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Determining the Preferences among the High School Students Towards the Local Malaysian Public Universities: A Case Study

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Abstract: This study discusses, the needs and preferences among the Malaysian Higher School Certificate (STPM) students towards the local public universities. An interview and survey form were used in collecting data. The samples of this study were the STPM and Malaysian Higher Religious Certificate (STAM) students, who were given a set of questionnaires. The result shows that the STPM and STAM students gave several important criteria, such as financial aids, job opportunity and availability of the programmes. Meanwhile, the interview session found that the specialty of the university, the reputation of the university, the location and the convenient factors of the university are the important factors. The contribution of this study lies on the result, which can be used by the local universities as the effort to market the university and to increase the students' enrolment. In the Decision Support System (DSS) case study, the five best rated preferences and needs would be used in the system as the third criteria to be considered by the STPM leavers.

Key words: Choosing university, DSS, MADM, STPM, university criteria

INTRODUCTION

Malaysian education generally consists a set of stages, which include; pre-school, primary education, secondary education, tertiary education and postgraduate education (Malaysia, 2009a). The Ministry of Education has not authorized the pre-school education. However, primary education and secondary education are governed by the ministry. Primary education consists of 6 years of education and at the end of 6 year, students must sit for the Primary School Evaluation Test (UPSR). Secondary education involves 5 or 6 and a half years of education. It has four levels of standardise test namely Lower Secondary Evaluation (PMR), Malaysian Certificate of Education (SPM) and Malaysian Higher School Certificate (STPM) and Malaysian Higher Religious Certificate (STAM) examinations (Wikipedia, 2009). Among all, the STPM and STAM are the pre-university examinations and the those leavers could use the STPM result as the key to step into the local higher learning institution (IPTA) or university level (Malaysia, 2008).

The STPM leavers use their STPM result as tickets to enter universities for undergraduate courses. There have been a number of criteria these students used in choosing a suitable university to pursue their studies. Some consider the location, fees, the programme structure, university reputation etc. (Shanka *et al*., 2005). There are also others who choose the university based on the parents, teachers or peers' suggestions (Raposo and Alves, 2007).

Since 2000, there have been rapid developments in improving the higher education system in Malaysia (Malaysia, 2009b). A number of new universities were build to cater for the increasing number of students who qualify to enter the university levels, while some were upgraded from university colleges to become full universities. As a result, STPM students have a total of twenty universities in Malaysia for them to select (Malaysia, 2009b). For this reason the research was conducted with the intention to find the most considered criteria taken by the STPM students in selecting the university they wish to continue their studies. This was due to the existence of twenty local public universities in Malaysia (Malaysia, 2009b), where every single university offers the different cultures and environments. Therefore, the students might have something in minds in considering the university selection.

However, studying and understanding the process of university selection is not easy. The process is complex because, the students must consider >1 criterion, not just

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the monetary, educational, environmental, as well as, social factors. This would involve a long term decision which affects the student's future life (Litten, 1980; Yost and Tucker, 1995).

The manual process of selecting the right university is sometimes a difficult task for the students. It is because, the holders have to consider >1 issues (Smith and Cavusgil, 1984). Thus, the students have started to make decisions by relying on the parents, teachers, relatives and friends' ideas and opinions (Aldosary and Rahman, 2006).

Yet, to know what the students really need and prefer was the main question. What should the university provide? What kind of universities do the students like? All the criteria must be thought so that the students will choose the best university (Kotler and Fox, 1995).

Therefore, it was important that to study and find the most considered criteria while choosing the suitable university. Besides of being the guidance for the STPM students, the findings could assist the DSS in listing the major university criteria, in order that the STPM leavers could rate them in the process of universities selection.

Related research: The issues of university choice have been broadly discussed in other countries such as the United Kingdom, Australia and America. The main discussion was the students have selected a university that match their selection criteria academically, socially and financially. Absher and Crawford (1996) has found a model of student college choice, which yields three major influences:

- Significant person, friends, parents and high school personnel
- Fix college characteristic, cost, financial aid, location, availability of programme
- College efforts to communicate with students, written information, campus visits and admission

A study by Joseph and Joseph (2002) summarized that courses, carrier information, physical aspects and facilities are critical issues that must be kept in mind. LeBlanc and Nguyen (1999) concluded that the perception of price in relation of price and quality as the most important factor. Soutar and Turner (2002) found that the most important criteria are course suitability, academic reputation, job prospect and teaching quality, while Shanka *et al.* (2005) identified that proximity to home, quality of education, cost of living and education, friends study, family recommendation and safety as the crucial scriteria. Meanwhile, Raposo and Alves (2007) concluded that proximity to home, parents and school teacher's recommendations are the strongest influences in choosing the university.

