

**Volume 21, Special Issue****Print ISSN: 1098-8394;  
Online ISSN: 1528-2651**

# **STUDENT SPIN-OFF INTENTIONS IN MALAYSIAN HIGHER EDUCATIONAL INSTITUTIONS: FOUNDERS' CHARACTERISTICS AND UNIVERSITY ROLES**

**Abdul Rahman Zahari, Universiti Tenaga Nasional  
Puteri Fadzline Muhamad Tamyez, Universiti Malaysia Pahang  
Noor Azlinna Azizan, Prince Sultan University  
Fariza Hashim, Prince Sultan University**

## **ABSTRACT**

*This study aims to examine the effects of founders' characteristics and university roles on student spin-off intentions in Malaysian higher educational institutions. The study of student spin-offs has captured the attention of policymakers, educators and researchers because of its contribution to achieving a university's vision and mission, regional economic growth, knowledge commercialization and employment generation. This study involved online survey research designed and informed by two research questions. A stratified sampling technique was applied and was able to obtain 369 samples from the founders of student spin-offs from eleven public universities in Malaysia. The data was analysed using partial least squares-structural equation modelling (PLS-SEM). The results indicate that four of the six paths in the conceptual model were significant and affirmed the direction proposed by this study. The need for achievement, innovativeness, a propensity for risk taking and self-efficacy were seen to be positively related to student spin-off intentions. However, two constructs, namely locus of control and university roles were not significant in relation to student spin-off intentions. This study will provide valuable insights for policymakers and universities enable them to reduce the number of unemployed graduates and create a viable entrepreneurial ecosystem within the universities. The majority of student spin-off studies have been conducted in developed countries so this study could offer different insights from previous studies because the setting is a developing country.*

**Keywords:** Student Spin-Offs, Founders' Characteristics, University Roles, Higher Educational Institutions, Malaysia.

## **INTRODUCTION**

In Malaysia, more than 200,000 graduates have been leaving universities and colleges every year since 2010 (Ministry of Higher Education, 2017). In relation to this, the labour force statistics reveal that there were 508,800 unemployed people in October 2017, with the majority of them being undergraduates (Department of Statistics Malaysia, 2017). The existence of supply and demand gaps not only contributed to the problem of graduate unemployment, but also damaged the effectiveness of public and private investment in higher education institutions (Boateng & Ofori, 2002). Therefore, numerous solutions are being offered by the government to solve these issues; one of them being the promotion of entrepreneurship development for

graduates (Central Bank of Malaysia, 2014). In addition, universities in Malaysia are actively taking part in supporting entrepreneurship activities through the establishment of entrepreneurship professorships, departments and centres for entrepreneurship (Yusoff, Zainol & Ibrahim, 2015). In 2015, the Malaysian Ministry of Higher Education launched the Malaysia Education Blueprint-Higher Education 2015-2025 (MEB, 2015). The Shift-1 of MEB indicated that the Malaysian higher educational institutions (HEIs) needed to produce holistic, entrepreneurial and balanced graduates in the future. Even though a wide variety of initiatives were established by policy makers and universities, the percentage of graduates becoming entrepreneurs is still very low. Only 2347 graduates became entrepreneurs in 2014, 2833 in 2015 and less than 7% in 2016 (Ministry of Higher Education, 2017).

To date, the field of student spin-offs among graduates has been the subject of increasing interest among scholars, mostly in developed countries (Manbachi et al., 2018). Student spin-off (SSO) companies can be accessed by students attending programs in any faculty at a university (Bailetti, 2011). They operate independently from the university and have their own legal, technical and commercial structures. According to Pirnay, Surlmont & Nlemvo (2003) SSOs and academic spin-offs (ASOs) are two types of university spin-offs (USOs). The Association of University Technology Managers (2015) reported that USOs have created 3 million jobs in the USA over the past 30 years, with more than 4000 spin-offs being established and generating US \$388 billion in gross domestic production. Fini et al. (2017) added that USOs in Italy, Norway and the UK also helped to create more jobs. Several past studies (Boh, De-Haan & Strom, 2015; Hayter, Lubynsky & Maroulis, 2016; Leire et al., 2016) have focused more attention on SSOs than ASOs due to a lack of research into the role of students in creating local entrepreneurial activities through the establishment of SSOs and despite the importance of this phenomenon. This study has also concentrated on SSOs because of the connection between spin-offs and local economic development. In this context SSOs have greater numbers, higher mobility rates and greater gross economic impact (Astebro & Bazzazian, 2011).

Starting a new venture is the result of an individual's decision which is why an individual's qualities as an entrepreneur are central to an examination of the field of entrepreneurship (Littunen, 2000). In addition, the individual is the main element of the psychological approach to new venture creation (Shaver & Scott, 1991). The role of personality factors is complex and is associated with business start-up intentions, in start-up success and in business success (Frank, Lueger & Korunka, 2007). Past empirical studies (Walter & Heinrichs, 2015; Chatterjee & Das, 2015; Nasip et al., 2017) also identified that personality traits or founders' characteristics have proven to be predictors of business creation. Due to these, the study of SSO founders' characteristics is worthy of investigation. Apart from founders' characteristics, the multiple roles performed by a university in promoting and influencing students to become entrepreneurs were also mentioned in the earlier studies (Yusoff et al., 2015; Karimi et al., 2015; Nowinski et al., 2017). The literature highlighted the significant contribution of entrepreneurship education, the establishment and effectiveness of entrepreneurship centres and technology transfer offices, business incubators and university incentive policies to the intentions of graduates to start new ventures. Therefore, a study of the relationship of university roles and SSO intentions is important because SSO firms originate in universities. With the dearth of studies of SSO intentions in developing countries, particularly in Malaysia, this study aims to assess the influence of founders' characteristics and university roles on SSO intentions in Malaysian public HEIs, by answering the following questions:

Do the founders' characteristics contribute to SSO intentions?

