"Project Managing" Your Best-Choice University Using Multi-Attribute Decision-Making (MADM) [1]

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"He who fails to plan is planning to fail." - Winston Churchill.

ABSTRACT

Selecting universities that can help us thrive is not an easy task. Some people managed to use the opportunity very well. However, others are not fortunate in the end. Because of that, it is crucial to consider some factors from each university we might get into. This research shows how to use Multi-Attribute Decision Making (MADM) to pick a university that would fit students the most theoretically. It would also show how we can differentiate universities numerically. MADM allows users to compare qualitative and quantitative data using compensatory and non-compensatory approaches. The conclusion states that MADM is one of the best ways that we can use to prevent later regrets in choosing the university. This research can be expanded by applying other feasible attributes or expanding the use of MADM in other problems.

Keywords: Best Universities, High School student, Data Analysis, Decision Making, Problem-Solving, and How to find a good university.

INTRODUCTION

Choosing the university that fits us can be one of life's most exciting yet challenging parts. While some students are lucky enough to find that their university satisfies their expectations, others regret their choice. Research conducted on 1453 students before and after they started college[2] suggested that about 50% of them chose to attend a college of "lesser" academic esteem relative to their high school. On average, 27% of these students had lower self-esteem and were threatened by depression.

Students often choose colleges based on a factor such as academic reputation or the rank of the university through particular ranking institutions. However, not considering simple factors such as the cost of attendance or how safe the place could affect students' behavior and increase their pressure to complete the path they are pursuing. It is essential to consider as many factors as possible before students choose which university to apply to. Based on this problem, a methodology is needed to create an organization of data, which could help students select a university.

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[2] Hess, A. J. April 30 2018. Study finds that picking the wrong college can make you depressed—here's why.

The Multi-Attribute Decision Making (MADM), also known as Analytical Hierarchy Method (AHP), is a tool that perfectly combines pure quantitative data with almost purely qualitative models used in the logical framework. This method has been proven to be practiced in business areas. We can also use this methodology to select which university would suit us. **By using the MADM, we could identify and compare the attributes of each university** we are interested in attending.

Some critical factors must be considered when applying this method to compare universities. The first is to question why we should use the approaches step by step to create the best decision. The second is to understand how vital the differences in factors are in the decision-making process. The last is to identify attributes that are not comparable but are equally important in the decision. The questions will be answered in the conclusion.

METHODOLOGY

There are six approaches to making a choice using Multi-Attribute Decision Making[3]. 4 of them are non-compensatory (full-dimensioned), and others are parts of the compensatory (single-dimensional) decision-making models:

1. Non-compensatory models

1.1. Dominance

1.1.1. Dominance sees that all attributes are equally important. This approach compares each party by their attributes. The best of the comparison can be assumed as the best contender.

1.2. Satisficing

1.2.1. This approach determines all attributes' minimum and maximum acceptable values. After that, we eliminate our choices that do not meet the requirements. This helps remove any option that significantly differs from our primary purposes while identifying which choices will be the best on our radar.

1.3. Disjunctive Reasoning

1.3.1. While other approaches compare all options and attributes, disjunctive reasoning only compares the attributes of the case. We compare each attribute with one another and write one if the attribute wins (more important than the other) or 0 if the attribute loses (less important than the other).

1.4. Lexicography

1.4.1. This method can be used after the user sorts the factors from the most important to the least in disjunctive reasoning. Here, all we need to do is to sort the universities in each attribute.

[3] 1.4.1.12 Unit 12- Managing Change - PTMC

Compensatory models rank all options from worst to best but cannot measure **how they score relative to one another**. For instance, the best option is only 10% better than the worst option. To get an accurate ratio scaling model, we have to start from zero, and all increments need to be the same value. This problem, however, is covered using the compensatory models.

2. Compensatory models

2.1. Non-dimensional Scaling

2.1.1. In this method, we must turn the relative options into a dimensionless value. After that, we continue with the calculation of the relative weight of each attribute.

2.2. Additive Weighting Technique

2.2.1. This tool is potent. It can assess and manage change and estimate the cost. This is a three-step process. First, add the total relative ranking of all options. Second, attribute weighting needs to be normalized. Then, we could determine the score ratio of each option. Some options that seem "**powerful**" in the non-compensatory models could still not be as good as the users' expectations.