A research done by Tucciarone (2008) used the word influencers representing the university criteria. The research has found that one of the influencers was advertisement of the institution. The advertisement was relevant be the influencer due to the component of liking an ad can create a positive feeling for a brand. Some other influencers or university criteria were proximity (Hoover, 2006; Jortner, 2001), academic programmes (Ashburn, 2007; Hoover, 2006; Johnson and Stewart, 1991; Jortner, 2001), social life (Jortner, 2001), scholarships and financial aids (Hoover, 2006), evidence that graduates get a job and a good one (Marklein, 2007), reputation (Ashburn, 2007) and perceived image of the institution (Grunde, 1976).

Kindle and Colby (2008) found that the university programmes, reputation and the future employment prospect were the biggest selection factors among the students. It was also found that the geographical location has played a role. In the other hand, the cost of the fees was reported as not very important due to the availability of the financial resources. Bowie *et al.* (2005) reported that the most important factors concerned in selecting university were geographic location, type of programme, class scheduling, academic reputation, amount of financial aid, interpersonal recommendations. In Sanchez *et al.* (1980) findings, the respondents have ranked the criteria; curriculum, location, prestige of school or university and financial incentives in order to choose the university.

In Malaysia, a research has been done by Baharun (2004) found five factors, value and reputation of education, programme structure, conducive facilities and resources, choice influencer or social force and customer orientation. Pimpa (2003) found that Thailand students prefer a university that suits the criteria of finance and information, while the expectation and persuasion from family are also, plays an important role. However, most of all, the Thailand students still believe that the academic programmes in the university are the most important criteria. According to Pimpa (2003), family played the biggest role in influencing the students' choice. This was because ...of its longevity and the intensity of the relationships.... Other social influencers included the school counsellors, school teachers, siblings and peer groups (Johnson and Stewart, 1991). Furthermore, Clayton (1999) found that the college admissions consultant could play role in influencing the students.

Thus, the STPM leavers as well have gone through the same situation. This did not mean that people, in this

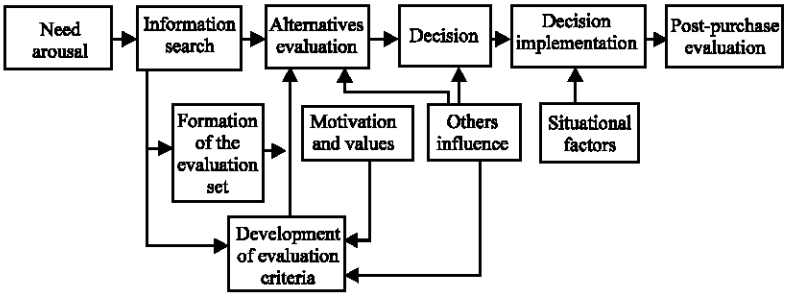

Fig. 1: Steps in complex decision (Kotler and Fox, 1995)

study; family, teachers and peers gave the wrong idea and suggestions. Most of them, especially, teachers could give the best advices but sometimes, the advices were based on thoughts, experiences and interests of the teachers that might not suit the STPM leaver very well. The STPM leavers would make the less risky decision if they follow the decision making model proposed by Kotler and Fox (1995) as shown in Fig. 1.

To solve the decision making problem in the DSS, Fuzzy MADM was used. Fuzzy MADM is an effective approach in developing a system to psychologically support human decision making (Yamashita, 1995). By using this approach, the solution will not only list the qualified programmes, but also state how well that particular programmes suits to a particular user's results based on a ranking system (Aljunid *et al*., 2005). Several fields have used this method in developing their DSS. They are scholarship students selection, travel demand analysis, career decision making model and hand over decision.

