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A Hybridized Competency-Based Teacher Candidate Selection System

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***Abstract*—**Teachers form the backbone of any educational system, hence selecting qualified candidates is very crucial. In Malaysia, the decision making in the selection process involves a few stages: Initial filtering through academic achievement, taking entry examination and going through an interview session. The last stage is the most challenging since it highly depends on human judgment. Therefore, this study sought to identify the selection criteria for teacher candidates that form the basis for an efficient multi-criteria teacher-candidate selection model for that last stage. The relevant criteria were determined from the literature and also based on expert input that is those who were involved in interviewing teacher candidates from a public university offering the formal training program. There are three main competency criteria that were identified which are content of knowledge, communication skills and personality. Further, each main criterion was divided into a few sub-criteria. The Analytical Hierarchy Process (AHP) technique was employed to allocate weights for the criteria and later, integrated a Simple Weighted Average (SWA) scoring approach to develop the selection model. Subsequently, a web-based Decision Support System was developed to assist in the process of selecting the qualified teacher candidates. The Teacher-Candidate Selection (TeCaS) system is able to assist the panel of interviewers during the selection process which involves a large amount of complex qualitative judgments.

***Keywords*—**Analytic Hierarchy Process, Simple Weighted Average, Decision Support System, Multi-criteria decision making problem.

I. Introduction

THE teacher-candidate selection for any formal teacher training program is an important decision making process that must be carried out with much concern. It is a difficult process due to the increasing demand and expectations towards teachers in the society. Furthermore, selecting qualified and best suited candidates as suggested by [1] from a pool of applicants is becoming a more complicated and difficult task since there are also society's and nation's concerns on the quality of teachers at hand.

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Looking at the Malaysian context, one could ask more questions. How did the authoritative institutions choose a teacher candidate? How is the selection process being carried out? What type of selection model used? What are the criteria used in selecting a potentially good teacher? In Malaysia, there are two ministries that are responsible for the whole teacher training or education programs, which are the Ministry of Education and Ministry of Higher Education. The requirements and criteria are set by the ministries. There are two levels of teacher education programs: the Diploma level, and the Bachelor level. It was learned that part of the decision making process is still heavily depended on human judgment [2], which could lead to inaccuracy and inefficiency.

Hence, the study reported in this paper tried to answer all of the questions being posed regarding the selection of teacher candidates. Subsequently, the objectives of the study were to (i) identify the most appropriate selection criteria for teacher candidates that form the basis for the selection system, (ii) develop an efficient hybridized multi-criteria selection model of teacher candidates for teacher training programs, (iii) develop an effective competency-based decision support system for selection of teacher candidates.

The work in this study combined both the qualitative and quantitative approaches in data collection where respondents are the experts who have been involved in the teacher-candidate selection process in a public university offering a teacher training program. They were also asked to explicitly quantify their qualitative criteria scoring.

II. Selection Criteria

As argued by [3], teacher-candidate selection process should be given special considerations. This process must support the integrity of the teaching profession by ensuring the selection of those individuals who have the potential to become effective teachers. In Malaysia, the teacher-candidate selection process involves a few stages, which are (i) filtering through academic achievement, (ii) requiring the candidates to sit for the Malaysian Educators Selection Inventory (MEdSI) as an entry examination, and (iii) going through an interview session [4]. The last stage is the most challenging since it is unstructured and highly dependent on human judgment. In fact, the selection criteria used during the interview session by the Ministry of Education is different from the ones used by the Ministry of Higher Education [5].

In the second stage, the candidates are evaluated on intrinsic qualities such as personality, interest towards teaching career, integrity and emotional [6]. Reference [7] suggested four evaluation criteria for the selection of teacher

candidates, while [8] proposed 12 criteria or characteristics similar to [9] with also 12 criteria. On the other hand, [10] came up with 21 evaluation criteria, while [11] have three more than that of [7] which makes it 15 criteria. These are among the literature on evaluation and selection criteria which can be viewed in detailed from [5].

After careful review from the literature, interviews and thorough discussions with experts who have vast experiences in the interview sessions of stage three in the selection process, we suggested three main criteria [12] with each main criterion was further decomposed into sub-criteria as shown in Table I. Main criteria content of knowledge (CK) has four sub-criteria, communication skill (CS) has six sub-criteria and personality (P) has eight sub-criteria.

