A Decision Support System to assist the Senior High School Students for their College and Degree Program Selection using Multi-Criteria Decision-Making Approach

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Abstract

Degree program and college selection process has always been a complicated and multi-criteria decision-making process. Education at higher level is now viewed as prodigious necessity for a successful career. The selections of the most relevant program course and college or university are vital for the senior high school (SHS) students to acquire the best educational experience. There are plentiful available information for the SHS students, about each college and its program courses offered and these are relatively laborious to obtain. To come up with a good decision, deliberate considerations of different factors such as the tuition, location, rank and so forth play an important role. In this study, the multi-criteria decision model approach used is the combined Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). AHP was used to determine the weights of the various factors. Using the weights obtained, TOPSIS was then applied to determine the alternatives' ranking based on the relative closeness to the ideal solution and its distance from the negative ideal solution. A computer-based decision support system was created which allows the users particularly the SHS students to make better decisions in their college and degree program selection process.

Keywords: *Analytical Hierarchy Process, Technique for Order Preference by Similarity to Ideal Solution, Multi-criteria decision model, College selection process*

INTRODUCTION

1.1 Background of the study

Education at a higher level is now viewed as necessary for a successful career. In 2018, City Mayors Annual Report about education in Cagayan de Oro City turned out that 87.63 percent is the completion rate. This is higher compared to 79.17 percent in the year 2012. Based on the given numbers, the completion rate in Cagayan de Oro City is increasing. According to Teresa Marie S. Sabao, aspirations have changed through the years and because it is a common place for education to finish secondary level, participation in the third level education is now available to most students completing secondary level. The decision to attend college to an institution of higher education has important outcomes for every individual and for the society that is why selecting well the college/university minimizes aggravations (Sabao, 2010). It will open new doors to have great career options and better chances for personal and professional growth that one can't just get any other way. In College, a person experience new areas of interest, expand your vision of possibilities, develop new friendship and network connections, achieve difficult goals, and develop self-confidence. The choice of career of the students is being influenced by some factors from the social environment, mainly by the parents as immediate family who plays an active role in choosing the right education for their children (Pafili & Mylonakis, 2011). Some are forced to follow the footsteps of their parents, others are applying for the course because it sounds easy for them and some are applying for another course because of the big profit that the job may offer after college.

In addition, attending to college provides opportunities and advantages that others might find hard later on life. For Vince Silva, college readiness will also measure a person's academic, social and psychological preparedness for college and can play a big role in the future success. College education can be a way to enhance opportunities for a good paying job in the future considering the global economy which is increasingly more competitive. Today, most colleges and universities are faced with challenges, for instance, the stability or retention of their students in their chosen program course. This seems global throughout the education institution in the third level. Students flock to courses which seemingly interest them but tend to shift to other courses. Shifting of course is a way of college students to change their chosen program to another that may have been chosen by many (Silva, 2014). In today's generation many college students tend to shift courses because of social, personal, and educational conflicts. Selecting the suitable course satisfy individual academic needs of the students, making their learning experience more personalized and keeping them interested. Students will leave institutions if they are not satisfied with any aspect, whether it's academic or administrative. Other students tend to shift from one course to another because they have developed a passionate interest in a different subject.

The students must choose by taking into account some criteria. As an example, several factors play a crucial role in this process such as the academic success of the university, the working opportunities provided, the distance of the university to the hometown of the student, the economic status of that city, the facilities of accommodation, campus safety, as well as other factors that are important to the student's personality. Considering all these factors, the student

should be given all the options and thus come up with the optimal decision. In this context, the ideal decision will be based from the considered factors.

There are plenty of Multi-Criteria Decision Making (MCDM) approaches available such as Analytic Hierarchy Process (AHP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Simple Additive Weighting (SAW), Multi-Attribute Utility Theory (MAUT), Elimination and Choice Translating Reality (ELECTRE), etc. In this study Analytic Hierarchy Process (AHP) will be used to determine students' critical evaluation factors and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) will be used to rank the alternatives which are the Colleges and Universities.