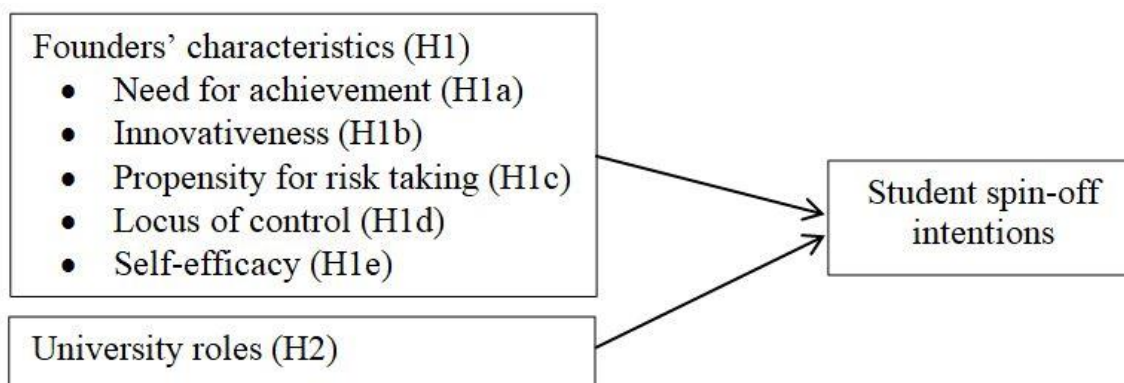
### What is the influence of university roles on SSO intentions?

The results of this study may help the policymakers and universities to strengthen their mission to reduce the number of unemployed graduates and create a robust university entrepreneurial ecosystem. The remainder of this paper is structured as follows: A review of the relevant literature and then an explanation of the research method applied, followed by an explanation and discussion of the results and a short conclusion.

## LITERATURE REVIEW

As a background to the theory, literature refers to two highly complementary models of individual behaviour, Ajzen's (1991) Theory of Planned Behaviour and Shapero & Sokol's (1982) Model of the Entrepreneurial Event. Ajzen's model explains and predicts how culture and social environments affect human behaviour. Ajzen (2005) investigated the factors of individual background such as age, gender, tribe, economic-social status, personal characteristics, personal traits and knowledge in his Theory of Planned Behaviour. Some past studies (Turker & Selcuk, 2009; Al Mamun et al., 2017) have included university roles and government support in their Theory of Planned Behaviour. This theory has been supported by many researchers of entrepreneurship including Olakitan (2014), Chatterjee & Das (2015), Karabulut (2016), Manik & Sidharta (2016), Nasip et al. (2017), Solesvik (2017) and Trivedi (2017).

The conceptual framework (Figure 1) sets out the relationship between founders' characteristics, university roles and SSO intentions constructs. University roles and founders' characteristics (need for achievement, innovativeness, propensity for risk taking, locus of control and self-efficacy) are considered as the exogenous constructs, while the SSO intentions is the endogenous construct. This has resulted in two hypotheses and five sub hypotheses being developed. The conceptual framework is adapted from Dinis et al. (2013) and Al Mamun et al. (2017).



**FIGURE 1**  
**CONCEPTUAL FRAMEWORK**

### The Effects of the Founders' Characteristics on Student Spin-Off Intentions

An individual with high entrepreneurial intentions is more likely to create a business compared to one with a lower entrepreneurial intention (Zeffane, 2012). Many past studies have

focused on personal characteristics such as independence, previous work experience, self-efficacy, locus of control, risk taking, the achievement of higher education and skills as predictors of entrepreneurial activity and the championing of new ventures (Roberts, 1991; Bateman & Crant, 1993). Moreover, previous studies of Chatterjee & Das (2015), Nasip et al. (2017) and Al Mamun et al. (2017) explained that the emergence of SSOs is heavily influenced by the founders' characteristics, namely a need for achievement, innovativeness, propensity for risk taking, locus of control and self-efficacy. This information led to the following hypothesis:

*H1: Founders' characteristics have a positive influence on SSO intentions.*

McClelland (1961) introduced the concept of the need for achievement based on insightful empirical evidence (obtained through several methods) and the existence of a connection between the need for achievement and (business) development. Davidsson (1989) also believed there was a strong link between the need for achievement and entrepreneurial behaviour and considered that this need to achieve, represents a crucial factor in entrepreneurial intentions. Other studies have indicated that university students who have a high need to achieve, will exhibit more entrepreneurial behaviour which could in turn, lead them to become entrepreneurs (Rofa, Ngah & Wahab, 2015; Karabulut, 2016; Yukongdi & Lofa, 2017). Innovativeness is related to recognizing and acting on business activities in new and unique ways (Robinson et al., 1991) and is strongly linked to an essential entrepreneurial characteristic (Schumpeter, 1934). Ghazali, Ibrahim & Zainol (2013) further defined innovativeness as crafting new products or higher quality products, generating new methods of production, attainment of new markets, creating a new source of supply or building new organizations or structures in business. It is suggested as a behaviour that characterizes entrepreneurial intention. Previous studies (Karanja, Ithinji & Nyaboga, 2016; Koe, 2016) also revealed that entrepreneurial intention is associated with innovative students.

Another key characteristic of an entrepreneur is a risk taking propensity. Risk taking propensity has been defined by Sexton & Bowman (1985) as one's orientation towards taking chances in a decision making situation. Previous studies (Pinho & de Sa, 2014; Karanja et al., 2016; Al Mamun et al., 2017) have indicated that students who can manage risks are linked with high entrepreneurial intentions. Altinay et al., (2012) consider the locus of control as an individual's perception of his or her ability to influence events in life. Specifically, an internal control expectation is usually associated with entrepreneurial characteristics and success (Brockhaus, 1980; Littunen, 2000). Past studies by Karanja et al. (2016) and Karabulut (2016) highlighted that students who have a high internal locus of control are more likely to become entrepreneurs than those with an external locus of control.

