

Factors Affecting Entrepreneurial Self-efficacy of Engineering Students

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Abstract

One of the most significant current discussions in economic development is entrepreneurship. Given government's commitment to entrepreneurship and innovation, higher institutions of learning are faced with the responsibility of curbing inherent challenges in today's graduate education. This is of particular concern among engineering students. This study was propelled by the tendency for engineering students to shy away from entrepreneurship as a career choice, particularly when they possess lower entrepreneurial self-efficacy than their fellow business students. A survey of engineering students from a Malaysian public university was conducted using 204 respondents. There were two major data analyses in this study. The relationship between personality traits and entrepreneurial self-efficacy of students were examined. Relationships between family background, as well as entrepreneurship education and entrepreneurial self-efficacy were also explored using Pearson correlation. Results obtained show that the relationship between each personality traits and entrepreneurial self-efficacy are different, emphasizing the relevance of personality traits in enhancing entrepreneurial self-efficacy. Positive correlations were found between family factors and entrepreneurial self-efficacy as well as between entrepreneurship education and entrepreneurial self-efficacy. Furthermore a multiple regression analysis showed that three variables entrepreneurship education, family factor and personality type reliably predicted entrepreneurial self-efficacy among engineering students surveyed. The results of this investigation show that perceived supports from family, competencies gained via entrepreneurship education and personality types affect entrepreneurial self-efficacy of engineering students.

Keywords: Entrepreneurial Self-efficacy; Commercialization; Innovation; Entrepreneurs

Introduction

There has been considerable global attention on entrepreneurship as a panacea for sustainable recovery from recent economic meltdown, yet so far, there has been no firm conclusions about how entrepreneurship programs should be structured in order to encourage non-business students to pursue entrepreneurial careers and grow sustainable ventures (Fayolle 2007). Entrepreneurship programs have become imperative in modern day higher institutions of learning, especially for the technology and science students. Although technical and scientific universities are potential origins of spin-off and start-ups (Kontio 2010), it has been discovered that entrepreneurial self-efficacy of engineering students is low compared to non-science and non-engineering students (Petrov, 2013; Pihie & Sani, 2008). With little entrepreneurial intention among technical and engineering students primarily due to low entrepreneurial self-efficacy (Yasin et al., 2011), it will be difficult to persuade engineering graduates to make entrepreneurship a career choice. Recent evidence suggests that entrepreneurial intention is largely dependent on entrepreneurial self-efficacy (Bernstein & Carayannis, 2012; Bullough et al., 2013; Yun, 2010).

Because of this, engineering students are likely going to turn away from entrepreneurship, thereby restricting inventions to the four walls of the laboratory (Yun 2010). Increasingly, entrepreneurial self-efficacy has been seen as a key determinant of intentions to start business venture (Brice & Spencer 2007; Boyd & Vozikis 1994). The perceived ability to succeed in business will motivate and encourage potential entrepreneurs into venture creation. Entrepreneurship is crucial in sustaining economic development of any nation and this has attracted the attention of policy makers globally and locally. Consequently, entrepreneurship has become important in public policy, mainly in the area of economic growth and employment creation. These considerations have thus heralded the birth of a number of strategies and plans needed for a healthy economy (OECD 2007).

Governments all over the world recognize technological innovative firms as entrepreneurial ventures that generate economic returns. Consequently, the governments have sown commitment in encouraging pervasive culture of creativity, innovation and entrepreneurship in science and technology alongside the establishment of an environment that inspires risk taking, rewards market-driven ideas and supports science and innovation (Ahn et al., 2010; Fuller, 2009). Though governments have saddled themselves with the responsibility of bringing idea to market and the tasks of commercialization of new technology will rest on the shoulders of universities, research institutes and the industries (Govindaraju et al., 2005). Govindaraju et al. (2005) suggested that “it is through technology commercialization a nation could join the rank of advanced nations”, as well as ensure that future generations will be more innovative (Kanga et al. 2012).

The main goal of this study is to examine factors that influence entrepreneurial self-efficacy among engineering students in a public university in Malaysia. The specific objectives of this study are as follow:

- To determine the relationship between entrepreneurial self-efficacy and personality traits of engineering students.
- To determine the relationship between family factors and entrepreneurial self-efficacy of engineering students.

- To examine the relationship between entrepreneurship education experience and engineering students' entrepreneurial self-efficacy.
- To identify the predictors of entrepreneurial self-efficacy among engineering students.

With high-tech and high-growth enterprises gradually taking a centre stage in public policies relating to entrepreneurship, institutions of higher learning are becoming a dynamic part of the innovation policies (Commission, 2013). As a result, policy makers have suggested that entrepreneurship at tertiary level should not be only for business students but for all (Chan, 2005; O'Connor, 2013; Ahmad, 2013). Most entrepreneurial development programs are thus organized as entrepreneurship education and trainings with a passionate desire to see the same outcome in engineering students as it obtains among the business students. Dreisler et al. (2006) believes this has led to numerous researches into entrepreneurship and innovation in education. The majority of entrepreneurial development programs are organized as entrepreneurship education and training. This study will be of great use to parents, policy makers, teachers, entrepreneurs and universities' faculty as it contribute to the body of knowledge in the field of entrepreneurship education. This study will also help to identify core factors in development of entrepreneurial self-efficacy among engineering students that could potentially lead to increased intentions and ultimately, venture creation.

