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Students' Career Decision Support System

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Abstract

Many studies reveal that upon graduation, most university undergraduates are still unclear about their future. Questions like whether they would be able to find a suitable job, which job sector should they be in, and what factors to consider in determining their job selection, often arise. In this paper we present a career decision support system to help these students plan for their career. The system will propose the most suitable job sector that a student should be in, based on the weights given for each determining factor selected and the evaluation of job sectors with respect to each factor done by the student himself. The evaluations are then combined and calculated using a simple scoring model approach. The system which was developed using Visual Basic 6 can be used by any student with minimal supervision, or by the academic career counselors as one of the tools to help students.

Keywords: Career choice; Career decision support system; Multi-criteria decision making; Simple scoring model.

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1. Introduction

In the new global economy, career planning has become a crucial issue of primary resource for young individuals. It is becoming even more crucial, especially among university fresh graduates since the days of abundant job opportunities no longer exist. Previously, older and female workers, and those with little education and/or engaged in manufacturing industries were the workers most vulnerable to become unemployed, but now, the new trend has emerged (World Employment and Social Outlook, 2015).

The impact of the slowdown in economic activity in 2001 not only affected employees in many countries, but it was also felt by the labor market in Malaysia, particularly in terms of retrenched workers in the manufacturing and service sectors. A total of 38,116 workers were retrenched (25,236 workers in 2000) with 75.6 percent coming from the manufacturing sector. In a government survey, about 60,000 university graduates were unemployed in 2005, and the statistics from the year 2008 to 2010 showed that about 28,000 to 34,000 graduates have failed to secure employment (Department of Statistics, 2011) due to various reasons (Sakalas *et al.*, 2006). To worsen the situation, studies have shown the evidence of an increasing rate of unemployment among Malaysian graduates from public universities (Krish *et al.*, 2012).

Labour market conditions for graduates in Malaysia are particularly tough due to competition from various sources. By the end of 2002 alone, about 53,000 graduates from local and private universities as well as from those trained locally and abroad, entered the labour market (Onn *et al.*, 2000). This figure rose by 17.1 percent in 2003 At the same time, job vacancies declined by 28 percent in January-July 2003 from 2002 with the manufacturing sector offering the most job opportunities which represented 38 percent of total job vacancies (Conditions in labor mart to improve further, 13 Sept 2003, Business Times (Malaysia)). Several economic setbacks in the country tightened the job market and many fresh graduates are increasingly finding it difficult to secure jobs of their choice (Onn et al., 2000); Towards 'job-ready' grads, New Straits Times, 14 Dec. 2003). The unemployment rate, however remains consistent at approximately 3 percent from 2010 – 2013 (http://www.statista.com/statistics/319019/unemployment-rate-in-malaysia/) and is expected to be between 3 to 4 percent until 2017 (World Employment and Social Outlook 2015).

There are a number of factors that contribute to this unemployment such as lack of confidence in identifying their first jobs, soft skills, fluency in language, interpersonal communication, wisdom, maturity, and difficulty in making career exploration plans (Jin *et al.*, 2009); (Krish *et al.*, 2012); (Alias *et al.*, 2013). Lack of information can also influence the decision on career because knowledge in career can help fresh graduates to be focused and clear on their career choices. Furthermore, making a wrong decision in choosing a career would not only affect one's psychology and emotion, but it would also affect the economy of an individual and would later lead to frustration (Mohd *et al.*, 2010).

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1.1. Problem Statement

Most, if not all, university students share the same goal. They want to use their university education to help them pursue a career. Pursuing a career starts with career planning and career planning should start in students' first year and continue throughout their university career. In fact, career planning is a lifelong process, which includes choosing an occupation, getting a job, growing in the job, possibly changing careers, and eventually retiring. It is a bit like putting a jigsaw together and part of these students' time prior to deciding on a career will be spent starting to put some of the pieces together. It is probably something that these students will be doing for most of their working life later. A satisfying career can be important to their happiness, since it determines the people they work with every day, the amount of leisure time they may have, and their standard of living. According to a study by Greenhaus and Callahan (1994), people who are satisfied with their career, will be more likely to live longer.

However, many studies involving university undergraduates reveal that upon graduation, most of the students are still unclear about their future when they graduate (Holton, 1995); (Counsell, 1996). They are still asking questions like:

i. Would they be able to find a suitable job?
ii. Which job sector should they be in?
iii. What factors should they consider when applying for a job?

Perhaps this "unclear state of mind" among the students was one of the reasons why out of 11,527 job vacancies available as on May 18, 2010, only 3,457 places were filled by graduate job seekers, although there were 32,331 new registered graduates recorded at the Jobs Malaysia (Wye *et al.*, 2012).

A study conducted by Nazri *et al.* (2003) on Universiti Utara Malaysia's (UUM) Decision Science graduating students revealed the same finding, i.e. most students were unclear about their career prospect and were not ready and well-equipped to enter the job market. These findings paralleled the finding by Julien (1999) which revealed that 60% of young people did not know where to find the information needed to be able to make a career decision.

