A Career Recommendation Framework to Determine Suitable Career for Fresh Graduated Students Based On iCGPA

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Abstract
Getting hired by industry after graduation is the aim of fresh graduated students. However, the fresh graduated students are facing issues in determining the suitable career based on their abilities. Besides, industries also facing issues in finding skilled graduated that can meet their job scope. As a result, fresh graduated students have difficulties in finding a suitable career that meet their abilities. In addition, industries have various number of job application that does not meet their requirements. Therefore, a tool is needed to determine the suitable career for fresh graduated students based on student abilities and the required skills by the industries. Thus, this research is proposing a career recommendation framework to determine the suitable career for fresh graduate students based on iCGPA. The career recommendation framework will assist fresh graduate students in determining the suitable career that they should apply based on student abilities and industry requirements. Hence, fresh graduated students will not involve in the career that does not suit with their abilities. Further, the lacking of skilled workers can be reducing.
Keywords: recommendation, iCGPA, decision making

1. Introduction

In our daily life consciously or unconsciously involving a lot of decision making (Saaty, 2008). In career development process, numerous decision has been made that will influence people life. Besides, the right career that has been choose will give high impact on the career achievement. Thus incorrect decision can result in wastage of resources in the industries and also affected people life (Ahmed, Sharif, & Ahmad, 2017). As a fresh graduated student that does not have enough experience, they having an issues and challenges in choosing a suitable career that suit with their abilities and skills. (Ali, Iftikhar, & Edwin, 2017; Shumba & Naong, 2012; Tien, 2001). To solve those issues, Integrated Cumulative Grade Point Average (iCGPA) can be used as a measure of student's ability and skill that can be used to identify appropriate careers to meet industry needs (BERNAMA, 2015).

Thus, this research aims to propose a career recommendation framework to determine a suitable career for fresh graduate students based on iCGPA. The career recommendation framework will assist fresh graduate students in determining the suitable career that they should apply based on student abilities and industry requirements. Hence, fresh graduated students will not involve in the career that does not suit with their abilities. Further, the

lacking of skilled workers can be reducing. This paper was organized into 4 sections which are the first section is background the study, follows by the second section explained the important concept of career which leads to the formulation on research framework. Lastly, this article ends with conclusion section.

2. Literature Review

2.1 iCGPA

Integrated Cumulative Grade Point Average (iCGPA) is an integrated mechanism for assessing and reporting of students' development and performance as well as learning gains of their ethics, knowledge and abilities. iCGPA was implemented to fulfill the requirement of first shifts of Malaysia Education Blueprint 2015 – 2025 which is to produce a graduate students that have holistic, entrepreneurial and balanced element (Education, 2015). iCGPA will help the students to identify their personal strengths and weaknesses. Using iCGPA, student can continuously do some improvement based on the knowledge that they got form the iCGPA. From the perspective of industry, iCGPA will enable them to identify future employees based on their required skills (Sani, 2017).

2.2 The Analytic Hierarchy Process

Saaty (1990) introducing analytic hierarchy process (AHP) to solve issues involving decision making. AHP has been applied in various domain with variety of problems (Schmoldt & Peterson, 1997). Two important component of AHP that used to analyze complex problem which are decision hierarchy and pairwise comparison. For the decision hierarchy, the problem will be structured in hierarchy that consists of objective, criteria and alternative. As for pairwise comparison, the pairwise comparison will be made between each of the element. Based on the pairwise comparison result, the synthesizing final priorities will be made to select the best decision for the problem (Saaty, 1990, 2008; Schmoldt & Peterson, 1997).