Self-efficacy

Social cognitive theory describes how past, present, and future behavioural outcomes are influenced by the interaction a critical variables (Bandura 1989). SCT theorizes a triadic reciprocal relationship of causation that involves three separate elements that relate in a multidirectional way (Bandura 1999). Bandura's social cognitive theory describes self-efficacy as a future-oriented belief of the level of competence that is expected from a person during a given situation or for solving a particular task. Generally, self-efficacy has been seen as strong forecaster of behaviour in human actions. There are four principal sources of acquiring information by humans and each one represents a potential experimental way of enhancing or creating self-efficacy (Bandura, 1997). These sources include mastery experiences that serve as indicators of capability, vicarious experiences (i.e., modeling), verbal persuasions that serve as social indicators of capability, and physiological or affective states from which we judge our capability. Overall, self-efficacy has shown correlational and causative relationships with diverse areas of functioning.

Self-efficacy is embedded in the theoretical framework of social cognitive theory which describes the place and position of human mechanism as being able to control their actions and activities (Bandura, 1986). However, researchers have problems conceptualizing and measuring self-efficacy, especially, as it relates to teachers. Therefore, it has often been conceptualized and measured differently; though they all stick to the underlying principles (Skaalvik & Skaalvik, 2010). Bandura (1986) in his towering work on self-efficacy, especially, the organizational portion of self-efficacy, maintains, conceptually, that people are self-efficacious than it appears in reality. Though, many evidence have been brought to fore to prove this verity, yet it still needs more statistical evidence, especially, in the area of entrepreneurial education.

Entrepreneurial Self-Efficacy (ESE)

The past decade has seen the rapid development of self-efficacy in entrepreneurship discussions, the concepts was made popular by Krueger & Brazeal (1994), who also defined it as it as a trait of personal competence and control, which assist in the conversion of perceived failures into learning experiences. Self- efficacy has been theoretically and empirically correlated to both entrepreneurial intentions and career development. A recent study by Pihie & Bagheri (2011) investigated teachers' and students' entrepreneurial self-efficacy, pointed out the fact that students perceived their abilities to succeed as merely moderate. Consequently, this might lead to fewer entrepreneurial intentions among them as there is an already established relationship between entrepreneurial self-efficacy and entrepreneurial intention (Chen & He, 2011).

Furthermore, ESE had been associated with venture creation and growth. Previous studies have reported that entrepreneurial self-efficacy positively affects students demand for entrepreneurship education (Chun-mei et al., 2011), while Zhao et al. (2005) reported that entrepreneurship education increases students' entrepreneurial self-efficacy. Although Lebusa (2011) found that entrepreneurship education failed to improve students' entrepreneurial self-efficacy, entrepreneurship education with a well-planned and implemented curriculum undoubtedly impacts students with the skills necessary to prosper in business. Students with these skills have perceived abilities to succeed.

Over the years, researchers have sown unquenchable interest in entrepreneurial cognition. One of the most stimulating characteristics of entrepreneurs is entrepreneurial self-efficacy. There is a well-established relationship between entrepreneurial self-efficacy and entrepreneurial intention (Brice & Spencer, 2007; Chun-mei et al., 2011; Krueger & Brazeal, 1994; Naktiyok, Karabey, & Gulluce, 2010; Sweida & Reichard, 2013). Bandura (1997) reported that self-efficacy is fundamental in the entrepreneur's undertaking. Entrepreneurs must show self-confidence in their abilities to affect the situations which are fundamental to their success. Furthermore to win investors' confidence, an aspiring entrepreneur needs to display the skills and competencies that are needed to succeed (Kasouf et al., 2013). This has made entrepreneurial self-efficacy a vital predictor of entrepreneurs' success. Entrepreneurial self-efficacy gives entrepreneurs the support to continue in the face of challenging situations and to resist setback during the start-up lifecycle of the venture. Competing in the global business environment needs entrepreneurs who are self-efficacious and resilient, therefore the development of entrepreneurial self-efficacy of engineering students is imperative if they are to survive in today's competitive society.

Entrepreneurial Personality

Personality refers to behavioural pattern that are developed primarily during formative years. An argument positing that entrepreneurial career choice in some people could be traced to their personality type is still debatable. Nevertheless, it is becoming increasingly important in entrepreneurship that attention be paid to personality. A number of studies have also established that there is relationship between personality types and entrepreneurial intention (Obschonka et al., 2012; Zarafshani & Rajabi, 2011). Beyond entrepreneurial intention, it has also been emphasized that venture start-up and business success depend on personality type (Halim et al., 2011; Obschonka et al., 2013). Prieto (2011) believes that people with a proactive personality are prone to turn into social entrepreneur because of their aggressiveness in challenging social inequalities. Entrepreneurs recognize and exploit

opportunity. Recognition of opportunities can be seen as a trait, the same thing with exploitation of the opportunities considering the risk associated with it.