1.2. Objective of the study

The objective of this research is therefore to develop a students' career decision support system that will help university undergraduate students to:

i. Identify the right job sector that suits their needs and interests.
ii. Get further information on a specific organization within the identified job sector.
iii. Know the relevant positions related to their field of study in that particular organization.
iv. Get in touch with their seniors (alumni) who are already holding the post in the organization.

This student's career decision support system can serve as a career-planning tool to be used by students as well as career-guidance counselors. By helping students prepare themselves for their future career, it is hoped that these students will be marketable and demanded by the future employers. At the same time, the career counselors may also find this career decision support system useful in helping them to function and serving their students better.

2. Literature Review

In order to develop the student's career decision support system, information pertaining to the factors that influence the choice of job, the available job sectors, the current job planning tools currently available, and finally, the techniques used in ranking and determining the proper weight for factors and decision alternatives must be gathered. This section gives a review obtained from the literature on the four aspects.

2.1. Factors Influencing Job Selection

As noted by Porath and Bateman (2006), self-management strategies are of most value when they improve individual effectiveness. Improving the career adaptability skills of decision-making and self-exploration will reduce the career concerns of young adults. Most career development theories are based on the notion that individuals will explore their environment, have insight into their own behaviors, values, and affect, and use this information and insights to make decisions about choosing work and a career (Holland, 1997); (Super, 1994).

Table 1 gives the factors that influence the choice of job or future career found in the literature of previous studies among fresh graduates or undergraduate students.

Table-1. Factors influencing job selection among fresh graduates

	Factors	Literature/Study
1.	Academic qualification	(Mohd *et al.*, 2010); (Beggs *et al.*, 2008)
2.	Salary/reward	(Zulkifli and Rogayah, 1997); (Zengina *et al.*, 2011); (Beggs et al., 2008); (Wildman and Torres, 2002)
3.	Working environment	(Creed *et al.*, 2009)

4.	Interest	(Sakalas *et al.*, 2006); (Mohd *et al.*, 2010); (Mcglynn, 2007)
5.	Physical and mental suitability	(Pappas *et al.*, 2011); (Creed *et al.*, 2009); (Beggs *et al.*, 2008)
6.	Work experiences	(Abu *et al.*, 2010)
7.	Role models, parents and family members, friends and teachers	(Dick and Rallis, 1991); (Mohd *et al.*, 2010); (Pappas *et al.*, 2011); (Agarwal, 2010); (Wildman and Torres, 2002)
8.	Social status	(Zulkifli and Rogayah, 1997); (Beggs *et al.*, 2008)
9.	Personality	(Rogers *et al.*, 2008)
10.	Future family plan	(Del Pino and Mereish, 2013); (Ma and Yeh, 2010); (Hansen, 2001); (Zody *et al.*, 2006)

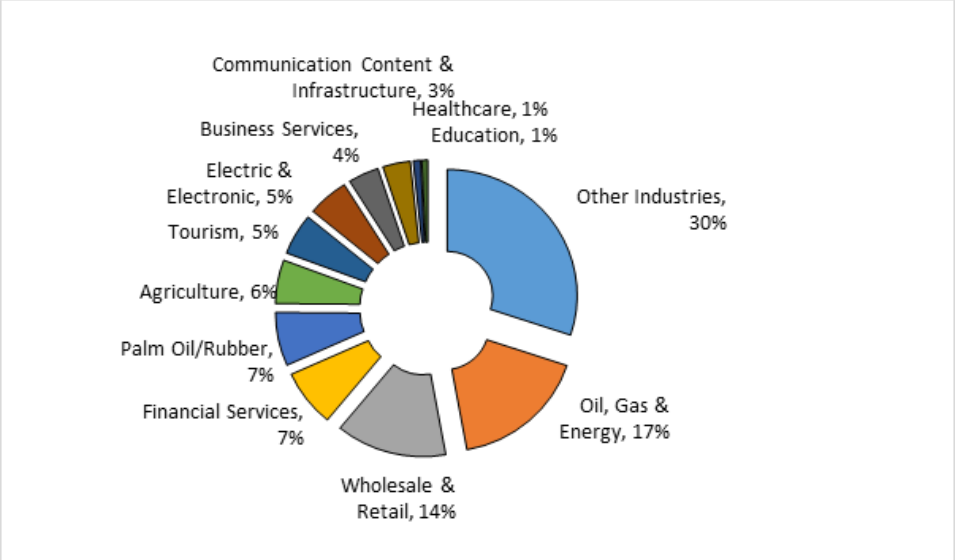
2.2. Job Sectors

The job sectors vary from country to country. In the United Kingdom, for example, the job sectors are as given the report in http://www.prospects.ac.uk/sectors.htm consisting of the following:

1. Accountancy, banking and finance
2. Business, consulting and management
3. Creative arts and culture
4. Engineering and manufacturing
5. Health and social care
6. IT and information services
7. Marketing, advertising and public relations
8. Property and construction
9. Recruitment and human resource
10. Science and pharmaceuticals
11. Transport and logistics

Meanwhile, in Malaysia, the job sectors are categorized as in figure 1.