The AHP is a technique for organizing and analysing complex decisions by using pair wise comparisons, it helps decision makers find one that best suits their goal and understanding of the problem introduced by Saaty, 1970. For Kuruüzüm & Atsan, 2001, AHP enables modelling in a hierarchical way showing the relationship between decision makers with complex problems, the ultimate goal of the problem, criteria, sub criteria and the alternatives. The TOPSIS, developed by Hwang and Yoon in 1981, evaluates the performances of the alternatives by identifying which one is the closest to the ideal solution and farthest to the negative ideal solution in a multi-dimensional computing space (Pei, 2015).

1.2 Statement of the Problem

Choosing a desired program course and the college/university to attend to is a complex decision process. This involves a lot of factors to consider before coming up with an optimal decision. Considering the global economy now which is very competitive, the college students are not at ease of what the future holds for them that is why choosing the ideal program course and college/university is very necessary and needs deliberate decision making.

1.3 Objective of the Study

The main objective of this study is to provide recommendations to graduating senior high school students in Cagayan de Oro City in selecting a degree program and the college/university suitable for them based on their preferences using Multi-Criteria Decision Making Methods.

Specifically, this study aims to:

1. To determine the factors affecting the choice for the college/university selection.
2. Formulate a mathematical model for college/university selection with the desired degree program for graduating senior high school students;
3. Design and develop a decision support system for college/university selection with the desired degree program for graduating senior high school students.

1.4 Scope and Limitation

This study focuses only to the available tertiary education institutions in Cagayan de Oro City. Among the many Multi-Criteria Decision-Making Methods, this research will be using combined Analytical Hierarchy Process (AHP) and the Technique for Order Preference by Ideal Solution (TOPSIS). The main respondents of this study are graduating senior high school students of Cagayan de Oro City.

1.5 Significance of the Study

This study will give benefits mainly to those who have plans in attending to an education institution in the tertiary level. This will also help the students reduce their problem in the complex decision making process in choosing the suitable college/university together with the desired degree program. Graduating senior high school students will have a better outlook of all the available choices and will be given recommendations that are near to their preferences. Furthermore, this study can become consummate information for those students and researchers who have been involved in studies about multi-criteria decision making methods application particularly in using AHP and TOPSIS.

METHODOLOGY

In order to achieve the objectives of this study, surveys and interviews were conducted among senior high school (SHS) and college students in various SHS, colleges and universities around Cagayan de Oro City, Philippines in order to determine the factors or criteria for college and degree program selection.

Top Five (5) criteria in college selection were considered namely:

1. Cost of Tuition & Other Fees
2. Availability of the Program
3. Quality/Reputation Ranking of the College
4. Location
5. Availability of Financial Aid

Among the many Multi-criteria Decision Making methods, combined Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was used in this research study.

The Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP), introduced by Thomas Saaty (1980), is an effective tool for dealing with complex decision making. It can aid the decision maker to set priorities and to make the best decision. By reducing complex decisions to a series of pair-wise comparisons, and then synthesizing the results; the AHP helps capture both subjective and objective aspects of a decision. In addition, the AHP incorporates a useful technique for checking the consistency of the decision maker's evaluations, thus reducing the bias in the decision making process.

The steps are as follows:

Step 1:

The establishment of pair-wise comparison matrix. Set up the pair-wise matrix of order n x n consists of n elements in the rows and columns whose priorities are to be determined.