As explained by Wood & Bandura (1989), self-efficacy is an individual's perception of his or her ability to successfully complete a given task. The self-perceived competence of the founders of entrepreneurial firms is positively related to entrepreneurial intention and performance (Hmieleski & Baron, 2008). According to Saleh (2014), students with a strong belief in personal capability or self-efficacy will have higher entrepreneurial intentions than those with low personal capabilities. These findings are supported in studies conducted by Pinho & de Sa (2014), Manik & Sidharta (2016) and Solesvik (2017). These findings led to the following sub hypotheses:

*H1a: The need for achievement positively influences SSO intentions.*

*H1b: Innovativeness positively influences SSO intentions.*

*H1c: A propensity for risk taking positively influences SSO intentions.*

*H1d: Locus of control positively influences SSO intentions.*

*H1e: Self-efficacy positively influences SSO intentions.*

## **The Effects of University Roles on SSO Intentions**

Undoubtedly, the role of universities in relation to entrepreneurship education is to promote and shape an entrepreneurial culture among students (Yusoff et al., 2015; Nowinski et al., 2017). More importantly, entrepreneurship education in universities is a significant contributor to spin-off creation in the longer term (Bigliardi et al., 2013). The role of a university to influence graduates to become student entrepreneurs is not only limited to entrepreneurship education per se, but could be influenced by other factors such as an entrepreneurially supportive environment, the establishment of entrepreneurial centres and technology transfer offices, networking with industries, government agencies and financial institutions, the establishment of business incubators and university incentive policies or reward systems (Keat, Selvarajah & Meyer, 2011; Hofer et al., 2010; Goldstein, Peer & Sedlacek, 2013; Saleh, 2014; Piterou & Birch, 2014; Ankrah & Al-Tabbaa, 2015; Guerrero, Urbano & Gajon, 2017). This information led to the following hypothesis:

*H2: University roles have a positive influence on SSO intentions.*

## **METHODOLOGY**

This study utilized an online survey approach designed to assess the effects of founders' characteristics and university roles on SSO intentions. The population of the study comprised all the SSO founders in eleven Malaysian public HEIs. The data set of population was gathered from entrepreneurship centres in Malaysian public HEIs. The SSO founders were selected as the respondents in this study because they established the SSO firms in the universities. Therefore, their experiences could be used to verify the factors that influence SSO intentions as suggested in the entrepreneurship literature. With the specific aim of gathering an acceptable response rate, 750 potential respondents were approached online (email) and invited to participate in the study during the data collection period of June 2017. Of the 750 email addresses, 21 emails failed to be delivered to the recipients (respondents) due to incorrect email addresses. This left a total of 729 valid email addresses to which emails were delivered successfully. Finally, a total of 369 completed questionnaires were gathered for this study. Therefore, the response rate was 50.6%. A stratified sampling technique was used to select the respondents in three types of Malaysian public HEIs, namely research universities, focused universities and comprehensive universities.

The questionnaire was designed with two sections. The first section consists of items relating to the constructs while the second part consists of nine demographic questions. A total of 33 item questions were used to explain exogenous and endogenous constructs by using a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). All constructs were measured using reflective indicators which show effects on variables (Jarvis, MacKenzie & Podsakoff, 2003). The questionnaire was endorsed by five panels of experts from the SSO and academic sector to maximize the validity of the indicators. Based on their suggestions, minor revisions

were made to the questionnaire. A pre-test of the questionnaire was also implemented with twenty subjects. As a result, some questions were reworded and restored to the relevant questionnaire sections. Also, a 75-pilot study respondent was involved to assess the survey measures. Consequently, some questions were reworded and resorted into the questionnaire sections.

This study involved a confirmatory factor analysis (CFA) to check the properties of the latent constructs in the proposed research model. The CFA tool used in this study was PLS-SEM (Smart PLS 3.0). Table 1 summarizes the measurement model's latent variables, number of measurement items, composite reliability (CR) and average variance extracted (AVE). In PLS-SEM, the reliability/internal consistency of the constructs was determined by using the CR values. The CR value should exceed 0.60 for exploratory model testing (Hair et al., 2017). Table 1 demonstrates that the CR values for all constructs were above 0.8. Therefore, the constructs were considered reliable (Hair et al., 2017). The next test of the measurement model is called convergent validity and should be accessed through AVE. The values of AVE were above the accepted value of 0.50 (Fornell & Larcker, 1981). Therefore, these indicators satisfied the requirements for the convergent validity of their respective constructs.

<b>Latent variable</b>	<b>No of items</b>	<b>CR*</b>	<b>AVE*</b>	<b>Research reference</b>
Need for achievement	4	0.858	0.604	Dinis et al. (2013), Pihie & Bagheri (2013) and Davidsson (1995)
Innovativeness	4	0.832	0.554	
Propensity of risk taking	4	0.863	0.613	
Locus of control	4	0.843	0.575	
Self-efficacy	4	0.896	0.684	
University roles	7	0.912	0.601	Turker & Selcuk (2009), Keat et al. (2011), Hofer et al. (2010) and Goldstein et al. (2013)
SSO intentions	6	0.959	0.796	Linan & Chen (2009)

\*CR (Composite reliability)=(square of the summation of the factor loading)/{(square of the summation of the factor loading)+(square of the summation of the error variances)}; AVE (Average variance extracted)=(summation of the square of the factor loadings)/{(summation of the square of the factor loadings)+(summation of the error variances)}.

## RESULTS AND DISCUSSION

### Demographics

The sample comprises a total of 369 respondents with more than half of the respondents being female (59.1%) and the remaining 40.9% male. The majority of the respondents (86.7%) were aged between 21 and 25, followed by 20 years of age and below, at 6.5%. With regards to ethnicity, almost all of respondents (85.6%) were Malay, 6.5% were Chinese and 4.9% Indian. In relation to religion, the majority of participants (88.6%) are Islamic followed by Buddhists at 5.1%. In terms of place of origin, more than half of respondents (52.5%) were from urban areas. Only 13.8% of the respondents were postgraduate students. The other 85.4% were undergraduate students. The majority of respondents were in year 2, 3 or 4 of their studies at 31.7%, 31.4% and 29.6% respectively. Also, 63.4% of participants were from focused universities, followed by research universities (26.8%) and comprehensive universities at 9.8%. Finally, the nature of the

businesses operated by respondents were mostly service oriented at 54.2% compared to being product oriented which was recorded at 45.8%.