Multiple Attributes Decision Making (MADM) method is used in the DSS mentioned before. MADM is widely used in selecting or ranking multiple alternatives (Ribeiro, 1996). Fuzzy MADM's aim is to obtain the best alternative-the one with the highest degree of satisfaction by assessing fuzzy attributes (Yeh, 2003). For instance, a buyer wants to buy a house. He or she has to consider several attributes (price, location, space) for each alternative available (semi-D, bungalow, apartment). By using the fuzzy MADM, the problem will be solved in to stage; first, the fuzzy process combines the values of attribute for each alternative; second, it ranks the alternatives with respect to the preference.

The major advantage of fuzzy MADM is the DM could give the preference on the alternatives obtained. The preference involved is fuzzy and is acquired by the DM's consideration. There are several methods to solve the MADM problem, such as interactive Simple Additive Weighting method (SAW), Multi Dimensional Scaling (MDS) with ideal point, Linear programming techniques for Multi-dimensional Analysis of Preference (LINMAP) and analytical hierarchy process. In a study conducted by Wang and Parkan (2005), Simple Additive Weighting (SAW) method was used in assessing the value of alternatives. This study is using the SAW method, due to the suitability of the problem with the method. The targets of DM in this study are the STPM leavers, which are not in the management decision group. Since the criteria in the decision making process are not very complex and the targeted group is in low level decision group, SAW method is seem to be an appropriate approach.

MATERIALS AND METHODS

The method used in this study was a set of questionnaires. The questionnaires contained four sections. Section 1 was demographic question, while section 2 was about the university criteria, section 3 questions the people influence in choosing university and section 4 was about students' perception towards local public universities.

Section 2, 3 and 4 required the students to give weigh in scale of 1-5. 1: strongly disagree, 2: disagree, 3: agree, 4: somehow agree and 5: strongly agree. The results were evaluated by using the software SPSS14.

The second method used was interview. Twenty STPM and ten STAM students were selected for the interview session. They were asked of 4 open ended questions. The interview session was held in group of 2 or 3 students so that the session would be in discussion mode.

This research took place at the schools that offer the STPM and STAM examination. A number of three hundred questionnaires were distributed to the students and two hundred and seventy eight were successfully returned.

RESULTS AND DISCUSSION

Questionnaires findings: The findings of this study have exposed about several things that are listed as considerations, while choosing the university process.

The findings are divided into three sections; the preferences and needs, students' influencer and perception towards the local public universities. Table 1 below shows the sample's profile.

Table 1 shows that the majority of the students were females and most of the students that is 68.7% came from the family that earned less than RM1000 per month. The table shows that 64% of the students were from rural area, while only 19.8% lived in town area. Lastly, the table indicates that only 3.6% students were in science stream and the largest group of sample in this study was the humanity stream group. This was due to the numbers of science stream students in the schools are less than the humanity stream students. Therefore, this study was mostly implied the humanity stream, rural and average family income students perspective.

Table 1: Summary of students' demographic profiles

Demographic profile	Frequency	%
Gender		
Female	159	57.2
Male	119	42.8
Family income		
<RM1000	191	68.7
RM1000 up to RM2000	45	16.2
RM2000 up to RM3000	26	9.4
>RM3000	14	5.0
Place of origin		
Town	55	19.8
Suburb	44	15.8
Rural	178	64.0
Stream		
Science	10	3.6
Humanity	185	66.5
Religious	83	29.9

Table 2: Ranked criteria of preferences and needs

Rank	Criteria of preferences and needs	Mean±SD
1	Financial aids	4.6±0.655
2	University is recognized by the prospective employers	4.53±0.735
3	Availability of the programme	4.44±0.751
4	Healthcare centre	4.41±0.734
5	Public facilities surround the university	4.35±0.748
6	Appropriate university environment	4.34±0.762
7	Programme structure	4.29±0.796
8	Appropriate social environment	4.24±0.897
9	Numerous fields of study	4.17±1.955
10	University reputation	4.14±0.857
11	Conducive facilities	4.01±0.838
12	Active in research and innovation activities	4.00±0.873
13	University promotion	3.65±0.893
14	Teaching and learning languages	3.94±0.879
15	Competition among races	3.39±1.032
16	Academic fees	3.32±1.196
17	In town location	3.08±0.989
18	Close to hometown	2.62±1.199

Preferences and needs: To analyze the findings of preferences and needs among the students towards the university, the mean application in SPSS has been used. Table 2 shows, the ranked criteria of preferences and needs. The first criterion is the most preferred criterion and the last criterion is the least considered criterion.

