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Third Language Selection for Career Prospect by using Analytical Hierarchy Process (AHP)

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ABSTRACT

One of the benefits for career prospect is having a third language. Selecting third language is a hard decision for students considering they have limited choices. The objective of this study is to determine the main criteria in selecting a third language as well as determine the highest demand among students. Analytics Hierarchy Process (AHP) method was chosen to conduct this study since 1977 (Saaty, 1977). Six criterions identified were ease of learning, culture, purpose of language, interest of student, parent influence and friend's influence. Choices of third language are Arabic, Mandarin, Japanese, Korean, German, French and Italian. The result shows Mandarin as the most preferred third language with the highest weightage of 0.1918. For main criteria, ease of learning is identified as main influencing factor in student third language selection. This data were verified by consistency index (CI) were all the CI is less than 0.1.

Keywords:
AHP;third language; career; higher education

1. Introduction

One of the benefits for career prospect is having a third language. Selecting third language is a hard decision for students considering they have limited choices. The third languages that have been provided by Akademik Pengajian Bahasa (APB) UiTM are Arabic, Mandarin, French, Korean, German, Italian and Japan. There are three levels of third language needed to be passed by UiTM student to graduate from the program. Third language learning is a big decision for students. Before selecting the third language course, student should know the criteria and benefits of the languages. Students must decide when choosing the third language course by considering multiple factors. Since the third language is important, they need to think carefully as this decision will affected their future whether in study or job hunting as well as job promotion. Having a third language will open up a bunch of job opportunities even in a small or local business because some jobs also need a student that have a qualification in third language as a requirement.

Analytic Hierarchy Process (AHP) method used in this study to determine the main criteria in third language selection and to identify the preferable third language that has high demand among UiTM students. Analytic Hierarchy Process was proposed by Thomas Saaty in the 1970s is a structured technique in making effective decisions on complex issues based on mathematics and psychology. It is also one of the Multi-Criteria Decision Making (MCDM) methods that are most widely used. In this

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method, the AHP considered a set of criteria and alternatives according to the problem in decision making [4].

2. Literature Review

Most of the universities and secondary schools provided third language as a subject. Malaysia's Public Higher Educational Institutions had provided compulsory elective or free elective for the foreign language such as Mandarin, Arabic, Spanish, French and others [6]. The attitude in learning process and the mind set plays an important role in understanding and developing skills such as speaking, writing and reading. The perception and opinion of the students that come from different races are totally different each other based on research done in University Pendidikan Sultan Idris [5]. Results shows that Indian students prefer European languages such as German and Spanish because they think these languages have some similarities to their second language which is English while Chinese students prefer Japanese language. For Malay students they do not show any tendency towards learn any language for their future career. Based on Zubairi [9] that carried out research on students from UiTM and UKM, the highest reason for UiTM students learn a foreign language because they think it will make them a more knowledgeable person be useful in getting a job. Hani [2] found that language skills plays an important key in career ownership as well as making it possible for people to make mobility that is to more in career wise.