### **Multivariate Normality and Common Method Bias**

This study tested the multivariate normality using the IBM SPSS Statistics for Windows, Version 24 because the partial least squares-structural equation modelling (PLS-SEM) does not require a multivariate normal data distribution. The results of multivariate skewness, kurtosis coefficients and Kolmogorov-Smirnov were less than 2, 7 and 0.05 respectively, confirming non-normality (West, Finch & Curran, 1995). This study could have resulted in common method bias because the measurement of the research constructs relied solely on the judgment of single individuals (founders of SSOs), however, Harman's single-factor test (recommended by Podsakoff et al., 2003) was used to check for common method bias. The percentage variance of a single factor was at 28.8%, less than the threshold value. Hence, there was no common method bias that would affect the data or the results.

### **Confirmatory Factor Analysis**

To carry out CFA, the study estimated a measurement model to evaluate the factor loading. Results showed the factor loadings, CR and AVE were above an acceptable benchmark. This study has adopted the guidelines recommended by Duarte & Raposo (2010) and Hair et al., (2017), where the indicators with loadings equal to or greater than 0.50 can be accepted. It was discovered that of the 33 items, no item had to be deleted because they showed loadings above the acceptable value. In addition, the measurement model had 6 exogenous variables with  $CR > 0.80$  and  $AVE > 0.50$ , indicating that reliability and convergent validity of all constructs had been established (Fornell & Larcker, 1981; Hair et al., 2017).

### **Ascertaining Discriminant Validity**

This study used the Heterotrait-Monotrait Ratio (HTMT) ratio of correlations approach to determine the discriminant validity of the constructs as suggested by Henseler, Ringle & Sarstedt (2015) because previous methods have shortcomings such as less sensitivity to identifying any discriminant validity problems. HTMT incorporates two techniques to measure the discriminant validity. The first technique is called the criterion or statistical test, where the HTMT value should not be greater than the HTMT.85 value of .85 (Kline, 2011) or the HTMT.90 value of 0.90 (Gold, Malhotra & Segars, 2001). As shown in Table 2, all values passed both HTMT.85 and HTMT.90 measures (Kline, 2011). The second technique is known as HTMTInference. This technique was used to test the null hypothesis ( $H_0: HTMT \geq 1$ ) compared to the alternative hypothesis ( $H_1: HTMT < 1$ ). The issue of discriminant validity is identified if the confidence interval contains the value of 1. The results of HTMTInference (second method) show that the confidence interval value for each construct is below 1. Thus, the discriminant validity has been established for the research constructs.

	IN	LC	NA	RT	SE	SI	UR
IN							
LC	0.672 <sup>a*</sup> 0.573, 0.753 <sup>b*</sup>						
NA	0.788, 0.714, 0.851	0.789 0.714, 0.854					
RT	0.738 0.661, 0.804	0.640 0.550, 0.719	0.683 0.601, 0.755				
SE	0.692 0.617, 0.756	0.525 0.430, 0.604	0.617 0.538, 0.683	0.664 0.582, 0.731			
SI	0.688 0.617, 0.749	0.551 0.465, 0.630	0.661 0.587, 0.724	0.656 0.578, 0.723	0.613 0.533, 0.678		
UR	0.361 0.257, 0.458	0.306 0.209, 0.397	0.398 0.311, 0.479	0.270 0.174, 0.364	0.523 0.436, 0.600	0.333 0.242, 0.423	

<sup>a\*</sup>The criterion for HTMT ratio is below .90; <sup>b</sup>The criterion for HTMT upper confidence intervals is below 1; IN = Innovativeness; LC=Locus of control; NA=Need for achievement; RT=Propensity of risk taking; SE=Self-efficacy; SI=SSO intentions; UR=University roles.

### Assessment of the Structural Model

To validate the proposed hypotheses and the structural model, the path coefficient between two latent variables was assessed. The results of the structural model used the bootstrapping procedure with 5000 times of resampling as suggested by Hair et al. (2017). From the t-value estimates (Table 3) of the bootstrapping process, there were two paths (LC→SI: H1d; UR→SI: H2) which were not statistically significant, whereas the paths of NA→SI (H1a), IN→SI (H1b), RT→SI (H1c) and SE→SI (H1e) were significant. The coefficient of LC→SI and UR→SI were very small and considered not significant. Thus, Sub Hypothesis 1d and Hypothesis 2 were not supported. The path coefficients of NA→SI, IN→SI, RT→SI and SE→SI were good and considered significant. Thus, Hypothesis 1 was supported because the majority (80%) of the characteristics of SSO founders was shown to positively influence SSO intentions.

Sub hypothesis	Relationship	Beta	t-value	Result	R <sup>2</sup>	f <sup>2</sup>	Q <sup>2</sup>	q <sup>2</sup>
H1a	NA→SI	0.191*	3.034	Supported	0.503	0.034	0.368	0.021
H1b	IN→SI	0.214**	3.839	Supported		0.048		0.027
H1c	RT→SI	0.212**	3.312	Supported		0.046		0.027
H1d	LC→SI	0.046 <sup>n.s.</sup>	0.802	Not supported		0.002		0.000
H1e	SE→SI	0.172*	2.702	Supported		0.030		0.016
H2	UR→SI	0.050 <sup>n.s.</sup>	0.933	Not supported		0.004		0.002

\*p<0.05; \*\*p<0.01; n.s.=not significant; NA=Need for achievement; IN=Innovativeness; RT=Propensity of risk taking; LC=Locus of control; SE=Self-efficacy; UR=University roles; SI=SSO intentions.