FINDINGS

The best way to visualize the MADM in this problem is by using a **study case**:

Dan is a high school student encouraged to continue his university studies abroad. Considering he chose to go to the U.S., there must be some complicated considerations in choosing which university would suit him. For information, his parents can only support his education with **$75,000** a year. His IELTS score overall is 6.5. He plans to exclude the SAT from his grading process due to his low score. Dan wants to be in a safe and good university, which he thinks is essential in deciding which university to attend.

Dan used Multi-Attribute Decision Making to help him to select his university. The attributes[4] he used to consider which university to attend are as follows:

1. Acceptance rates

1.1. Counts the percentage of students accepted to the university each year. The more students get interested in a university, the more likely the university will be better. The information regarding each university acceptance rate is as follows:

[4] Niche: Explore Schools, Companies, and Neighborhoods

University	Acceptance Rates
University A	20%
University B	23%
University C	52%
University D	27%
University E	20%
University F	91%
University G	80%
University H	40%

2. Graduation rates

2.1. Determine the percentage of students who graduated from each university. The more students complete their studies; then the more university is likely to be better. Below is the data:

University	Graduation Rates
University A	85%
University B	87%
University C	84%
University D	90%
University E	90%
University F	60%
University G	63%
University H	81%

3. Salary upon graduation

3.1. Average salary/money students get after graduating from the university.

University	Salary Upon Graduation
University A	$ 68,100
University B	$ 70,700
University C	$ 50,000
University D	$ 66,000
University E	$ 85,000
University F	$ 37,000
University G	$ 40,000
University H	$ 72,500

4. Placement rates

4.1. The possibility of a person getting accepted by the university.

University	Placement Rates
University A	20%
University B	18%
University C	18%
University D	10%
University E	9%
University F	67%
University G	55%
University H	19%

5. Tuition cost

5.1. The tuition needed by the university each year. Because his parents can only support him with no more than $ 75,000, the lower the cost, the better it would be.

University	Tuition Cost
University A	$ 50,800
University B	$ 51,500
University C	$ 9,200
University D	$ 8,500
University E	$ 11,900
University F	$ 14,100
University G	$ 8,000
University H	$ 12,000

6. Living costs

6.1. This information shows the cost of living in a particular area. Same as tuition cost; the least the cost, the better it would be. Below is the data on living costs in each city:

University	Living Cost
University A	$ 24,000
University B	$ 21,000
University C	$ 19,000
University D	$ 18,700
University E	$ 22,500
University F	$ 24,400
University G	$ 17,000
University H	$ 22,000

7. Quality of life in each city[5]

7.1. Determines how the people live there. The safety index is as follows:

[5] Numbeo.com

The place of the university	Quality of life index
University A, B, E	165
University C	170
University D	190
University F	160
University G	170
University H	165

8. The safety of each University

8.1. Determines the safety of each university. The information can be seen below:

Safety	Score
University A	B
University B	B
University C	B
University D	B
University E	B
University F	B-
University G	B
University H	B-

9. English Language Proficiency (International)

9.1. Some U.S. universities consider students' English proficiency for international students. Therefore, sometimes it will not be necessary to apply to a university where the English proficiency requirement is above the student's average.

Note that there are several exceptions due to the **tight differences** between some elements. Therefore, some attributes with the percentage/amount, such as 1 - 3 differences, would be considered equal.

Approach 1: Dominance

Dominance (Using PairWise Comparison)							
Selection Attributes	Uni A vs. Uni B	Uni A vs. Uni C	Uni A vs. Uni D	Uni A vs. Uni E	Uni A vs. Uni F	Uni A vs. Uni G	Uni A vs. Uni H
The safety of each uni	Equal	Equal	Equal	Equal	Better	Equal	Better
Acceptance rates	Equal	Better	Better	Worse	Better	Better	Better
Graduation rates	Equal	Equal	Worse	Worse	Better	Better	Better
Salary upon graduation	Equal	Better	Equal	Worse	Better	Better	Worse
Placement rates	Equal	Equal	Worse	Worse	Better	Better	Equal
Tuition cost	Equal	Worse	Worse	Equal	Worse	Worse	Equal
Living costs	Equal	Worse	Worse	Equal	Equal	Worse	Equal
Quality of life in each city	Equal	Worse	Worse	Equal	Better	Worse	Equal