3. Career Recommendation Framework

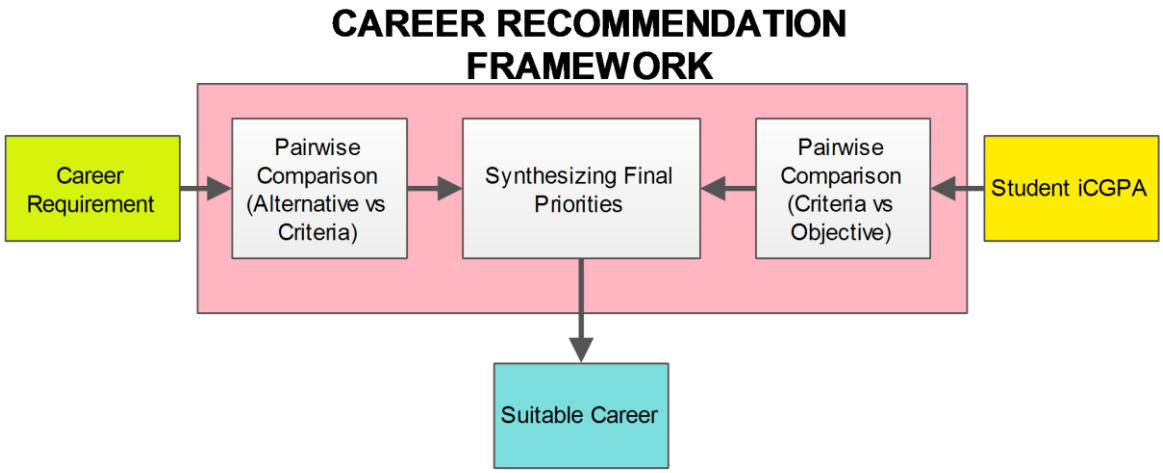

Figure 1: Career recommendation for conceptual framework

Figure 1 shows the purposed conceptual framework that will be used in career recommendation research framework. This framework will be used to generated list of suitable career that the fresh graduated student should apply based on their abilities and industry requirement. This framework will get the input from career requirement that provided by the industry and also from the student iCGPA result. The input from the career requirement will be process using pairwise comparison (alternative vs criteria) to identify the criteria's that are needed in each career. The input from the student iCGPA will be process using pairwise comparison (criteria vs objective) to identify the student ability. The result from the both pairwise comparison (alternative vs criteria) and pairwise comparison (criteria vs objective) will be process using synthesizing final priorities to ranking the career based on the student abilities. Based on the synthesizing final priorities result, this framework will suggest the suitable career for the student.

3.1 Decision Hierarchy

Figure 2 shows the decision hierarchy for career recommendation framework. The objective is to determine the suitable career for fresh graduate based on iCGPA. The criteria's in this hierarchy are define using 8 elements in iCGPA which is knowledge, practical skills, social skills & responsibilities, ethics & values, communication, problem solving, information management, and entrepreneurship. The alternatives in this hierarchy are the working prospect that is outlined in program curriculum.

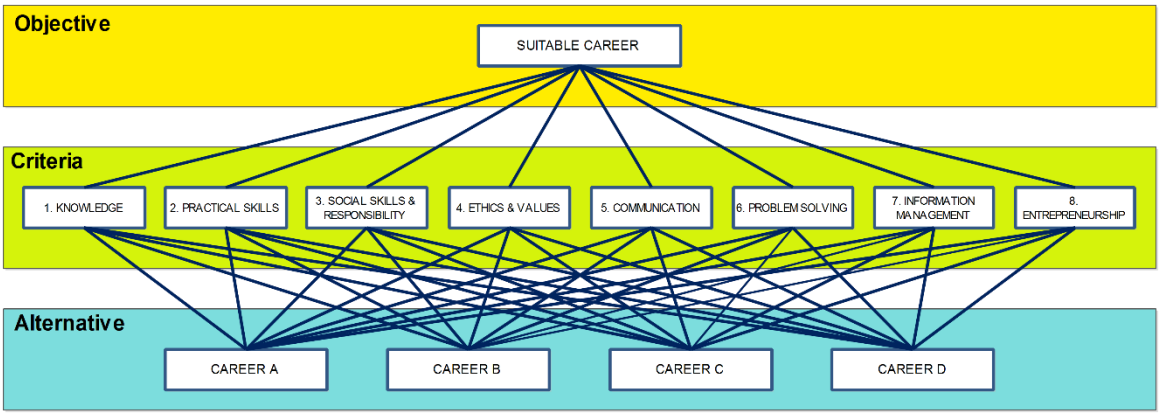

Figure 2: Decision hierarchy

3.2 Pairwise Comparisons

Based on the decision hierarchy, pairwise comparisons will be made by comparing the alternative with criteria and then criteria with objective.

3.2.1 Alternative vs Criteria

The pairwise comparison of alternative and criteria will be made by the expert in the industry using AHP fundamental scale as shows in Table 1 (Saaty, 1990). Using knowledge and experience, the industry experts need to evaluate the career requirement with respect to each of the criteria.