Dehkordi et al. (2012) showed that there are differences in the personality trait of entrepreneurs and non-entrepreneur based on certain traits (Need of achievement, Tendency to risk, Internal locus of control, Self-confidence, Tolerance of ambiguity, Innovativeness). The study highlighted that entrepreneurs have some essential psychological characteristics, which lead to the manifestation of specific personality traits. Zarafshani & Rajabi (2011) posited that in training entrepreneurs, educators should take into account the personality differences in learning styles of potential entrepreneurs. Traditional trait theories have identified various models, the most popular ones being the three-factor model as well as the Big Five' factor model. However, the Big Five personality classification in recent years has gained more attention in studies of entrepreneurial personality as it classifies different personality traits into conscientiousness, extraversion, openness to experience, neuroticism, and agreeableness.

Over the years the big five personality traits have been seen as widely acceptable constructs of personality traits. Although this has not been without challenges from many quarters, the Big Five personality traits still continue to gain the attention of researchers in many fields. A number of studies have tried to examine the link between the Big Five personality traits and entrepreneurial behaviour (Abdul et al., 2012; Ahmed et al. (2011); Chu, 2000; Khalafi, Razavi, & Behzadian, 2011; Shane, 2010; Zhao & Seibert, 2006). The tendency to become an entrepreneur can be examined through the general framework of the big five model (Shane, 2010). Wilfling & Silbereisen (2011) believe individuals tend to be attracted to the career that suits their personality trait and people with high scores on personality traits associated with entrepreneurial behaviour will inevitably choose entrepreneurship as a career.

Entrepreneurship Education

Entrepreneurship education has been linked to increase in entrepreneurial self-efficacy of potential entrepreneurs (Chell, 2008; Gürol & Atsan, 2006; Wilson, 2007). However, entrepreneurial self-efficacy among engineering and science students is still low compared with those of business students. This may be due to other factors outside entrepreneurship education. Entrepreneurship education equips potential entrepreneurs with the skills necessary to succeed in business. With perceived ability to succeed in business after acquiring the necessary skills through entrepreneurship education, entrepreneurial intention of students are found to have increased (Hamidi et al., 2008).

With much attention being paid to venture creation and small business management, it has been advocated that entrepreneurship education be inculcated into every program in higher education (Gürol & Atsan, 2006; Pittaway & Cope, 2007). A considerable amount of literature has been published on entrepreneurial intention. These studies have established positive relationship between entrepreneurship education and entrepreneurial intention (Naktiyok et al., 2010; Sánchez, 2011). Bernstein & Carayannis, (2012) also found that entrepreneurial intention among non-business students emerge as a result of entrepreneurship courses offered. Entrepreneurship education increases competences, thereby boosting the possibility of success for potential entrepreneurs at start-up (Elmuti, 2012).

Family factors

Most importantly, family plays a crucial role in the career choice of an individual. Some of the most convincing proofs indicating the influence of entrepreneurial role models on entrepreneurial development are presented in previous research studies on families of entrepreneurs. Scherer et al. (1989) argued that parents play a crucial role in influencing the learning process of their children. The effect of the family socialization environment, beliefs and practices on how children learn new concepts is significant. Children whose parents are self-employed are found to either start new ventures or continue the running of the family business as a career (Díaz-Casero et al., 2009; Leaptrott & Mcdonald, 2008). According to Carr & Sequeira (2007) previous participation in family owned business has exerts pronouncedly positive influence on entrepreneurial intention. Competence gained in the process as well as perceived support from family members boost their confidence and thus their intention. One of the major determinants of new firm formation is the presence of a role model in the family, who in many occasions provide the needed emotional supports at the developmental stage of the new venture (Arregle et al., 2013; Brixy, Sternberg et al., 2012; Chell & Baines, 2000). Scherer et al. (1989) emphasized the role of family backgrounds, beliefs and customs in the learning process of children, and maintained that the social environment of young ones has a significant influence on their entrepreneurial attitudes especially those impressed upon them by their parents. Students from home that have family businesses are found to be more confident about their ability to successfully run a business venture (Hallak et al., 2012). These students have gone through a learning process either as a result of helping out in the family business or observing the way their parents run the business. In addition, Ajzen's (1991) theory of planned behavior (TPB) reveals that subjective norms is a strong predictor of intention. According to Byabashaija & Katono (2011), Subjective norms could be defined as a measure of the peer and societal expectations placed on an individual with respect to conformity to certain behavioral pattern. Perceived supports from family and friends will boost their interest in entrepreneurship and will eventually directly or indirectly affect their entrepreneurial intention. Meanwhile Byabashaija & Katono (2011) maintain that in situations where friends and family expect graduate to take up an employment after graduation, perceived family support is weak for career choice in entrepreneurship, thus resulting in low entrepreneurial intention.

Theory and model relevant to the study

Social Cognitive Career Theory (Lent et al., 1994) originates from social cognitive theory by Bandura's (1986), which was developed from his previous, Social Learning Theory, and comprises complex reciprocal interactions between people, their behaviour, and their environments. Bandura's theory integrated elements of symbolizing, forethought, vicarious learning, self-regulation, and self-reflection. Bandura (1986), advanced the concept of self-efficacy out of his SCT model based on the understanding that individuals must first believe they have the capabilities to influence their environment then they ultimately exercise control over their actions in order to generate desired outcomes. Self-efficacy is one element of social cognitive theory. It plays a central role in governing our thought, motivations and actions (Ewen, 2010). Bandura (1989) argues that "self-efficacy beliefs function as an important set of proximal determinants of human motivation, affection and action". As a result, researchers in several field of study have paid much attention to self-efficacy as a component of Social Cognitive Career Theory.