Dominance (Using PairWise Comparison)							
Selection Attributes	Uni B vs. Uni A	Uni B vs. Uni C	Uni B vs. Uni D	Uni B vs. Uni E	Uni B vs. Uni F	Uni B vs. Uni G	Uni B vs. Uni H
The safety of each uni	Equal	Equal	Equal	Equal	Better	Equal	Better
Acceptance rates	Equal	Better	Better	Worse	Better	Better	Better
Graduation rates	Equal	Equal	Equal	Equal	Better	Better	Better
Salary upon graduation	Equal	Better	Better	Worse	Better	Better	Equal
Placement rates	Equal	Equal	Worse	Worse	Better	Better	Equal
Tuition cost	Equal	Worse	Worse	Equal	Worse	Worse	Equal
Living costs	Equal	Equal	Equal	Equal	Better	Worse	Worse
Quality of life in each city	Equal	Worse	Worse	Equal	Better	Worse	Equal

Dominance (Using PairWise Comparison)							
Selection Attributes	Uni C vs. Uni A	Uni C vs. Uni B	Uni C vs. Uni D	Uni C vs. Uni E	Uni C vs. Uni F	Uni C vs. Uni G	Uni C vs. Uni H
The safety of each uni	Equal	Equal	Equal	Equal	Better	Equal	Better
Acceptance rates	Worse	Worse	Worse	Worse	Better	Better	Worse
Graduation rates	Equal	Equal	Worse	Worse	Better	Better	Equal
Salary upon graduation	Worse	Worse	Worse	Worse	Better	Better	Worse
Placement rates	Equal	Equal	Worse	Worse	Better	Better	Equal
Tuition cost	Better	Better	Worse	Better	Worse	Better	Better
Living costs	Better	Equal	Equal	Better	Better	Equal	Equal
Quality of life in each city	Better	Better	Worse	Better	Better	Equal	Better

Dominance (Using PairWise Comparison)							
Selection Attributes	Uni D vs. Uni A	Uni D vs. Uni B	Uni D vs. Uni C	Uni D vs. Uni E	Uni D vs. Uni F	Uni D vs. Uni G	Uni D vs. Uni H
The safety of each uni	Equal	Equal	Equal	Equal	Better	Equal	Better
Acceptance rates	Worse	Worse	Better	Worse	Better	Better	Better
Graduation rates	Better	Equal	Better	Equal	Better	Better	Better
Salary upon graduation	Equal	Worse	Better	Worse	Better	Better	Worse
Placement rates	Better	Better	Better	Equal	Better	Better	Better
Tuition cost	Better	Better	Better	Better	Better	Better	Better
Living costs	Better	Equal	Equal	Better	Better	Equal	Better
Quality of life in each city	Better	Better	Better	Better	Better	Better	Better

Dominance (Using PairWise Comparison)							
Selection Attributes	Uni E vs. Uni A	Uni E vs. Uni B	Uni E vs. Uni C	Uni E vs. Uni D	Uni E vs. Uni F	Uni E vs. Uni G	Uni E vs. Uni H
The safety of each uni	Equal	Equal	Equal	Equal	Better	Equal	Better
Acceptance rates	Equal	Equal	Better	Better	Better	Better	Better
Graduation rates	Better	Equal	Better	Equal	Better	Better	Better
Salary upon graduation	Better	Better	Better	Better	Better	Better	Better
Placement rates	Better	Better	Better	Equal	Better	Better	Better
Tuition cost	Equal	Equal	Worse	Worse	Worse	Worse	Better
Living costs	Equal	Equal	Worse	Worse	Equal	Worse	Equal
Quality of life in each city	Equal	Equal	Worse	Worse	Better	Worse	Equal

Dominance (Using PairWise Comparison)							
Selection Attributes	Uni F vs. Uni A	Uni F vs. Uni B	Uni F vs. Uni C	Uni F vs. Uni D	Uni F vs. Uni E	Uni F vs. Uni G	Uni F vs. Uni H
The safety of each uni	Worse	Worse	Worse	Worse	Worse	Worse	Equal
Acceptance rates	Worse	Worse	Worse	Worse	Worse	Worse	Worse
Graduation rates	Worse	Worse	Worse	Worse	Worse	Equal	Worse
Salary upon graduation	Worse	Worse	Worse	Worse	Worse	Equal	Worse
Placement rates	Worse	Worse	Worse	Worse	Worse	Worse	Worse
Tuition cost	Better	Better	Worse	Worse	Better	Better	Better
Living costs	Equal	Worse	Worse	Worse	Equal	Worse	Equal
Quality of life in each city	Worse	Worse	Worse	Worse	Worse	Worse	Worse

