

Factors Contributing to Programme Choice and Subsequent Career Selection among Engineering Students

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Abstract

The purpose of this study was to determine the relationship between factors that contribute to programme choice, personality (career orientation) and career intention among engineering students. A survey was carried out involving 371 engineering students from two programmes, namely civil and mechanical engineering programmes in one university. Data were gathered on four factors that influence participants to choose engineering as a programme of study namely, people, personal, programme and gender. Data were also gathered on participants' career orientation and career intention. Interesting findings were obtained regarding the influential factors for programme choice. Both males (86%) and female participants (83%) cite "job guarantee" as the most influential factor that makes them choose to study engineering. "Interest in engineering" is the second most influential factor cited by males (78%) while "confidence in their ability" (73%) is the second most cited factor by females. Being male is the third most cited reason for choosing engineering for males (76%) while interest is the third most cited factor for females (68%). Results of the analysis also indicate that, there is no difference between males and females with respect to career orientations. On career intention however, a vast difference was observed between males and females with 81% percent of males reported that they intend to pursue an engineering career after graduation and only 59% of females participants reported that they intend to do so. In conclusion, similar initial motivations to study engineering and similar personality between males and females engineering students do not necessarily lead to similar intention to pursue an engineering career.

Keywords: career selection; personality; career orientation, engineering career

1. Introduction

Malaysia aspires to be a developed nation by 2020 [1]. This vision can only be realized with adequate pool of engineering expertise to play their important role in the development and wealth creation of the nation [2], [3]. According to the Institution of Engineers Malaysia [4], Malaysia requires 200,000 engineers to serve our developing nation; an increase of 140,000 from the current population of 60,000 engineers. In view of the large demand for engineers, women who make 30% of the working age population of the country [5] may need to increase their participations in engineering related career. The engineering sector which has always been dominated by males cannot continue to be so if the demand is to be met. In fact, the scenario is indeed changing with greater number of women seeking and successfully acquiring places in engineering programmes [6].

According to the Ministry of Higher Education statistics, the ratio of female to male students in Malaysian post-secondary technical programmes is 2:3. This ratio is however not reflected in actual

female graduates in technical and engineering career that are in line with their academic qualifications [7]. For example, the percentages of engineers and its associated posts are only 18% females while the rest, 82% are males; a ratio of 9:41 [8]. Compare this ratio with the programme enrolment ratio of 2:3, clearly subsequent participations of females in engineering career are much below expectation [9]. The question is, if they do not intend to pursue an engineering career, why did they choose to study engineering in the first place? What are the factors that influence them to study engineering? Do females and males differ in the factors that influence them to study engineering?

Many would agree that academic qualification is an important determinant of subsequent career [10]. However, sometimes personality can cast a bigger influence on career choice compared to academic qualifications [11]. The purpose of this exploratory study was to identify the factors that contribute to career selection among engineering students. Prior to one's participation in an engineering career, one needs to be enrolled in an engineering programme first. Thus factors contributing to programme choice

are important towards our understanding of career choice in engineering. The theoretical framework of the study is illustrated in Figure 1.

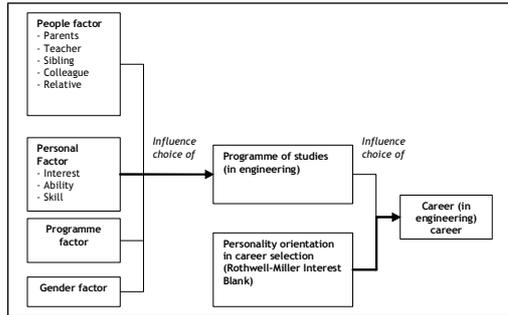


Figure 1 Theoretical framework

2. Programme choice and career selection in engineering

The reasons why a person chooses to study engineering can influence their subsequent career selection [12]. For example, a graduate who studies engineering upon parental pressure may choose a different career path that is more in agreement with their personal needs after graduation. In short, being an engineering graduate does not automatically lead one to an engineering career [13].

2.1. Factors that influence choice of academic programme

Students' decision to study engineering is influenced by a combination of factors that can be divided into people factor, personal factor, programme factor and gender factor [14]. People factor such as teachers (Fox (1961) and parents [15], have been found to be highly influential in programme selection. In Malaysia, parents' influence on their children has been found to be more dominant than teachers influence [16].