2. Research Methodology

The criteria's that influence the selection of third language are determined as ease of learning, culture, purpose of language, interest of students, parents' influence and friends' influence. Ease of learning is defined how easy it is to adapt to learning a new grammar and a new language. Second criteria are the culture of the language itself. Purpose of language is related to the benefits of third language study such as job opportunity, travel and meeting new friends. Interest of students is defined as the personal interest of students towards a specific language. The fifth criterion is Parents' influence which involves students' ability in learning different language. Lastly, friends' influence is defined as peer pressure in selecting certain language. Languages are listed as alternatives which are Mandarin, Arabic, Japanese, Korean, French, Italian and German.
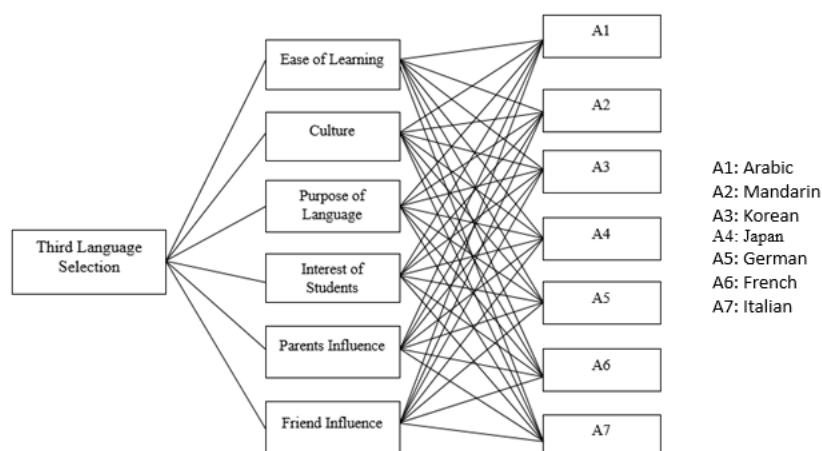

Fig. 1. Hierarchy Framework of Research

Analyses the data

Data was obtained from the questionnaires distribute among 200 new students from 3 faculties. Pairwise comparisons were done to determine the relative importance of each criterion. By pairing two criteria C_i and C_j and letting $C_i = a$ and $C_j = b$ then each elements in pairwise comparison matrix is defined by,

$$c_{ij} = \begin{cases} |a-b|, & 0 < a < b \\ 1, & a = b \\ \frac{1}{|a-b|+1}, & b < a < 1 \end{cases} \qquad (1)$$

The pairwise comparison matrix generated for this research is

Table 1
Criteria matrix – pairwise comparison

	Ease of learning	Culture	Purpose of language	Interest of students	Parent influence	Friend influence
Ease of learning	1	4	3	2	6	6
Culture	$\frac{1}{4}$	1	$\frac{1}{2}$	$\frac{1}{3}$	3	3
Purpose of language	$\frac{1}{3}$	2	1	$\frac{1}{2}$	4	4
Interest of students	$\frac{1}{2}$	3	2	1	5	5
Parent influence	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	1	1
Friend influence	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	1	1

Each element in this matrix represents difference in importance between criteria as explained in table 2.

The next step is determining the weightage for each criterion by normalizing the pairwise comparison matrix using equation below

$$W_i = \frac{1}{n} \sum_{j=1}^{n} v_{ij}$$

$$(2)$$

where v_{ij} element in normalized matrix and *n* is a number of criteria

Table 2
Scale of Pairwise Comparison

The Fundamental Scale for Pairwise Comparison		
Intensity of important	**Definition**	**Explanation**
1	Equally important	Two elements contribute equally to the objective
3	Moderately important	Experience and judgement slightly favour one element over another
5	Strongly important	Experience and judgement strongly favour one element over another
7	Very strongly important	One element is favoured very strongly over another
9	Extremely important	The evidence favouring one element over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between the two adjacent judgement	When compromise is needed. Perhaps, 6 can be used for in-between 5 and 7.
$\frac{1}{3},\frac{1}{4},\frac{1}{5},\frac{1}{6},\frac{1}{7},\frac{1}{8},\frac{1}{9},$	These values represent the opposite of the reciprocal whole numbers. For example, if "9" means that x is much more importance than Y, $\frac{1}{9}$ means that x is less important than Y

Below is the normalized matrix,

Table 3
Criteria matrix – normalize matrix

	Ease of learning	Culture	Purpose of language	Interest of students	Parent influence	Friend influence	Weightage
Ease of learning	0.4138	0.3750	0.4286	0.4724	0.3000	0.3000	0.3816
Culture	0.4034	0.0938	0.0714	0.0787	0.1500	0.1500	0.1079
Purpose of language	0.1379	0.1875	0.1429	0.1181	0.2000	0.2000	0.1644
Interest of students	0.2069	0.2813	0.2857	0.2363	0.2500	0.2500	0.2517
Parent influence	0.0690	0.0313	0.0357	0.0472	0.0500	0.0500	0.0472
Friend influence	0.0690	0.0313	0.0357	0.0472	0.0500	0.0500	0.0472

This result shows that the important criteria with the value of 0.3816 for one student that responded this questionnaire is ease of learning while parent influence and friend influence are not important criteria for this selection.