Fig-1. Malaysia GDP structure, based on NKEA sectors (FY2013) (Data source: Department of Statistics Malaysia)



2.3. Current Supporting Tools on Career Planning

Since career planning is an important decision to be made, some people seek advices from career-counselling in order to make a better decision for their future. Nevertheless, in this current new world, computer has replaced the role of a counselor by automatically generating suggestion as a guidance for career planning. Currently, there are a number of self-help tools or computer-based career information and guidance systems such as Career Information System (CIS) (http://www.mass.gov/lwd/employment-services/job-seekers-services/career-planning/career-information.html), SIGI Plus (http://sigi3.org/SIGI3-Research.html), DISCOVER (http://www.careerexplorer.net/discover), and CHOICES Planner (http://www.aashwasan.org/ourservices/eep.html?gclid=CL3Uu4n7jMoCFY0XaAodCbcOdg). However, all of these tools are very general and is not tailor-made to a specific focused group.

2.4. Methods to Select the Best Alternative According to Various Factors

For selecting the best alternative such as the best career sector to be in according to various criteria, or in this case, the factors that influence the career choice, there are various methods that can be used such as aggregated indices randomization method (AIRM), analytic hierarchy process (AHP), analytic network process (ANP), best worst method (BWM), characteristic objects methods (COMET), ELECTRE, evidential reasoning approach (ER), multi-attribute value theory (MAUT), potentially all pairwise rankings of all possible alternatives (PAPRIKA), simple scoring method (SSM), and many more (Chen and Hwang, 1992); (Amine *et al.*, 2014). Normally, the result will be in the form of the ranking scores of the alternatives and in many instances the ranking as well as the scores differ from method to method (Amine *et al.*, 2014). Therefore, as the result may differ according to the model selected, it is relevant to establish the practical and managerial implications for selecting one model or the other and providing evidence of which models best fit certain specific environment (Dehe and Bamford, 2015).

Of all the techniques, two basic methods that are mostly covered by decision making textbooks and widely used by practitioners are AHP (Saaty, 2008) and SSM (Taylor, 2013). Although AHP is superior over SSM due to its pairwise comparison among factors and decision alternatives process, AHP may not be suitable for this career decision support system since it is very difficult for a user of the system to produce a consistent pairwise comparison which therefore produces an invalid result (Alonso and Lamata, 2006). SSM, on the other hand is a very straightforward approach that does not have to deal with pairwise comparison. The evaluation can be executed quickly and it does not require the use of a complex mathematical calculations.

For a basic SSM, the decision criteria or factors are weighted in terms of their relative importance, and each decision alternative is graded in terms of how well it satisfies the factors, according to the following formula (Taylor, 2013):

$$S_i = \sum g_{ij} w_j \qquad (1)$$

Where

w_j = a weight between 0 and 1 (or any other suitable scale) assigned to factor j, indicating its relative importance, where 1 is extremely important and 0 is not important at all.

g_{ij} = a grade between 0 and 100 (or any other suitable scale) indicating how well the decision alternative i satisfies factor j, where 100 indicates extremely high satisfaction and 0 indicates virtually no satisfaction.

S_i = the total score for decision alternative i where the higher the score, the better.

3. The Career Decision Support System

This development and the implementation of the career decision support system involved several steps:

STEP 1 - Identifying the suitable relevant factors that affect students' career choice. The factors were obtained through literature and interview with current students of a university (i.e. Universiti Utara Malaysia (UUM)) in Malaysia. A survey using a sample of 500 UUM final year students, selected at random, was conducted to identify the top 12 factors that contribute towards students' career choice. The factors to be chosen are as follows:

A. Factors from literature:

1. Academic qualification
2. Salary/Reward
3. Working environment
4. Interest
5. Mental and Physical Suitability
6. Work experiences
7. Role models, parents and family members, friends and teachers
8. Career information
9. Personality
10. Future family plan

And

B. Factors suggested by the students:

1. Needed by society
2. Skills and abilities
3. Chance to be promoted

STEP 2 – Identifying the suitable relevant job sectors that offer positions related to students' academic degree program. The job sectors were identified through literature, newspaper advertisements and career portal.

STEP 3 – Identifying UUM alumni members who are now being employed by various industries within each relevant job sectors. This was done through the existing contacts via Facebook and through the UUM alumni center.

STEP 4 – Developing the career decision support system. This was achieved through the integration of the simple scoring model with Visual Basic 6. The flow chart, i.e. the system architecture of the steps involved is as given in the Appendix.

STEP 5 – Implementing the career decision support system. Here we asked three undergraduate final year students from UUM's Decision Science program and 2 career counselors from the UUM Career Service department to experiment with the system.