The R<sup>2</sup> value was reported at 0.503 and considered moderate (Chin, 1998). The research model of this study explains that the 50.3% variation in the SSO intentions construct was accounted for by founders' characteristics and university roles construct. To quantify the significant effects, this study assessed the effect sizes (f<sup>2</sup>). The f<sup>2</sup> of locus of control and university roles were considered very weak effect sizes, whereas the f<sup>2</sup> of other constructs were



associated with small effect sizes (Cohen, 1988). Furthermore, the  $Q^2$  value for SSO intentions was 0.368, indicating high predictive relevance (Chin, 2010). The relative impact of predictive relevance can be determined by comparing the  $q^2$  effect size. Table 3 shows that all constructs, except for locus of control and university roles, had only a small effect on SSO intentions (Cohen, 1988). Finally, this study obtained a global fit index value of 0.633 for the research model which exceeds the cutoff value, thus, the research model has a better predictive power and the findings of the study adequately validated the PLS model globally (Wetzels, Odekerken-Schroder & Van Oppen, 2009; Chin, 2010).

### Multigroup Analysis

To provide an in-depth understanding from the theoretical and practical perspectives, this study examined the model using the multigroup analysis (PLS-MGA) approach. Among the antecedents, this study only selected gender and nature of business subgroups because the other subgroups namely age, ethnicity, religion, place of origin, year of study, type of public HEI and level of study encountered a singular matrix error. Therefore, only subgroups without a singular matrix error were considered in the PLS-MGA. The findings in Table 4 indicate that the effects of need for achievement on SSO intentions differed significantly at 5% across the nature of business subgroups. Moreover, the p values of all other associations are greater than 0.05, demonstrating a lack of the heterogeneity.

<b>Relationship</b>	<b>Gender</b>	<b>Nature of Business</b>
Need for achievement → SSO intentions	0.277	0.021
Innovativeness → SSO intentions	0.572	0.961
Propensity of risk taking → SSO intentions	0.736	0.897
Locus of control → SSO intentions	0.280	0.343
Self-efficacy → SSO intentions	0.716	0.151
University roles → SSO intentions	0.282	0.978

## DISCUSSION

The purpose of this study was to assess the effects of founders' characteristics and university roles on SSO intentions. Firstly, the findings confirmed that the founders' characteristics such as need for achievement (H1a), innovativeness (H1b), propensity for risk taking (H1c) and self-efficacy (H1e) were found to be positive and significantly associated with SSO intentions. Therefore, Hypothesis 1 was supported. These findings are in line with the previous works of Karimi et al. (2015), Nasip et al. (2017) and Al Mamun et al. (2017) who revealed that these characteristics were positively related to entrepreneurial intention among graduates. Moreover, the connection between the need for achievement (H1a) and SSO intentions was found to be significant. These findings are consistent with previous studies by Rokhman & Ahamed (2015), Karabulut (2016) and Yukongdi & Lofa (2017) who confirmed that the need for achievement significantly influenced entrepreneurial intentions. However, some past studies (Hmieleski & Corbett, 2006; Susetyo & Lestari, 2014) have shown that the need for achievement was not significant in relation to entrepreneurial intentions. As depicted in Table 3, innovativeness (H1b) positively influences SSO intentions was supported. Examples of past

studies that recorded similar findings to this study can be found in the research carried out by Dinis et al. (2013), Saleh (2014), Chatterjee & Das (2015) and Koe (2016). Law & Breznik (2017) also confirmed that innovativeness among students of engineering and non-engineering courses positively influenced entrepreneurial intentions.

This study verified that the propensity for risk taking (H1c) positively influences SSO intentions and the results were similar to a previous study carried out by Al Mamun et al. (2017). This study indicated that students who can manage risks are positively linked to high entrepreneurial intentions. Moreover, previous work by Susetyo & Lestari (2014), Karimi et al. (2015) and Karabulut (2016) also highlighted that the propensity for risk taking was positively related to entrepreneurial intentions. However, this study was unable to demonstrate that locus of control (H1d) significantly influenced SSO intentions. A possible explanation for this might be that the founders of SSOs have less belief in their own capabilities to successfully engage in the creation of new ventures (Fietze & Boyd, 2017). The findings are in agreement with several studies such as those by Uddin & Bose (2012), Ferreira et al. (2012) and Nasip et al. (2017) who found that there was no significant relationship between locus of control and entrepreneurial intention among students in Bangladesh, Portugal and Malaysia respectively. Table 3 revealed that self-efficacy (H1e) positively influenced SSO intentions among SSO founders. One salient example is in the findings of Pihie & Bagheri (2013) who proved that self-efficacy has the most significant impact on graduates' intentions to become entrepreneurs. Another studies conducted by Manik & Sidharta (2016) and Solesvik (2017) revealed that students from universities in emerging and developed countries also agreed that self-efficacy affects students' intention to become entrepreneurs.

Secondly, this study has been unable to demonstrate that university roles (H2) are significant in relation to SSO intentions among SSO founders in Malaysian public HEIs. These findings align with the work of Turker & Selcuk (2009), Zhang, Duysters & Cloudt (2013), Keat & Nasiru (2015), Karimi et al. (2015), Mustafa et al. (2016), Herman & Stefanescu (2017) and Nowinski et al. (2017). Furthermore, the results of multigroup analysis (PLS-MGA) indicate that the effects of need for achievement on SSO intentions differed significantly (at a 5% level of significance) across the nature of business subgroups. These findings are in line with earlier studies by Saleh (2014), Solesvik (2017), Nowinski et al. (2017), Yukongdi & Lofa (2017) and Fietze & Boyd (2017).

## CONCLUSION AND FUTURE SUGGESTION

The findings confirmed that SSO founders' characteristics did impact SSO intentions. The findings highlighted the importance of university students having the characteristics (need for achievement, innovativeness, propensity for risk taking and self-efficacy) if they wished to become student entrepreneurs. Moreover, the university roles construct has unable to demonstrate a significant relationship with SSO intentions. Because of this, the universities should increase and improve their efforts to revise entrepreneurship education to make it more effective. Besides, the other roles of the universities such as providing entrepreneurship centres and technology transfer offices, business incubators and university incentive policies or rewards systems could be strengthened to influence SSO intentions among graduates.