According to Lent et al. (1994), a number of factors that influence self-efficacy (Figure 1). Although in the field of entrepreneurship, researchers have established a positive relationship between entrepreneurship education and entrepreneurial self-efficacy, entrepreneurial self-efficacy is observably low among engineering students compared with business students. There are other factors that influence self-efficacy from the model. This study will consider the inclusion of family and personality factor in addition to entrepreneurship education in a research framework that examines entrepreneurial self-efficacy among engineering students. These factors have been chosen because ‘the influence of family and personal life on career decisions is increasingly receiving substantial amounts of media attention’ (Beauregard, 2007). Moreover, a considerable amount of literature has been published on how one’s personal trait and family can influence an individual’s choice of career in entrepreneurship.

Conceptual Framework

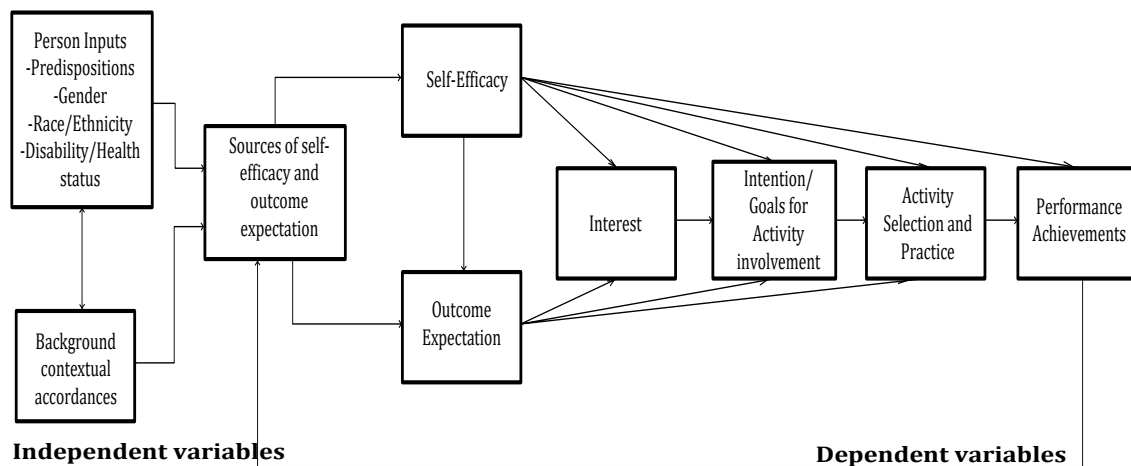


Figure 1. Social Cognitive Career Theory (SCCT)
Source: Adapted from Social Cognitive Career Theory (Lent et al., 1994).

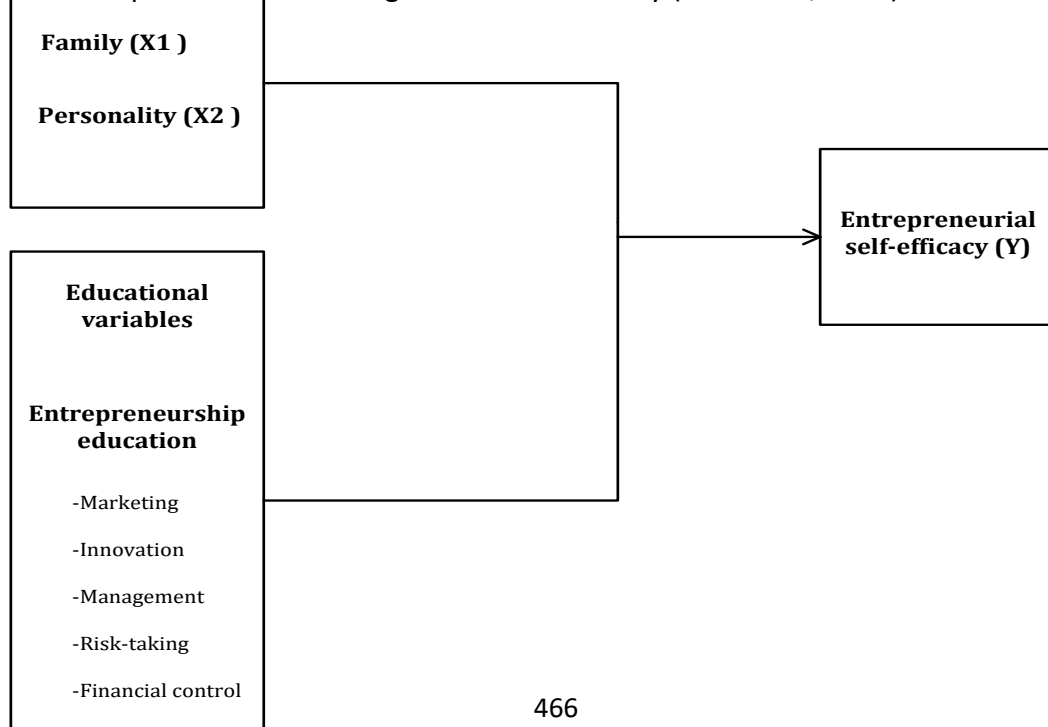


Figure 2: The research framework

Methodology

The purpose of this study is to understand the factors that influence entrepreneurial self-efficacy among engineering students based on Social Cognitive Career Theory. This study examines each of these factors in relation to entrepreneurial self-efficacy among engineering students. This is a correlational study design using survey procedures in data collection. The study was carried out using engineering students as survey respondents. Data were collected from engineering students in University Putra Malaysia using questionnaires with seven-point Likert-like scale starting from 1 =strongly disagree to 7=strongly agree. A total of 204 penultimate and final year students were surveyed. The questionnaires were adapted from the works of Baughn et al. (2006), Wang et al. (2010), Tung (2011), Vestergaard et al. (2012) and Gosling et al. (2003).