Personal factor such as a strong interest in engineering as a career has been the driving force in influencing some students to study engineering [17], [18]. On the other hand, lack of interest in science and mathematics has been the cause of low enrolments in engineering and technical programmes [19].

Some traditional thinking males have chosen to study engineering because it is a male profession. Having a strong believe that enrolment in engineering education programme is a stepping stone to secure employment has been the influential factor in some people [20]. In summary, a person' decision to study engineering can be influenced by other people, self, programme factor and gender.

2.2. Factors that influence choice of a career

Studying engineering does not necessarily lead to an engineering career although it is the most logical step to do so afterwards [21], [22]. Other factors may play a role in predisposing engineering graduates to non-engineering careers. One of these factors that have been highlighted often is personality factor with respect to career orientation. According to Holland Theory, compatibility between one's career and personality is the key to successful and fulfilling career that a person chooses to participate in [23]. Therefore, personality with respect to career orientation could also be a determining factor in career choice.

According to Holland theory in [20] people can be categorized into six types and each person may be dominant in certain types but not others. The types are as shown in Table 1.

Table 1 Personality types, description and suitable occupations

Type	Description	Example of suitable jobs
Realistic	outdoor type, not too keen on socializing, like working with things (tools, machines etc).	Farmer, Truck driver, Pilot, Builder, Carpenter
Investigative	interested in logic and concepts, enjoy and be good at abstract thought, often interested in science, like working with information (abstract ideas and theories)	Chemist, Mathematician, Pharmacist, Dentist, Researcher
Artistic	tends to use their imagination a lot, like to express their feelings and ideas, dislike rules and regulations, enjoy music, drama and art, like to create things.	Artist, Actor, Dancer, Designer, DJ, Composer, Painter
Social	enjoys the company of others, helpful, warm and caring.	Nurse, Librarian, Counselor, Physiotherapist
Enterprising	enjoys the company of others, dominating, persuasive rather than helping, enjoys actions more than thought, like to lead.	Sales Rep, Headmaster, Lawyer, Managers, Journalist
Conventional	likes rules and regulations, structure and order, tend to be well organized, lack imagination.	Secretary, Typist, Clerk, Factory worker

Interestingly, it has been observed that most females frequently tend to score predominately in three personality types: Artistic, Social, and Conventional, whilst males score more predominately on the Realistic, Investigative and Enterprising types.

3. Methodology

3.1. Population and Samples

The population for this study was engineering students in one Malaysian university. The Layered Random Sampling procedure was used for sample selection. Three hundred and seventy one engineering students from two programmes, namely civil and mechanical engineering programmes in one university were selected as participants.

3.2. Data gathering tools

Two data gathering tools were used, a questionnaire and the Rothwell-Miller Interest Blank (RMIB). The questionnaire was used to gather data on factors that most influence programme choice based on four identified factors and data on career intention.

The questionnaire was divided into two sections; Section A was on students' background and career intention and Section B was on factors that influence programme choice, namely people factor, personal factor, programme factor and gender factor. For Section B, students were required to rate their agreements to given statements based on the five point Lickert Scale.

Items on People Factor are designed to yield information on the people who influence the participants' decision to study engineering. The people listed were parents, teacher, colleague and relative. Items on the Personal Factor yield information on participants' interest, perceived abilities and skills related to engineering. Items on Programme Factor include perceived career prospect, interesting work and sponsorship. Items on Gender Factor are designed to assess participants' view on gender role in engineering career. The reliability of the questionnaire using the Cronbach Alpha method varies from .36 – .98. The lowest reliability was for sibling sub-factor under the people factor.

The RMIB inventory was used to assess participants' career preferences. It was chosen because, it has been used successfully in other studies in Malaysia before and it is easy to use [24]. The RMIB provides indication of one's career interest

based on twelve categories. It is an expansion of the Holland personality types. Rothwell-Miller's personality categories are Outdoor, Mechanical, Computational, Scientific, Persuasive, Aesthetic, Literary, Musical, Social Service, Clerical, Practical and Medical.

4. Results

Out of the 500 questionnaires distributed, 392 (78.4%) were returned and out of this only 371 (74.2%) were completed and used in the analysis. Most of the participants (84.2%) were either in their first or second year of study and the age range was between 20-24 years old. A total of 96.2% of the participants were from science and technical background in their secondary education.