TABLE I
TEACHER-CANDIDATE SELECTION CRITERIA

CK	CS	P
General Knowledge	Pronunciation	Attire
Subject matter Knowledge	Clarity	Behaviours & Ethics/Poise
Current Issue	Constructive Ideas	Leadership
Real/Authentic Situation	Language Proficiency	Motivation
	Fluency	Confidence
	Completeness of Statement	Tolerance
		Sensitivity
		Creativity

III. HYBRIDIZED MULTI-CRITERIA SELECTION MODEL

Consideration on the best suitable technique to be applied was done through relevant previous works on techniques such as the Analytic Hierarchy Process (AHP), Goal Programming (GP), Simple Weighted Average (SWA), ELECTRE III, Analytic Network Process (ANP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and Rank-Based Weight methods as discussed in [5]. Subsequently, the AHP was opted for use in this multi-criteria decision making problem as it is suitable for comparing two decision elements at a time (Islam & Shuib, 2005). Thus, it shall be applied in criteria comparisons, which then allocates appropriate weights. In addition, the AHP technique is also suitable for group decision making [13] as in our study.

Following the AHP, the SWA technique was then used to develop an efficient multi-criteria teacher-candidate selection model based on the weighted criteria. SWA is a scoring model as similar to the one in [14]. The SWA technique is simpler to implement and able to rank, which finally selects the best teacher candidate according to the criteria identified. Taking into consideration the advantages of both techniques, the integration of these techniques has been explored and experimented in this specific teacher-candidate selection problem. A specialized AHP questionnaire was developed for use in structured interviews with the experts. This questionnaire guided the experts to quantify their decision judgement. The data which are the identified criteria and the criteria scoring were then analyzed and computed using both the AHP and SWA techniques to manage the complexity of the subjective selection in the decision making process.

IV. WEB-BASED DECISION SUPPORT SYSTEM

There are five phases involved in the development of a web-based decision support system (DSS) for the teacher-candidate selection model, namely the requirement planning, creating design, development or construction, analysis or review prototype, and implementation, in accordance with the Rapid Application Development (RAD) [15]. In this development lifecycle, the phases continued in an iterative process. In the development of the Teacher-Candidate Selection (TeCaS) System, the four essential aspects of RAD were enforced. Those aspects are methodology, people involvement, management, and tools without which the development of the system would not occur at a high speed.

The designing of the TeCaS system is adapted and modified based on the work by [16]. The architecture of the TeCaS system as shown in Fig. 1 is based on a Client-Server model on the internet, which includes all of the characteristics of a DSS.

This architecture was adopted as it is able to split the analysis function between the client and the server, thus leaving all of the client's presentation and all of the data management on the server. Within the TeCaS system, the selection weights for the eighteen criteria are executed by the client, whereas the analysis, which consequently produces the overall score, is performed by the server. In this design phase, there are process modeling and database modeling that we have done within the TeCaS System. Overall, the development of the system is based on the requirement analysis phase, which was used to ensure that the application's development achieves its main objectives and was on the right path of its development activities.

Testing phase is part of the process for reviewing the prototype as to assure that the TeCaS system is an error-free system. Having done all activities in the previous phases, we finally manage to build exactly what was requested and required, although there is still room for innovation and flexibility. Thus, we present some of the important interfaces for the TeCaS System as exhibited in Fig. 2 till Fig. 6.

V. CONCLUSIONS AND FUTURE WORK

The work in this study has successfully identified three main criteria and a total of eighteen sub-criteria in selecting teacher candidates to enter teacher training programs in Malaysia. These criteria are deemed reliable and valid, thus can be used during the interview sessions since they were examined and determined after a thorough literature and experts' review. The process of quantifying the criteria weights and computing the respective scores is successfully materialized through the hybridization of the AHP and SWA scoring model. The two techniques were innovatively utilized to analyze and manage the complexity of the subjective selection in the decision making process.

