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The Effect of Entrepreneurial Traits in Relation to Technology Entrepreneurship Education and Entrepreneurial Behavior

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ABSTRACT

Entrepreneurship has become an important national agenda especially in creating young entrepreneurs. This paper aims to determine entrepreneurial behavior through technology entrepreneurship education and entrepreneurial personality traits of students from the Science and Technology clusters. The purpose of technology entrepreneurship as a subject is to encourage students to embark on their entrepreneurship venture using technology. A total of five hundred and ninety-two usable questionnaires were collected at the end of the semester. Partial Least Square was utilized to explore the relationship of variables. Entrepreneurial personality traits mediated the relationship between technology entrepreneurship education and entrepreneurial behavior despite the lack of business exposure among students. Technology entrepreneurship education helps to foster entrepreneurial behavior among students. In addition, knowing students' entrepreneurial personality traits further strengthens entrepreneurial behavior.

Keywords: *Entrepreneurial behavior, entrepreneurial personality traits, technology entrepreneurship education*

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INTRODUCTION

Entrepreneurship has been comprehended as a fundamental ground of successful economies as well as a powerful stimulus of hope for developing economies. It works as an engine that drives the economies of most nations. In Malaysia, as it is moving towards Vision 2020, to become a developed economy, the need to integrate education and entrepreneurship becomes an important strategy for the creation of nation's wealth and generation of employment. The latter has grown into a great concern of the government since the number of unemployed youths is growing faster and larger compared to the creation of jobs in Malaysia (The Malay Mail, 2016). The record shows the number of graduates was 4,005,400 while the number of skilled jobs available was 3,587,500 in 2015. Ideally, entrepreneurship education is a central point in advancing entrepreneurial awareness and activities. Giacomini et al. (2011) explain that entrepreneurship education is crucial as entrepreneurial activities involved are essential elements of employment, innovation and economic growth. In Malaysia, the Ministry of Higher Education (MOHE) through their Malaysia Education Blueprint (MEB 2015-2025) requires universities to provide entrepreneurship education in their academic programmes in order to produce graduates with entrepreneurial skills. Technology entrepreneurship (TEE) is a special strand of entrepreneurial education (EE) that has been developed and implemented by some Institutes of Higher Learning (IHL) for students who are studying science, technology, engineering and mathematics. The TEE subject may help to increase student's awareness about opportunities and challenges in entrepreneurship. The development of young graduate entrepreneurs is a critical area to be looked into to reinforce the character of youths whether in the form of employment or business venture through education. This paper aims to study the impact of technology entrepreneurship education on entrepreneurial behavior among the students in the Science and Technology cluster in the Universiti Teknologi MARA with the inclusion of entrepreneurial personality traits of students as a mediating variable in order to establish a framework that would show the relationship of each dimension.

LITERATURE REVIEW

Technology Entrepreneurship Education and Entrepreneurial Personality Traits

Entrepreneurship education has been addressed extensively in most higher learning institutions all over the world. Entrepreneurship education plays a significant role in influencing entrepreneurial personality traits amongst students (Küttima et al. 2014). The content of entrepreneurship education has to respond to the growing interest and demand. Currently the programs seem to focus on new venture creation in science and technology. TEE plays a critical role in orienting and developing future engineering students and young entrepreneurs, by providing them the skills, knowledge and capabilities to launch and manage new business ventures (Dutta et al., 2011). Recently, TEE has gained interest among researchers and policy makers to recognize the positive impact on economic development, although, this field is in its infancy compared to other fields such as economics, entrepreneurship and management. As technology entrepreneurship is quite new, some researchers relate technology entrepreneurship as technology innovation (Beckman et al., 2012). It is important to study about traits as the traits model has been a significant element of research on entrepreneurship recently. Various research studies have analyzed certain personality traits as the characteristics of entrepreneurs. According to Gurol and Ahsan (2006), the entrepreneurial personality traits (EPT) comprises of six personality characteristics which are achievement, locus of control, risk taking propensity, tolerance for ambiguity, innovativeness and self-confidence.

