Bandura, 1998)	Self-Efficacy	Cognitive Motivational Affective Selection

Fuzzy Delphi Method (FDM)

The idea of traditional Delphi, which takes a lot of time, has been given a new twist. (Ishikawa et al., 1993) to avoid flaws like repeated surveys of experts, which are expensive and lead to a lower answer rate, especially if the survey is hard. According to (Ishikawa et al., 1993), as it is proposed, the Fuzzy Delph Method has the advantage of reducing: 1) Fuzziness, which is always present in the results; 2) the number of surveys; 3) the semantic structure of forecast items is made clear; and 4) the individual characteristics of the expert (forecaster) are made clear. The change is made to fix the flaws in the standard Delphi Method (DM), which lead to low agreement on the results, the loss of important information, and a slow investigation.(Saffie, Amirah Nur', & Rasmani, 2016).

Because this study can be done in many different ways, the FDM has been used as one of the tools to check the criteria to find expert agreement. The criteria that have been picked for this MCTKAF by experts through consensus are explained in this (Yau'Mee Hayati Hj Mohamed Yusof, Arshah, & Romli, 2020a). Figure 1 depicts the selection tree for selecting the consensus view. The following section will discuss the MCDM techniques selected for this study.

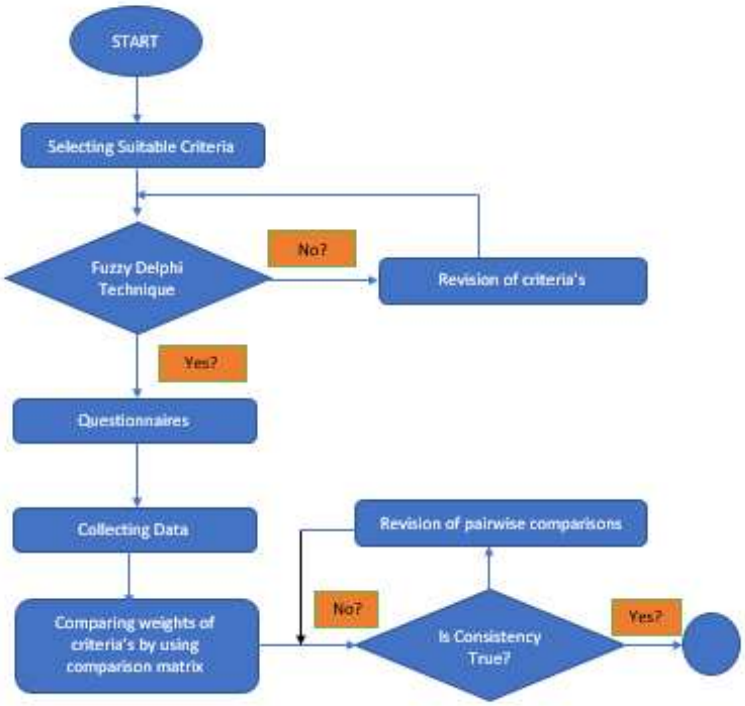

Figure 15. Fuzzy Delphi Method

Hybrid MCDM

The method of multi-criteria decision-making (MCDM) addresses the decision-making process in relation to multiple objectives. A decision-maker (DM) must select from numerous quantifiable or non-quantifiable criteria. One of the primary goals of MCDM is to assist DMs in integrating objective measurements with value judgements that are not dependent on the perspective of individuals but on collective thoughts. (Aruldoss, Lakshmi, & Venkatesan, 2013). This method provides powerful decision-making in areas where the best option is extremely complicated (Aruldoss et al., 2013). Generally, the objectives are incompatible, so the solution must be a compromise based on the preferences of the decision-maker. There are numerous situations in which weighing contending factors prior to making a decision is necessary. In MCDM models, a decision-maker must typically rank and select from a finite number of options. Frequently, it is also necessary to weight a limited number of criteria according to their relative importance. As demonstrated in Table 2, MCDM techniques have been utilised in a range of human selection applications to determine the optimal course of action. This study's primary objective is to apply MCDM as a talent performance indicator for selecting academic administration positions for aspiring academics. Several authors (Afshari, Mojahed, & Yusuff, 2010; Kolios, Mytilinou, Lozano-Minguez, & Salonitis, 2016; Mimi, Alias, & Abdullah, 2017) 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 2. Due to many methods in MCDM, researchers make list of criteria to choose which one is the best to be used

according to area of application. According to (Eldrandaly, Ahmed, & AbdelAziz, 2009), different MCDM strategies are suited to various decision circumstances. AHP is recommended, for instance, when individuals cannot quantify their preferences for various criteria and alternatives. Numerous inexperienced users have difficulty determining which MCDM technique is most appropriate for their particular decision situation.

