

## CRITERIA FOR SELECTION OF THE BEST STUDENT AT UPSI BASED ON ANALYTICAL HIERARCHY PROCESS

(Kriterium untuk Pemilihan Pelajar Terbaik di UPSI berdasarkan Proses Hierarki Analisis)

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### ABSTRACT

Every year, Universiti Pendidikan Sultan Idris (UPSI) needs to choose the best graduating student to be awarded during the convocation ceremony. Normally, the candidate selection in Malaysian public universities is carried out through an evaluation process by the faculty/university, however this process is less efficient. To prevent biases, several criteria need to be considered. Therefore, this research utilizes Analytical Hierarchy Process (AHP) method to identify and prioritize the criteria for selecting the most suitable candidate among undergraduate students in UPSI. There are two phases in this research. Phase 1 involves in developing a questionnaire that contains a list of criteria that an excellent student must have. The questionnaire has been distributed to the experts to check the validity and a group of lecturers have been selected to test the reliability of the questionnaire as well as to shortlist the main criteria to be considered and included in Phase 2 of this research. In Phase 2, an AHP decision matrix is developed, and the candidates will be ranked based on the selected criteria obtained from Phase 1 and their weight values. The candidate with the highest priority value will be chosen as the best student. Five lecturers were involved as a decision maker in Phase 2 of this research. The analysis through AHP found that CGPA greater than 3.75 were the most important criteria and among eight candidates, Candidate 3 is the best student with score of 0.168. The result obtained in this research gives a list of must-have criteria to be an excellent student and also shows that the AHP method is very useful in making a decision that involves many choices. Thus, this method is relevant to be used as a method for selecting an undergraduate best student. The implication of the study is the AHP method can be applied in the educational field since it is consistent and can reduce bias.

*Keywords:* AHP; multi-criteria decision-making; excellent student; pairwise comparison; expert choice

### ABSTRAK

Setiap tahun UPSI perlu memilih graduan yang cemerlang untuk dianugerahkan sebagai pelajar terbaik semasa majlis konvokesyen. Secara amalnya, pemilihan calon dilaksanakan melalui proses penilaian oleh pihak fakulti/universiti dan proses ini kurang efisien. Bagi memastikan pemilihan pelajar terbaik dilakukan secara adil, beberapa kriterium perlu dipertimbangkan. Maka, kajian ini menggunakan kaedah Proses Hierarki Analisis (PHA) untuk mengenal pasti dan menyusun kriterium berdasarkan keutamaan bagi memilih calon yang terbaik dalam kalangan pelajar sarjana muda di UPSI. Terdapat dua fasa dalam kajian ini. Fasa 1 melibatkan pembangunan soal selidik yang mengandungi senarai kriterium yang perlu ada pada pelajar cemerlang. Soal selidik ini telah diedarkan kepada pakar untuk disahkan dan kemudian diberi kepada sekumpulan pensyarah yang terpilih untuk diuji kebolehpercayaannya serta mendapat senarai pendek kriterium yang akan dipertimbangkan dalam Fasa 2 kajian ini. Matriks keputusan PHA dibangunkan dalam Fasa 2 dan calon disusun mengikut peringkat berdasarkan kriterium yang terpilih dalam Fasa 1 dan nilai pemberatannya. Calon yang mendapat nilai keutamaan tertinggi akan dipilih sebagai pelajar terbaik. Lima orang pensyarah terlibat sebagai pembuat keputusan dalam Fasa 2 kajian ini. Analisis menggunakan PHA mendapati kriterium yang paling utama adalah kriterium CGPA melebihi 3.75 dan Calon 3 telah terpilih sebagai pelajar

terbaik dalam kalangan lapan orang calon dengan nilai skor sebanyak 0.168. Keputusan kajian ini memberikan senarai kriterium yang perlu ada pada seorang pelajar yang cemerlang dan menunjukkan bahawa kaedah PHA ini sangat membantu dalam membuat keputusan yang melibatkan pelbagai pilihan. Maka, kaedah ini sangat relevan untuk digunakan dalam pemilihan seorang pelajar sarjana muda yang terbaik. Implikasi kajian ini ialah kaedah PHA boleh digunakan dalam bidang pendidikan kerana ia konsisten dan dapat mengurangkan berlakunya ketidakadilan.

