

Engineering Students Towards Entrepreneurship Awareness

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Abstract

Entrepreneurship is often thought to be a likely subject for students in the business discipline but not for engineering students and this however is a fallacy as there is the need for Malaysia to identify an awareness of entrepreneurship in the engineering sector. At present the awareness for entrepreneurship is believed lacking in certain engineering courses and undergraduates do not really get much exposure to such enterprises. The purpose of this paper is to identify the interest among engineering students towards entrepreneurship. This paper discusses the factors related to the awareness of entrepreneurship taking into consideration the following different engineering courses, gender, family influence and race backgrounds. The survey results show that female, Chinese students and the Mechanical Engineering students are keen and geared towards entrepreneurship. These research results are very interesting as a snap shot study in developing and enhancing the awareness of entrepreneurship among the engineering respondents.

Keywords: Entrepreneurship, Gender, Race

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Introduction

The interest shown by students for entrepreneurship has become an interesting discussion topic these days. Numerous studies have been carried out in an attempt to explain the major reasons for gearing towards entrepreneurship and how individual interest can be created through exposure. There is no argument to say that entrepreneurship can't increase the individual's economic situation in terms of income. Due to that, many sectors, either government or non-government will realize that a lot of studies and research efforts have to be carried out. The educational system will play a role as an institution to raise enterprising people where the focus will be more on students and graduates. For the non-academic people, other departments of the ministry also play their role by organizing workshops for motivation, training sessions and courses as well as offer various schemes for loans. All the effort is for only one purpose which is to build up entrepreneurship skills in all who are getting involved in it.

Basically, the engineering students are more interested in being hired as employees as that compared to wanting to set up their own business. They are neither ready nor confident to set up their own companies without the knowledge and support they need to fall back on. A profession in engineering requires an individual to be always active and be knowledgeable. The continuing self improvement and training as well as hands-on learning will help them to be more proactive, knowledgeable, competent and creative. They will also need to be aware of the latest updated issues and skills for career advancement or for an occupational change. From the research done by Stephen (2006), the authors find that if the population in the engineering field is increasing, there will be several effects like the number of engineers in the labour force will continue to increase as well and the average age of engineers will increase and the total number of retirements also will increase over years. One of the issues to be looked into is the situation of retiring engineers and fresh engineers who need to compete with others. This will be one of the reasons why the engineering students have to get involved in entrepreneurship as early as they can. As mentioned by Urve et al. (2006), the government and researchers are getting highly interested in this issue as a research topic. The study however concentrates more on the issue of the reasons why students especially engineering students don't like to be involved in entrepreneurship, and to also seek solutions as to how to get them to be interested in building their own businesses.

Genetic factors could also contribute for an individual's interest in entrepreneurship. The genes defined as DNA and which are transmitted biologically from parents to their children could contribute to this factor. Figure 1 presents the mechanisms through which genetic factors influence entrepreneurship. This process can happen in four ways. Firstly, the genes affect the chemical mechanism that increases an interest in a person for entrepreneurship activities. Secondly, the genes may predispose a person to develop individual attributes. Thirdly, genes can increase an individual's sensitivity towards an environment and finally genes also can increase individual exposure sensitivity towards an environment (Nicolaou and Shane, 2009). All these mechanisms could increase the likelihood for a person to engage in entrepreneurial activities.

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Source: Nicolaou and Shane (2009) Figure 1. Genetic Factors Mechanisms Influence Entrepreneurship

This paper aims to identify and examine entrepreneurship awareness among the final year engineering students and factors that influence the students from pursuing entrepreneurship. The students are from five types of engineering fields (courses) and they are mechanical, chemical, electrical, civil and architectural at the National University of Malaysia (Universiti Kebangsaan Malaysia, UKM). The students will have to answer a survey questionnaire based on their opinions and interest for entrepreneurship. To accomplish this aim, earlier research studies and literature reviewed on entrepreneurship theories are the basis used to study the awareness of entrepreneurship in engineering students. The research questions have been developed to seek justification of the important effect/s of entrepreneurship education and the influence of courses taken, by gender and race on the entrepreneurial ambitions of the students.