## Contribution and Implications

This study has contributed to extending the founders' characteristics, university roles and SSO intentions framework in the Malaysian public HEIs context. This study indicates that SSO intentions only contributed by founders' characteristics. The findings suggest that it may be useful for entrepreneurship centres in Malaysian public HEIs to conduct personality tests in order to ensure that SSO prospects are identified early which will enable them to set up their own SSOs. Besides, an extension of the founders' characteristics assessment could be used to measure SSO performance. Furthermore, the policymakers can set broader objectives to provide the university with more resources. With more resources allocated, the universities would be able to generate a viable entrepreneurial ecosystem to establish more SSOs in Malaysian HEIs. This would enable SSOs to create self-jobs and job opportunities in the community, diversify the local economy and attract talent and investment from industry. This study also provided several vital contributions to the theory. The SSO literature will be extended by the findings of this study in the context of public HEIs in Malaysia, a non-Western country. Clearly, the theory used to explain SSO intentions has been supported.

## Limitations and Future Suggestions

This study is not without its limitations. Firstly, the study was conducted in Malaysian public HEIs. Therefore, it limits the generalizability of the findings. The results might be different if evaluating all public HEIs or other types of HEIs in Malaysia. Hence, future studies replicating the present study in different settings would further support the research model. Secondly, the data was gathered using a cross-sectional design and typical limitations of cross-sectional design could affect this study. Also, this approach is confined to a single point of time, thus there is less ability to uncover the exact nature of the theoretical linkages being investigated. Future studies using a qualitative study approach could utilize some of the issues raised here. Thirdly, this study was able to make propositions regarding SSO founders' characteristics on SSO intentions but did not concentrate on other factors associated with SSO intentions. Future studies should integrate other factors such as the entrepreneurial environment and societal influences as part of the enablers of SSO intentions. Finally, the findings of this study are likely to have relevance for other types of HEIs in Malaysian settings where culture, conditions and issues of SSOs may be similar. However, there is a limitation in terms of generalizing the findings of this study to other SSO settings in developed or developing countries. Therefore, future studies could obtain different perceptions from other countries.

## REFERENCES

- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Process*, 50, 179-211.
- Ajzen, I. (2005). *Attitudes, personality and behaviour (Second Edition)*. UK: Open University Press-McGraw Hill Education.
- Al Mamun, A., Che Nawi, N., Mohiuddin, M., Shamsudin, S.F.F. & Fazal, S.A. (2017). Entrepreneurial intention and startup preparation: A study among business students in Malaysia. *Journal of Education for Business*, 92(6), 296-314.
- Altınay, L., Madanoglu, M., Daniele, R. & Lashley, C. (2012). The influence of family tradition and psychological traits on entrepreneurial intention. *International Journal of Hospitality Management*, 31(2), 489-499.
- Ankrah, S. & Al-Tabbaa, O. (2015). Universities-industry collaboration: A systematic review. *Scandinavian Journal of Management*.

- Association of University Technology Managers. (2015). *The AUTM briefing book: 2015*. Key issues in the technology transfer business.
- Astebro, T. & Bazzazian, N. (2011). Universities, entrepreneurship and local economic development. *Handbook of Research on Entrepreneurship and Regional Development*. Cheltenham: Edward Elgar.
- Bailetti, T. (2011). Fostering student entrepreneurship and university spinoff companies. *Technology Innovation Management Review*, 7-12.
- Bateman, T.S. & Crant, J.M. (1993). The proactive component of organizational behaviour: A measure and correlates. *Journal of Organizational Behaviour*, 14(2), 103-118.
- Bigliardi, B., Galati, F. & Verbano, C. (2013). Evaluating performance of university spin-off companies: Lessons from Italy. *Journal of Technology Management & Innovation*, 8(2), 178-188.
- Boateng, K. & Ofori, S.E. (2002). *An analytical study of the labour market for tertiary graduates in Ghana*.
- Boh, W.F., De-Haan, U. & Strom, R. (2015). University technology transfer through entrepreneurship: Faculty and students in spinoffs. *The Journal of Technology Transfer*, 1-9.
- Brockhaus, R.H. (1980). Risk taking propensity of entrepreneurs. *Academy of Management Journal*, 23(3), 509-520.
- Chatterjee, N. & Das, N. (2015). Key psychological factors as predictors of entrepreneurial success: A conceptual framework. *Academy of Entrepreneurship Journal*, 21(1), 102-114.
- Central Bank of Malaysia. (2014). *The 2014 budget speech*.
- Chin, W.W. (2010). How to write up and report PLS analyses. In Esposito Vinci, V., Chin, W.W., Henseler, J. & Wang, H. (Eds.), *Handbook of partial least squares: Concepts, methods and applications*. Heidelberg: Springer, 655-690.
- Chin, W.W. (1998). The partial least squares approach to structural equation modelling. In Marcoulides, G.A. (Eds.), *Modern methods for business research*. Mahwah, New Jersey: Lawrence Erlbaum Associates, 295-336.
- Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. New York: Routledge Academic.
- Davidsson, P. (1989). Continued entrepreneurship and small firm business. Stockholm: Stockholm School of Economics.
- Davidsson, P. (1995). Determinants of entrepreneurial intentions. Working paper presented at *the Annual Meeting of the Rent IX Workshop*, Piacenza, Italy.
- Department of Statistics Malaysia. (2017). *Key statistics of labour force in Malaysia*.
- Dinis, A., do Paço, A., Ferreira, J., Raposo, M. & Ricardo, R.G. (2013). Psychological characteristics and entrepreneurial intentions among secondary students. *Education and Training*, 55(8/9), 763-780.
- Duarte, P. & Raposo, M. (2010). A PLS model to study brand preference: An application to the mobile phone market. In Esposito Vinzi, V., Chin, W.W., Henseler, J. & Wang, H. (Eds.), *Handbook of partial least squares*. New York: Springer Berlin Heidelberg, 449-485.
- Frank, H., Lueger, M. & Korunka, C. (2007). The significance of personality in business start-up intentions, start-up realization and business success. *Entrepreneurship and Regional Development*, 19(3), 227-251.
- Ferreira, J.J., Raposo, M.L., Rodrigues, R.G., Dinis, A. & do Paço, A. (2012). A model of entrepreneurial intention: An application of the psychological and behavioural approaches. *Journal of Small Business and Enterprise Development*, 19(3), 424-440.
- Fietze, S. & Boyd, B. (2017). Entrepreneurial intention of Danish students: A correspondence analysis. *International Journal of Entrepreneurial Behaviour & Research*, 23(4), 656-672.
- Fini, R., Fu, K., Mathisen, M.T., Rasmussen, E. & Wright, M. (2017). Institutional determinants of university spin-off quantity and quality: A longitudinal, multilevel, cross country study. *Small Business Economics*, 48(2), 361-391.
- Fornell, C. & Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50.
- Ghazali, Z., Ibrahim, N.A. & Zainol, F.A. (2013). Factors affecting entrepreneurial intention among UniSZA students. *Asian Social Science*, 9(1), 85-93.
- Gold, A.H., Malhotra, A. & Segars, A.H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems*, 18(1), 185-214.
- Goldstein, H., Peer, V. & Sedlacek, S. (2013). Vienna as a region of knowledge: Increasing the generation of university spin-offs. *Vienna Chamber of Commerce (WKW)*, 44.
- Guerrero, M., Urbano, D. & Gajon, E. (2017). Higher education entrepreneurial ecosystems: Exploring the role of business incubators in an emerging economy. *International Review of Entrepreneurship*, 15(2), 175-202.
- Hair, J.F., Hult, G.T.M., Ringle, C.M. & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM) (Second Edition)*. Thousand Oaks, CA: Sage.