*Kata kunci:* PHA; pembuatan keputusan multi-kriterium; pelajar cemerlang; perbandingan berpasangan; pilihan pakar

## 1. Introduction

Nowadays, we can see that the modern education world is much up to date, lots of problems and decisions need to be made. In Malaysia, Ministry of Education Malaysia (MOE) and the Ministry of Higher Education (MOHE) are the bodies that are responsible for making the decision and developing Malaysian education system to continue its development. To meet the needs of the industry, the MOHE proposed the usage of the Integrated Cumulative Grade Point Average (iCGPA) to all higher institutions in Malaysia. The iCGPA is an evaluation system to access and report student's integrated development and performance, as well as their ethical, knowledge, and ability learning gains (Suhaila & Nur Faraheen 2018). This system should address some critical issues including institutional efforts in support of developing the holistic student and graduate employability.

MOHE suggested that the assessment of academic proficiency, character development, and non-academic proficiency development should be conducted parallel every semester (Mohd Salehuddin *et al.* 2017). Therefore, rewarding management in many universities in Malaysia has been implemented to motivate the students to excel in their studies and be well-rounded. Most of the universities came out with an initiative to give rewards or awards to selected students who are excellent not only in academic but also in co-curriculum as motivation for them to be more successful in the future and to encourage the other students to work harder.

Universiti Pendidikan Sultan Idris (UPSI) is one of the public institutions of higher education which plays an important part in the history of Malaysia education is no exception in granting awards for their excellent students. The university normally selects their excellent students based on their achievement in academic. However, academic excellence only does not guarantee that they are also excellent in social skills, communication skills and interpersonal skills. Hence, it is hard to evaluate the excellence of the students equally without any bias during decision making.

According to Nur Idalisa *et al.* (2015), personal evaluation becomes a problem especially when it comes to identify, giving merit and evaluating the candidates from a list. Award selection is normally carried out through surveys or evaluation process by the faculty or the management of the campus. The results of this evaluation process led to the selection of qualified candidates as required by the organization because the decision makers need to know the criteria which must be given priority so that the selected candidate will be able to meet the desired criteria. In the education field, the problem of evaluating the students' performance exists when there were the different opinions about which criteria need to be focused on selecting the best students (Nur Afriza *et al.* 2017).

Therefore, the aim of this research is to identify the criteria that an excellent student should have and to select the most suitable candidate to be awarded as the best student in UPSI

convocation ceremony based on the ranked criteria. In this research, the Analytic Hierarchy Process (AHP) will be used to solve problems of selecting the most suitable candidates to receive the award for their excellence equally without any bias based on some criteria. In the 1970s, the AHP which is a Multi-Criteria Decision-Making method was developed by Thomas L. Saaty to solve the problem during the decision-making process (Saaty 1980). This AHP method allowed decision makers to model a complex problem in a hierarchical structure, showing the relationships of the goal, objectives (criteria), and alternatives. AHP is also made up of several components which are structuring the problem to build up the hierarchy, collecting data through pairwise comparisons, judgments, an eigenvector method for deriving weights and consistency considerations.

## **2. Methodology**

Analytical Hierarchy Process was developed in the 1970s as a way of dealing with weapons tradeoffs, resource and asset allocation, and decision-making when Thomas L. Saaty was a professor at the Wharton School of Business and a consultant with the Arms Control Disarmament Agency (Alexander 2012). Today, AHP becomes one of the most popular methods of Multi-Criteria Decision-Making (MCDM). This method calculates the correlation between the weights of indices and the overall value of each option based on the calculated weight (Saaty 1980). Compared to other MCDM methods, AHP was widely used for multi-criteria decision and generally gave better results (Saaty 2008). In AHP, the human mind uses an organized knowledge for decision-making and is the main advantage of the AHP over the other methods (Nurul Huda *et al.* 2017).

The AHP uses the judgments of decision makers to form a problem modeling in a hierarchical structure. The hierarchy is used to derive ratio-scaled measured for decision alternatives and the relative value that alternatives have against organizational goals and project risks. In the AHP method, the verbal scale is used to enter judgments and it was essentially an ordinal scale. The AHP derives ratio scales from pairwise comparisons of the factors and solved those pairwise comparisons in mathematically optimal solution by using matrix method. The AHP also uses actual measures like price, counts, or subjective opinions as inputs into a numerical matrix (Liang & Peng 2017). The outputs include ratio scales and consistency indices derived by computing eigenvalues and eigenvectors. Readers can refer to Saaty (1980) and Moayeri *et al.* (2015) for thorough reading on this method.