Step 2:

Perform pair-wise comparisons of all the elements Saaty's fundamental scale of absolute numbers (Tsinidou et al., 2010) to perform pair-wise comparison between the elements. This comparison scale enables the decision-maker to incorporate experience and knowledge intuitively and indicate how many times an element dominates another with respect to the criterion. The decision-maker can express his preference between each pair of elements verbally as Absolutely More Important, Very Strongly Important, Strongly More Important, Weakly More Important and Equally More Important. These descriptive preferences would then be translated into numerical values 9, 7, 5, 3, 1 respectively, with 2, 4, 6 and 8 as intermediate values for comparisons between two successive judgements. Reciprocals of these values are used for the corresponding transposed judgements. For a matrix of order "n", n(n-1)/2 comparisons are required. When the pair-wise comparisons are completed, proceed to the next step to estimate the Eigen values of the matrix.

Step 3:

The estimation of Eigen values of the matrix. After a matrix multiplication of pair-wise comparisons, an Eigenvector was obtained with its Eigen values. Averaging over normalized columns method proposed by Thomas Saaty is used to estimate the Eigen values. In this method, first sum the values in each column of the pair-wise comparison matrix and then divide each element in a column by the sum of its respective column. The resultant matrix is termed as the normalized pair-wise comparison matrix. Finally sum the elements in each row of the normalized pair-wise comparison matrix and divide the sum with the number of elements. The result of this computation is referred to as the priority matrix and is an estimation of the Eigen values of the matrix.

Step 4:

Checking the consistency of pair-wise judgements. In order to verify the consistency of the pair-wise comparison matrix, Saaty proposed consistency index (CI) and consistency ratio (CR) defined as follows:

$$C.I = \frac{\lambda max - n}{(n-1)} \quad C.R = \frac{C.I}{R.I}$$

Where: λmax = maximum principal Eigen value of the comparison matrix.
n = number of elements (order of the pair-wise comparison matrix).

The value of λmax is obtained by first multiplying the pair-wise comparison matrix with the priority matrix. Then divide the first element of the resulting matrix by the first element of the resulting matrix, the second element of the resulting matrix by the second element in the priority matrix and so on. A single column matrix is obtained and the average of the elements of the matrix gives the value of λmax. The RI in the above equation represents the average consistency index for numerous random entries of same order reciprocal matrices.

Microsoft Excel will be used in creating a database. Microsoft Excel is a very powerful tool in presenting data with the use of graphs, tables, and objects. It allows users to organize, format and calculate data with formulas using a spreadsheet system. It also permits users to arrange data so as to view various factors from different perspectives. Visual Basic is used for applications in Excel, allowing users to create a variety of complex numerical methods. Programmers are given an option to code directly using the Visual Basic Editor, including Windows for writing code, debugging and code module organization.

The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), introduced by Hwang and Yoon in 1981, is a method of compensatory aggregation that compares a set of alternatives by identifying weights for each criterion, normalizing scores for each criterion and calculating geometric distance between each alternative and the ideal alternative, which is the best score in each criterion.

The TOPSIS is also one of the multi-criteria decision-making processes developed by Hwang and Yoon in 1981 process is as follows:

Step 1: Consider the decision matrix D, which consist of alternatives and criteria described by:

$$\mathrm{D} = \begin{array}{c} \\ A_1 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{ccc} C_1 & \dots & C_n \end{array} \\ \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{1m} & \cdots & x_{mn} \end{bmatrix} \end{array}$$

Where $A_1,\ A_2, \dots, A_m$ are the viable alternatives, and $C_1,\ C_2, \dots, C_n$ are the criteria. X_{ij} indicates the rating of the alternatives A_i according to criteria C_j.

The weight vector W is composed of the individual weights W = $(w_1, w_2, \dots, w_n)$ with $w_j (j = 1, \dots, n)$ for each criterion C_j satisfying $\sum_{j=1}^{n} w_j = 1$.

The criteria are classified into two types: benefit and cost. The *benefit* criterion means that a higher value is better while for *cost* criterion, it is the opposite. The data of decision matrix *D* come from the different sources. So, it is necessary to normalize them in order to obtain a dimensionless matrix.

Step 2: Normalized the decision matrix *D* to obtain dimensionless matrix.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}$$

with $i = 1, \dots, m;\ j = 1, \dots, n.\ R = [r_{ij}]_{mxn}$ is the normalized decision matrix.
The decision matrix ***R*** represents the relative rating of the alternatives.