Table 1: Total of Scale Items Used in this work

| Constructs | Number of Items | Sources |
|--------------------------------------|-----------------|---|
| Family | 5 items | Baughn et al. (2006), Wang et al. (2010) |
| Entrepreneurship Education | 20 items | |
| Innovation | 4 items | |
| Marketing | 4 items | Tung (2011), Vestergaard et al. (2012) |
| Finance | 4 items | |
| Management | 4 items | |
| Risk-taking | 4 items | |
| Personality | 10 items | Gosling et al. (2003) |
| Entrepreneurial Self-Efficacy | 16 items | Baughn et al. (2006) |

The Statistical Package for the Social Sciences program (SPSS) version 20 for windows was used to analyze the data. Data analysis included simple descriptive statistics, correlation and multiple regressions. Simple descriptive statistics including frequencies and percentages were used to analyze the respondents' background and demographic data. Correlation analysis was performed to establish the strength of relationships between respondents' family factors and entrepreneurial self-efficacy of the respondents and likewise between Entrepreneurship education and students' entrepreneurial self-efficacy as well as between personality and entrepreneurial self-efficacy. In addition, multiple regressions were conducted for predictors of entrepreneurial self-efficacy. The analyses sought to provide an insights into that affect entrepreneurial self-efficacy among engineering students, as well as to test the applicability of the Social Cognitive Career Theory.

Table 2: Reliability tests of the instruments (N=204)

| Constructs | Number of Items | Cronbach's Alpha |
|-------------------------------|-----------------|------------------|
| Family | 5 | 0.843 |
| Entrepreneurship Education | 20 | 0.978 |
| Personality | 10 | 0.785 |
| Entrepreneurial Self-Efficacy | 16 | 0.958 |

Reliable and valid survey measurement is critical to the exactness of research findings. The reliability analysis of an instrument measures the ability of an instrument to consistently yield the same results when measurements are repeated on the items of instruments. In this study, both reliability and validity of the measurements were examined. Cronbach's alpha statistic, the most commonly used test method for the internal consistency, was used to check the measurement reliability. All the constructs yielded scores that were more than 0.70 the commonly recommended value.

Content or face validity was also used for this study. Content validity is a subjective but systematic assessment of the extent to which the content of a scale measures a construct. The measure is said to possess face validity when it appears apparent to experts that the measure sufficiently covers the concept. Items for the variables used in our study were carefully developed based on available literature on entrepreneurship and education.

Results

Among the 204 respondents, 55.9% were male and 42.6% were female while 1.5% accounted for missing value in that they failed to specify their gender. In term of race, 65.2% of respondents were Malay, 27.5% of the participants were Chinese, 2% of them were Indian and 3.9% of them belonged to other races while 1.5% did not specify their race. As touching the number of entrepreneurship related course(s) that have been taken by the respondents, 69.6% of them have taken one entrepreneurship related course, 8.8% of them have taken two entrepreneurship related courses and 1% of them have taken three entrepreneurship related courses. 59.8% were in the third year of their study and 29.9% in the fourth year of their study and 10.3% did not indicate the year of their study.

Table 3: Correlation between Big five personality traits and Entrepreneurial Self-Efficacy

| Variables | 1 | 2 | 3 | 4 | 5 | 6 |
|---------------------------------|--------|--------|--------|-------|--------|---|
| 1 Entrepreneurial self-efficacy | | | | | | |
| 2 Extraversion | .281** | | | | | |
| 3 Openness to Experience | .281 | .307** | | | | |
| 4 Agreeableness | -.019 | -.169 | .112 | | | |
| 5 Conscientiousness | .244** | .376** | .507** | -.050 | | |
| 6 Emotional Stability | .346** | .349** | .361** | .119 | .406** | |

** . Correlation is significant at the 0.01 level (2-tailed).

The results of the correlational analysis between entrepreneurial self-efficacy and the big five personality traits are summarized in Table 2 above. The correlations between entrepreneurial self-efficacy and extraversion ($r = .281$, $p < .05$), conscientiousness ($r = .244$, $p < .05$) and

emotional stability ($r = .346$, $p < .05$) were all positive and statistically significant. Meanwhile the correlation between entrepreneurial self-efficacy and openness to experience ($r = .281$) was positive but not statistically significant. Entrepreneurial self-efficacy however correlated negatively ($r = -.019$) with agreeableness. This relatively was however not significant.