Table 5. 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 Institutions	Qualification Marks Experience in years Salary Expectation Ability handle different subject Research Activities Technical Skill Presentation/Communication Skill	NONE	(Kumar, Radhika, & Suman, 2013)	(Kumar et al., 2013)			(Kumar et al., 2013)
Academic Staff Selection	Individual Factor Academic Factor Work Faculty	NONE			(Rouyende		
Evaluation of Personnel Selection Criteria Using Consistent Fuzzy Preference Relations	Activity Fee Education Internal Factors Business Factors	NONE				(Ozdemir, Nalbant, & Basligil,	
Academic staff promotion in higher education by using Analytic Hierarchy Process (AHP)	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 Outcomes Recognition and Reputation Financial Performance Effective Implementation	(Scott, Coates, & Anderson, 2008)					(Jantan, Yusof, & Ishak, 2019)

For example in the study done by (Kolios et al., 2016) in area of real estate and land management, they used seven (7) methods such as (ELECTRE), (MAUT), (ANP), (MACBETH), (AHP), (TOPSIS), (PROMETHEE) and four (4) criteria of choosing MCDM method that is suitable for the proposed model. Another study (Aruldoss et al., 2013) also comes with numerous methods and criteria such fuzzy TOPSIS, fuzzy VIKOR, and fuzzy GRA for evaluation on urban mobility projects. As proposed by (Aruldoss et al., 2013), the best alternative method can also use the veto rule to select. In other word, the alternative(s) that the majority of methods rank the highest will lastly be selected. The summary can be seen from Table 3.

Hybrid MCDM is widely used by many researcher in order to find the best solution in their prospect (Alguliyev, Aliguliyev, & Mahmudova, 2015; Chatterjee, Zavadskas, Tamošaitiene, Adhikary, & Kar, 2018; Dahooie, Abadi, Vanaki, & Firoozfar, 2018; Sitorus & Brito-Parada, 2020). For example in (Şenel, Şenel, & Aydemir, 2018), compared to the ELECTRE approach, the TOPSIS method provides more accurate and trustworthy findings in personnel selection. Comparison between MCDM method also been used in (Zhou, Wang, Lim, He, & Li, 2018) pertaining to the proposed hybrid fuzzy The DEMATEL-AEW-FVIKOR method demonstrates its flexibility with regard to the decision-maker's preference. Six techniques of MCDM, SAW, WPM, AHP, TOPSIS, CFPR, and ELECTRE, have been discovered to solve the nature of the MC TKAF, as shown in Table 4. As shown in Table 4, each MCDM technique has its own set of formulations and objectives based on the requirements of the various regions. Since there are numerous MCDM approaches, researchers compile a list of parameters to determine which one is optimal for a given application domain. According to (Eldrandaly et al., 2009) different for instance, AHP is recommended in situations where individuals are unable to measure their preferences for different parameters and alternatives. MCDM approaches fit different types of the decision situation. While CFPR is purposely used for simplifying the pairwise comparison (Mimi et al., 2017) and ELECTRE (Şenel et al., 2018),is used when comparing binary, superiority between different decision points for each rating factor, is employed. Many new users struggle to determine which sort of MCDM technique is optimal for their situation. Each technique's functions, calculation stages, and formulas are listed in the table below.

Table 6. MCDM Criteria Selection

Author	Area	Criteria of MCDM Selection
Kolios, A., Mytilinou, V., Lozano-Minguez, E., & Salonitis, K. (2016) (Kolios et al., 2016)	real estate and land management	The weighting of variables (optional action) Determining the framework of expected properties

		Calculation of the overall index of suitability The identification of the method best suited to resolve the decision-making problem
Aruldoss, M., Lakshmi, T. M., & Venkatesan, V. P. (2013) (Aruldoss et al., 2013)	urban mobility projects	the alternative (s) that is ranked as the highest by the majority of methods

Methodology

Research Design

As shown in Figure 2, the three sections of this study consist of Phases 1, 2, and 3. In phase one, three subphases of the current tacit knowledge acquisition (TKA) are analysed: document analysis, validation, and the fuzzy Delphi technique, in that order. In Phase 2, the findings of Phase 1 are utilised to develop a framework for Tacit Knowledge Acquisition Framework (TKAF) that is compatible with the HEI environment and employs Fuzzy Delphi to achieve consensus agreement. Using a multi-criteria decision-making procedure, the final stage of Phase 3 is to evaluate how well the Talent Development Intervention Programme (TDIP) will complement the Tacit Knowledge Acquisition Framework (TKAF).