Dominance (Using PairWise Comparison)							
Selection Attributes	Uni G vs. Uni A	Uni G vs. Uni B	Uni G vs. Uni C	Uni G vs. Uni D	Uni G vs. Uni E	Uni G vs. Uni F	Uni G vs. Uni H
The safety of each uni	Equal	Equal	Equal	Equal	Equal	Better	Better
Acceptance rates	Worse	Worse	Worse	Worse	Worse	Worse	Worse
Graduation rates	Worse	Worse	Worse	Worse	Worse	Better	Worse
Salary upon graduation	Worse	Worse	Worse	Worse	Worse	Equal	Worse
Placement rates	Worse	Worse	Worse	Worse	Worse	Better	Worse
Tuition cost	Better	Better	Worse	Worse	Better	Worse	Better
Living costs	Better	Better	Equal	Equal	Better	Better	Better
Quality of life in each city	Better	Better	Equal	Worse	Better	Better	Better

Dominance (Using PairWise Comparison)							
Selection Attributes	Uni H vs. Uni A	Uni H vs. Uni B	Uni H vs. Uni C	Uni H vs. Uni D	Uni H vs. Uni E	Uni H vs. Uni F	Uni H vs. Uni G
The safety of each uni	Worse	Worse	Worse	Worse	Worse	Equal	Worse
Acceptance rates	Worse	Worse	Better	Worse	Worse	Better	Better
Graduation rates	Worse	Worse	Better	Worse	Worse	Better	Better
Salary upon graduation	Better	Equal	Worse	Better	Worse	Better	Better
Placement rates	Equal	Equal	Equal	Worse	Worse	Better	Better
Tuition cost	Equal	Equal	Worse	Worse	Equal	Worse	Worse
Living costs	Equal	Equal	Equal	Worse	Equal	Equal	Worse
Quality of life in each city	Equal	Equal	Worse	Worse	Equal	Better	Worse

Table of Comparison #1 - 4[6]

[6] Model by Sullivan, Wickes, & Kroeling (2014) Engineering Economics 15th Edition

Based on the comparison, university D is the best choice, followed by university E. Now, consider them as the strongest candidates for Dan's university for a moment.

Approach 2: Satisficing[7]

	Minimum Acceptable Value	Maximum Acceptable Value	Unacceptable Alternative
The safety of each uni	B-	-	None
Acceptance rates	15%	75%	Uni F & G
Graduation rates	60%	100%	None
Salary upon graduation ($)	30	-	None
Placement rates	-	100%	None
Total Costs Needed ($)	0	75	Uni B
Quality of life in each city		-	
English Proficiency (Overall IELTS)	6.0	6.5	Uni A & E

Table of Comparison #5

Dan had eliminated universities that could not accept him or universities that were not as good as he demanded. In this case, options for university E cannot be entered because the IELTS requirements are higher than Dan's. Therefore, university D is now the most suitable for Dan. Note that we will still be comparing eliminated universities to model the comparison.

[7] Model by Sullivan, Wickes, & Kroeling (2014) Engineering Economics 15th Edition

Approach 3: Disjunctive reasoning[8]

	The safety of each uni	Acceptance rates	Graduation rates	Salary upon graduation	Placement rates	Tuition cost	Living costs	Quality of life in each city	Ordinal Ranking
The safety of each uni		1	1	1	1	1	1	1	7
Acceptance rates	0		0	1	1	1	1	0	4
Graduation rates	0	1		1	1	1	1	1	6
Salary upon graduation	0	0	0		1	0	0	0	1
Placement rates	0	0	1	0		1	1	0	3
Tuition cost	0	0	0	1	0		1	0	2
Living costs	0	0	0	1	0	0		0	1
Quality of life in each city	0	1	0	1	1	1	1		5

Table of Comparison #6

By sorting all aspects, Dan had a clear overview of what the university he chose should have.