Table 4: Correlation between Family, Entrepreneurship Education and Entrepreneurial Self-Efficacy

| Variables | Family | Entrepreneurship Education | Entrepreneurial Self-Efficacy |
|-------------------------------|--------|----------------------------|-------------------------------|
| Family | 1.000 | | |
| Entrepreneurship Education | .682 | 1.000 | |
| Entrepreneurial Self-Efficacy | .587 | .762 | 1.000 |

Correlation is significant at the 0.01 level (2-tailed)

Results from correlation analysis as presented in Table 4 are significant at the $p = 0.01$ level. There was a significant correlation between entrepreneurship education and entrepreneurial self-efficacy ($r = .762$, $n = 190$, two tailed $p < .01$), Higher entrepreneurial self-efficacy was associated with entrepreneurship education. The most notable finding was a significant positive correlation between family and entrepreneurship education ($r = .682$, $n = 197$, two tailed $p < .01$). Social learning theory found its origin from the prominence on learning from other people with a central idea that behaviour results from the interaction of situations and persons.

However, the goal of improving entrepreneurship awareness and attitude among engineering students is generally not considered unattainable. Despite the fact that their choices of study have been influenced by a number of factors in which job seeking in engineering firm is a major determinant, entrepreneurship education as an experiential way of learning could help strengthen a potential engineering entrepreneur's self-belief in his or her ability to and create a new business. Engineering students have domain-specific knowledge from their chosen field of education that determines the type of opportunities they will recognize. While normally all entrepreneurs search their personal and everyday life to come up with new ideas, engineering students have the advantage of a specific field of knowledge that may provide innovative ideas for new businesses (Fayolle 2007). For example, engineers deal with technological developments and innovation on a daily basis (Drucker, 1985; Fayolle, 1999). When teaching entrepreneurship education to engineering students, educators should realize they should build on the domain-specific knowledge that the students have acquired during other courses.

As shown in the Table 2 above, there was a positive correlation ($r = 0.587$) between the respondents' perceived support from their family and their entrepreneurial self-efficacy. The development of entrepreneurial behaviour will likely occur when an individual observes a valued model which could be their parents. Upon discovery that their involvement in entrepreneurship have been rewarding, this may tend to positively affect the entrepreneurial self-efficacy of their descendants (Zarafshani & Rajabi, 2011). Furthermore, the competencies gained through experience in their participation in family business can without doubt enhance their entrepreneurial self-efficacy (Ahmed et al., 2011). Although students whose

parents own a business learn their socialization process in the family environment, entrepreneurship education could be of help in the socialization process of students whose parents have no business experience.

Table 5: Summary of Multiple Regression Analysis

| Variables | B | SEB | β |
|----------------------------|------|------|---------|
| Entrepreneurship Education | .439 | .044 | .611 |
| Family Factor | .307 | .151 | .124 |
| Personality Trait | .385 | .098 | .195 |

Note* $p < .05$; B = unstandardized regression coefficient; SEB = Standardized error of the coefficient; β = standardized regression coefficient

A multiple regression analysis was run to predict entrepreneurial self-efficacy from variables such as entrepreneurship education family factor and personality trait. The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were met. These variables significantly predicted entrepreneurial self-efficacy, $F(3, 197) = 98.946$, $p < .0005$, adj. $R^2 = .62$. All three variables added significantly to the prediction ($p < .05$). Regression coefficients and standard errors obtained are presented in Table 4. This establishes the predictors of entrepreneurial self-efficacy of engineering students based on Social Cognitive Career Theory.

Discussion

This study has shown that perceived supports from family member could positively affect entrepreneurial self-efficacy of engineering students. Students with the belief that family member will support their effort to make entrepreneurship a career choice have the perceived abilities to succeed in the business world. Furthermore, friends and family remain potential sources of financial and social capital. Past researches have established the influence of family business on venture creation of potential entrepreneurs and the performance of their firms (Hallak et al., 2012; Robinson & Stubberud, 2012). The competencies and connection gained from running family business affect entrepreneurial self-efficacy of students that come from homes with family business.

The second major finding was the observed a positive relation between entrepreneurship education and entrepreneurial self-efficacy which aligned with previous studies (Chell, 2008; Gürol & Atsan, 2006; Wilson, 2007). Competencies students acquired through entrepreneurship education increase their confidence of becoming successful in the real business world. Entrepreneurship education has also been found to have positive relationship with entrepreneurial intention and opportunity recognition. Additionally, these are positively correlated with entrepreneurial self-efficacy (Naktiyok et al., 2010; Sánchez, 2011). With the perceived ability to successfully run a business students may signal their intention to go into business and then begin to scan the environment for potential opportunities.

The relevance of personality types in entrepreneurship is clearly supported by the current findings. It was discovered that each of the personality traits has different effect on entrepreneurial self-efficacy. This stance is also supported by available literatures (Obschonka et al., 2013a, 2012; Okhomina, 2010). An entrepreneur is characterized by creativity, innovativeness and risk taking which can be found in a person that scores high on openness. Comparing the correlation co-efficient between entrepreneurial self-efficacy and the five personality types, it was found that Emotional Stability was positively related with entrepreneurial self-efficacy. Notably also the obtained correlation co-efficient was higher than was obtained for others comparisons. Furthermore, this trait does not favour entrepreneurial personality. Extraversion, Openness to Experience and Conscientiousness were found to be good traits of entrepreneurs as they all showed positive relationship with entrepreneurial self-efficacy. The relationship between entrepreneurial self-efficacy and Openness to Experience was however not statistically significant.