4.1. Factors that influence programme choice

Personal factor has the strongest influence on programme choice followed by gender, programme and people factor (Table 2). Within the personal factor, interest and perceived ability are the most influential sub-factors. Although overall program factor is third in terms of influence, perceived job guaranty (one of the sub-factors) has a strong influence on programme selection.

Table 2 Factors that influence decision on programme choice

Factor	M	Sub-factor	M	Influence
People	2.65 (4 th)	Parent	2.73	Mild
		Colleague	2.59	Mild
		Teacher	2.95	Mild
		Sibling	2.45	Mild
		Relative	2.52	Mild
Personal	3.79 (1 st)	Interest	3.97	Strong
		Skill	3.57	Mild
		Ability	3.84	Strong
Program	2.90 (3 rd)	Job guaranty	4.01	Strong
		Scholarship	2.29	Mild
		Lack of choice	2.41	Mild
Gender	3.76 (2 nd)		3.76	Strong

Although people factor does not seem to be highly influential, but within this factor the teacher factor was found to statistically significantly higher than others, $F(4,1850) = 15, p < 0.05$.

4.2. Factors on programme choice: Comparison between gender

Both males (86%) and female participants (83%) cite "job guaranty" (from program factor) as the most influential factor that makes them choose to study engineering (Table 3).

Table 3

“Interest in engineering” (sub-factor of personal factor) is the second most influential factor cited by males (78%) while “confidence in their ability” (73%) is the second most cited factor by females. Being male is the third most cited reason for choosing engineering for males (76%) while interest is the third most cited factor for females (68%).

4.3. Career orientation and career intention

There were similar personality types with respect to career orientations between males and females (Table 4)

Table 4 Distribution of career orientation according to gender

Personality	Females		Males	
	<i>f</i>	%	<i>f</i>	%
Outdoor	6	3.97	17	7.73
Mechanical	35	23.18	38	17.27
Computational	15	9.93	17	7.73
Scientific	23	15.23	39	17.73
Persuasive	3	1.99	13	5.91
Aesthetic	23	15.23	28	12.73
Literary	2	1.32	4	1.82
Musical	5	3.31	4	1.82
Social Service	15	9.93	17	7.73
Clerical	7	4.64	9	4.09
Practical	7	4.64	14	6.36
Medical	10	6.62	20	9.09
Total	151	100.00	220	100

Overall, only 69.27% of the participants reported that they would choose to participate in engineering career, while the rest opted for non-engineering career. A vast difference was observed between

males and females reported intention with 81% percent of males reported that they intended to pursue an engineering career after graduation and only 59% of females participants reported that they intended to do so.

However, out of the 69.27% choosing to participate in engineering career, 56.60% have incompatible personality for their intended career and only 12.67% shows career-personality compatibility based on the RMIB. The summary of the relationship between influencing factors, personality and career intention is shown in Figure 2.



Figure 2 Factors influencing programme choice and career intention among engineering students.

5. Discussion

The results indicate that personal factor has a strong influence on programme choice. Within this factor ‘interest’ and ‘perception on ability’ are the most influential on programme selection. These factors indicate intrinsic motivation. Intrinsic motivation is a motivating factor that leads to action without expecting or asking for reward. Outwardly, it looks like that students’ choice of engineering programme is internally motivated. However, analysis of the programme factor indicates that “job guaranty” (a sub-factor) is also high on influence in programme choice. This means that, students’ decision to study engineering were influenced by a combination of intrinsic and extrinsic motivational factors.

The low influence of people factor is inconsistent with the findings by Natalie [25]. Her finding indicate that people play a very significant role in programme choice. The difference could be due to the fact that participants in the current study are already with high intrinsic motivation which negates the need for people’s influence in their programme choice.

6. Conclusion

This study set out to determine the factors that influence students' decision to study engineering and it was found that "job guaranty" is the most influential factor that makes the participants choose to study engineering for both males and females students. "Interest in engineering" and "confidence in their ability" is the second most influential factors for males and females respectively. Traditional thinking "Being male" is the third most cited reason for choosing engineering for males while "interest in engineering" is the third most cited factor for females.

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