Approach 4: Lexicography[9]

[8] Model by Sullivan, Wickes, & Kroeling (2014) Engineering Economics 15th Edition

[9] Model by Sullivan, Wickes, & Kroeling (2014) Engineering Economics 15th Edition

Ordinal Ranking		Relative Ranking of University Candidates Based on Attributes
The safety of each uni	7	A, B, C, D, E, G, F, H
Graduation rates	6	D, E, B, A, C, H, G, F
Quality of life in each city	5	C, D, G, A, B, E, H, F
Acceptance rates	4	E, A, B, D, H, C, G, F
Placement rates	3	E, D, B, C, H, A, G, F
Tuition cost	2	D, F, C, G, E, A, H, B
Living costs	1	G, D, C, B, H, E, A, F
Salary upon graduation	1	E, H, B, A, D, C, G, F

Table of Comparison #7

University E & D seem dominant in each scenario. However, since university E has been eliminated, university D is the best choice for Dan based on the non-compensatory model.

Approach 5: Non-Dimensional Scaling Technique[10]

Remember that non-compensatory approaches cannot calculate how each option is relative to one another using real ratio scaling. Therefore, Dan used the non-dimensional scaling to ensure how good exactly each university is.

[10] Model by Sullivan, Wickes, & Kroeling (2014) Engineering Economics 15th Edition

Undesirable: (Worst case - Attribute value) / (Worst case - Best case)			
Desirable: (Attribute value - Worst case) / (Best case - Worst case)			
Attribute	Value	Formula	Dimensionless Value
The safety of each university A = 4	D	(4 - 1) / 3	1.00
B = 3	B-	(4 - 2.5) / 3	0.5
C = 2	B	(4 - 3) / 3	0.33
+/- = +/- 0.5	A	(4 - 4) / 3	0.00
Graduation rates (%)	60	(90 - 60) / (90 - 60)	1.00
	63	(90 - 63) / (90 - 60)	0.90
	81	(90 - 81) / (90 - 60)	0.30
	84	(90 - 84) / (90 - 60)	0.20
	85	(90 - 85) / (90 - 60)	0.17
	87	(90 - 87) / (90 - 60)	0.10
	90	(90 - 90) / (90 - 60)	0.00
	90	(90 - 90) / (90 - 60)	0.00
Quality of life in each city	160	(190 - 160) / (190 - 160)	1.00
	165	(190 - 165) / (190 - 160)	0.83
	170	(190 - 170) / (190 - 160)	0.67
	190	(190 - 190) / (190 - 160)	0.00
	9	(80 - 9) / (80 - 9)	1.00

Acceptance rates (100 - value (%))	20	(80 - 20) / (80 - 9)	0.84
	48	(80 - 48) / (80 - 9)	0.45
	60	(80 - 60) / (80 - 9)	0.28
	73	(80 - 73) / (80 - 9)	0.10
	77	(80 - 77) / (80 - 9)	0.04
	80	(80 - 80) / (80 - 9)	0.00
Placement rates (100 - value (%))	33	(91 - 33) / (91 - 33)	1.00
	45	(91 - 45) / (91 - 33)	0.79
	80	(91 - 80) / (91 - 33)	0.19
	81	(91 - 81) / (91 - 33)	0.17
	82	(91 - 82) / (91 - 33)	0.15
	90	(91 - 90) / (91 - 33)	0.02
	91	(91 - 91) / (91 - 33)	0.00
Tuition cost ($)	8000	(51,500 - 8000) / (51,500 - 8000)	1.00
	8,5	(51,500 - 8500) / (51,500 - 8000)	0.99
	9,2	(51,500 - 9200) / (51,500 - 8000)	0.97
	11,9	(51,500 - 11,900) / (51,500 - 8000)	0.91
	12	(51,500 - 12000) / (51,500 - 8000)	0.91

	14,1	(51,500 - 14100) / (51,500 - 8000)	0.86
	50,8	(51,500 - 50,800) / (51,500 - 8000)	0.02
	51,5	(51,500 - 51,500) / (51,500 - 8000)	0.00
	17	(24,400 - 17,000) / (24,400 - 17,000)	1.00
	18,7	(24,400 - 18,700) / (24,400 - 17,000)	0.77
	19	(24,400 - 19,000) / (24,400 - 17,000)	0.73
	21	(24,400 - 21,000) / (24,400 - 17,000)	0.46
Living costs ($)	22	(24,400 - 22,000) / (24,400 - 17,000)	0.32
	22,5	(24,400 - 22,500) / (24,400 - 17,000)	0.26
	24	(24,400 - 24,000) / (24,400 - 17,000)	0.05
	24,4	(24,400 - 24,400) / (24,400 - 17,000)	0.00
	37	(85,000 - 37,000) / (85,000 - 37,000)	1.00
	40	(85,000 - 40,000) / (85,000 - 37,000)	0.94
	50	(85,000 - 50,000) / (85,000 - 37,000)	0.73