Consistency Index (CI) is uses to access the consistency of the comparison matrix. The comparison matrix, C is consistency if and only if,

$$\mathbf{CW^T} = n\mathbf{W^T} \tag{3}$$

$$\mathbf{CW^T} = \begin{bmatrix} 1 & 4 & 3 & 2 & 6 & 6 \\ 0.25 & 1 & 0.5 & 0.333 & 3 & 3 \\ 0.333 & 2 & 1 & 0.5 & 4 & 4 \\ 0.5 & 3 & 2 & 1 & 5 & 5 \\ 0.167 & 0.333 & 0.25 & 0.2 & 1 & 1 \\ 0.167 & 0.333 & 0.25 & 0.2 & 1 & 1 \end{bmatrix} \begin{bmatrix} 0.3816 \\ 0.1079 \\ 0.1644 \\ 0.2517 \\ 0.0472 \\ 0.0472 \end{bmatrix} = \begin{bmatrix} 2.3761 \\ 0.6526 \\ 1.0108 \\ 1.5669 \\ 0.2854 \\ 0.2854 \end{bmatrix}$$

$$\mathbf{nW^T} = 6 \begin{bmatrix} 0.3816 \\ 0.1079 \\ 0.1644 \\ 0.2517 \\ 0.0472 \\ 0.0472 \end{bmatrix} = \begin{bmatrix} 2.2896 \\ 0.6474 \\ 0.9864 \\ 1.5102 \\ 0.2832 \\ 0.2832 \end{bmatrix}$$

From the result above show that the comparison matrix is not consistent so we need to find the consistency ratio (CR) to determine either the inconsistency level is accept or not.

To calculate CR firstly we need to find e_{max}

$$e_{max} = \frac{1}{n} \sum_{i=1}^{n} \frac{i^{th} CW^T}{i^{th} W^T} \qquad (4)$$

where e_{max} for this particular student was

$$e_{max} = \frac{1}{6} \left(\frac{2.3761}{0.3816} + \frac{0.6526}{0.1079} + \frac{1.0108}{0.1644} + \frac{1.5669}{0.2517} + \frac{0.2854}{0.0472} + \frac{0.2854}{0.0472} \right) = 6.1238 \qquad (4.1)$$

Secondly, consistency index (CI) was calculated where

$$CI = \frac{e_{max} - n}{n - 1} \qquad (5)$$

$$CI = \frac{6.1238 - 6}{5} = 0.0248 \qquad (5.1)$$

Next, identify random index (RI) where RI is the consistency index of a randomly generated pairwise comparison matrix. It is depends on the *n* being compared and takes on the following values:

Table 4
Random Index

N	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

This RI was applied for all students. Lastly, consistency ratio was calculated.

The AHP provides a measure of the consistency of pairwise comparison judgments by computing a consistency ratio. We should compare consistency index (CI) with the random index (RI) to get the consistency ratio (CR).

$$CR = \frac{CI}{RI} < 0.1 \qquad (6)$$

If the consistency ratio is less than 0.1, then the level of consistency of a matrix is acceptable.