Entrepreneurship and Engineering

In the past, development for poorer countries has often meant catching up and becoming more like industrialized nations. In the process of developing a lot of expertise in different sectors gathers to support the economy. Engineers play the main role in designing structures, buildings, manufacturing, electronic components and engage in new methods or activities that need for this phase of improvement. These projects will deal with a lot of people who may be of the same race, speak the same language or they may not be of the same race nor speak the same language. In terms of that, good communications skills are very important to make sure everything will go as planned. Nowadays, engineers are well trained and can face any situation in most fields. Fresh engineers will learn from the institutions and their seniors and learning goes around in circles. Engineers must learn to communicate with people around them like learning to listen to the local population, studying the environment, work in any situation regardless of status in life and so on (Parsons, 1996). This natural learning education may affect or help most engineers developing their own entrepreneurship skills.

Entrepreneurship is the basis for economic growth in Malaysia and also the entire world. Entrepreneurship is said to be the symbol of business achievement and can be considered a pioneer for today's testimony on new business venture successes. Decades ago, Malaysia was an agricultural country and the economy was growing within this activity. As for now, Malaysia has developed itself into a newly industrialized country. But, both types of economic growths arise from entrepreneurship. There will be one entrepreneur who creates the opportunities and lots of people will work under this enterprise. The question that arises here is, "Why do a lot of people preferred

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be hired rather than be the hirer?" Lent et al. (2005) reviewed literature from that period and found that one will choose a career based on one's interest. A person's career interest is based on two major themes: firstly, an individual's expectations of the career; and secondly, the individual's beliefs that he or she can meet the requirements to attain such a career (academic milestone self-efficacy).

Engineering students will be the subject to study as entrepreneurship is important and can become a good career opportunity for engineering students or others who have interest in it. One of the important components of entrepreneurship is the combination of technology of information and communication. The continuing existing technology and methods also need highly skilled and knowledgeable engineers, but the most important and challenging task is been able to identify new applications or methods. An engineering education from the Institutions of Higher Learning (IHL) or ministry departments can only help by providing training, using equipment and financial help in terms of loans and bursaries. Entrepreneurship itself can also be encouraged by instilling social consciousness in students; a sense that the ultimate goal and reward of engineering is not only by applying scientific principles for the betterment of the society, but also awareness that misguidance could do more harm than good. To provide these skills, educators can provide some form of experience to students by giving them project experiences where students practice serving the need of a society. From this sort of practice, students will be able to realize that entrepreneurship requires belief, patience, strategies and risk taking. The technology is part of the challenge but there are still a lot of issues to be dealt with including financing the venture (Messerschmitt & Stuck, 2008).

After graduating, engineering students who are looking for jobs will mostly work as engineers in factories, at managing projects and at construction sites. It will depend on what they studied as their major subject at the university (Richard, 1997). To become a business engineer will be extremely challenging and critical to the success of engineering firms in the future. Sears (1994) found that those who want to become the business engineers have to learn to define and create the variety or branch of work. For students, institutions will consult them in the engineering field with the application of technical skills on progressively more complex projects. As been studied, there is a bigger need for businesses with regard to managing budgets, schedules, and deliverables on progressively larger projects. Therefore training sessions will help students to be more creative and experience the real environment being in the entrepreneurship world. The education programme should include an introduction to the potential career path of business engineers. If it is expected of some graduate engineers to become business engineers seven to ten years after graduation, the graduate must be given some of the basic skills required to achieve that goal. Although undergraduates need to be exposed to these fundamental business concepts, the undergraduate education should not be the primary forum for training in engineering business management for business engineers.

Theoretically, research involving the gender issue for entrepreneurship will lead to two challenges. Firstly, to theorize differences between female and male entrepreneurs and secondly, to theorize place in such a way that the place-based constitution of gendered social relations, gender symbolism and gendered beings is recognized (Gunnerud 1997). According to the International Federation of Women Entrepreneurs - Ninth IFWE Global Conference (Unknown 2002); Gender has nothing to do with the success or failure of any businesses. There are really no sectors meant for just women entrepreneurs or any activity been exclusively the domain of males. The basic traits of good and effective entrepreneurship and management, apply to both men and women. However, in a particular scenario in Kelantan (one of the states in Malaysia) there are really most businesses fields dominated by women.