4. Results

Based on the survey result, the top 12 factors that influence students' choice for a future career are as follows:

1. Academic qualification
2. Chance to be promoted
3. Salary/Reward
4. Working environment
5. Interest
6. Needed by society
7. Mental and Physical Suitability
8. Work experiences
9. Role models, parents and family members, friends and teachers
10. Skills and abilities
11. Career information
12. Personality

Meanwhile the job sectors accumulated from the literature are:

1. Accountancy, banking and finance
2. Business, consulting and management
3. Creative arts and culture
4. Engineering and manufacturing
5. Health and social care
6. IT and information services
7. Marketing, advertising and public relation
8. Property and construction
9. Recruitment and human resource
10. Science and pharmaceuticals
11. Transport and logistics
12. Armed forces and emergency services
13. Charities and voluntary work
14. Energy and utilities
15. Environment and agriculture
16. Hospitality, tourism and sport
17. Law
18. Media and publishing
19. Public sector
20. Retail and sales
21. Teaching and education

The students' career decision support system developed is as illustrated in the next few pages. The illustration is based on a trial done by one of the students. The system begins with a "Welcoming Page" as given by figure 2 followed by a brief introduction about the system and what it is supposed to do (see figure 3).

Fig-2. Welcome page

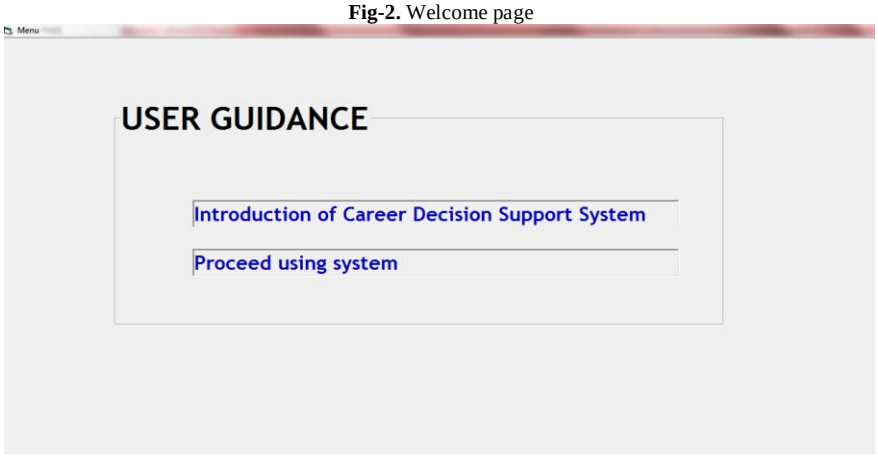
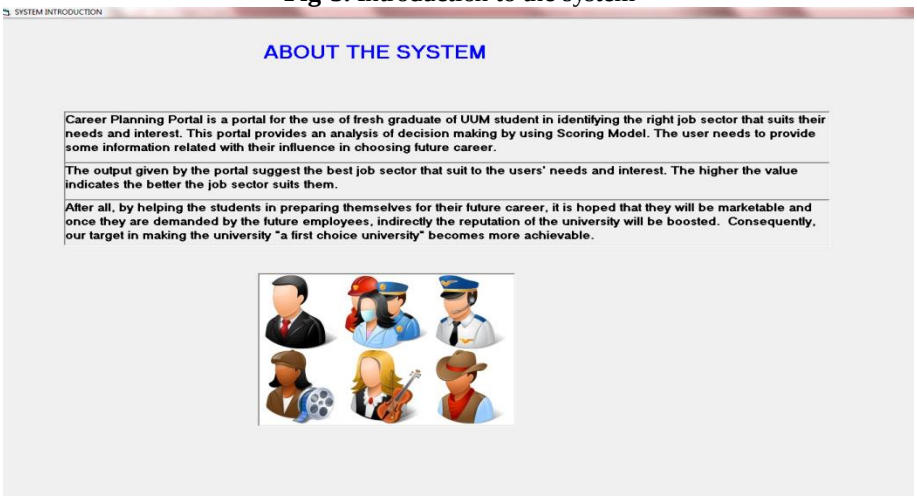
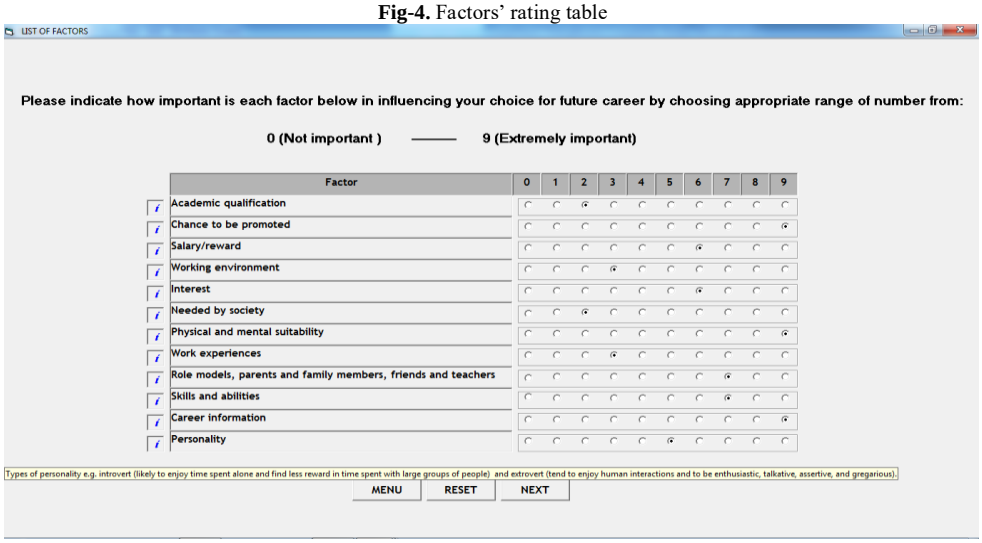