Based on the Table 2, the STPM students would firstly consider the university that offers the financial aids, educational loans or scholarships. This was because, the demographic profiles show that most of the students were from rural area and the family incomes were less than RM1000 per month. All the students gave the important responses to this criteria and it means 0% of the students gave the weight for less important or not important. Second important criterion was the chosen university must be recognized by the prospective employers. STPM students would choose the university that could confirm them job opportunity. For instance, the educational university would be the most chosen for the students who want to be teachers. It was agreed that job opportunity was important by most of the students. However, still there were some students that did not concern about this issue.

The third criterion considered in choosing the university was the availability of the course. Students tend to choose the university that offers the course that fit their interest. Most of the students put this criterion in high weight, shown by the low value of the standard deviation (0.751). It meant that the students gave the quite common answers in the questionnaires. Subsequently, the finding shows that students put the healthcare matters in the consideration process. Then, the findings show that public facilities covering the accommodation facilities surround the university was ranked at number five, followed by the appropriate university environment. The appropriate environment means the university campus is suitable as the knowledge and learning place. The seventh criterion was the programme structure. Students need to know the way of teaching and learning, what are the contents of the course and more. Next, findings show that students also looked at the social environment of the university, which was how the university tolerates with the students socially and also the social life in the campus. The ninth rank was numerous fields of study and the tenth criterion was the university reputation.

Table 2 also shows, the least considered criteria of the preferences and needs among the STPM students. The findings confirmed that competition among races, academic fees, in town location and close to hometown were the least criteria of preferences and needs among the STPM students towards the local university. However, those criteria had a large value of standard deviation; 1.032, 1.196, 0.989 and 1.199, respectively. The standard deviation values illustrated that the data or weight of answers given were in scattered pattern, which means there were students who put those criteria in high

consideration. This fact gave an idea that even the criteria were not the most considerable factors among the STPM students, but those were still significant and appropriate to be highlighted by the universities.

Choice influencer: As the additional information, Table 3 explains the choice influencer among the STPM students in university selection process. The highest mean was 4.43 and the lowest mean was 3.17.

The findings shows that students made the decision mostly based on themselves (mean of 4.43), followed by parents, teachers and peer, respectively, while the least influence people were the siblings. This ranking means the students would listen to the parents (mean of 3.68) and teachers' (mean of 3.64) opinion the most after considering their own thought. Peers and sibling played the least role in the decision process. The students also stated that they must put the parents' thought in prior, due to the money that the parents pay for the study. Furthermore, students listen to the teachers because the teachers know them very well in the academic side. Other than that those parents and teachers have more experience and awareness concerning the higher education selection that could guide the students.

Interview findings: A number of 30 students were interviewed in this study 20 STPM students and 10 STAM students. The findings of the interview session show that all the STPM and STAM students tended to choose the university that they know the most. The students stated that, the university publicity and popularity are important. For this reason, the reputation of the university plays a big role to market the university towards the prospective students.

The second interview finding shows that all of the students have been attracted by the university that is popular in a certain field of study. For example, students will put Putra Malaysia Universiti (UPM) as the first choice if they would like to study agriculture. The students gave a negative answer when they were asked if they would like to study in Universiti Teknologi Mara (UiTM) for the same course. The reason was, UiTM is not popular for the particular field and the students rarely heard achievements from the university in the field of study. However, students that have keen in art and hospitality studies positively put UiTM as the first choice.

Furthermore, 8 out of 10 Higher Religious Certificate (STAM) students said that they wanted to go to Egypt, Medina, Yemen, Morocco or other middle-east countries to further their study. The main factor was they wanted to study at the place of origin of the particular knowledge or

Table 3: Choice influencer among the STPM students

Rank	Influencer	Mean±SD
1	Self	4.432±0.811
2	Parents	3.68±1.029
3	Teachers	3.64±0.990
4	Peers	3.24±0.916
5	Siblings	3.17±3.245

field of study. It was due to the quality of lecturer and the old style method of teaching and learning that the students believe have contributed in producing the expert students in the field of study. Therefore, it could be said that each university was chosen based on its specialty.