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Research Methodology

This chapter describes and elaborates the existing entrepreneurship sense of our respondents as ascertained from the survey questionnaires that were distributed to them. Respondents in this study are the final year engineering students ranging from the ages of 23 to 26 years from the Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia (UKM) or National University of Malaysia. At this engineering faculty, there are about 400 final year students from five different departments. These departments are the Mechanical and Materials Engineering Department (or JKMB for short), Electric and Electronics Engineering Department (JKEES), Process and Chemical Engineering Department (JKKP), Civil and Structural Engineering Department (JKAS), and Architecture Department (JSB). The questionnaire has been created based on the research scope and objective. The content of the research questionnaire is outlined below: 1. Personal Information of a Student; 2. Entrepreneurship Awareness; 3. Level of Student Participation in Entrepreneurship; 4. Self Awareness; and 5. Motivating Factors.

To make the questionnaire user-friendly, the research question structure is put in the format of a form with a set of statement and agreement, which the respondent decides on a Likert Scale of 1 to 5, with a scale value of one being the Least Agreed and a score of five being the Most Agreed. The respondents are given the questionnaire to complete at the beginning of one of their scheduled class. The survey is carried out for about three weeks where the final year engineering students are randomly given the questionnaire in their departments. Each questionnaire takes around 20 minutes to be answered. Out of 400 students, 370 successful survey questionnaires i.e. 92.5% of the total correspondents were collected. In order to translate the collected data into meaningful research results, a statistical technique was applied. The analysis for this study was carried out by using the SPSS 15.0 for Windows. The data analysis on entrepreneurship awareness will be discussed in this study.

Results and Discussions

The discussion of this research is divided into three sections i.e. gender, race, and course. Gender will be the main topic here as to compare entrepreneurship awareness between male and female students. As for the race factor, the research is only able to compare between the Malay and Chinese students. The Indian students are not included in this study due to a small number of them studying at the engineering faculty of this university. For information, Malaysia is a multi-racial population with three main ethnic groups: Malays, Chinese and Indians. Different courses towards entrepreneurship awareness also being discussed here.

Male versus Female towards Entrepreneurship

It can be seen from the data in Table 1 that a majority of students at the engineering faculty are women (60%). This table shows the trend at all the universities currently in Malaysia where female students are more than male students and therefore the statistics will affect the case study in this research.

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Gender	Frequency	Percentage (%)	
Female	225	60	
Male	150	40	
Total	375	100	

Table 1. Gender Population at the Faculty of Engineering, UKM

Since gender is the most interesting topic to be discussed (Gunnerud 1997), the authors of this report have done some comparison studies on gender role in entrepreneurship among engineering students. Firstly, for defining the overall entrepreneurial activity of students the authors asked the respondents whether they were thinking of becoming entrepreneurs. The results obtained are presented in Figure 2. Interestingly, a majority of female students (54.2%) has the intention to be active in entrepreneurship as compared to the male students. Male students (44.7%) were not sure if they had the intention of becoming entrepreneurs.



Figure 2. Students who intend to become entrepreneurs

On the subject of entrepreneurship, it is apparent from Figure 2 that the male students lack self confidence as compared to the female students. Perhaps, the male students would resort to entrepreneurship as their last choice. From the authors' perspective, this phenomenon occurs due to the nature of entrepreneurship being a high risk venture and also being an insecure form of income. Men are known to be the bread winners of their families so, perhaps the male respondents need a stable income to support their families. The surveys also proved that where there are instances of male respondents who are interested in becoming entrepreneurs are also are not prepared to take up the challenge of taking risks. This view is in line with the research findings of Nicolaou and Shane (2009), where he stresses that the tendency of people involved in entrepreneurial activities are influenced by their genes.