Step 3: Calculate the weighted normalized matrix $P = [p_{ij}]_{mxn}$ with $i = 1, \dots, m;\ j = 1, \dots, n$ by multiplying the normalized decision matrix by its associated weights.

$$p_{ij} = w_j r_{ij}\ with\ i = 1, \dots, m;\ j = 1, \dots, n.$$

Step 4: Identifying the positive ideal solutions and negative ideal solutions.

$$A^+ = (p_1^+ p_2^+, \dots, p_m^+)\ where\ p_j^+ = (max_i\ p_{ij}, j \in J_1, min_i p_{ij}, j \in J_2)$$
$$A^- = (p_1^- p_2^-, \dots, p_m^-)\ where\ p_j^- = (max_i\ p_{ij}, j \in J_1, min_i p_{ij}, j \in J_2)$$

Where $J_1\ and\ J_2$ represent benefit and cost criteria respectively.

Step 5: Calculate the separation measures from the positive ideal solutions and negative ideal solutions.

$$d_i^+ = \sqrt{\sum_{j=1}^{n} (p_j^+ - p_{ij})^2} \quad with\ i = 1, \dots, m$$

$$d_i^- = \sqrt{\sum_{j=1}^{n} (p_j^- - p_{ij})^2} \quad with\ i = 1, \dots, m.$$

Step 6: Calculate the relative closeness coefficient for each alternative with respect to positive ideal solution.

$$C_i = \frac{d_i^-}{d_i^+ + d_i^-}$$

Step 7: Rank the alternatives according to the relative closeness coefficients. The best alternatives are those that have higher value C_i and therefore should be chosen.

RESULTS AND DISCUSSION

In this study, a Microsoft Excel – based system was developed in order to automate the process of calculation of decision matrices. The Microsoft Excel has a programming aspect, allowing the user to employ numerical methods. Also, it has interactive features allowing user interfaces that can completely hide the spreadsheet used as data calculators from the user, making it look like application that asks the user questions and provides answers.

Through Microsoft Excel, questions for pairwise-comparison of college/university preference were integrated in the system so that once the graduating senior high school student answers, corresponding ratios will be generated automatically. The said ratios will be the elements or the entries of the matrices of the different Mathematical models. The concepts and methodologies of each MCDM were also integrated in the system by applying advanced Excel formulas and functions.

The spreadsheet for the data calculation were all hidden so as to make it look like a decision support application. Once all the conditions set by the system to the user were met, an automated ideal college/university with the desired degree program recommendation will then be presented by the system based from the calculated data.

Figure 1 shows the decision support system landing page using the Microsoft Excel interface. The system contains five (5) active tabs but only four (4) are visible since the hidden tab is for calculation purposes.

