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The Dematel Method for Assessing Contributing Factors in University Selection

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Abstract
One of the most consequential choices a student will ever make is which university to attend. The number of universities from which to choose is growing, so would-be students are on the lookout for those that will give them a truly unique and unforgettable educational experience. Moreover, today's students are looking for graduate programs that will lead to well-paying careers. The primary objective of this paper is to analyse the determinants of students' decisions to enrol in a specific university using the DEMATEL method. This study involved 123 undergraduates from the Negeri Sembilan Campus of the University of Technology MARA, Malaysia (Campus Seremban). A survey was created in Google Forms and sent out to students to collect information. Contributing factors in selecting universities were evaluated using seven criteria: the student's impression of the university's location (LO), the number of available academic majors (AM), tuition costs (FE), the convenience of campus facilities and transportation (UT), the atmosphere and number of extracurricular activities (AS), the student's academic qualifications (AQ), and the student's willingness to recommend the university to others (RE). According to the findings of this study, FE is the most influencing factor in selecting a university, followed by AQ and AM. The least important of these is RE. In addition, this study revealed that the causes criteria are LO, AM AS, and RE. In contrast, the effect group consists of FE, UT, and AQ.
Keywords: University Selection, DEMATEL, Fees, Academic Qualifications

Introduction

The selection of a university and major are important junctures in the lives of all individuals, as they shape future careers and have a lasting impact on their lives. Students' enthusiasm and commitment are frequently influenced by their selection of a suitable major or university. This implies that students who choose a major without considering their career objectives will lose their desire to learn; they will struggle to keep up with their coursework and find a suitable career. Therefore, it is essential to investigate the factors that influence the interests of university students in order to help them make more informed decisions and ensure their future success and happiness. The purpose of this research is to identify the factors that influence students' university choices using methods other than statistical

analysis. In addition, there is scant evidence in the scientific literature to support any causal relationship between these variables. In the present study, we intend to propose a DEMATEL-based analysis of the factors influencing students' university choices. This study investigates the determinants of students' university choices in order to answer the following questions:

- What factors influence the decision of university students to continue their education at a particular institution?
- Which factors are crucial?
- How do the factors influencing the university selection of students interact?

The structure of the following section will be as follows: To determine the factors influencing students' decisions to continue their education at the university level, a comprehensive review of the relevant literature was conducted. The DEMATEL method will subsequently be described in Section 3. Section 4 will provide a DEMATEL-based analysis of the factors influencing students' university choices (demographic and analysing the structural model and causal relationship). The final section includes a discussion and conclusion based on the research findings.

Literature Review

In an effort to understand the different factors influencing international postgraduate students in selecting universities in Malaysia, Dahari (2011) revealed the primary factors influencing international students' decision to pursue postgraduate studies in Malaysian universities are the available programs by using analytic hierarchy process (AHP) . Further, Asian and Western country students differed significantly in regard to the importance they placed on each of the various factors.

Similarly, Misran et al (2012) conducted an investigation into students' choices of universities and programs of study at the undergraduate level in Malaysia. The most significant factors are suitability, interest, and career opportunity influenced their choice of university and field of study. The descriptive analysis method was used in this study, and there was no interaction between these criteria. According to Polat (2012) statistical analysis result, the physical environment of the institution is the most significant factor in students' department and university selection. This is followed by information on the university's location, sociocultural resources, and informal information, opinions, and stories about the university.

While Winn et al (2014) examined the factors that influence master's students' program selection in the southwestern United States. Their findings indicated that students choose their current university and programs primarily because of the course delivery methods (with hybrid courses being the most popular) and the convenience offered by the programs. The third and fourth most important factors were tuition costs and reputation, respectively.

Following the findings by Echchabi & Al-Hajri (2018) it was discovered that the most important factor in university selection is the reputation of the institution, which is followed by completion time, academic quality, and the qualifications of academic staff.