Consequently, family factors, personality traits and entrepreneurial education affect entrepreneurial self-efficacy in the context of this study according to Social Cognitive Career Theory. Exclusive attention to these factors is important in our bid to produce generations of engineering entrepreneurs. Each of these factors are vital in determining the career choice of students. The family plays a pivotal role in the formation of personality either through inheritable factor and/or socialization in the family. It is worthwhile to note that the parents

career also affect the choice of programs that students opted to study in higher institution. For those that have been affected negatively as related to entrepreneurship due to un-entrepreneurial family influence, entrepreneurship education is another form of organizational socialization where personality can be reformed and transformed in favour of entrepreneurship.

Conclusions

The findings of this study have shown that family factor plays a crucial role in entrepreneurial self-efficacy of engineering student, having relatives that are self-employed and perceived supports from members of their family enhance their entrepreneurial self-efficacy. In addition, their personality traits also determine whether these students believe in their ability to success as an entrepreneur, for those of them that are innovative, creative and are not afraid of taking calculated risk are born to success as entrepreneurs. Finally, the competencies gained through entrepreneurship education experience have great impact on their entrepreneurial self-efficacy. Based on findings of this study, family factor, personality traits and entrepreneurship education are essential and the development of these are crucial in engineering students for a career choice in entrepreneurship. Entrepreneurship educator should tailor the objectives of their training toward the reformation and transformation into entrepreneurial personality among engineering students.

In view of these, policy makers should see to impactful implementation of policy that encourage family business and sensitize the populace on the benefits from entrepreneurship. With these benefits in mind the society at large can give the supports needed to spur engineering students' interest in entrepreneurship.

References

- Ahmad, S.Z., 2013. The need for inclusion of entrepreneurship education in Malaysia lower and higher learning institutions. *Education + Training*, 55(2), pp.191–203.
- Ahmed, I., Aamir, M. & Ijaz, H.A., 2011. External factors and entrepreneurial career intentions ; moderating role of personality traits. *International Journal of Academic Research*, 3(5), pp.262–268.
- Ahn, M.J., Gray, B.J. & Collier, A., 2010. *Centre for Entrepreneurship Working Paper Series Innovation, Technology Transfer and Commercialisation in New Zealand*.
- Ajzen, I., 1991. The theory of planned behavior. *Organizational behavior and human decision*, 50, 179-211.
- Arregle, J.-L. et al., 2013. Family Ties in Entrepreneurs' Social Networks and New Venture Growth. *Entrepreneurship Theory and Practice*,
- Bandura, a, 1989. Human agency in social cognitive theory. *The American Psychologist*, 44(9), pp.1175–84.
- Bandura, A., 1999. Social cognitive theory: An agentic perspective. *Asian Journal of Social Psychology*, 2(1), pp.21–41.
- Baughn, C. C., Cao, J. S. R., Le, L. T. M., Lim, V. a., & Neupert, K. E. (2006). Normative, Social and Cognitive Predictors of Entrepreneurial Interest in China, Vietnam and the Philippines. *Journal of Developmental Entrepreneurship*, 11(01), 57–77.
- Bernstein, A.T. & Carayannis, E.G., 2012. Exploring the Value Proposition of the Undergraduate Entrepreneurship Major and Elective Based on Student Self-Efficacy and Outcome Expectations. *Journal of Knowledge Management, Economics and Information Technology*, pp.265–279.