Fig-3. Introduction to the system



Next, users will be directed to the next page whereby in this page, users will have to rate the importance or the level of influence of each factor towards their career choice. Figure 4 shows the evaluation done by student A. Here, instead of using a rating scale ranging from 0 to 100, we used a scale from 0 to 9 only.

Fig-4. Factors' rating table



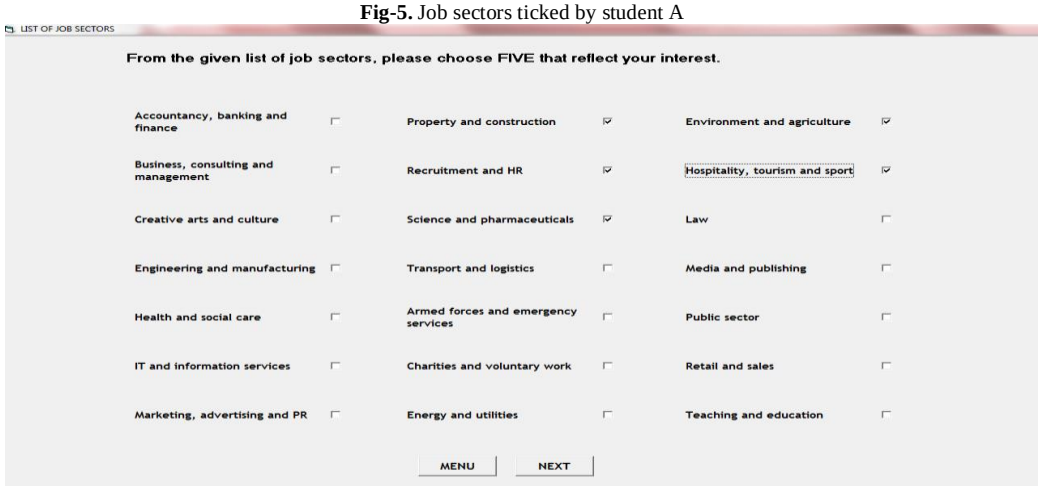
The evaluation done by student A (as shown in figure 4) gives the following result as shown in table 2.

Table-2. The level of influence of each factor towards student A's career choice

Factor	**Rating** **0 = Not important; 9 = Extremely important**
1. Academic qualification	2
2. Chance to be promoted	9
3. Salary/Reward	6
4. Working environment	3
5. Interest	6
6. Needed by society	2
7. Mental and Physical Suitability	9
8. Work experiences	3
9. Role models, parents and family members, friends and teachers	7
10. Skills and abilities	7
11. Career information	9
12. Personality	5

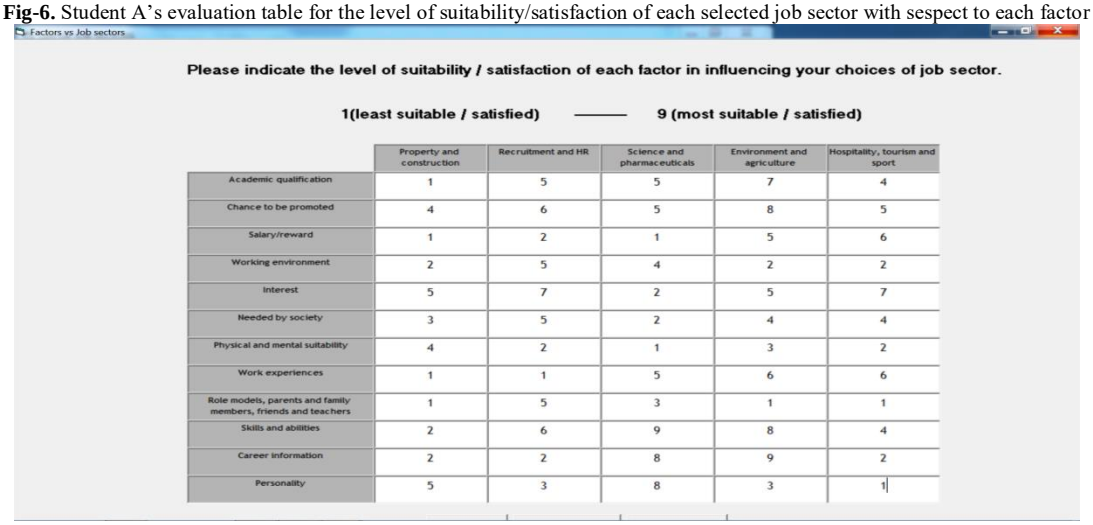
After this, users will be transported to the next page whereby they will be asked to tick five job sectors that they most preferred. In figure 5 below, we can see that student A has chosen property and construction, recruitment and HR, science and pharmaceuticals, environment and agriculture, and finally, hospitality, tourism and sport as his top 5 job sectors.