This research uses a mixed-method which is the qualitative and quantitative data collection method. The quantitative and qualitative research design methods are depending on the main of the data collections and the use of instruments such as interviews and surveys. There are two phases in this research.

### **2.1. Phase 1: Identify the criteria of an excellent student**

A questionnaire (Questionnaire 1) that contains a list of criteria that an excellent student must have is developed. These criteria are obtained from literature and brainstorming input among researchers and lecturers. The validity of the questionnaire is validated by two (2) experts: one (1) academician and one (1) in administration department. Then, the questionnaire is distributed to the selected 30 academicians to test the reliability of the questionnaire as well as to shortlist only five (5) main criteria that an excellent student should have.

**2.2. Phase 2: Ranking of all candidates based on the criteria**

The list of qualified candidates from each faculty has been obtained from the Academic Division, UPSI. However, only eight (8) candidates are willing to take part in this research. Then from the hierarchical conclave best student selection, as can be seen in Figure 1, a questionnaire is developed (Questionnaire 2) containing pairwise comparison between candidates for each criterion with detailed guidance and explanation. The questionnaire is distributed to five (5) decision makers after the validation process from two experts. These five decision makers are selected among lecturers at management level from several academic departments. Finally, the weighting matrix was generated to analyze the data using Expert Choice software.