Figure 1. Decision Support System landing page

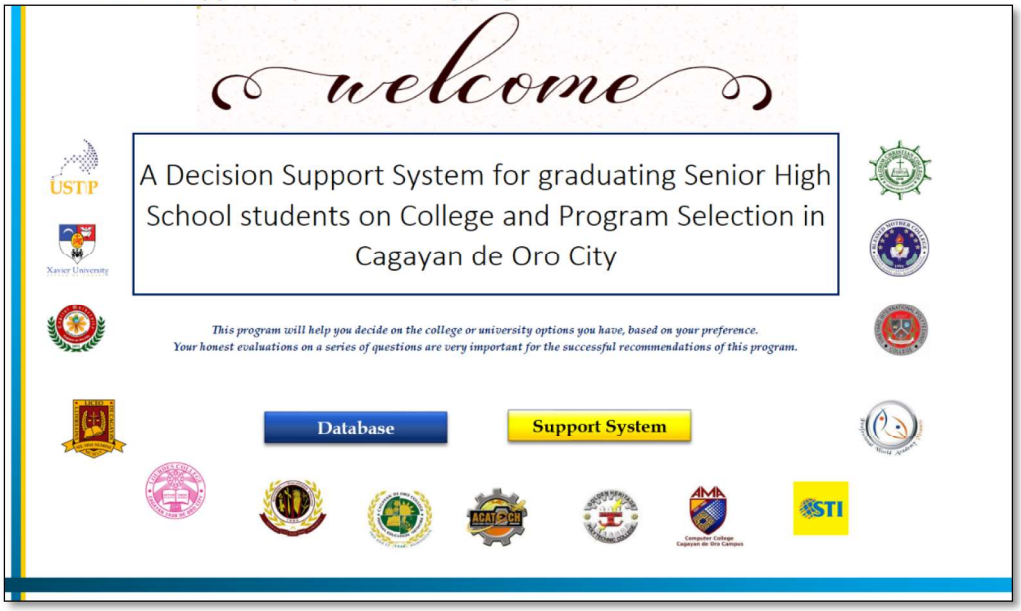
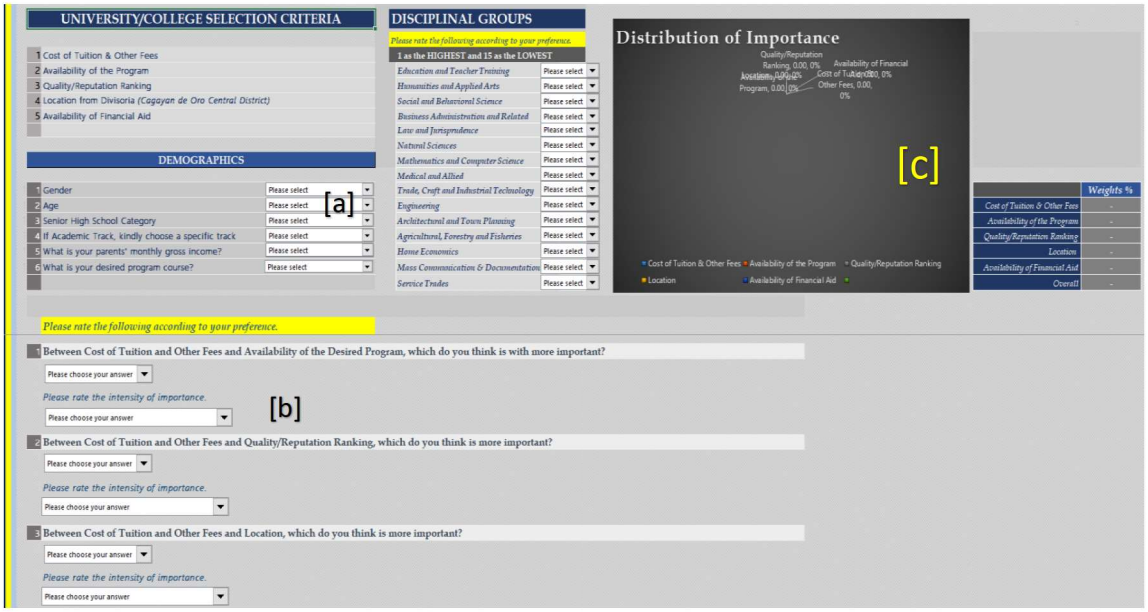


Figure 2 shows the decision support main platform after the user of the system has selected and clicked the button "Support System" in Figure 1.

Figure 2. Decision Support System main platform



[a] The details of the user (demographics) will be asked. The user will have to simply "toggle" to select an answer.

[b] Pairwise comparisons will be made. The user must carefully evaluate his answer in order to be consistent. It is very important to be coherent in pairwise comparison because the system can detect inconsistencies. The answers per question will be transformed into ratios which will be the entries in the decision matrix.
[c] A pie chart will emerge showing the distribution of importance once all of the pairwise comparisons were made.