Besides all of the stated factors that influenced the university selection among the students, the universities are also hoped to provide the appropriate environment, which pictures the university as a full of knowledge place with good academicians and the conducive facilities, such as great collection of books and references in library, high-tech laboratories, comfortable accommodation and surrounded by easy-to-get public transports and accommodation. Other than that universities must offer them good customer orientation in all units and departments.

Finally, all of the students have selected the university that they think was recognized by the prospective employers. Future job was one of the critical issues aroused in the process of selecting university and also the programme. Fourteen STPM students think that they would apply for the programme or universities that promise them a bright future job, leaving behind their field of interest. Six of the STPM students would mix the interest to the other field that promises them the prospective job. For instance, a student that has interest in Art would apply for Education in Art programme, other who loves sports would apply for Education in Sport Science programme.

Utilizing the findings, the DSS would show a list of five best rated university criteria as one of the criteria considered other than results, field of interest and preferred university. The STPM leavers should rate the list according to their preferences on university criteria. Then, the MADM engine would filter all the qualified programmes through the criteria.

Figure 2 shows, the system flow that starts with the user need to enter the results, interest, university criteria and preferred university. The system engine would filter all the possible programmes and universities called alternatives based on the results. Then all of the alternatives would be filtered once again through the field of interest, university criteria and preferred university.

Empirical illustration: It was mentioned before that to solve the decision making problem in DSS, a method of

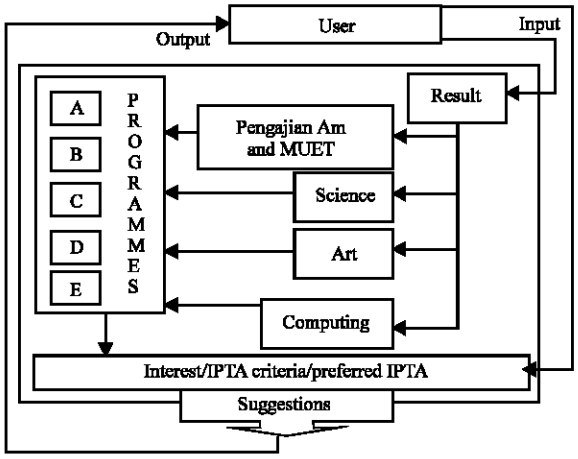

Fig. 2: Fuzzy MADM model for university programmes selection

Fuzzy MADM, Simple Additive Weighting (SAW) method was used. By using the SAW method, the decision making problem is divided into four parts:

Alternatives (S), let S = {S1, S2, S3, … Sm}
Attributes (R), let R = {R1, R2, R3, … Rn}
Weight of attributes (w), let w = {w1, w2, w3, …
Decision matrix, let A = [aij]

Matrix format is the easiest way to represent the MADM problem. Purposely, the problem with m alternatives (S1, S2, S3, … S_m) which are evaluated by the n attributes (R1, R2, R3, … R_n) can be viewed wn, geometrically.

In this case, the alternatives are the list programmes offered by the twenty local public universities in Malaysia and the attributes are the STPM leaver's result, the interest of study, university criteria and preferred university.

However, before the decision matrix could be obtained, the calculation on the STPM result must be done at the first stage. The results are transformed to become one number that can represent an element in the decision matrix by using:

$$a_{m1} = \sum_{k\geq 1}^{n} r_k \, q_n \tag{1}$$

Where:

r_k = Represents the results
q_n = Represents the minimum requirements for a certain programme

Then the decision matrix can be form as follows:

$$A = \begin{array}{c} \\ S_1 \\ S_2 \\ S_3 \\ \vdots \\ S_m \end{array} \begin{array}{c} \begin{array}{ccccc} R_1 & R_2 & R_3 & \cdots & R_n \end{array} \\ \begin{bmatrix} a_{11} & a_{21} & a_{31} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{32} & \cdots & a_{2n} \\ a_{31} & a_{32} & a_{33} & \cdots & a_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & a_{m3} & \cdots & a_{mn} \end{bmatrix} \end{array} \tag{2}$$

To rank the alternatives, the decision matrix must be normalized into matrix B. It is due to the attributes are generally immeasurable by using the decision matrix A (Fan *et al*., 2002). Equation 3 and 4 are used to normalize the matrix A:

$$b_{mn} = \frac{a_{mn} - a_n^{min}}{a_n^{max} - a_n^{min}} \text{ (for result attribute)} \tag{3}$$

$$b_{mn} = \frac{a_n^{max} - a_{mn}}{a_n^{max} - a_n^{min}} \text{ (for interest, IPTA criteria and preferred IPTA attributes)} \tag{4}$$

Finally, the alternatives in decision matrix B can be ranked by using the Eq. 5 (Fan *et al*., 2002):

$$d_i = \sum_{n=1}^{j} b_{mn} \, w_n \qquad m = 1 \cdots i \tag{5}$$

Consider the following examples of student's STPM results and minimum IPTA requirement for a particular programme (Table 4 and 5).