Fig-5. Job sectors ticked by student A



Having rated the level of importance of each factor towards the determination of the future career and having chosen the top 5 job sectors preferred, the users need to rate the level of suitability/satisfaction of each job sector with respect to each factor. This is done in the system as shown by figure 6 and table 3.

Fig-6. Student A's evaluation table for the level of suitability/satisfaction of each selected job sector with sespect to each factor



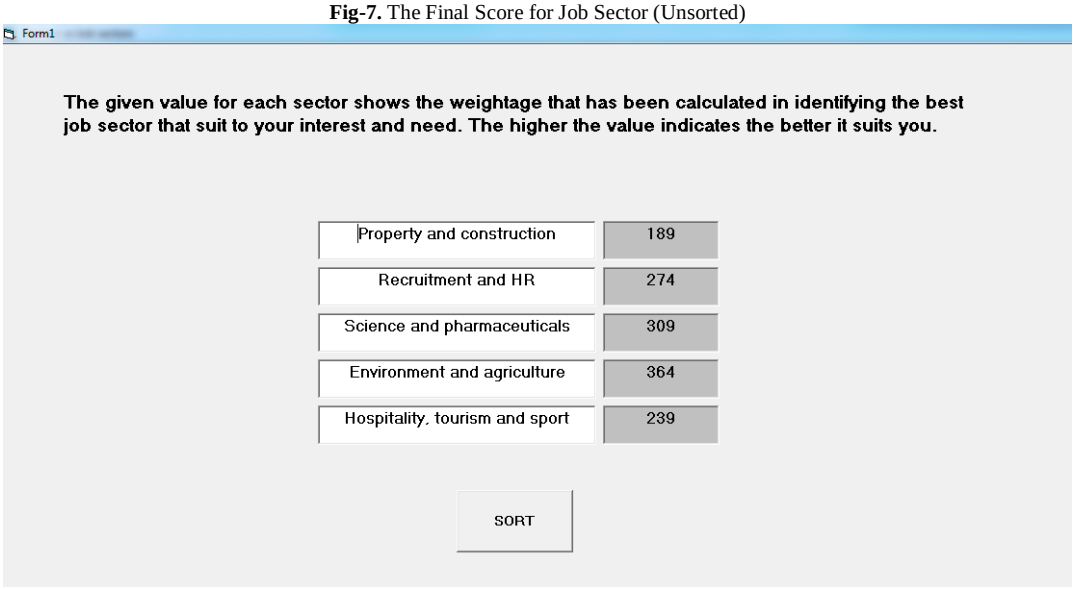
	Property and construction	Recruitment and HR	Science and pharmaceuticals	Environment and agriculture	Hospitality, tourism and sport
Academic qualification	1	5	5	7	4
Chance to be promoted	4	6	5	8	5
Salary/reward	1	2	1	5	6
Working environment	2	5	4	2	2
Interest	5	7	2	5	7
Needed by society	3	5	2	4	4
Physical and mental suitability	4	2	1	3	2
Work experiences	1	1	5	6	6
Role models, parents and family members, friends and teachers	1	5	3	1	1
Skills and abilities	2	6	9	8	4
Career information	2	2	8	9	2
Personality	5	3	8	3	1

Table-3. Student A's evaluation table for the level of suitability/satisfaction of each selected job sector with respect to each factor

Factor	Property and Construct	Recruitment and HR	Science and Pharmaceuticals	Environment and Agriculture	Hospitality, Tourism and Sport
	1	5	5	7	4
	4	6	5	8	5
1. Academic qualification	1	2	1	5	6
2. Chance to be promoted	2	5	4	2	2
3. Salary/Reward	5	7	2	5	7
4. Working environment	3	5	2	4	4
5. Interest	4	2	1	3	2
6. Needed by society					
7. Mental and Physical Suitability	1	1	5	6	6
8. Work experiences	1	5	3	1	1
9. Role models, parents and family members, friends and teachers					
10. Skills and abilities					
11. Career information	2	6	9	8	4
12. Personality	2	2	8	9	2
	5	3	8	3	1

Now that all the necessary evaluations are completed, the system will then calculate the total score obtained by each job sector using the simple scoring formula as mentioned previously (i.e. formula 1). Based on the scores given in figure 7, the student should choose a career in the environment and agriculture sector. The second best sector for him is science and pharmaceutical.