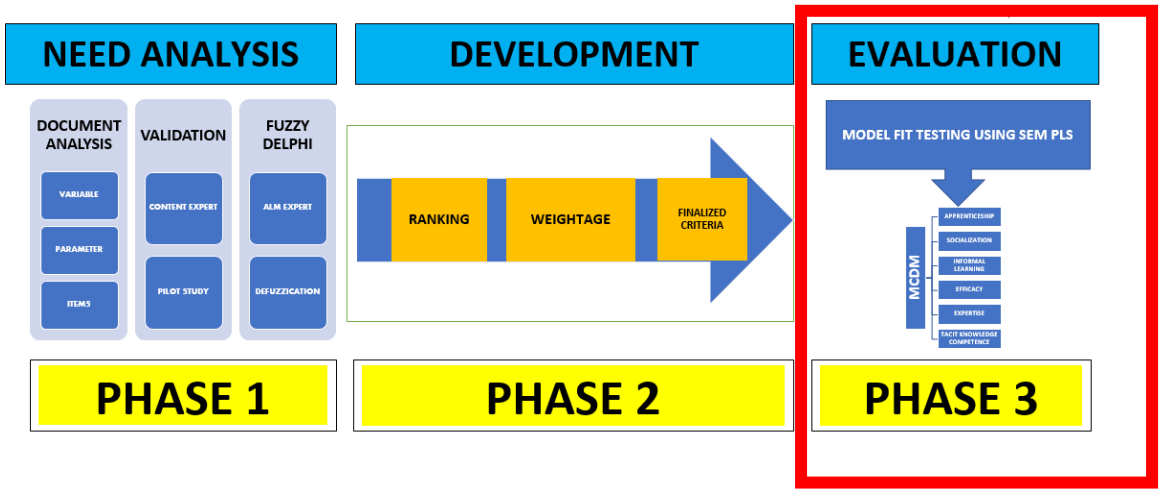

Figure 16. Research Design

Research Framework

The Proposed framework of MCTKAF will be evaluated by using Smart PLS 4.0. Five independent variables, and one Dependent variable have been chosen to be our proposed framework as illustrated in Figure 1.5. The parameter used for each indicator are based on (Odell, 2011) for coaching,(Pfund, Byars-Winston, Branchaw, Hurtado, & Eagan, 2016) for mentoring ,(Lu & Yang, 2015) for Job Rotation,(Dhliwayo, Nyanumba, &

Shepherd, 2014) for On Job Training,(Garcia & Garcia, 2015),(Chen & Gully, 2001),(Platt, 2010),(Bandura, 1998) for Efficacy,(2005, 1986) for Expertise and (BĂNACU, BUŞU, & Alexandra Cătălina, 2013) for Tacit Knowledge Competence. The result of the proposed framework will be discussed in our incoming paper. The figure 3 below show our model in this study.

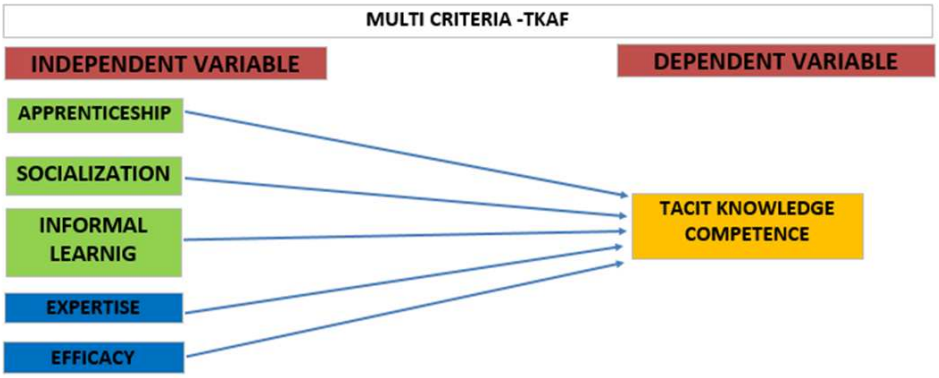

Figure 17. Research Model MCTKAF

Proposed Hybrid

Model

Decision Support System on MCTKAF are based on the flowchart in figure 4 below. The algorithm within the system will allow the decision maker to choose the right candidate to fill in the roles.