The first step in this procedure is to require the R_1 in the decision matrix by using Eq. 1. Secondly, the decision matrix A can be formed as follows:

$$A = \begin{array}{c} \\ \text{Bio. Sci.} \\ \text{Chem. Sci.} \\ \text{Marine Sci.} \\ \text{Matirime Tech.} \end{array} \begin{array}{c} \begin{array}{cccc} & & & \end{array} \\ \begin{bmatrix} 25.34 & 40 & 10 & 20 \\ 20.67 & 20 & 30 & 10 \\ 19.34 & 30 & 40 & 40 \\ 23.01 & 10* & 40 & 30 \end{bmatrix} \end{array}$$

Note that the column with the mark * is where, the findings of students' preferences and needs for the local public universities would be used.

Next, this decision matrix must be normalized by using the Eq. 3 and 4. The normalized decision matrix B, have to be evaluated by the attributes weight w_n. The attributes weights have been decided as 0.5, 0.3, 0.15 and 0.05 for results, interest, university criteria and the preferred university, respectively. The normalized matrix is shown in the matrix B.

Table 4: Student's STPM result

Subjects	Results (points)
General Study (GS)	3.67
Mathematics T (Math. T)	3.00
Physics	1.67
Chemical (Chem)	2.33
Biology (Bio)	2.00

Table 5: Minimum IPTA requirements

Programmes	GS	Math T	Physics	Chem.	Bio.
Biological Science	2	2	2	2	2
Chemical Scince	2	1	1	2	2
Marine Science	2	1	1	1	1
Maritime Technology	2	2	2	1	2

$$B = \begin{bmatrix} 0 & 1 & 0 & 1/3 \\ 647/600 & 1/3 & 2/3 & 0 \\ 1 & 2/3 & 1 & 1 \\ 233/600 & 0 & 1 & 2/3 \end{bmatrix} = \begin{matrix} 0.3167 \\ 0.7392 \\ 0.85 \\ 0.3775 \end{matrix}$$

$$w_n \quad 0.5 \quad 0.3 \quad 0.15 \quad 0.05$$

The last step is to rank all the available alternatives. Eq. 5 is used to rank the alternatives. By using the Eq. 5, each element in the matrix, a_{mn} must be multiplied with the weight w_n. Then, the products in each row are summed up. The value of S_1 is 0.3167, S_2 is 0.7392, S_3 is 0.85 and S_4 is 0.3775. Therefore, the ranked result suggested to the STPM leavers is; Marine Science and Chemical Science> Maritime Technology>Biological Science.

CONCLUSION

Based on the findings, the most considered university are the university that provide the financial support and helps to the students, could guarantee the job opportunities and the availability of the course. In the other hand, the least considered criteria are the proximity or the nearness of the university location, in town university location and the academic fees. Second section of the findings shows that students might choose a university based on the influencer thought. The influencer includes parents, teachers, friends and siblings. Nevertheless, self opinion is the most dominant influencer among the students.

The findings have been integrated into the university selection DSS and the contribution has been utilized in the university criteria section. The developer has the guidance on what to be listed in the university criteria and directly it simplifies the section rather than let the STPM leavers give their own words of preferences. In selecting the right university and programmes, the DSS must work on the STPM result (multiple attributes) to produce suggestions (alternatives). Fuzzy MADM provides the best approach to solve this complex problem. It could rank the alternatives based on the interest (e.g., engineering, computer or business) of the STPM leavers. As the result, the STPM leavers would get the best suggestion on which programmes and university they should go, produced by the IPTA Selection DSS using Fuzzy Multiple Attribute Decision Making. Lastly, it is hoped that this research will give lots of benefits to people, especially in education and decision support system fields.

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