Table 2. The intention of	of exploring new entrepreneur	ship opportunities
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	Disagree (%)	Not Sure (%)	Agree (%)
Female	2.7	22.2	75.1
Male	5.3	30.0	64.7

From the data in Table 2, it indicates that female students (75.1%) are more interested in exploring new entrepreneurship opportunities in the university. As mentioned earlier in this study,

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there are more female students than the male students in this faculty. The most important factor that has to be taken into consideration is the industrial management perspective on female engineers. Despite the graduate level changes, the cultural image of engineering is perceived as a masculine profession (Evetts, 1998). Other authors cite the image has a significant impact on society and that contributes to engineering to be perceived as an unsuitable profession for women (Powell et al. 2004). In Malaysia, majority of industrial companies prefer male engineers to female engineers. Therefore, female engineering students try to look for alternative opportunities like venturing into entrepreneurship so that they would be able to build their career or be their own bosses or be self-employed.

The results for whether respondents are interested in attending any entrepreneurship courses obtained from the survey conducted are shown in Figure 3. The data shows that 31.1 per cent of female students are interested is less compared to 32.7 per cent of male students who are not interested or are not sure. This result confirmed that most of the female students are looking forward to enhance their entrepreneurship activities as compared to male students.



Figure 3. Percentages of Female and Male students who are not interested in attending entrepreneurship courses

In some situations in Malaysia, generally, the female students are known to be study-orientated and hardworking with more female students pursuing tertiary levels. It is believed that the female students carry the feminism and patience that will be very important in the entrepreneur field (Fischer et al., 1993). Throughout our experience and in certain cases, many male students always prefer more practical, hands-on and don't like to attend 'theory' classes. Perhaps, another reason why women are interested in entrepreneurship is because they wish to compete with the men, but men are supposedly more successful in business as compared to women. This is due to their brain capacity being more utilized and focused, which is scientifically proven by researchers (Satoshi, 2008).

Another question which the authors asked the respondents is whether they had recently set up a business or were at the time of the survey setting up a business. Although the majority of population is females, however, as can be seen from Table 3, more male students responded positively to this question as compared to their female counterparts. With the above explanations, the authors speculate that male students need extra pocket money as they do part time businesses for income while studying at the campus. These results show that to some extends, female students

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showed a better direction towards entrepreneurship awareness as compared to male students, although some of the male students have gained some business experience.

- perception towards setting up a business				
		Disagree (%)	Not Sure (%)	Agree (%)
	Female	26.2	27.1	46.7
	Male	28.7	21.3	50.0

Table 3. The perception towards setting up a business

Entrepreneurship Interest by Race

For the race category, only Malay and Chinese students are being compared and analyzed due to the population of Indian students being very small. The populations of Malay and Chinese students are 55.2 per cent and 41.3 per cent respectively whereas there is only about 2 per cent Indian students. Firstly, for defining the overall entrepreneurial activity among students of different races, the authors asked the respondents whether they were thinking of becoming entrepreneurs or would like to work as employees. As shown in Table 4, a majority of the Malay students (38.6%) prefer to work as employees. The percentage of Malay students who are not sure is also high i.e. 38.6 per cent as compared to Chinese students (31%).

Table 4. Intending to become entrepreneurs

	Disagree (%)	Not Sure (%)	Agree (%)
Malay	22.7	38.6	38.6
Chinese	32.3	31.0	36.8

Secondly, the authors asked the respondents whether they were thinking of becoming," your own boss" after completing their courses. It can be seen from Figure 4 that majority of Chinese students prefer or agree to become entrepreneurs (49.7%) as compared to Malay students (47.8%). This may be because of Chinese tradition or culture. During the British colonization period in Malaya, the main economic assets of the land were tin mines and rubber plantations. Chinese migrant workers worked in the tin mines while the Indians and Malays were mostly placed in rubber plantations and agricultural sectors respectively. Most of the located tin mines nowadays are major cities of the country such as Ipoh, Kuala Lumpur and Penang. Due to this, most of the current Chinese family backgrounds are business or entrepreneurship orientated. Therefore, the new upcoming Chinese youngsters i.e. students tend to follow the steps of their ancestors. This is supported by Nicolaou and Shane (2009) where the author highlights the tendency of people involved in entrepreneurial activity influenced by genetic or family background.