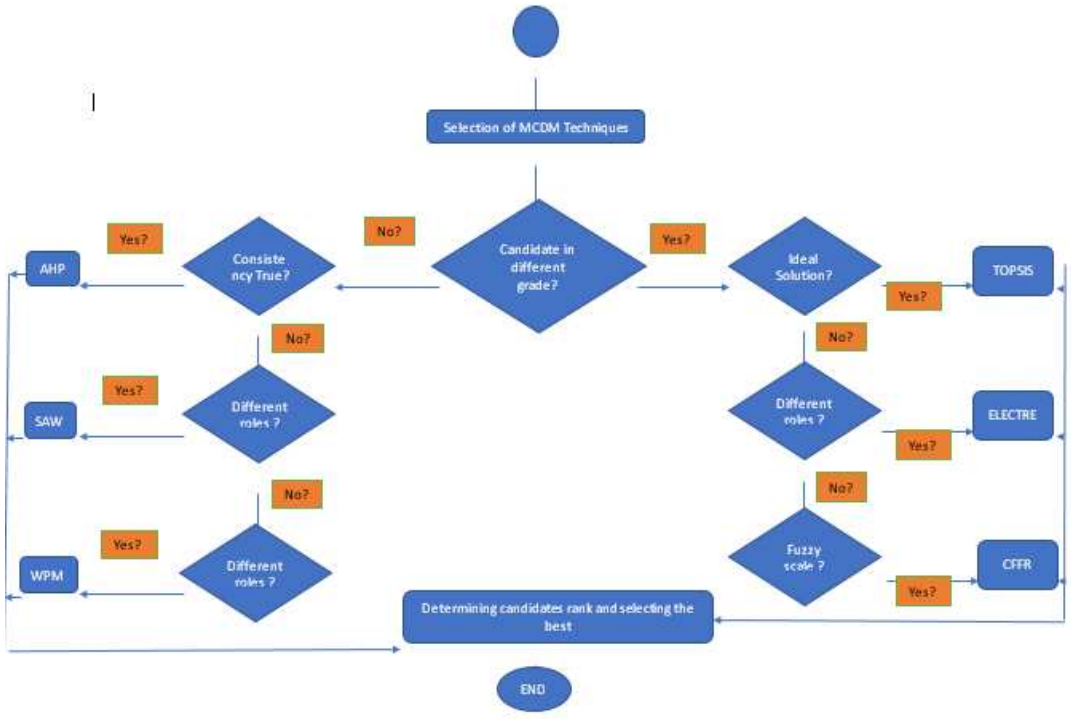

Figure 18. Hybrid MCDM Selection

Results

The finalized result has been transformed using six(6) different techniques of MCDM in which almost all of the techniques to produce similar result . The conclusion of the each of technique has been explained in TABLE 5.

Table 7. Result

	CFFR	ELECTRE	SAW	WPM	AHP	TOPSIS
Result	In this case UITM1 is the best personnel for the position of Deputy Rector followed by UITM2, and UITM3 Further discussion on results can be referred to (Yau'mee Hayati Hj Mohamed Yusof, Arshah, & Romli, 2021)	So in this case, by using ELECTRE formula, UITM1 is the best personnel for the position of Deputy Rector followed by UITM2, and UITM3 Further discussion on results can be referred to (Yau'mee Hayati Hj Mohamed Yusof et al., 2021)	SAW formula showed that UITM3 is the best personnel for the position of Deputy Rector followed by UITM2, and UITM1 Further discussion on resultscan be referred to (Yau'Mee Hayati Hj Mohamed Yusof, Arshah, & Romli, 2020b)	WPM formula finalized UITM 1 as the first choice, followed by UITM2, and UITM1 Further discussion on results can be referred to (Yau'Mee Hayati Hj Mohamed Yusof et al., 2020b)	AHP formula finalized UITM 1 as the first choice, followed by UITM2, and UITM1 Further discussion on results can be referred to (Yau'Mee Hayati Hj Mohamed Yusof et al., 2020b)	TOPSIS formula finalized UITM 1 as the first choice, followed by UITM2, and UITM1 Further discussion on results can be referred to (Yau'Mee Hayati Hj Mohamed Yusof et al., 2020b)

Sensitivity Analysis

To rank the candidates, the final normalized weight is computed. The candidate for that position who ranks first or has the highest final weight value is shown. The three candidates will be ranked for possible jobs as stated in TABLE 5 based on the final weight results for all procedures.