Figure 3 below shows a completed College and Degree Program Selection Decision Support System with Consistent Evaluation.

Figure 3. A DSS with consistent evaluations

[1] After answering all the details in the tab including the pairwise comparison, the user must click the button “Please click here to calculate” found after the last question, in order for the decision support system to run the calculations integrated in the system.
[2] This prompt will appear if the evaluation of the user is consistent based from the formula on Consistency Ratio which should be less than 0.10. If the CR is greater than 0.10, another prompt will appear stating that the user must re-assess his answers.
[3] A pie chart is shown presenting the distribution of importance based from the user’s preference that is coming from the results of the pairwise comparisons. Percentages of the apportionment are visible in the pie chart. It will also serve as weights of the main criteria.
[4] This prompt will only appear if the evaluation is consistent otherwise, this won’t be visible. This is a link to proceed to the college/university recommendation page.

Figure 4 shows a submitted College and Degree Program Selection Support System with lacking data.

Figure 4. A DSS with incomplete data

[1] The user forgot to answer the second question of pairwise comparison.
[2] This prompt will appear if the user of the decision support system was not able to complete answering all the questions or missed to answer some details within the page. The system won't allow an incomplete data and recommendation will not be generated.
[3] The pie chart was not presented due to incomplete data.
[4] The link to proceed to the college/university recommendation page will not be available if there is an incomplete data.

Figure 5 shows a submitted College and Degree Program Selection Support System with complete data. However, the evaluation of the system says that the user has inconsistencies in its decision-making.

Figure 5. A DSS with inconsistent evaluations

[1] This prompt will appear if the user of the DSS was not consistent with his evaluation during the pairwise comparison. It has been detected that there are inconsistencies with the evaluation. Thus, the Consistency ratio is greater that than value set in the system which is 0.10.
[2] The link to proceed to the college/university recommendation page will not be available if there is an inconsistency of data.

Figure 6 below shows the data calculator spreadsheet for the main criteria in college and degree selection. This tab is not visible to the decision system user in order to design the template look like a decision support application

Figure 6. College selection main criteria data calculator

COLLEGE SELECTION

Gender	Male
Age	18 yrs. old
Senior High School Category	Public
If Academic Track, kindly choose a specific track	Academic Track - STEM
What is your parents' monthly gross income?	30, 000 - 34, 999
What is your desired program course?	B.S. in Electrical Technology & Management
Complete	
1	

Go for Subdivision

	C matrix	Cost of Tuition & Other Fees	Availability of the Program	Quality/Reputation Ranking	Location	Availability of Financial Aid
1	Cost of Tuition & Other Fees	1.00	0.11	0.14	3.00	3.00
1	Availability of the Program	9.00	1.00	3.00	9.00	9.00
1	Quality/Reputation Ranking	7.00	0.33	1.00	9.00	7.00
1	Location	0.20	0.11	0.11	1.00	0.50
1	Availability of Financial Aid	0.33	0.11	0.14	2.00	1.00
		17.53	1.67	4.40	26.00	20.50
0	ok	35.07				

[1]

Normalized Matrix						Weights {W}
	0.057	0.067	0.032	0.192	0.146	0.099
	0.513	0.600	0.682	0.346	0.439	0.516
	0.399	0.200	0.227	0.346	0.341	0.303
	0.011	0.067	0.025	0.038	0.024	0.033
	0.019	0.067	0.032	0.077	0.049	0.049
	1.000	1.000	1.000	1.000	1.000	1.000
	0.099	0.516	0.303	0.033	0.049	

[2]

	Weights	{W sub s} = [C]*{W}	Consistency {Ws} * 1/W	Consistency Vector
Cost of Tuition & Other Fees	9.90	0.5121	5.174433546	
Availability of the Program	51.62	3.0536	5.915950205	
Quality/Reputation Ranking	30.29	1.8083	5.970651201	
Location	3.32	0.1684	5.066971148	
Availability of Financial Aid	4.88	0.2489	5.102231674	