Sundarrajh & Zulkfili (2019) revealed most students put an emphasis on the university's reputation as a primary determining factor. Following that, the university's courses are offered. Another critical factor considered was the program's cost. Respondents regard location as a critical factor, as they place a premium on convenience. Influence from family

members, friends, peers, and educators plays a significant role in students' decision-making processes as well.

Tsai et al (2017) used conjoint analysis to determine the factors that may influence international students' decisions about which universities to attend in Taiwan. They discovered that the most influential factor is scholarship, followed by desired course language and international environment (all three components have the same rating), then future career, and finally institutional

Methodology

In 1971, the Bastille Laboratory of the United States proposed the Decision-Making Trial and Evaluation Laboratory (DEMATEL) as a system analytical method. This integrated method analyses relationship factors using certain mathematical tools, such as matrix theory and graph theory. DEMATEL is a reliable technique for analyzing and evaluating influential factors. It is possible to synthesize the advice or experience of experts and to simplify the uncertain component of complex systems. This methodology can test the interdependence of unpredictable characteristics or attributes, and it also demonstrates that the characteristics of a crucial system and its development trend are interdependent.

The DEMATEL method is a refinement of the expert meeting prediction method, which is a meticulously organized procedure developed by scientists. The researchers utilized a series of questionnaires and solicited expert advice by conducting multiple rounds on a particular subject until the panel members appeared to reach consensus. Due to its practical advantages, the DEMATEL methodology has been widely adopted in a variety of fields. In terms of assisting researchers in better comprehending the nature of the problem, the DEMATEL method is superior to the questionnaire method. There are numerous real-world applications of DEMATEL (Abdullah et al., 2019; Aycin & Kayapinar Kaya, 2021; Buyukozkan et al., 2018; Guruviah & Augustin, 2019; Yadav et al., 2021). DEMATEL is distinguished by 6 main steps

- **1. Creating the Matrix of Direct Influences:** A respondents performs pairwise comparisons to determine the degree of influence and directionality between criteria. The results are represented by a *nxn* matrix called the direct-relation matrix *A,* where represents the degree to which criterion i affects criterion j.

$$A = \begin{bmatrix} 0 & a_{1,2} & \dots & a_{1,n} \\ a_{2,1} & 0 & \dots & a_{2,n} \\ \dots & \dots & 0 & \\ a_{n,1} & a_{n,2} & \dots & 0 \end{bmatrix}$$

1. **Calculating the direct-influenced matrix normalization:** The normalized direct relation matrix *M* is obtained from matrix *A* by formulas (1) and:

$$M = k \cdot A \qquad (1)$$

$$k = \left(\frac{1}{\sum_{j=1}^{n} |a_{ij}|} \right) i, j \in \{1, 2, 3, ..., n\} \quad (2)$$

2. **Constructing the matrix of total relationships**: After normalizing the direct-relation matrix *A*, the total-relation matrix S is calculated via the formula (3), where *I* denotes the Identity Matrix:

$$S = M + M^{2} + M^{3} + \cdots = \sum_{i=1}^{\infty} M^{i} = M(I - M)^{-1} \quad (3)$$

3. **Create a causal graph:** By utilizing $c + r$ and *(r_i-c_i)*, where c denotes the sum of columns and r denotes the sum of rows in matrix S, as exposed in formulas (4)-(6). Criteria with positive *(r_i-c_i)* values exert a greater influence on the other criteria. These are referred to as "dispatchers." Others with negative *(r_i-c_i)* values are more influenced by another. These are referred to as "receivers." On the other hand, the value of $c + r$ indicates the degree to which each criterion is related to the others.

$$S = \left[s_{ij} \right]_{n \times n}, i, j \in \{1, 2, 3, \ldots, n\} \quad (4)$$

$$r = \sum_{j=1}^{n} s_{ij} \quad (5)$$

$$c = \sum_{i=1}^{n} s_{ij} \quad (6)$$

4. **Obtaining the inner dependence matrix and impact relationship map:** Map the dataset (*(r_i+c_i)* ,*(r_i-c_i)*). The threshold value is set to indicate the influence level between criteria.
5. **Acquiring the internal reliance matrix:** In this step, the normalisation method is used to ensure that the sum of each column in the total-relation $n \times n$ matrix equals 1, and then the inner reliance matrix can be obtained.