Fig-7. The Final Score for Job Sector (Unsorted)



To illustrate how the total score is calculated, we show the calculation for the total score obtained by the property and construction sector in table 4 below.

Table-4. The calculation for total score bbtained by the property and construction sector

Factor	Weight w_i	How well the sector satisfies factor I (g_i)	$w_i g_i$
1. Academic qualification	2	1	2
2. Chance to be promoted	9	4	36
3. Salary/Reward	6	1	6
4. Working environment	3	2	6
5. Interest	6	5	30
6. Needed by society	2	3	6
7. Mental and Physical Suitability	9	4	36
8. Work experiences	3	1	3
9. Role models, parents and family members, friends and teachers	7	1	7
10. Skills and abilities	7	2	14
11. Career information	9	2	18
12. Personality	5	5	25
Total Score			**189**

As mentioned previously, the score may differ if a different technique is employed (Amine *et al.*, 2014). Therefore, there is no need for the comparison of the result obtained here with the results obtained from other approaches.

Finally, we asked three undergraduate final year students from the UUM's Decision Science program and 2 career counselors from the UUM Career Service department to experiment with the system and evaluate the system. The result of their evaluation is as shown in table 5.

Table-5. System evaluation by users

User	Score 1 = Very Bad, 5 = Very Good			
	User Interface	**Instruction Given**	**Ease of Use**	**Usefulness**
Counselor 1	4	5	4	5
Counselor 2	4	4	5	5
Student 1	3	5	5	5
Student 2	4	5	5	5
Student 3	2	4	5	5

The results of the evaluation show that overall, they are satisfied with the system. However, the user interface needs to be improved further.

5. Conclusion

The aim of this study is to develop a students' career decision support system that will guide students towards their career planning. We accomplished this through the utilization of a simple mathematical multi-criteria decision science technique called simple scoring model. However, in this report we only illustrated the results for our research objective (i) and (ii). We are currently still in the process of gathering the information about the alumni members.

Once the alumni information gathering is completed, this career decision support system will function as follows.

i. After the most suitable job sector has been identified for the student/user, the student can then click on the job sector link. The student then will be transferred to another window/page that showcases all the available companies or organizations within that job sector.

ii. The student can proceed by clicking on any of the company links. The next window/page that follows as the result of the click will have the name of the alumni members who are currently attached to that company/organization.

iii. Finally, once the student clicks on any of the student name links, the student will get the information regarding the title of the job held by the alumni member, the email address, the contact number, as well as the job specification.

The portal can be managed by any university career counsellor or the head of department for any undergraduate program, and can be utilized by students from any academic degree program. However, to allow the portal to be fully-useful and beneficial, it is crucial that:

i. The information about the alumni members are current and updated from time to time. This can be made possible with the involvement of alumni. Engaging alumni to disseminate the information regarding their job function can guide students in making correct decision for their career (Heckman and Guskey, 1998).

ii. Some of the ratings with regards to the rating for job sectors with respect to some criteria can be predetermined by career experts who perhaps have the correct info, instead of asking the students to rate. For example, the rating for job sectors with respect to salary and needed by society may be predetermined by the career experts. The students may not have enough knowledge to do the rating themselves.

Describes SIGI, a guidance system in which an individual interacts with a computer in exploring the guidance process. The user learns to examine his values, obtain and use relevant information, interpret predictive data, and formulate plans. The interaction makes it possible to arrive at tentative career decisions regarding educational and occupational options, and to modify them in the light of additional information. The emphasis is on the process of decision making rather than on the wisdom of the decision, which is very difficult to evaluate.