H1: Technology Entrepreneurship Education has a positive relationship to Entrepreneurial Personality Traits

Entrepreneurial Personality Traits and Entrepreneurial Behavior

Summers (2000 as cited in Daim et al. 2016) emphasizes that the main element of entrepreneurial behavior (EB) is the combination the individual's experience, background and motivation to start a business. EB can be referred to as an ability to recognize business opportunities (Chell, 1999) which is further added by Palma et al. ((2009) as an intention to make

a profit from new business opportunities. EB which covers three separate activities, namely; the identification of a new business opportunity; the formation of a new venture to exploit that opportunity, and the management of the new venture to make it grow over time (Palma et al. 2009). In addition, entrepreneurial behaviors of individuals are motivated and/or stimulated by their personality traits and socio-cultural history (Mueller and Thomas, 2001). EPT assumes that entrepreneurs have certain characteristics, attitudes and values that make them unique (Karabulut, 2016). In addition, participation in entrepreneurship education and activities has a positive influence on students' entrepreneurial engagement and shows a higher intention for students to form their businesses (Ajike et al. 2015, Wong et al. 2014). Technology entrepreneurship is about linking individuals to technological knowledge for the purpose of creating and capturing value to create new business opportunities. Therefore, exposure of students in technology, coupled with exploitation of entrepreneurial personality traits, can foster an entrepreneurial behaviour amongst students since entrepreneurship and entrepreneurial attitude are not totally innate and they can be cultivated by education (Chen et al. 2012).

H2: Entrepreneurial Personality Traits has a positive relationship to Entrepreneurial Behavior

H3: Entrepreneurial Personality Traits mediates the relationship between Technology Entrepreneurship Education and Entrepreneurial Behavior

METHODOLOGY

The unit of analysis in this study is students from the Science and Technology cluster who have attended the technology entrepreneurship class for one semester in Universiti Teknologi MARA, Malaysia. Non-probability purposive sampling was used in this study whereby only students who have attended the technology entrepreneurship class were chosen and those who were not involved were excluded from the sample. The subject is one of elective subjects introduced since 2003. Respondents of this survey have classes in Technology Entrepreneurship for 14 weeks. In this class, students were introduced to the fundamentals of entrepreneurship and how to identify business opportunities through technology. Out of 15 faculties,

only 5 faculties were selected and a total of five hundred and ninety-two usable questionnaires were collected. Table 1 shows the respondents' profile.

Table 1: Respondent Profile

Variable	Category	Frequency	%
Gender	Male	226	38.1
	Female	368	61.9
Age	19-21 years old	192	32.3
	22-25 years old	396	66.7
	> 25 years old	5	1
Faculty	Faculty of Mechanical Engineering	154	25.9
	Faculty of Built Environment	154	25.9
	Faculty of Art & Design	26	4.4
	Faculty of Applied Science	159	26.8
	Faculty of Science Computer	101	17

Most of the respondents were female (61.9%) while males represented 38.1% of the sample. The majority of respondents were from the age group 22 – 25 years old and 51.8% of respondents were from the Faculty of Mechanical Engineering and Faculty of Built Environment (51.8%). About 34.2% have less than 1 year experience in a business venture. Only 20.7% of respondents are currently running a business while 79.3% are not in business while 45.8% have no exposure to any business venture.

Constructs Development

The EPT measurements were adopted from several authors such as the need for achievement measurement was adopted from Kristiansen and Indarti (2004), innovativeness, proactive and locus of control adapted from Mueller and Thomas (2001). Risk-taking was adapted from Koh (1996) while the tolerance of ambiguity scale was adapted from Kirton (1981). Entrepreneurial behavior comprises of attitude towards entrepreneurship, subjective norms and perceived behavioral control was adopted from Linan and Chen (2006) and Karimi et al. (2016). Items from Gurol and Atsan (2006) and Remeike et al. (2013) were adopted for entrepreneurship education. Items statements in the variables sections were measured as subjective estimates using a five-point Likert scale (with 1 = strongly disagree and 5 = strongly agree).

Data Analysis

The SPSS 22.0 was used for descriptive statistical analysis and correlation analysis. The latent constructs, TEE, EPT and EB were analyzed using Structural Equation Modeling (SEM). For this study, the Partial Least Squares (PLS) was used because it can handle small samples, non-normal distributions and formative construct (Hair, Sarstedt, Ringle & Mena, 2012). The PLS structural equation model is composed of two sub-models: the measurement model and structural model. The measurement model represents the relationships between the observed data and the latent variables. The structural model represents the relationships between the latent variables. In this study, the data was analysed using the SmartPLS version 3.0.