- Hayter, C.S., Lubynsky, R. & Maroulis, S.J. (2016). Who is the academic entrepreneur? The role of graduate students in the development of university spinoffs. *Journal of Technology Transfer*, 41(4), 1-18.
- Henseler, J., Ringle, C.M. & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling. *Journal of the Academy of Marketing Science*, 43(1), 115-135.
- Herman, E. & Stefanescu, D. (2017). Can higher education stimulate entrepreneurial intentions among engineering and business students? *Educational Studies*, 43(3), 312-327.
- Hmieleski, K.M. & Corbett, A.C. (2006). Proclivity for improvisation as a predictor of entrepreneurial intentions. *Journal of Small Business Management*, 44, 45-63.
- Hmieleski, K.M. & Baron, R.A. (2008). When does entrepreneurial self-efficacy enhance versus reduce firm performance? *Strategic Entrepreneurship Journal*, 2(1), 57-72.
- Hofer, A.R., Potter, J., Fayolle, A., Gulbrandsen, M., Hannon, P., Harding, R., Dahlstrand, A.L. & Phan, P.H. (2010). From strategy to practice in university entrepreneurship support: Strengthening entrepreneurship and local economic development in Eastern Germany: Youth, entrepreneurship and innovation. *OECD Local Economic and Employment Development (LEED) Working Papers*, 2010/09, OECD Publishing.
- Jarvis, C.B., MacKenzie, S.B. & Podsakoff, P.M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research*, 30(2), 199-218.
- Karabulut, A.T. (2016). Personality traits on entrepreneurial intention. *Social and Behavioural Sciences*, 229, 12-21.
- Karanja, T.W., Ithniji, G.K. & Nyaboga, A. (2016). The contribution of personality trait in entrepreneurial intentions among university students in Kenya. *International Journal of Economics, Commerce and Management*, IV(7), 64-82.
- Karimi, S., Biemans, H.J.A., NaderiMahdei, K., Lans, T., Chizari, M. & Mulder, M. (2015). Testing the relationship between personality characteristics, contextual factors and entrepreneurial intentions in a developing country. *International Journal of Psychology*, 52, 227-240.
- Keat, O.Y. & Nasiru, A. (2015). Perceived effective entrepreneurship education and entrepreneurial intention: The role of the perception of university support and perceived creativity disposition. *Journal of Education and Vocational Research*, 6(2), 70-79.
- Keat, O.Y., Selvarajah, C. & Meyer, D. (2011). Inclination towards entrepreneurship among university students: An empirical study of Malaysian university students. *International Journal of Business and Social Sciences*, 2(4), 206-220.
- Kline, R.B. (2011). *Principles and practice of structural equation modelling*. New York: Guilford Press.
- Koe, W.L. (2016). The relationship between individual entrepreneurial orientation and entrepreneurial intention. *Journal of Global Entrepreneurship Research*, 6(13), 1-11.
- Law, K.M.Y. & Breznik, K. (2017). Impacts of innovativeness and attitude on entrepreneurial intention: Among engineering and non-engineering students. *International Journal of Technology and Design Education*, 27(4), 683-700.
- Leire, M., Rosa, C., Juan, I.I. & Nekane, E. (2016). Factors fostering students' spin-off firm formation: An empirical comparative study of universities from North and South Europe. *Journal of Management Development*, 35(6), 814-846.
- Linan, F. & Chen, Y. (2009). Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship: Theory and Practice*, 33(3), 593-617.
- Littunen, H. (2000). Entrepreneurship and characteristics of the entrepreneurial personality. *International Journal of Entrepreneurial Behaviour & Research*, 6(6), 295-309.
- Manbachi, A., Kreamer-Tonin, K., Walch, P., Gamo, N.J., Khoshakhlagh, P., Zhang, Y.S., Montague, C., Acharya, S., Logsdon, E.A., Allen, R.H., Durr, N.J., Luciano, M.G., Theodore, N., Brem, H. & Yazdi, Y. (2018). Starting a medical technology venture as a young academic innovator or student entrepreneur. *Annals of Biomedical Engineering*, 46(1), 1-13.
- Manik, E. & Sidharta, I. (2016). Entrepreneurial intention on studentpreneurs to become entrepreneur. *International Review of Management and Marketing*, 6(3), 625-630.
- McClelland, D.C. (1961). *The achieving society*. Princeton, NJ: Van Nostrand.
- Ministry of Higher Education. (2017). Graduate tracer study 2017.
- Ministry of Higher Education.(2015). *Malaysia Education Blueprint 2015-2025: Higher education*.
- Mustafa, M.J., Hernandez, E., Mahon, C. & Chee, L.K. (2016). Entrepreneurial intentions of university students in an emerging economy: The influence of university support and proactive personality on students' entrepreneurial intention. *Journal of Entrepreneurship in Emerging Economies*, 8(2), 162-179.