Salary upon graduation ($)	66	(85,000 - 66,000) / (85,000 - 37,000)	0.40
	68,1	(85,000 - 68,100) / (85,000 - 37,000)	0.35
	70,7	(85,000 - 70,700) / (85,000 - 37,000)	0.30
	72,5	(85,000 - 72,500) / (85,000 - 37,000)	0.26
	85	(85,000 - 85,000) / (85,000 - 37,000)	0.00

Table of Comparison #9

After this, Dan calculated the relative weighting of each attribute.

Attribute	Uni A	Uni B	Uni C	Uni D
Safety	B	B	B	B
Graduation rates (%)	85	87	84	90
Quality of life in each city	165	165	170	190
Acceptance rates (%)	20	23	52	27
Placement rates (%)	20	18	18	10
Tuition cost ($)	50,8	51,5	9,2	8,5
Living costs ($)	24	21	19	18,7
Salary upon graduation ($)	68,1	70,7	50	66
Safety: A > B > C > D				
Safety: 1 - dimensionless value	Uni A	Uni B	Uni C	Uni D
Graduation rates (%): 1 - dimensionless value	0.66	0.66	0.66	0.66
Quality of life in each city: 1 - dimensionless value	0.83	0.90	0.80	1.00
Acceptance rates (%): Dimensionless value	0.17	0.17	0.33	1.00
Placement rates (%): Dimensionless value	1.00	0.96	0.45	0.90
Tuition cost ($): Dimensionless value	0.19	0.15	0.15	0.98
Living costs ($): Dimensionless value	0.02	0.00	0.97	0.99
Salary upon graduation ($): 1 - dimensionless value	0.05	0.46	0.73	0.77
Safety: 1 - dimensionless value	0.65	0.70	0.27	0.60
TOTAL	3.57	4.00	4.36	6.9

Table of Comparison #10

Attribute	Uni E	Uni F	Uni G	Uni H
Safety	B	B-	B	B-
Graduation rates (%)	90	60	63	81
Quality of life in each city	165	160	170	165
Acceptance rates (%)	20	91	80	40
Placement rates (%)	9	67	55	19
Tuition cost ($)	11,9	14,1	8	12
Living costs ($)	22,5	24,4	17	22
Salary upon graduation ($)	85	37.000	40	72,5
Safety: A > B > C > D				
Attribute	Uni E	Uni F	Uni G	Uni H
Safety: 1 - dimensionless value	0.66	0.50	0.66	0.50
Graduation rates (%): 1 - dimensionless value	1.00	0.00	0.10	0.70
Quality of life in each city: 1 - dimensionless value	0.17	0.00	0.33	0.17
Acceptance rates (%): Dimensionless value	1.00	0.00	0.16	0.72
Placement rates (%): Dimensionless value	1.00	0.00	0.21	0.83
Tuition cost ($): Dimensionless value	0.91	0.86	1.00	0.91
Living costs ($): Dimensionless value	0.26	0.00	1.00	0.32
Salary upon graduation ($): 1 - dimensionless value	1.00	0.00	0.06	0.74
TOTAL	6.34	1.36	3.86	4.89

Table of Comparison #11

Note that some use the formula: 1 - the dimensionless value. In contrast, some of them used the dimensionless value. Based on the result, we know that university D holds the largest score, 6.9. It is 1.09 times better than university E and five times better than university F.

Approach 6: Additive Weighting Technique[11]

	Step 1	Step 2		Uni A		Uni B		Uni C		Uni D	
Attribute	Relative rank	Normalized weight (A)		(B)	(B) * (A)	(C)	(C) * (A)	(D)	(C) * (A)	(E)	(E) * (A)
Safety	7	7/29 =	0.24	0.66	0.1584	0.66	0.1584	0.66	0.1584	0.66	0.1584
Graduation rates (%)	6	6/29 =	0.20	0.83	0.166	0.90	0.18	0.80	0.16	1.00	0.2
Quality of life in each city	5	5/29 =	0.17	0.17	0.0289	0.17	0.0289	0.33	0.0561	1.00	0.17
Acceptance rates (%)	4	4/29 =	0.14	1.00	0.14	0.96	0.1344	0.45	0.063	0.90	0.126
Placement rates (%)	3	3/29 =	0.10	0.19	0.019	0.15	0.015	0.15	0.015	0.98	0.098
Tuition cost ($)	2	2/29 =	0.07	0.02	0.0014	0.00	0	0.97	0.0679	0.99	0.0693
Living costs ($)	1	1/29 =	0.03	0.05	0.0015	0.46	0.0138	0.73	0.0219	0.77	0.0231
Salary upon graduation ($)	1	1/29 =	0.03	0.65	0.0195	0.70	0.021	0.27	0.0081	0.60	0.018
Total	29	1	1		0.5347		0.5515		0.5504		0.8628