Measurement Model

Convergent validity is the degree to which multiple items to measure the same concept are in agreement (Hair et al., 2017). As suggested by Hair et al., (2010, 2013) we used factor loadings, composite reliability (CR) and the average extracted (AVE) to assess convergent validity. The recommended values for loadings were set at > 0.5 , the AVE should be > 0.5 and the CR should be > 0.7 . Figure 1 presents the framework for this study where EPT and EB are presented as second-order constructs. Table 2 shows that the results of the measurement model exceeded the recommended values indicating sufficient convergence validity

Table 2: The Measurement Model

1 st Order	2 nd Order	Items	Loadings	CR	AVE
Technology		9	0.709- 0.783	0.932	0.572
Entrepreneurship					
Education					
Need of Achievement		3	0.803- 0.818	0.854	0.661
Innovativeness		3	0.748-0.825	0.831	0.621
Proactive		2	0.894-0.895	0.889	0.800
Risk Taking		2	0.912- 0.914	0.914	0.841
Locus of Control		2	0.883- 0.899	0.885	0.794
Tolerance of Ambiguity		3	0.770- 0.818	0.843	0.641

	Entrepreneurial Traits			0.891	0.357
Attitude		2	0.917- 0.918	0.914	0.842
Subjective Norms		3	0.886-0.924	0.928	0.811
Perceived Control Behavior		4	0.752- 0.872	0.854	0.661
	Entrepreneurial Behavior			0.902	0.506
Notes: AVE – Average Variance Explained; CR – Composite Reliability					

Discriminant analysis is the degree to which items differentiate among constructs or measure distinct concepts (Hair et al., 2017). As suggested by Henseler, Ringle and Sarstedt (2015), this study used the Heterotrait-monotrait Ratio of Correlations (HTMT) to detect the lack of discriminant analysis. If the HTMT value is below 0.90, discriminant validity has been established between two reflective constructs. Table 3 shows the results of the discriminant analysis where all values are below 0.90 thus demonstrating adequate discriminant validity.

Table 3: Discriminant Analysis

Construct	1	2	3
1. TEE	0.757		
2. EPT	0.638	0.598	
3. EB	0.655	0.557	0.711

Structural Model

Structural equation modeling was used to test the causal relationships among TEE, EPT and EB. In PLS, the path coefficients (t-values) and R-square were used to measure the strengths of latent variables. As shown in Figure 1, the model’s predictive explanatory power for entrepreneurial behavior refers to R-square to explain how much of the variance in the dependent variable can be explained by the independent variable. Using the bootstrapping technique with a re-sampling of 500, the path estimates and

t-statistics were calculated for the hypothesized relationships. TEE explained 37.2% of variance in EPT while both TEE and EPT explained 36.9% of variance in EB. Table 3 presents the outcome for the hypotheses. From the analysis, it was found that TEE ($\beta = 0.610, p < 0.000$) was positively related to EPT. While EPT ($\beta = 0.492, p < 0.000$) was positively related to EB. Total effect through bootstrapping was used to test the mediation analysis that fulfill the Hair et al. (2014) criteria for assessing the mediation effect, and later on, the VAF (variance account for) calculation proved that mediation exist through entrepreneurial personality traits between technology entrepreneurship education and entrepreneurial behavior. The coefficient of determining R^2 had a moderate value of 0.242 for EB, substantiating the model's predictive validity (Hair et al., 2013). This finding is also supported by the Q^2 value (Geisser, 1974; Stone, 1974) of the predictive relevance. After running the blindfolding procedure (Henseler et al., 2009) with an omission distance D 7, the Q^2 value of EB (0.114), which is well above zero, indicated the predictive relevance of the PLS path model. Total effect through bootstrapping was used to test the mediation analysis that fulfills the Hair et al. (2014) criteria for assessing the mediation effect, and the VAF calculation (99%) proved that a mediation effect exists between TEE and EB.