[5]

[4]

VALID?	YES

λ 5.446047555

Random Index (RI) n = 5 1.12

CI = (λ – n)/(n - 1)

CI	0.111511889
CR = CI/RI	0.099564186

[3]

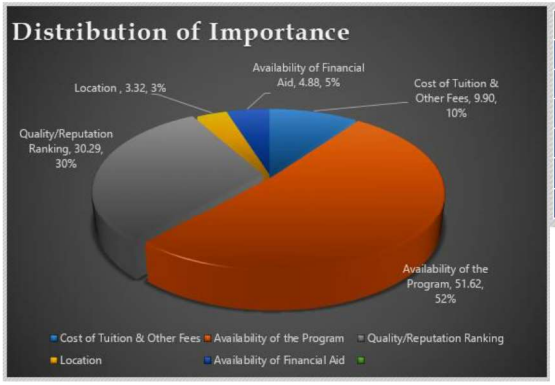
[1] The answers presented by the user in Figure 3 were converted into ratios in a 5x5 matrix [C].
[2] This is the normalized matrix using the methods of AHP.
[3] Consistency Ratio is calculated and the result is 0.09956 which is less than 0.10.
[4] Validity Test. Since the value of CR is less than 0.10 then the evaluation is consistent.
[5] The generated weighted matrix. This will serve as the data in the pie chart in Figure 3.

Figure 7 below presents the recommendation specifications of the college and degree selection alternatives in the city after the user was able to complete the process in the decision support system with consistent evaluation.