Table of Comparison #12

[11] Model by Sullivan, Wickes, & Kroeling (2014) Engineering Economics 15th Edition

	Step 1	Step 2		Uni E		Uni F		Uni G		Uni H	
Attribute	Relative rank	Normalized weight (A)		(F)	(F) * (A)	(G)	(G) * (A)	(H)	(H) * (A)	(I)	(I) * (A)
Safety	7	7/29 =	0.24	0.66	0.1584	0.50	0.12	0.66	0.1584	0.50	0.12
Graduation rates (%)	6	6/29 =	0.20	1.00	0.2	0.00	0	0.10	0.02	0.70	0.14
Quality of life in each city	5	5/29 =	0.17	0.17	0.0289	0.00	0	0.33	0.0561	0.17	0.0289
Acceptance rates (%)	4	4/29 =	0.14	1.00	0.14	0.00	0	0.16	0.0224	0.72	0.1008
Placement rates (%)	3	3/29 =	0.10	1.00	0.1	0.00	0	0.21	0.021	0.83	0.083
Tuition cost ($)	2	2/29 =	0.07	0.91	0.0637	0.86	0.0602	1.00	0.07	0.91	0.0637
Living costs ($)	1	1/29 =	0.03	0.26	0.0078	0.00	0	1.00	0.03	0.32	0.0096
Salary upon graduation ($)	1	1/29 =	0.03	1.00	0.03	0.00	0	0.06	0.0018	0.74	0.0222
Total	29	1	1		0.7288		0.1802		0.3797		0.5682

Table of Comparison #13

This comparison also managed to show the differences between the universities by the number. After all this research, Dan concluded that university D would be the best university for him.

CONCLUSIONS

Choosing a university that fits us best should take time and effort. This is because our lives might change once we have joined the university, and our life might change drastically. In a university, students have to be ready both physically and mentally, but we also have to be ready with our finances and other things. We must consider whether the university is good enough for us. We have to be able to identify which university is willing to accept us or not. All of that can be determined using the MADM.

Multi-Attribute Decision Making would be beneficial in determining our chosen university. This is because the decision-making process could compare qualitative and quantitative data without separating them. Although the process seems complicated, it would help us defy regrets that could have come to us. Hence, it has been proven that **Multi-Attribute Decision Making tools can help students choose their university.**

The MADM process must be conducted step-by-step because one step is related to another. Remember that we use the lexicography approach based on the result of disjunctive reasoning. Remember that data that could be analyzed several times have a better probability of success than those analyzed only once. Making comparisons like this helps determine our decision because one factor might differ greatly from another. Notice that there are factors that could be more easily comparable. These factors must be considered in decision-making as they can become thorns in the flesh.

FOLLOW-ON RESEARCH

The MADM has now been proven to be used in universities' selection process. There are several reasons why this research needs to be improved. The first reason is to consider that other people would like other attributes to be considered in selecting their university. The second reason is that this research assumes that we are accepted into the universities. There should be a calculation on the possibility of our getting into each university because universities have different considerations in selecting their students.

Apart from that, the MADM can be used for research in developing other things. Things like engineering, building, and programming often use the help of MADM in sorting and selecting their respective attributes[12]. We can also use this method to improve our daily life, like creating a monthly schedule based on the tools. There are many other ways we can use this approach. Note that the format does not have to follow these six approaches. We can make the MADM as flexible as our needs.