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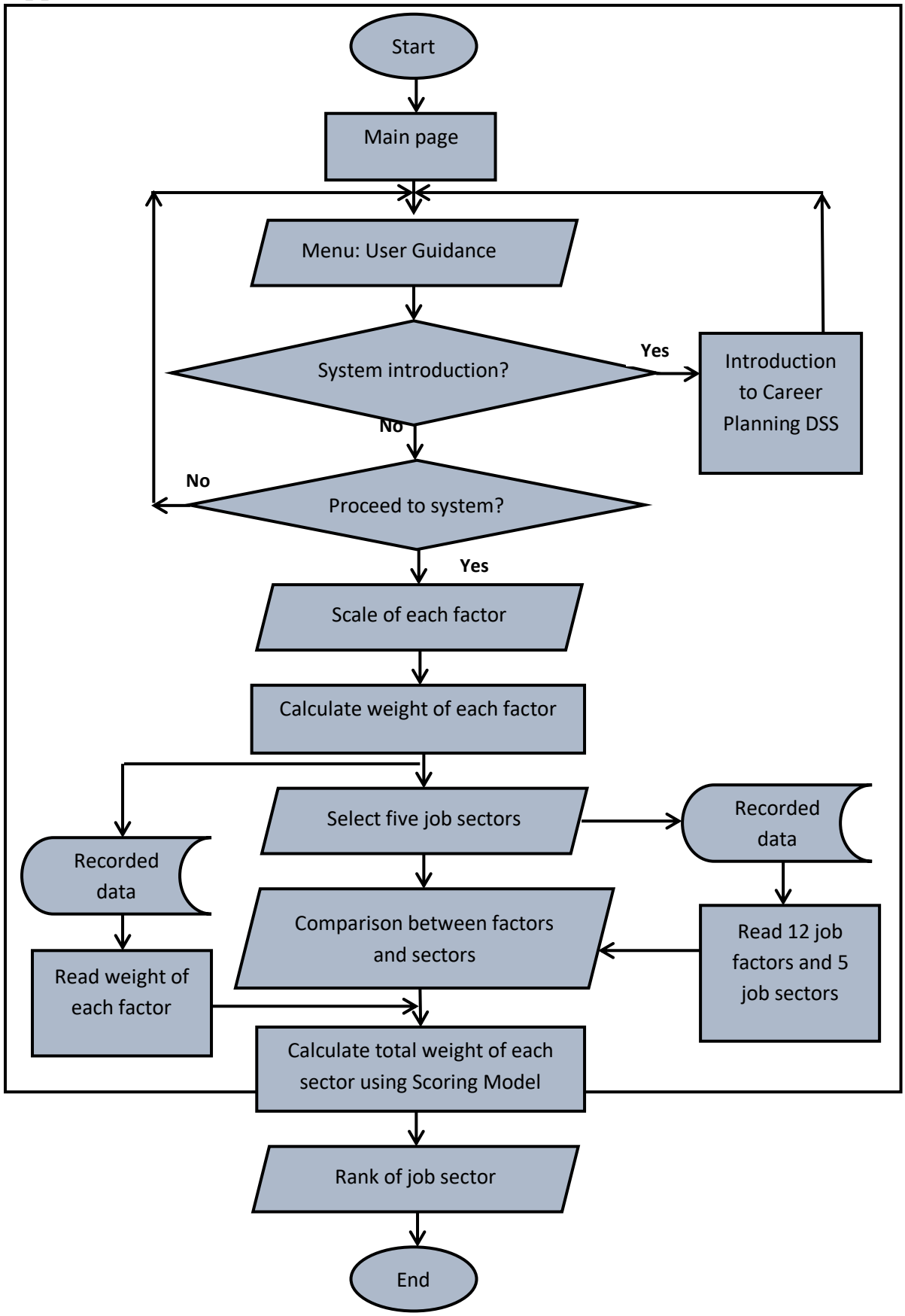
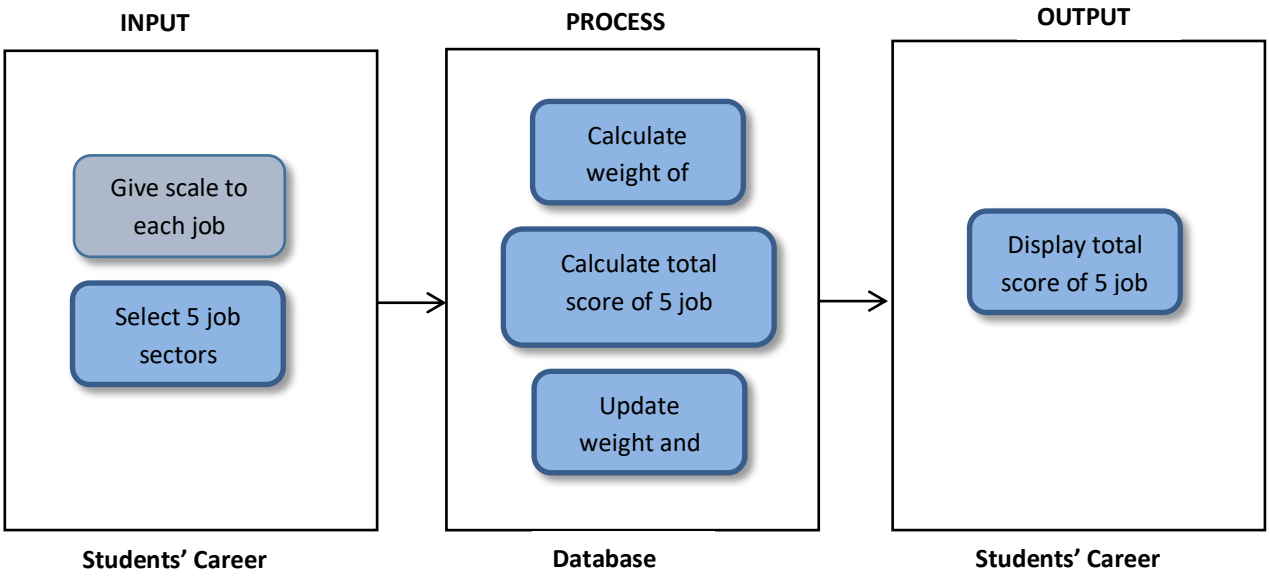
Appendix 1: Flow Chart for the DSS



Appendix 2: System Architecture for the DSS