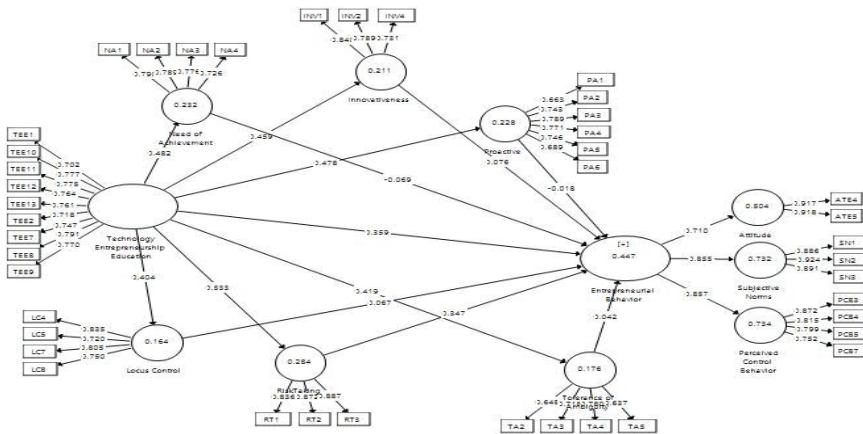


Figure 1. Structural Model

Table 4: Hypotheses Testing

Hypothesis	Beta	SE	t-value	p-value	f ²	r ²	q ²	Findings
H1								
TEE -> EPT	0.610	0.057	20.944	p>0.000	0.593	0.372	0.112	Supported
H2								
EPT -> EB	0.492	0.080	5.008	p>0.000	0.319			Supported
H3								
TEE -> EPT->EB	0.300	0.074	13.375	p>0.000		0.242	0.114	Supported

DISCUSSION

The purpose of this study was to determine the antecedents of entrepreneurial behavior of students in the Science and Technology clusters. The findings show that technology entrepreneurship education has a positive relationship to entrepreneurial behavior which is similar to Norasmah et al (2010), Gurol & Ahsan (2016), Wong et al. (2014), Rengiah & Sentosa (2016) thus supporting H1. The relationship between EPT and EB was positive therefore H2 is also supported. This finding is similar to Gurol & Ahsan (2006), Yan (2010). In fact, the inclusion of entrepreneurial personality traits (EPT) had further strengthened the relationships (Busige, 2008). The findings also revealed that, entrepreneurial personality traits (EPT) was found to be a mediator with VAF of 99% between TEE and EB which support H3. Entrepreneurial personality traits is not well explored in determining entrepreneurial behavior and intention thus this study has highlighted the gap. It is interesting to discover that entrepreneurial personality traits are important to develop an entrepreneurial attitude among students. According to Gorman et al. (1997) and Kourilsky and Walstad (1998), the impact of entrepreneurial education has been recognized as one of the most important factors that can help young people to understand and to encourage an attitude towards an entrepreneurial initiative. The study has shown that the antecedents collectively contributed to variance in EB (36.9%) (Fayolle et al. 2006). The results of this study confirm that EPT is a mediator between TEE and EB. In this study, students of the S&T students were found to embrace technology entrepreneurship through a combination of technological knowledge and entrepreneurial skills and competency (Syahida, 2008).

CONCLUSION

Technology entrepreneurship education is important to promote an entrepreneurial behavior and intention amongst students especially in this digital entrepreneurship era where technology is one of the key resources. However, the number of graduate entrepreneurs is still low and has become the nation's concern in producing more graduate entrepreneurs in tackling the unemployment issue. Entrepreneurial personality traits is important to be addressed as it plays an important role to promote entrepreneurship. Exposure to education alone would not be enough to trigger the behavior and intention towards entrepreneurship. Thus, programs and activities to build and develop entrepreneurial personality traits should be given more attention. Continuous exposure in entrepreneurial activities also can help to nurture this traits thus encourage more young entrepreneurs in campuses. This study is not without limitations. First, out of 15 faculties of Science and Technology, only five faculties were involved in this survey. Thus, the findings cannot be generalized. Secondly, the questionnaire is a self-assessment survey therefore; it might raise a bias issue. However, this study has achieved its objectives to determine entrepreneurial behavior and intention of students. Future research should add antecedents like digital exposure and application of Internet of Things (IoT) which is in line to digital entrepreneurship's drive.

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