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Figure 4. Becoming their 'own bosses' after completing studies

Nowadays one can see that Malays and Indians are also building their own businesses and entrepreneurship skills. From this research, all students are equally given more opportunities and knowledge about entrepreneurship by universities and industries. The attitude of the Bumiputera (indigenous people) community towards entrepreneurship was also changed as the Government introduced many policies towards privatization and Small and Medium Industry (SMI) development. Besides, by encouraging privatization, new opportunities for the private sector have spawned several notable, Bumiputera organizations.

Courses for Entrepreneurship

In this research four different departments are being discussed. Figure 5 presents the population of each department respectively. The departments are Mechanical Engineering (JKMB-24.8%), Electrical Engineering (JKEES-30.1%), Civil Engineering (JKAS-19.5%) and Chemical Engineering (JKKP-18.9%). Architecture department is not discussed here as it is in low population range (JSB-6.7%).





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Interestingly, when the authors asked the respondents whether they want to be their own boss, a majority of mechanical students (JKMB-52.7%) agreed and also the same mechanical students population (JKMB-81.7%) are keen in becoming entrepreneurs after their studies which can be seen from Table 4 and Table 5 respectively. In the case of JKMB, the department has offered two engineering courses, i.e. mechanical engineering and manufacturing engineering. This phenomenon probably occurs due to the courses provided by the mechanical department (especially manufacturing students) which are not only technical focused but also focused on project management and entrepreneurship. In addition to it, manufacturing students tend to learn about entrepreneurship in courses such as Industrial Project, Manufacturing Strategy, and Economics etc. All these courses help the students to be independent in their future business plans and to be aware of entrepreneurship. This is supported by the Fauziah et al. (2004) where the author highlighted that entrepreneurship courses should be thought to technical students as well as business students in the universities.

8				
	DISAGREE (%)	NOT SURE (%)	AGREE (%)	
JKMB	11.8	35.5	52.7	
JKES	11.5	42.5	46.0	
JKAS	19.2	34.2	46.6	
JKKP	9.9	42.3	47.9	

Table 4. Becoming own bosses after completing studies

Table 5. Intention of becoming entrepreneurs

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	DISAGREE (%)	NOT SURE (%)	AGREE (%)	
JKMB	1.1	17.2	81.7	
JKES	8.8	26.5	64.6	
JKAS	4.1	16.4	79.5	
JKKP	11.3	22.5	66.2	

The respondents were also asked whether they had recently been involved in any entrepreneurship related events. The answers show that civil engineering students are more involved (57.5%) as compared to students from other engineering disciplines. Perhaps, this is due to the current syllabus of civil engineering is more practical in nature i.e. hands-on and field works. Besides that, it is believed that most of the civil engineering students are gained hands-on works on joint-venture projects with outside consultant firms in order to complete their courses. Therefore, these consultant firms sometimes request the students to get and actively involved or help them in finishing their projects.

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Figure 6. Being involved in entrepreneurship events

Conclusions and Suggestions

These research results are very interesting as a snap shot study in developing and enhancing the current awareness of entrepreneurship and motivation among the engineering students, particularly in developing country like Malaysia. The present study was designed to identify the current awareness of entrepreneurship among final year engineering students at UKM. The research results show that despite the considerable role of race and family background in developing the entrepreneurship spirit, education and learning (in the case of manufacturing students) and industrial support (in the case of civil engineering students) also play a role in enhancing the entrepreneurship awareness among these engineering students. The findings of this study suggest that IHL should concurrently implement both the entrepreneurship syllabus and industry joint-ventures in order for their graduates to have a better understanding of entrepreneurship.

There are some limitations of the present study. The most limitation lies in the fact that only the final year engineering graduates from one IHL in Malaysia is being discussed in this research. Further research is required to incorporate a wider range of graduates and make comparisons between other different IHL in Malaysia. A future research can also be considered where other sources of data such as feedback from alumni and employers from the industries especially in technical fields can be included. However, despite the weakness found in this research, the present research can be seen as a preliminary investigation of the opportunity to strengthen the awareness towards entrepreneurship at this university. Hopefully with better understanding in entrepreneurship by future graduates, the nation would be able to expand its human resource capital in entrepreneurship. This definitely will spur our intention to become a nation of entrepreneurs of a developed country in accordance to the Malaysian Vision of 2020 and One Malaysia (1Malaysia) - a dream of success.

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