Table 8. Summary of Integrated MCDM

	SAW			WPM			TOPSIS			AHP			CFFR			ELECTRE		
CANDIDATE	UITM 1	UITM2	UITM3	UITM 1	UITM2	UITM3	UITM 1	UITM2	UITM3	UITM 1	UITM2	UITM3	UITM 1	UITM2	UITM3	UITM 1	UITM2	UITM3
PERFORMANCE	9.01	9.36	9.5	8.94	8.89	8.89	0.76	0.25	0.22	16.13	15.73	15.73	58.04	57.35	57.35			
RANK	3	2	1	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

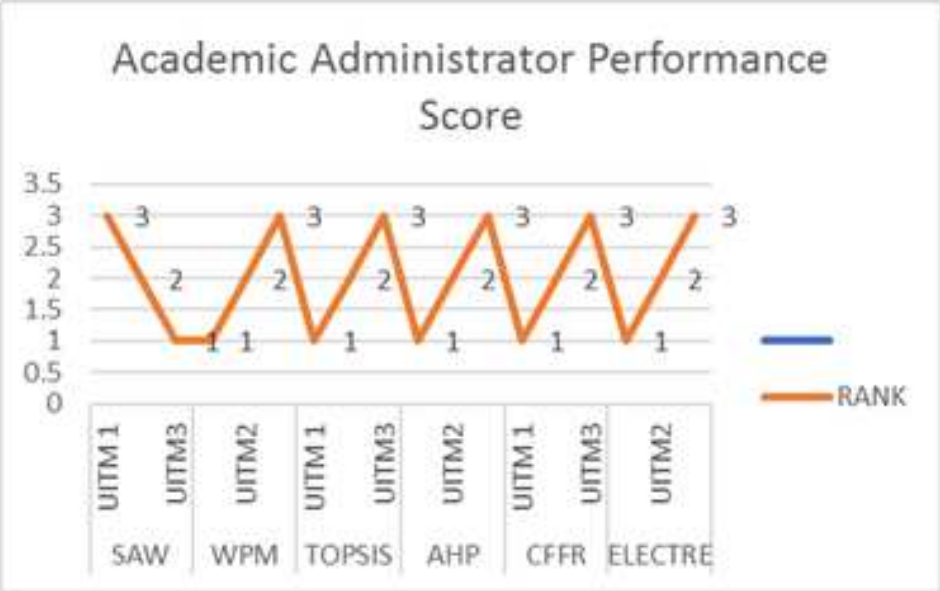

Figure 19. Academic Administrator Performance Score

The results of Table 6 and Figure 5 show that the selection for majority techniques provides a solution for the academic administrator jobs (Aruldoss et al., 2013) is consistent for candidate UITM 1 (ELECTRE,CFFR,WPM, AHP and TOPSIS) as the first choice. As proposed by (Aruldoss et al., 2013) the best alternative technique can also use the veto rule to select. In other words, the option(s) that the majority of ways score the highest will be chosen last. The criteria of selection are based on the technique that must support Multicriteria, Linguistic Fuzziness, and including the Fuzzy Delphi process as suggested by (Kolios et al., 2016)and (Aruldoss et al., 2013). According to (Aruldoss et al., 2013), selection of which MCDM technique is based on the study of own scope performance, for example, the method has to be chosen in such a way for different problems that have to be solved. This is equivalent to (Kolios et al., 2016) said that one technique outperforms the remainder since predictive precision depends on the nature of the issue, as well as the collection and handling of information in a manner that best suits each technique and implementation. Candidate UITM 1 (WPM, AHP, TOPSIS, CFPR, and ELECTRE) is the first choice in the majority of methods (Aruldoss et al., 2013) solution for academic administrator jobs selection. We can use the recommendation of (Kolios et al., 2016) and (Aruldoss et al., 2013)to choose which result is the best suit to the case. The next section will explain the hybrid MCDM that we would like to be integrated based on decision support system (DSS) on MCTKAF.

Database Structure

In proposed Decision Support System (DSS), the following ERD diagram is developed to create the structure of the database. Hybrid MCDM algorithm has been coded into the DSS for making the candidate selection is much able to seen via pattern rather that numbers.