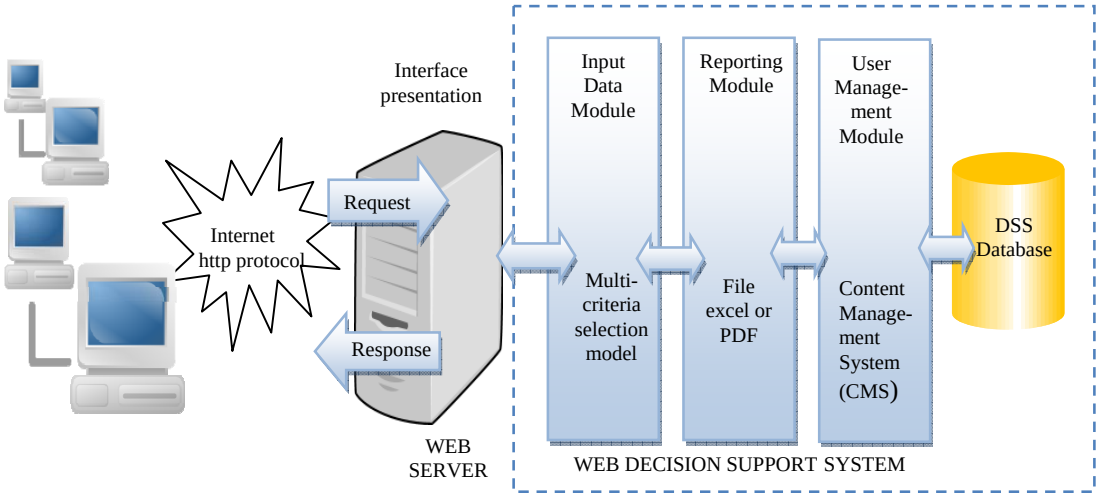

Fig. 1 Architecture of the TeCaS System

Fig. 2 Main interface for the TeCaS System

Fig. 3 Interface for the TeCaS setting menu

Fig. 4 Interface for user setting menu in TeCaS System

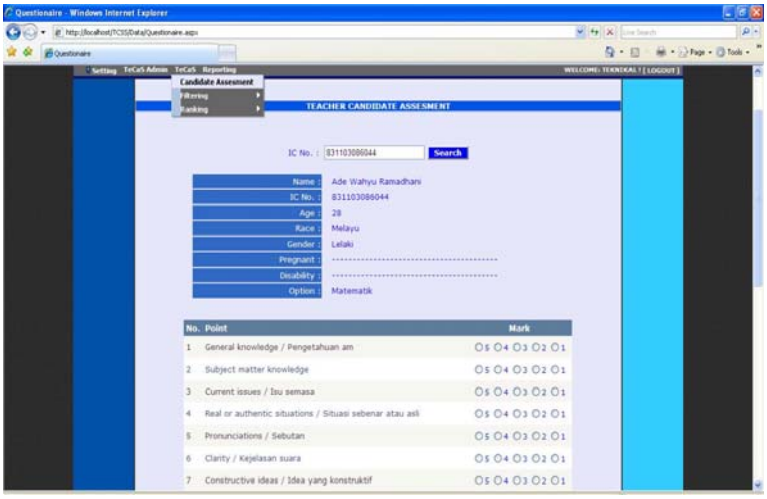

Fig. 5 Interface for evaluation task in TeCaS System

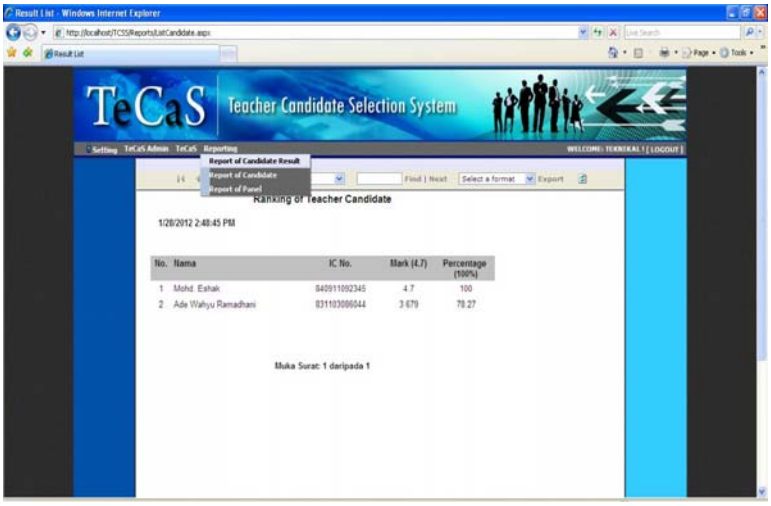

Fig. 6 Interface for reporting the selection process in TeCaS System

Finally, we have successfully developed an effective competency-based DSS for selection of teacher candidates, which is also a web-based approach. The output of our work is an improved and efficient TeCaS model which introduced the mixed methods of qualitative and quantitative in acquiring the relevant criteria to the development of the hybridized system. The selection process is more standardized now and the interviewers' scores can be consistent, thus minimizing biasness.

However, we believe that TeCaS model can be further improved if more respondents or experts from other teacher training programs across Malaysia, so as the results could be more generalized. In term of the web-based DSS, other features could be integrated or embedded, such as places for interviews and interviewing committee. This could provide a more comprehensive web-based DSS to cover the real-world teacher-candidate selection problem.

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