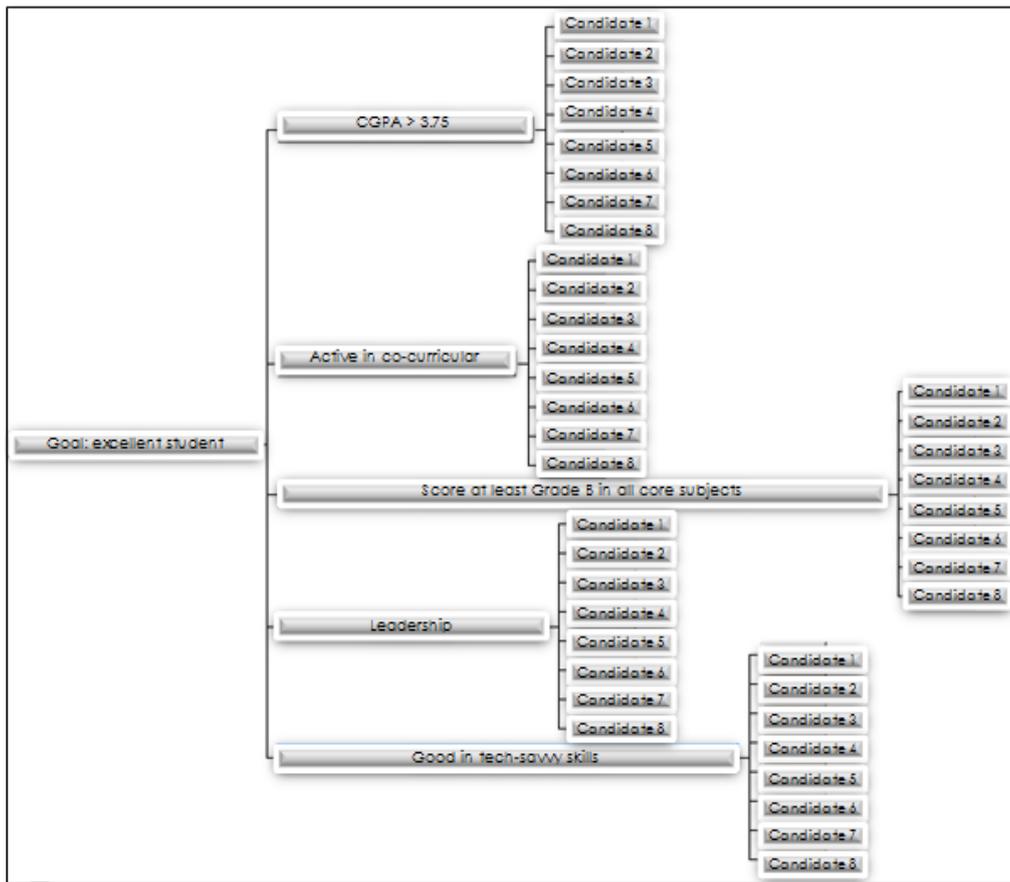


Figure 1: Hierarchical conclave best student selection

**3. Results and Analysis**

In this study, criteria of an excellent student have been shortlisted as shown in Table 1 together with the priority value for each criterion. These priority values are obtained from pairwise comparison between criteria in Questionnaire 2.

Based on Table 1, criterion K1 has the highest priority (0.39) in selecting the best student in the convocation ceremony. The second criterion is K4 with the priority value 0.229, followed by criteria K3, K5 and K2. This finding shows that academic performance and personal skills

are important criteria in identifying the best undergraduate student. The normal practice of selecting the best students mostly based on academics while in this method, we only consider academic achievement around 50% and the rest is from soft skills.

Table 1: Criteria of an excellent student

Label	Criterion	Priority Value	Ranking
K1	Cumulative Grade Point Average (CGPA) more than 3.75	0.390	1
K2	Active in co-curricular activities	0.060	5
K3	Score at least Grade B in all core subjects	0.227	3
K4	Leadership	0.229	2
K5	Good in tech-savvy skills	0.093	4

After inserting the details of Questionnaire 2 into Expert Choice software, the result of each candidate is stated as in Figure 2. From the figure, it shows that the paired comparison of candidates has a good stability since the inconsistency rate is 0.07. Based on the priority value, we found that Candidate 3 has the highest priority value (0.168). Therefore, Candidate 3 is qualified to be chosen as the best student in the 22<sup>nd</sup> UPSI convocation ceremony. This candidate is also active in co-curricular activities and one of members in students' representative council.

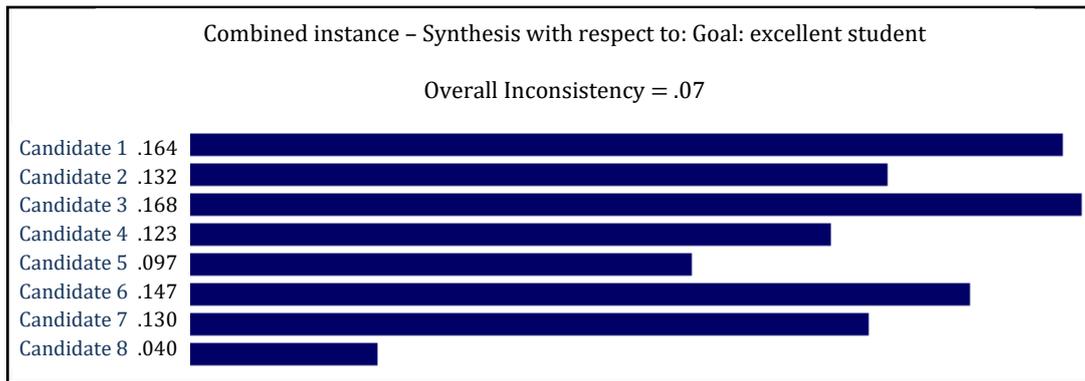


Figure 2: Final result of Expert Choice

#### 4. Conclusions

The AHP method is highly recommended to handle the decision-making problems that involve multiple criteria in systems of many levels. This method can help decision-makers to make decisions when multi-criteria and relevant alternatives are taken into consideration at the same time by establishing a relative weightage to each criterion. The AHP method has received a lot of interest as a potential solution to decision-making difficulties in a variety of fields, including government, marketing, education, healthcare, sports, business, industry and many others. Therefore, this method is suitable as a decision-making tool in Malaysian education field that considers criteria other than purely academic as a holistic evaluation.

The findings of this research are very useful and important to help other researchers to do similar advanced research especially in the education field in the future. In addition, this research can motivate the students to be an excellent and successful person not only in their studies but also in their future undertakings. Besides that, this research is also important for universities to decide the most suitable criteria which their excellent students should have.

Furthermore, the finding of this research can help the universities choose the best candidates to be awarded as top students without any bias by using the AHP method.

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