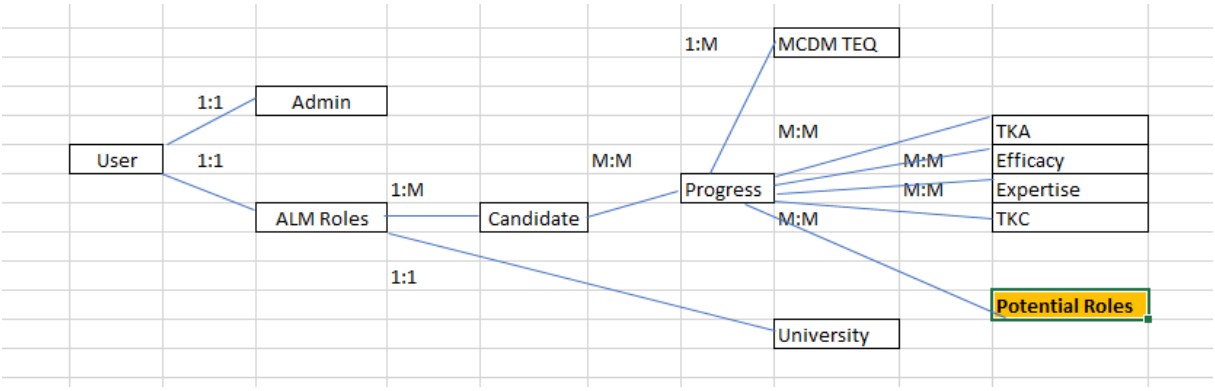

Figure 20. Database Structure in DSS MCTKAF

The following is the Personalization Interface for each candidate as shown in Figure 7.

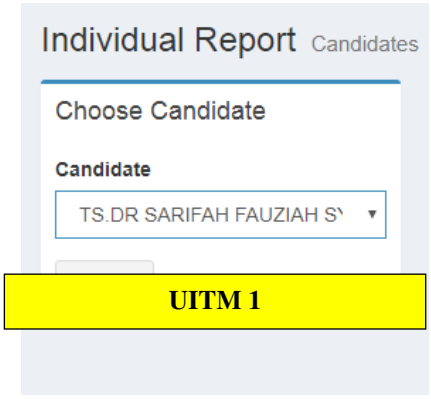

Figure 21. Personalization Interface

The following is the Candidate Progress Interface for each candidate as shown in Figure 8.

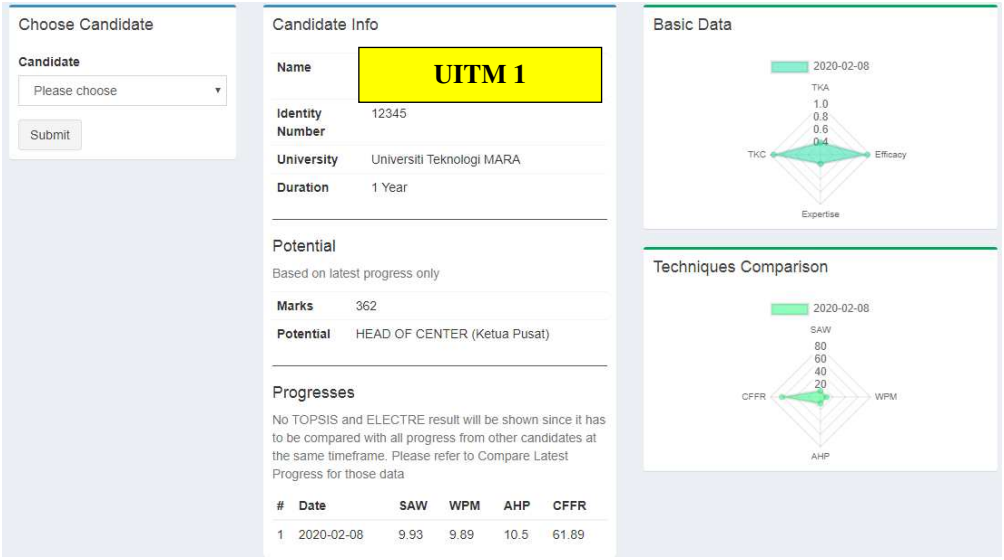

Figure 22. Candidate Progress

The following is the Candidate Comparison Progress for each candidate as shown in Figure 9.