Analysis of influencing factor in students' selection of university based on DEMATEL Method

Demographic

The purpose of this study is to examine the influence of the DEMATEL Method on students' university selection. The seven criteria were developed in accordance with the influential factors identified in the literature on university admissions. Students at UiTM Seremban were given university selection questionnaires through Google Form in order to collect data and information. Due to the absence of statistical analysis in this study, 123 students were counted over a four-week data collection period.

Figure 1 depicts that 51.2% of respondents were female and 48.8% were male. Figure 2 depicts the age distribution of respondents, with 35.3% of respondents under the age of 23. Figure 3 depicts the faculty affiliations of the respondents, with 41.5% from FSKM and 31.7% from FSPPP. As shown in Figure 4, 77.2% of respondents are currently enrolled in a degree programme.

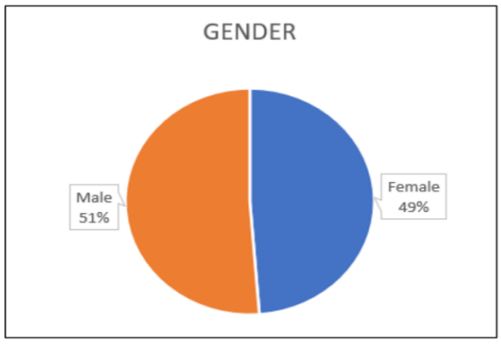

Figure 1. *Gender*

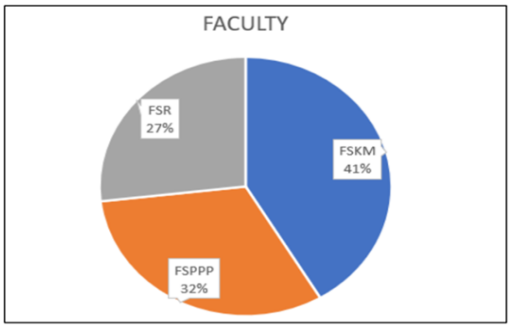

Figure 3. *Faculty*

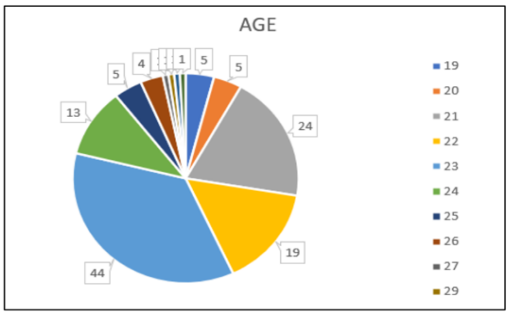

Figure 2. *Age*

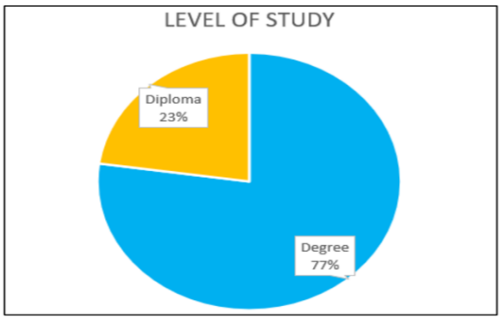

Figure 4. *Level of study*

To determine the most effective criteria in determining the relationship between the two criteria, 7 verbal variables choice scales from "Very low influence" until "Very High influence" were given for DEMATEL questions to facilitate computational and static selection of the best answer. The verbal variables were converted to absolute numbers as displayed in table 1.

Table 1
Absolute numbers of verbal variables

Linguistic Terms	Influence Score
Very low influence	0
Low influence	1
Medium low influence	2
Medium influence	3
Medium high influence	4
High influence	5
Very High influence	6

Findings of Structural Model and Causal Relationship

First, the direct-relation matrix was created as in table 2. Then, a normalized direct-relation matrix shown in table 3 and calculated using the equation (1) and equation (2). To find the relationship between these criteria, a total-relation matrix as in table 4 was created. This table was generated by using the equation from equation (3). The sum of row and column was calculated to create (r_i-c_i) with using equation (5) and (6). Lastly, the combination of (r_i+c_i) and

(r_i-c_i) was calculated to generate the degree of prominence and net cause/effect as in table 5.