- Boyd, N. & Vozikis, G., 1994. The influence of self-efficacy on the development of entrepreneurial intentions and actions. *Entrepreneurship Theory and Practice*.
- Brice, J. & Spencer, B., 2007. Entrepreneurial Profiling: A decision policy analysis of the influence of entrepreneurial self-efficacy on. *Academy of Entrepreneurship Journal*, 13(2), pp.47–68.
- Brixy, U., Sternberg, R. & Stüber, H., 2012. The Selectiveness of the Entrepreneurial Process. *Journal of Small Business Management*, 50(1), pp.105–131.
- Bullough, A., Renko, M. & Myatt, T., 2013. Danger Zone Entrepreneurs: The Importance of Resilience and Self-Efficacy for Entrepreneurial Intentions. *Entrepreneurship Theory and Practice*, (602), p.n/a–n/a.
- Byabashaija, W. & Katono, I., 2011. the Impact of College Entrepreneurial Education on Entrepreneurial Attitudes and Intention To Start a Business in Uganda. *Journal of Developmental Entrepreneurship*, 16(01), pp.127–144.
- Carr, J.C. & Sequeira, J.M., 2007. Prior family business exposure as intergenerational influence and entrepreneurial intent: A Theory of Planned Behavior approach. *Journal of Business Research*, 60(10), pp.1090–1098.
- Chan, E.S.K., 2005. Entrepreneurship Education in Australia- A Preliminary Study. *Journal of Asia Entrepreneurship and Sustainability*, (Garcia 1999), pp.1–16.
- Chell, E. & Baines, S., 2000. Networking, entrepreneurship and microbusiness behaviour. *Entrepreneurship & Regional Development*, 12(3), pp.195–215.
- COMMISSION, E., 2013. *Entrepreneurship 2020 Action Plan: Reigniting the entrepreneurial spirit in Europe*,
- Dehkordi, A. M., Sasani, A., Fathi, M., & Khanmohammadi, E. (2012). Investigating the Effect of Emotional Intelligence and Personality Traits on Entrepreneurial Intention Using the Fuzzy DEMATEL Method. *International Journal of Business and Social Science*, 3(13), 286-296
- Díaz-Casero, J. C., Ferreira, J. J. M., Mogollón, R. H., & Raposo, M. L. B. (2012). Influence of institutional environment on entrepreneurial intention: a comparative study of two countries university students. *International Entrepreneurship and Management Journal*, 8(1), 55-74.
- Dreisler, P., Blenker, P. & Kjeldsen, J., 2006. *Entrepreneurship Education – the New Challenge Facing the Universities: A framework or understanding and development of entrepreneurial university communities*,
- Fayolle, A. ed., 2007. *Handbook of research in entrepreneurship education, volume 2*, Edward Elgar Publishing Limited.
- Fuller, D.B., 2009. *Reinvigorating Hong Kong 's Innovation System : An Overview of Hong Kong Innovation Project A project commissioned by Savantas Policy Institute Report prepared by Dr . Douglas B . Fuller and the Project Team Reinvigorating Hong Kong ' s Innovation System*,
- Gosling, S.D., Rentfrow, P.J. & Swann, W.B., 2003. A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, 37(6), pp.504–528.
- Hallak, R., Assaker, G. & O'Connor, P., 2012. Are Family and Nonfamily Tourism Businesses Different? An Examination of the Entrepreneurial Self-Efficacy-Entrepreneurial Performance Relationship. *Journal of Hospitality & Tourism Research*.
- Govindaraju, V. C., Sundram, V. P. K., Kamil, M. H. B. M., Ibrahim, Z., & Ghapar, F. B. A. (2005, February). SCIENCE, TECHNOLOGY AND INNOVATION IN MALAYSIA: WHAT DO THE KEY INDICATORS SUGGEST?. In Presented at "IRPA seminar on (Vol. 25, p. 27).

- Kanga, M., Cockbain, P., Khajeh, M., Fernando, S., McMullan, P., & Stone, J. (2012). Innovation in engineering.
- Kontio, J., 2010. Inspiring the inner entrepreneur in students – a case study of entrepreneurship studies in Tuus. In *International CDIO Conference*. Montréal.
- Krueger, N.F. & Brazeal, D. V, 1994. Entrepreneurial Potential and Potential Entrepreneurs. *Entrepreneurship theory and practice*.
- Leaptrott, J. & McDonald, J.M., 2008. Entrepreneurial opportunity exploitation and the family : relationship-based factors that affect the adult child ' s decision to jointly participate with parents in a new venture. *The Entrepreneurial Executive*, 13, pp.101–116.
- Lebusa, M.J., 2011. Does Entrepreneurial Education Enhance Under-graduate Students ' Entrepreneurial Self-efficacy ? A Case at one University of Technology in South Africa. , 10(1), pp.53–64.
- Lent, R.W., Brown, S.D. & Hackett, G., 1994. Toward a Unifying Social Cognitive Theory of Career and Academic Interest, Choice and Performance. *Journal Vocational Behavior*, 45.
- O'Connor, A., 2013. A conceptual framework for entrepreneurship education policy: Meeting government and economic purposes. *Journal of Business Venturing*, 28(4), pp.546–563.
- OECD, 2007. *OECD Reviews of Innovation Policy New Zealand*,
- Petrov, V., 2013. Self-Efficacy Among Students Of Engineering In Novi Sad. In *The 6th PSU-UNS International Conference on Engineering and Technology (ICET-2013)*, Novi Sad, Serbia. Novi Sad, Serbia, pp. 1–5.
- Pihie, Z. & Bagheri, A., 2011. Teachers' and Students' Entrepreneurial Self-efficacy: Implication for Effective Teaching Practices. *Procedia-Social and Behavioral Sciences*, 00, pp.1071–1080.
- Pihie, L., Akmaliah, Z., Sani, A., & Salleh, A. (2008). Science and Engineering Students: are they entrepreneurial?. *The International Journal of Learning*, 15(7), 105-110.
- Scherer, R., Adams, J. & Wiebe, F., 1989. Developing entrepreneurial behaviours: A social learning theory perspective. *Journal of Organizational ...*
- Vestergaard, L., Moberg, K. & Jørgensen, C., 2012. *Impact of Entrepreneurship Education in Denmark - 2011*,
- Wang, L., Prieto, L. & Hinrichs, K.T., 2010. Direct and Indirect Effects of Individual and Environmental Factors on Motivation for Self-Employment. *Journal of Developmental Entrepreneurship*, 15(04), pp.481–502.
- Yasin, A.Y.M., Mahmood, N.A.A.N. & Jaafar, N.A.N., 2011. Students ' Entrepreneurial Inclination at a Malaysian Polytechnic : A Preliminary Investigation. , 4(2), pp.198–208.
- Yun, C., 2010. Does entrepreneurship education matter students ' entrepreneurial intention ? A Chinese perspective. *IEEE*, (2009), pp.3–6.
- Zhao, H., Seibert, S. & Hills, G., 2005. The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of Applied Psychology*, 90(6), pp.1265–1272.