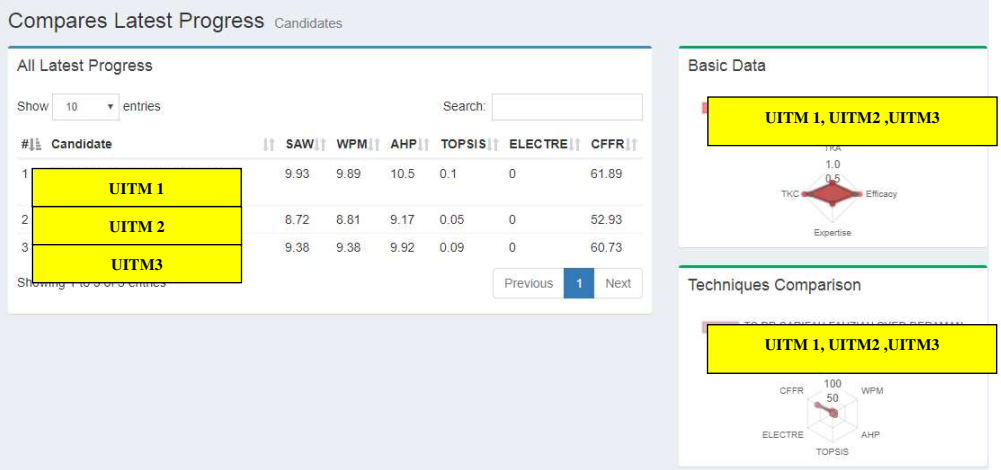

Figure 23. Candidate Report

Post Evaluation on Proof of Concept (POC)

Three assessors from three (3) categories of Malaysian public university have been approached to test practicality of the system. They have been asked to use the DSS MCTKAF to key in the profile of their suitable successor and get anlaysis from the system. The profile of each evaluator can be referred from this Table 6.

Table 9 Evaluator Brief Description

EVALUATOR	POSITION	TYPE OF MALAYSIAPUBLIC UNIVERSITY
1. UC EVALUATOR	RECTOR	COMPREHENSIVE
2. UF EVALUATOR	DIRECtTOR	FOCUS
3. UR EVALUATOR	PROGRAM COORDINATOR	RESEARCH

Seven (7) questions on system usage been asked in Google Form (Content, Implementation, Need of Study, Phenomenon, Behaviour, Suitability and Overall) with the result of the evaluation may be refered on the following Table 7.

Overall, three(3) evaluators from three(3) different universities has been asked to use the POC of DSS MC-TKAF, all of them believe this POC has potential to be incorporated in Malaysian Public HEI Talent Development Intervention Program in order to retain the successor in academic and leadership line with some suggestion to add on some elements on explicit knowledge which will be considered later in other phases.

Table 10. Descriptive Analysis

UNIVERSITIY CATEGORY: COMPREHENSIVE, FOCUS, RESEARCH							
ITEM	CONTENT	IMPLEMENTATION	NEEDS OF STUDY	PHENOMENON	BEHAVIOUR	SUITABILITY	OVERALL
MEDIAN	4	4	4	4	4	5	ACCEPTED

Conclusion

All of these ranked criteria can be used to select the ALM, and they will shed light on the relative importance of various features for each role. The proposed implementation of DSS MCTKAF might provide managers and HR with insights based on patterns rather than raw data. Managers and human resources departments may have a clear mental image of how they would use these factors to evaluate personnel. Thus, to assist decision-makers, MCDM researchers can utilize the recommendations of (Aruldoss et al., 2013), (Kolios et al., 2016) to determine which outcome is the best. The hybrid MCDM proposed in this paper yields UITM1 as the first successful candidate. Next up is UITM2, then UITM3. The ALM can be chosen based on these prioritized criteria, which also serve to illuminate the significance of specific aspects for their respective functions. The proposed implementation of DSS MCTKAF might provide managers and HR with insights based on patterns rather than raw data. Managers and HR departments may have a clear mental image of how they would evaluate people using these standards.

Recommendations

The proposed hybrid MCDM, which now a Decision Support System of MC-TKAF, aims to provide fresh perspective to the ALM for intervening in talent acquisition by targeting a new approach to building an intervention programme to foster talent development at a public university institution. This will deepen and broaden our knowledge of ongoing and future studies on this subject, which is especially useful for determining viable alternatives to existing talent development intervention programmes in higher education.

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