Table 2
The direct-relation matrix

	FE	*UT*	*LO*	*AM*	*AQ*	*AS*	*RE*
FE	0.0000	4.6116	4.4463	4.3967	4.4959	4.4463	4.2479
UT	4.6281	0.0000	4.4545	4.3058	4.4380	4.4215	4.2397
LO	4.6777	4.4132	0.0000	4.3967	4.4463	4.4628	4.2810
AM	4.7521	4.4380	4.3636	0.0000	4.5833	4.4667	4.3058
AQ	4.6942	4.3719	4.3388	4.5372	0.0000	4.4132	4.3388
AM	4.5537	4.3719	4.3719	4.4545	4.4628	0.0000	4.2727
RE	4.5785	4.3884	4.3719	4.4711	4.3967	4.2727	0.0000

Table 3
The normalized direct-relation matrix

	FE	*UT*	*LO*	*AM*	*AQ*	*AS*	*RE*
FE	0.0000	0.1714	0.1652	0.1634	0.1671	0.1652	0.1579
UT	0.1720	0.0000	0.1655	0.1600	0.1649	0.1643	0.1576
LO	0.1738	0.1640	0.0000	0.1634	0.1652	0.1658	0.1591
AM	0.1766	0.1649	0.1622	0.0000	0.1703	0.1660	0.1600
AQ	0.1744	0.1625	0.1612	0.1686	0.0000	0.1640	0.1612
AM	0.1692	0.1625	0.1625	0.1655	0.1658	0.0000	0.1588
RE	0.1701	0.1631	0.1625	0.1662	0.1634	0.1588	0.0000

Table 4
The total-relation matrix

	FE	*UT*	*LO*	*AM*	*AQ*	*AS*	*RE*
FE	13.8673	13.4659	13.3521	13.4414	13.5583	13.4118	13.0591
UT	13.9440	13.2522	13.2855	13.3717	13.4889	13.3440	12.9935
LO	14.0305	13.4750	13.2246	13.4559	13.5716	13.4266	13.0741
AM	14.1363	13.5753	13.4630	13.4149	13.6757	13.5260	13.1714
AQ	14.0389	13.4815	13.3710	13.4673	13.4375	13.4329	13.0831
AM	13.9425	13.3925	13.2838	13.3763	13.4902	13.2034	12.9950
RE	13.9395	13.3894	13.2802	13.3732	13.4847	13.3369	12.8545

The causal diagram is built with the horizontal axis (r_i+c_i) and the vertical axis (r_i-c_i). If the (r_i-c_i) axis is positive, the factor is in the cause group. Otherwise, if the (r_i-c_i) axis is negative, the factor is in the effect group. Besides that, it also separates seven criteria into two groups according to whether their value of (r_i-c_i) is positive or negative. The result of (r_i+c_i) and (r_i-c_i) are shown in table 5.

Table 5
The degree of prominence and net cause/effects

Criteria	*Details*	r_i	c_i	(r_i+c_i)	*Rank*	(r_i-c_i)	**Causal relationship**
FE	Fees	94	98	192.055	1	-3.743	effect
UT	Utilities / Transportation	94	94	187.712	4	-0.352	effect
LO	Location	94	93	187.519	5	0.998	cause
AM	Academic Major Available	95	94	188.863	3	1.062	cause
AQ	Academic Qualification	94	95	189.019	2	-0.395	effect
AS	Ambiance / Student Activities	94	94	187.365	6	0.002	cause
RE	Recommendation by Others	94	91	184.889	7	2.428	cause