Figure 7. Recommendation page for the college and degree program selection

COLLEGE / UNIVERSITY & PROGRAM DETAILS

Rank	College Type	College/University Name	Program	Discipline	Address	College/University Ranking in the Philippines	Total Assessment	Location (meters) from Divisoria
1	State University	USTP - CDO Campus	B.S. in Electrical Engineering	Engineering	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
2	Private University	Xavier University	B.S. in Electrical Engineering	Engineering	Corrales Avenue, Cagayan de Oro City	17th	₱38,530.00	400
3	Private University	Liceo de Cagayan	B.S. in Electrical Engineering	Engineering	Rodolfo N. Pelaez Blvd, Cagayan de Oro City	128th	₱27,959.60	1,300
4	Private College	Cagayan de Oro College	B.S. in Electrical Engineering	Engineering	Max Y. Suniel St, Cagayan de Oro	Unranked	₱24,793.50	1,000
5	Private University	Xavier University	B.S. in Civil Engineering	Engineering	Corrales Avenue, Cagayan de Oro City	17th	₱35,380.00	400
6	Private University	Xavier University	B.S. in Industrial Engineering	Engineering	Corrales Avenue, Cagayan de Oro City	17th	₱35,380.00	400
7	State University	USTP - CDO Campus	B.S. in Electro-Mechanical Technology	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
8	State University	USTP - CDO Campus	B.S. in Electronics & Communications Technology	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
9	State University	USTP - CDO Campus	B.S. in Electronics Technology (ES)	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
10	State University	USTP - CDO Campus	B.S. in Electronics Technology (MST)	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
11	State University	USTP - CDO Campus	B.S. in Electronics Technology (TN)	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
12	State University	USTP - CDO Campus	B.S. in Energy Systems and Management (EnMCM)	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
13	State University	USTP - CDO Campus	B.S. in Energy Systems and Management (PSDE)	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
14	State University	USTP - CDO Campus	B.S. in Electrical Technology & Management	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
15	State University	USTP - CDO Campus	B.S. in Manufacturing Engineering Technology	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
16	State University	USTP - CDO Campus	B.S. in Civil Engineering	Engineering	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
17	State University	USTP - CDO Campus	B.S. in Electronics Engineering	Engineering	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
18	State University	USTP - CDO Campus	B.S. in Mechanical Engineering	Engineering	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
19	State University	USTP - CDO Campus	B.S. in Geodetic Engineering	Engineering	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
20	State University	USTP - CDO Campus	B.S. in Computer engineering	Engineering	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
21	Private University	Xavier University	B.S. in Electronics Engineering	Engineering	Corrales Avenue, Cagayan de Oro City	17th	₱38,530.00	400
22	State University	USTP - CDO Campus	B.S. in Automotive Mechanical Technology	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
23	State University	USTP - CDO Campus	B.S. in Autotronics	Trade, Craft and Industrial Technology	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
24	Private University	Xavier University	B.S. in Chemical Engineering	Engineering	Corrales Avenue, Cagayan de Oro City	17th	₱42,205.00	400
25	Private University	Xavier University	B.S. in Mechanical Engineering	Engineering	Corrales Avenue, Cagayan de Oro City	17th	₱42,810.00	400
26	Private University	Capitol University	B.S. in Civil Engineering	Engineering	Corrales Ext, Barangay 23, Cagayan de Oro City	139th	₱21,751.28	1,700
27	Private University	Capitol University	B.S. in Mechanical Engineering	Engineering	Corrales Ext, Barangay 23, Cagayan de Oro City	139th	₱21,751.28	1,700
28	Private University	Capitol University	B.S. in Electronics and Communications Engineering	Engineering	Corrales Ext, Barangay 23, Cagayan de Oro City	139th	₱21,751.28	1,700
29	Private University	Capitol University	B.S. in Marine Engineering	Engineering	Corrales Ext, Barangay 23, Cagayan de Oro City	139th	₱21,751.28	1,700
30	Private University	Xavier University	B.S. in Mathematics	Mathematics and Computer Science	Corrales Avenue, Cagayan de Oro City	17th	₱30,520.00	400
31	Private University	Liceo de Cagayan	B.S. in Civil Engineering	Engineering	Rodolfo N. Pelaez Blvd, Cagayan de Oro City	128th	₱27,959.60	1,300
32	Private University	Liceo de Cagayan	B.S. in Computer Engineering	Engineering	Rodolfo N. Pelaez Blvd, Cagayan de Oro City	128th	₱27,959.60	1,300
33	Private University	Liceo de Cagayan	B.S. in Electronics and Communications Engineering	Engineering	Rodolfo N. Pelaez Blvd, Cagayan de Oro City	128th	₱27,959.60	1,300
34	Private University	Liceo de Cagayan	B.S. in Science in Industrial Engineering	Engineering	Rodolfo N. Pelaez Blvd, Cagayan de Oro City	128th	₱27,959.60	1,300
35	State University	USTP - CDO Campus	B.S. in Architecture	Architectural and Town Planning	C.M. Recto Ave., Lapasan, Cagayan de Oro City	81st	*Free tuition c/o CHED UniFAST	2,500
36	Private University	Xavier University	B.S. in Computer Science	Mathematics and Computer Science	Corrales Avenue, Cagayan de Oro City	17th	₱31,390.00	400



	Weights %
Cost of Tuition & Other Fees	9.90
Availability of the Program	51.62
Quality/Reputation Ranking	30.29
Location	3.32
Availability of Financial Aid	4.88
Overall	100.00

[1]

The recommendation of the system was based on the given weights (here shown as [1]) of the main criteria.

CONCLUSION AND RECOMMENDATIONS

The decision support system (DSS) developed in this study provides the graduating Senior High School students in Cagayan de Oro City of recommendations on college / university selection including the suitable curricular program based from the factors considered.

Moreover, students are given better perspective on college selection by providing them all the available alternatives in college and program selection. Most of the details of the college and curricular programs are already provided. The results of the study further show that recommendations vary depending on the weights of the factors.

The combined Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is great blend of Multi-criteria decision making methods as the AHP uses pairwise comparison and minimizes inconsistent evaluations and TOPSIS conveniently ranks the alternatives based on relative closeness to the ideal positive solution and its distance from the negative ideal solution.

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