Table 1: *AHP* Fundamental *Scale*

The Fundamental Scale for Pairwise Comparisons		
Intensity of Importance	**Definition**	**Explanation**
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment moderately favor one element over another
5	Strong importance	Experience and judgment strongly favor one element over another
7	Very strong importance	One element is favored very strongly over another; its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order of affirmation
Intensities of 2, 4, 6, and 8 can be used to express intermediate values. Intensities of 1.1, 1.2, 1.3, etc. can be used for elements that are very close in importance.		

Table 2 shows the example of alternative comparison with the first criteria which is knowledge. After comparison has been made, the weights will be transfer to the matrix as shows in Table 3.

Table 2: Example of alternative compared with respect to knowledge

Career A	1	Career B	9	Career B need more skill knowledge than Career A. Weight: 9
Career A	5	Career C	3	Career A need more skill knowledge than Career C. Weight: 5
Career A	7	Career D	1	Career A need more skill knowledge than Career D. Weight: 7
Career B	9	Career C	5	Career B need more skill knowledge than Career C. Weight: 9
Career B	7	Career D	3	Career B need more skill knowledge than Career D. Weight: 7
Career C	7	Career D	9	Career D need more skill knowledge than Career C. Weight: 9

Table 3: Example of pairwise comparison matrix for alternative

Knowledge	Career A	Career B	Career C	Career D
Career A	1	1/9	5	7
Career B	9	1	9	7
Career C	3/5	5/9	1	7/9
Career D	1/7	3/7	9	1

Knowledge	Career A	Career B	Career C	Career D
Career A	1.00	0.11	5.00	7.00
Career B	9.00	1.00	9.00	7.00
Career C	0.60	0.56	1.00	0.78
Career D	0.14	0.43	9.00	1.00

After that, the sum of column for each career will be calculated. Table 4 shows the example of the sum for each column calculation. Normalization will be process after calculating the sum of column. Table 5 shows the example of normalization process. The value in every column will be divided with the sum of the column. The normalization value is used to calculate the priority ordering for each career with respect to each of the criteria.

Table 4: Sum each column for alternative.

Knowledge	Career A	Career B	Career C	Career D
Career A	1.00	0.11	5.00	7.00
Career B	9.00	1.00	9.00	7.00
Career C	0.60	0.56	1.00	0.78
Career D	0.14	0.43	9.00	1.00
SUM	11	2.1	24	15.78

Table 5: Normalization of column for alternative

Knowledge	Career A	Career B	Career C	Career D
Career A	1.00 / 11	0.11 / 2.1	5.00 / 24	7.00 / 15.78
Career B	9.00 / 11	1.00 / 2.1	9.00 / 24	7.00 / 15.78
Career C	0.60 / 11	0.56 / 2.1	1.00 / 24	0.78 / 15.78
Career D	0.14 / 11	0.43 / 2.1	9.00 / 24	1.00 / 15.78

Knowledge	Career A	Career B	Career C	Career D
Career A	0.1	0.05	0.20	0.44
Career B	0.82	0.48	0.38	0.44
Career C	0.06	0.27	0.04	0.06
Career D	0.02	0.2	0.38	0.06
TOTAL	1.00	1.00	1.00	1.00

After normalization process, sum of each rows for AHP matrix will be calculate to get average value for each row. The average value is called the Criteria Weight (W). Table 6 shows the example of sum for each row calculation. To get the priority vector or we called Eigen Value, the sum of each rows is divided by number of careers. Table 7 shows the example of priority vector.

Table 6: *Sum each row for alternative*

Knowledge	Career A	Career B	Career C	Career D	TOTAL
Career A	0.1	0.05	0.20	0.44	0.79
Career B	0.82	0.48	0.38	0.44	2.12
Career C	0.06	0.27	0.04	0.06	0.43
Career D	0.02	0.2	0.38	0.06	0.66

Table 7: Example of priority vector for alternative

Knowledge	Career A	Career B	Career C	Career D	TOTAL	PRIORITY
Career A	0.1	0.05	0.20	0.44	0.79 / 4	0.2
Career B	0.82	0.48	0.38	0.44	2.12 / 4	0.53
Career C	0.06	0.27	0.04	0.06	0.43 / 4	0.10
Career D	0.02	0.2	0.38	0.06	0.66 / 4	0.17

3.2.2 Criteria vs Objective

The pairwise comparison of criteria and objective are obtained using the fresh graduated student's iCGPA result based on result scale as shows in Table 8.