Weightage of alternative for each criterion was calculated by using equation (2). Then, calculate the weightage of alternative using equation below

$$\left[W_{AC1}{}^{T} \; W_{AC2}{}^{T} \; W_{AC3}{}^{T} \; \ldots \ldots W_{ACn}{}^{T}\right] x \left[W_{C}{}^{T}\right] = \left[W_{A}{}^{T}\right] \qquad (7)$$

Table 5
Alternative matrix based on criteria ease of learning– pairwise comparison matrix

	Arabic	Mandarin	Japanese	Korean	German	French	Italian	Weightage
Arabic	1	1	1	1	2	2	2	0.1818
Mandarin	1	1	1	1	2	2	2	0.1818
Japanese	1	1	1	1	2	2	2	0.1818
Korean	1	1	1	1	2	2	2	0.1818
German	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1	0.0909
French	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1	0.0909
Italian	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1	0.0909

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Table 5 shows the pairwise comparison matrix for alternative base on criteria ease of learning for one student.

Table 6
Weightage of alternative based on criteria

	Ease of learning	Culture	Purpose of language	Interest of students	Parent influence	Friend influence		Weightage of criteria		Weightage of alternative
Arabic	0.1818	0.0408	0.1578	0.1397	0.2222	0.2000		0.3816		0.1548
Mandarin	0.1818	0.1009	0.2798	0.1397	0.2222	0.2000		0.1079		0.1814
Japanese	0.1818	0.2778	0.1578	0.2465	0.1111	0.2000		0.1644		0.2020
Korean	0.1818	0.2778	0.1578	0.2465	0.1111	0.2000		0.2517		0.2020
German	0.0909	0.1009	0.0823	0.0758	0.1111	0.0667		0.0472		0.0866
French	0.0909	0.1009	0.0823	0.0758	0.1111	0.0667		0.0472		0.0866
Italian	0.0909	0.1009	0.0823	0.0758	0.1111	0.0667				0.0866

3. Results

Table 7 shows the final result for the weightage of criteria for 200 students.

Table 7
Weightage for Criteria

CRITERIA	WEIGHTAGE	RANK
Ease of Learning (C_1)	0.2091	1
Culture (C_2)	0.1570	4
Purpose of Language (C_3)	0.1710	3
Interest of Students (C_4)	0.1953	2
Parents Influence (C_5)	0.1331	6
Friend Influence (C_6)	0.1344	5

From the results, Ease of Learning (C_1) is the most important criteria with weightage of 0.2091. The criteria Interest of Students (C_4) holds the second important criteria with the weightage of 0.1953 followed by Purpose of Language (C_3) with 0.1710. The fourth important criterion is Culture (C_2), getting 0.1570 and criteria Friend Influence (C_6) comes next with 0.1344. Parents Influence (C_5) is the least important criteria to affect the third language selection with the lowest weightage 0.1331.

The overall result of weightage of alternative is shown in table 8. Table 8 shows the weightage of important alternative. New undergraduate students were asked to rank the degree of important based on the alternative given by considering all the alternatives in selection third language for their third language course. From the table above, it can be seen that most third language that have been chosen is Mandarin (A_2) with highest weightage of 0.1918. This is followed by Arabic (A_1) that holds a second position with weightage of 0.1873, then Korean (A_3) 0.1607, Japan (A_4) 0.1556, German (A_5) 0.1049 and French (A_6) with weightage of 0.1023. While Italian (A_7) turns out to be the least third language that was preferred by students with weightage of 0.0974. This weightage where use to rank the most preferable in choosing third language.

Table 8
Weightage for Alternative

ALTERNATIVE	WEIGHTAGE	RANK
Arabic (A_1)	0.1873	2
Mandarin (A_2)	0.1918	1
Korean (A_3)	0.1607	3
Japan (A_4)	0.1556	4
German (A_5)	0.1049	5
French (A_6)	0.1023	6
Italian (A_7)	0.0974	7

4. Conclusion

The result shows the ease of learning, interest of students and purpose of language gave highest influence in determining the third language selection. Mandarin was the most preferable since higher jobs prospect for those who can speak this language as listed in job vacancies and advertisements. Further research can be done by incorporating as fuzzy AHP, technique for order of preference by similarity to ideal solution (TOPSIS) and data envelopment analysis (DEA).

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