BIBLIOGRAPHY

Hess, A. J. (n.d.). Study finds that picking the wrong college can make you depressed—here's why. CNBC. https://www.cnbc.com/2018/04/30/study-finds-that-picking-the-wrong-college-can-make-you-depressed.html

Niche. (2014). Niche: Explore Schools, Companies, and Neighborhoods. Niche. https://www.niche.com/

1.4.1.12 Unit 12- Managing Change - PTMC. (2021, April 9). https://build-project-management-competency.com/1-4-1-12-unit-12/

Quality of Life. (2009). Numbeo.com. https://www.numbeo.com/quality-of-life/

Engineering Economy: Sullivan, William G., Wicks, Elin M., Koelling, C. Patrick: 9780132554909: Amazon.com: Books. (2022). Amazon.com. https://www.amazon.com/Engineering-Economy-Edition-William-Sullivan/dp/0132554909

Wisnugroho, J. (2020). Indonesia Oil & Gas Cost Estimating vs. International "Best-Tested and Proven" Practices – A Benchmarking Study [Review of Indonesia Oil & Gas Cost Estimating vs. International "Best-Tested and Proven" Practices – A Benchmarking Study]. 9(2). https://pmworldlibrary.net/wp-content/uploads/2020/02/pmwj90-Feb2020-Wisnugroho-benchmarking-indonesia-og-cost-estimating-vs-international3.pdf

Grammarly. (2019). Grammarly.com. https://app.grammarly.com/

Factors to Consider When Choosing a College. (n.d.). Www.educationcorner.com. Retrieved January 17, 2023, from https://www.educationcorner.com/factors-choosing-a-college.html#:~:text=If%20you%27re%20shopping%20around%20for%20colleges%2C%20you%27re%20going

graduate-coach. (2020, April 29). 12 Things to consider when choosing a university. Graduate Coach. https://graduatecoach.co.uk/blog/things-to-consider-when-choosing-a-university/#:~:text=12%20Things%20to%20consider%20when%20choosing%20a%20university

Nine factors to consider when choosing a university. (2021, October 7). Undergraduate Programs. https://uwaterloo.ca/future-students/missing-manual/applying/nine-factors-consider-when-choosing-university

7 Tips to Prepare for Starting University. (n.d.). Top Universities. Retrieved January 17, 2023, from https://www.topuniversities.com/blog/7-tips-prepare-starting-university#:~:text=7%20Tips%20to%20Prepare%20for%20Starting%20University%201

[12] Xu, Z. 2015. Uncertain Multi-Attribute Decision Making.

MyBib Contributors. (2019, May 26). The APA Citation Generator is FREE & Fast (6th Edition, 2019). MyBB. https://www.mybib.com/tools/apa-citation-generator

Psychology Today. (2019). Decision-Making | Psychology Today. Psychology Today. https://www.psychologytoday.com/us/basics/decision-making

Xu, Z. (2015). Uncertain Multi-Attribute Decision Making: Methods and Applications. In Google Books. Springer. https://books.google.co.id/books?hl=en&lr=&id=RUSMBgAAQBAJ&oi=fnd&pg=PR6&dq=multi+attribute+decision+making&ots=rNsR1WQUnr&sig=F2DQsW3z-xzSt25pxmquGQ4n4oo&redir_esc=y#v=onepage&q=multi%20attribute%20decision%20making&f=false

Eisenhardt, K. M., & Zbaracki, M. J. (1992). Strategic decision making. Strategic Management Journal, 13(S2), 17–37.

Decision-Making & Its Importance in Problem-Solving. (2020, September 17). Harappa. https://harappa.education/harappa-diaries/what-is-decision-making/

Cara Memilih Universitas Yang Tepat. (n.d.). Www.hotcourses.co.id. Retrieved January 17, 2023, from https://www.hotcourses.co.id/study-abroad-info/university-applications/cara-memilih-universitas-yang-tepat/#:~:text=Selain%20memilih%20universitas%20yang%20berkualitas%2C%20sebaiknya%20kamu%20juga

Kompasiana.com. (2023, January 15). Tips Memilih Universitas 2023. KOMPASIANA. https://www.kompasiana.com/luxampire3535/63c2c8d14addee39724f0932/tips-memilih-universitas-2023

Pengambilan Keputusan (Decision Making). (n.d.). https://www.kajianpustaka.com/2018/04/pengambilan-keputusan-decision-making.html

Pengambilan Keputusan Secara Rasional V Intuitif. (2015, July 24). Perspektif. https://fakhrurrojihasan.wordpress.com/2015/07/24/pengambilan-keputusan-secara-rasional-v-intuitif/#:~:text=Pengambilan%20keputusan%20secara%20rasional%20adalah%20memperhatikan%20konsistensi%20dan

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