Table 8: *iCGPA scale*

Intensity of Achievement	Achievement	Academic Status
5	3.67 - 4.00	Excellent
4	3.00 - < 3.67	Credit
3	2.00 - < 3.00	Pass
2	1.00 - < 2.00	Pass With Condition
1	< 1.00	Fail

Table 9 shows the example of criteria comparison to reaching the objective. After comparison has been made, the weight will be transfer to the matric as shows in Table 10.

Table 9: Example of criteria compared with respect to reaching the objective

Knowledge	3	Practical Skills	5	Practical Skills is higher than Knowledge. Weight: 5
Knowledge	3	Social Skills & Responsibilities	5	Social Skills & Responsibilities is higher than Knowledge Weight: 5
.....	...	.....	...	.....
.....	...	.....	...	.....
Problem Solving	2	Entrepreneurship	3	Entrepreneurship is higher than problem solving. Weight: 3
Information Management	4	Entrepreneurship	3	Information Management is higher than entrepreneurship. Weight: 4

Table 10: Example of pairwise comparison matrix for criteria

Criteria	Knowledge	.....	.....	Entreprenuership
Knowledge	1	.....	.....	3/3
.....	.....	1	.....	.....
.....	.....	.....	1	.....
Entrepreneurship	3/3	.....	.....	1

Criteria	Knowledge	.....	.....	Entreprenuership
Knowledge	1	.....	.....	1
.....	.....	1	.....	.....
.....	.....	.....	1	.....
Entrepreneurship	1	.....	.....	1

After that sum of each rows for AHP matrix will be calculate to get average value for each row of criteria. The average value is called the Criteria Weight (W). Table 11 shows the example of sum for each row calculation. To get the priority vector or we called Eigen Value, the sum of each rows is divided by number of criteria's. Table 12 shows the example of priority vector for Criteria.

Table 11: Sum each row for criteria

Criteria	Knowledge	.....	.....	Entreprenuership	Total
Knowledge	1	.....	.....	1	4.26
.....	.....	1	.....	.....	.....
.....	.....	.....	1	.....	.....
Entrepreneurship	1	.....	.....	1	3.67

Table 12: Example of priority vector for criteria

Criteria	Knowledge	.....	.....	Entreprenuership	Total	Priority
Knowledge	1	.....	.....	1	4.26 / 8	0.53
.....	.....	1	.....	.....	.....	.....
.....	.....	.....	1	.....	.....	.....
Entrepreneurship	1	.....	.....	1	3.67 / 8	0.46

3.3 Synthesizing Final Priorities

After knowing the priorities of the criteria with respect to the objective, and the priorities of the alternatives with respect to the criteria, the priorities of the alternatives with respect to the objective will be calculate as shown in Table 13. After that, the result of calculation between alternative with respect to the objective will be transfer to the matrix as shows in Table 14.

Table 13: Calculating of alternative with respect to the objective

Criteria Vs Objective		Alternative	Alternative vs Objective
Knowledge	0.53	Career A Career B Career C Career D	0.2 x 0.53 = 0.106 0.53 x 0.53 = 0.281 0.1 x 0.53 = 0.053 0.17 x 0.53 = 0.090 1.00 0.53
.....		.....	.....
.....		.....	.....
Entrepreneurship	0.46	Career A Career B Career C Career D	0.2 x 0.46 = 0.092 0.53 x 0.46 = 0.244 0.1 x 0.46 = 0.046 0.17 x 0.46 = 0.078 1.00 0.46

Table 14: Example of overall priorities for student A

Priority with the respect to					
Student A	Knowledge	.....	.....	Entrepreneurship	Objective
Career A	0.106	.....	.....	0.092	0.198
Career B	0.281	.....	.....	0.244	0.526
Career C	0.053	.....	.....	0.046	0.099
Career D	0.090	.....	.....	0.078	0.168
Total	0.53	.....	.....	0.46	1.000

3.4 Make Decision

Based on the career requirement by the industries, student can identify the suitable career that they should apply based on their ability and skills. The career that have highest priority with the respect to the objective is the most suitable career for the student based on their ability and skills.

4. Conclusion

The issues and challenges in choosing the right career for fresh graduated student has motivated this research to proposing a career recommendation framework. This framework will assist fresh graduated student in identifying the suitable career for them. In the future work, the work will be extending and performed its experiments on a real dataset to test its accuracy. In addition, comparison will be made with existing methods to evaluate the proposed framework.

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