DEMATEL is a powerful tool for analysing and creating causal links in structured models of any kind. DEMATEL can assist in identifying unintended connections between unrelated components. Variables in the research group may exhibit moderate cause-and-effect correlations and control interactions. On a straight graph, we can verify the interdependence of the variables and observe their relationships. DEMATEL can help identify viable solutions to a specific problem or set of obstacles. Table 5 indicates that the most influential factor on students' selection of a university is Fees (FE), followed by Academic Major Available (AM) and Academic Qualification (AQ), with Recommendation by Others being the least influential of the seven criteria (RE). When the remaining factors have moderate(r_i+c_i) values and their (r_i-c_i) values are comparatively low, which point as a strong influence. Lastly, the cause criteria are Location (LO), Academic Major Available (AM) Ambiance/Student Activities (AS) and Recommendation by Others (RE) and for effect criteria are Fees (FE), Utilities/Transportation (UT), Academic Qualification (AQ). The cause and effect diagram based on criteria are shown in figure 5.

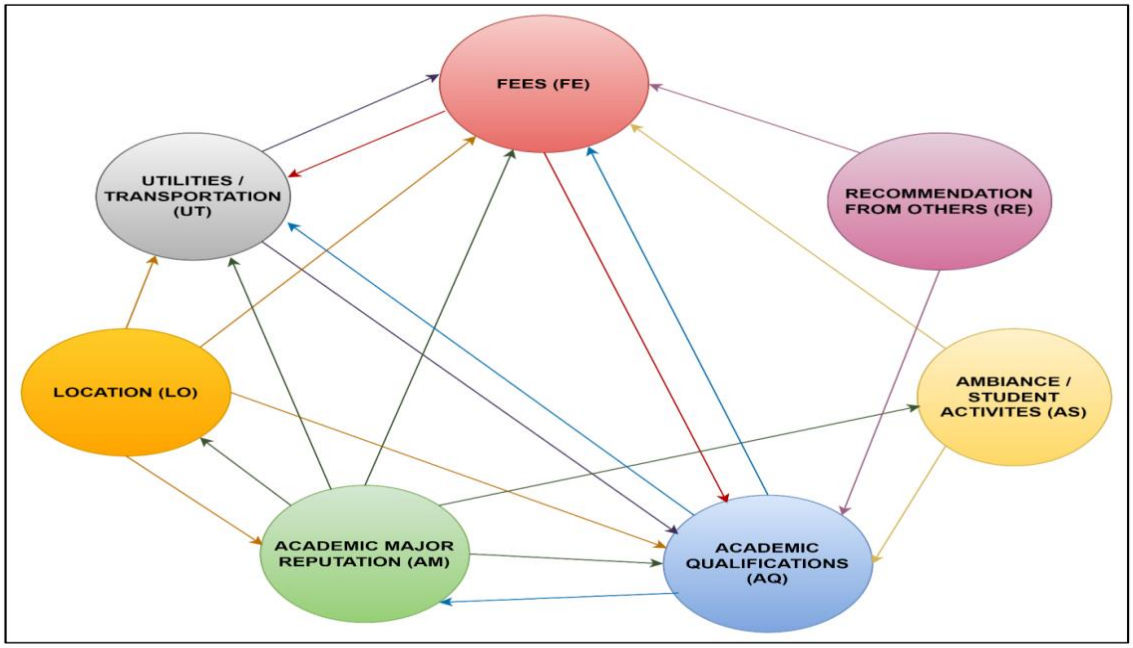

Figure 5. The cause-and-effect diagram based on criteria

Conclusion and Further Research

This study used the DEMATEL method to analyse and identify the most significant criteria for applying to a university, as well as their interrelationships. The three most important criteria are Location, Majors Available, and Academic Qualification (AQ). The purpose of the study was to gain a better understanding of the factor's students consider when selecting a university. Fees (FE), Academic Qualification (AQ), and Utilities / Transportation (UT) have the greatest influence on the other components, according to our findings.

This study aids in the identification of the most important factors influencing students' university selection decisions and enables us to gain a more comprehensive understanding of those factors. This research will benefit universities by providing information or criteria that will entice prospective students to enrol at their institution. Additionally, it may contribute to the enhancement of the university's services. Second, prospective students are able to comprehend the pertinent criteria and guidelines and utilise them when selecting a university. Finally, parents who recognise the significance of the factor and can assist their children in selecting a college.

It may be advantageous to include fuzzy environments in future research. This study presents the criteria in a static relationship. These connections are, however, subject to change over time. Consequently, a sensitivity analysis based on the dynamic scenario is necessary. In addition, there are additional multi-attribute decision-making processes, such as AHP, that generate scales via pairwise comparisons and expert judgement.

References

Abdullah, L., Zulkifli, N., Liao, H., Herrera-Viedma, E., & Al-Barakati, A. (2019). An interval-valued intuitionistic fuzzy DEMATEL method combined with Choquet integral for sustainable solid waste management. *Engineering Applications of Artificial Intelligence*, *82*(April), 207–215. https://doi.org/10.1016/j.engappai.2019.04.005

Ayçin, E., & Kayapinar Kaya, S. (2021). Towards the circular economy: Analysis of barriers to implementation of Turkey's zero waste management using the fuzzy DEMATEL method. *Waste Management & Research: The Journal for a Sustainable Circular Economy*, *February*, 0734242X2098878. https://doi.org/10.1177/0734242x20988781

Buyukozkan, G., Karabulut, Y., & Guler, M. (2018). Strategic renewable energy source selection for Turkey with hesitant fuzzy MCDM method. *Studies in Systems, Decision and Control*, *149*, 229–250. https://doi.org/10.1007/978-3-319-75690-5_11

Echchabi, A., & Al-Hajri, S. (2018). Factors Influencing Students' Selection of Universities: the Case of Oman. *Journal of Education Research and Evaluation*, *2*(2), 83. https://doi.org/10.23887/jere.v2i2.13694

Guruviah, V., & Augustin, F. (2019). IC fabrication process steps analysis using fuzzy dematel method. *International Journal of Innovative Technology and Exploring Engineering*, *9*(1), 1968–1973. https://doi.org/10.35940/ijitee.I7642.119119

Misran, N., Abd.Aziz, N., Arsad, N., Hussain, H., Zaki, W. M. D. W., & Sahuri, S. N. S. (2012). Influencing Factors for Matriculation Students in Selecting University and Program of Study. *Procedia - Social and Behavioral Sciences*, *60*(Eac 2011), 567–574. https://doi.org/10.1016/j.sbspro.2012.09.424

Polat, S. (2012). The Factors that Students Consider in University and Department Selection: A Qualitative and Quantitative Study of Kocaeli University, Faculty of Education Students. *Procedia - Social and Behavioral Sciences*, *47*, 2140–2145. https://doi.org/10.1016/j.sbspro.2012.06.963

Sundarrajh, S., & Zulkfili, N. (2019). Factors Influencing International Students Decision of University Selection in Malaysia. *International Journal of Education, Learning and Training*, *4*(1), 10–26. https://doi.org/10.24924/ijelt/2019.04/v4.iss1/011.26

Tsai, Y.-C., Trang, L. T., & Kobori, K. (2017). Factors Influencing International Students to Study at Universities in Taiwan. *International Journal for Innovation Education and Research*, *5*(1), 1–11. https://doi.org/10.31686/ijier.vol5.iss1.46

Winn, M., Leach, L., Erwin, S., & Benedict, L. (2014). Factors Affecting Graduate Educational Leadership Program Selection. *Administrative Issues Journal: Education, Practice, and Research*, *4*(1). https://doi.org/10.5929/2014.4.1.4

Yadav, H., Soni, U., & Kumar, G. (2021). Analysing challenges to smart waste management for a sustainable circular economy in developing countries: a fuzzy DEMATEL study. *Smart and Sustainable Built Environment*, *March 2022*. https://doi.org/10.1108/SASBE-06-2021-0097

Dahari, Z. (2011). Factors influencing international students' choice towards universities in Malaysia. *African Journal of Business Management*, *5*(26), 10615–10620. https://doi.org/10.5897/ajbm11.521