- Nasip, S., Amirul, S.R., Sondoh Jr, S.L. & Tanakinjal, G.H. (2017). Psychological characteristics and entrepreneurial intention: A study among university students in North Borneo, Malaysia. *Education and Training*, 59(7/8), 825-840.
- Nowinski, W., Haddoud, M.Y., Lancaric, D., Egerova, D. & Czegledi, C. (2017). The impact of entrepreneurship education, entrepreneurial self-efficacy and gender on entrepreneurial intentions of university students in the Visegrad countries. *Studies in Higher Education*.
- Olakitan, O.O. (2014). The influence of some personality factors on entrepreneurial intentions. *International Journal of Business and Social Science*, 5(1), 278-284.
- Pihie, Z.A.L. & Bagheri, A. (2013). Self-efficacy and entrepreneurial intention: The mediation effect of self-regulation. *Vacations and Learning*.
- Pinho, J.C. & de Sa, E.S. (2014). Personal characteristics, business relationships and entrepreneurial performance. *Journal of Small Business and Enterprise Development*, 21(2), 284-300.
- Pirnay, F., Surlemont, B. & Nlemvo, F. (2003). Toward a typology of university spin-offs. *Small Business Economics*, 21(4), 355-369.
- Piterou, A. & Birch, C. (2014). The role of higher education institutions in supporting innovation in SMEs: University-based incubators and student internships as knowledge transfer tools. *The Journal of Innovation Impact*, 7(1), 72-79.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. & Podsakoff, N.P. (2003). Common method biases in behavioural research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903.
- Roberts, E.B. (1991). *Entrepreneurs in high technology: Lesson from MIT and beyond*. New York, Oxford: Oxford University Press.
- Robinson, P.B., Stimpson, D.V., Huefner, J.C. & Hunt, H.K. (1991). An attitude approach to the prediction of entrepreneurship. *Entrepreneurship: Theory and Practice*, (Summer), 13-31.
- Rofa, N., Ngah, R. & Ab Wahab, I. (2015). The relationship of personal traits and entrepreneurial potential of Malaysian graduates: The role of entrepreneurial networking and entrepreneurial environment. *Journal of Global Business and Social Entrepreneurship*, 1(1), 1-8.
- Rokhman, W. & Ahamed, F. (2015). The role of social and psychological factors on entrepreneurial intention among Islamic college students in Indonesia. *Entrepreneurial Business and Economic Review*, 3(1), 29-42.
- Saleh, H.A. (2014). The perceptions of the Lebanese of choosing their career in entrepreneurship. *Jordan Journal of Business Administration*, 10(2), 333-364.
- Schumpeter, J. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Sexton, D.L. & Bowman, N. (1985). The entrepreneur: A capable executive and more. *Journal of Business Venturing*, 1(1), 129-140.
- Shapiro, A. & Sokol, L. (1982). The social dimensions of entrepreneurship. In Kent, C., Sexton, D. & Vesper, K. (Eds.), *Encyclopedia of Entrepreneurship* (pp.72-90). Englewood Cliffs, New Jersey: Prentice-Hall.
- Shaver, K.G. & Scott, L.R. (1991). Person, process, choice: The psychology of new venture creation. *Entrepreneurship: Theory and Practice*, 16, 23-45.
- Solesvik, M.Z. (2017). A cross-national study of personal initiative as a mediator between self-efficacy and entrepreneurial intentions. *Journal of East-West Business*, 23(3), 215-237.
- Susetyo, D. & Lestari, P.S. (2014). Developing entrepreneurial intention model of university students: An empirical study on University Students in Semarang, Indonesia. *International Journal of Engineering and Management Sciences*, 5(3), 184-196.
- Trivedi, R.H. (2017). Entrepreneurial-intention constraint model: A comparative analysis among post-graduate management students in India, Singapore and Malaysia. *International Entrepreneurship and Management Journal*, 1-23.
- Turker, D. & Selcuk, S.S. (2009). Which factors affect entrepreneurial intention of university students? *Journal of European Industrial Training*, 33(2), 142-159.
- Uddin, M.R. & Bose, T.K. (2012). Determinants of entrepreneurial intention of business students in Bangladesh. *International Journal of Business and Management*, 7(24), 128-137.
- Walter, S.G. & Heinrichs, S. (2015). Who becomes an entrepreneur? A 30-years-review of individual-level research. *Journal of Small Business and Enterprise Development*, 22(2), 225-248.
- West, S.G., Finch, J.F. & Curran, P.J. (1995). Structural equation models with non-normal variables: Problems and remedies. In Hoyle, R.H. (Ed.), *Structural equation modelling: Concepts, issues and applications* (56-75). Newbery Park, CA: Sage.

- Wetzels, M., Odekerken-Schroder, G. & Van Oppen, C. (2009). Using PLS path modelling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, 33(1), 177-195.
- Wood, R. & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review*, 14(3), 361-384.
- Yukongdi, V. & Lopa, N.Z. (2017). Entrepreneurial intention: A study of individual, situational and gender differences. *Journal of Small Business and Enterprise Development*, 24(2), 333-352.
- Yusoff, M.N.H., Zainol, F.A. & Ibrahim, M.D. (2015). Entrepreneurship education in Malaysia's institutions of higher learning-A review of the current practices. *International Education Studies*, 8(1), 17-28.
- Zeffane, R. (2012). Gender and youth entrepreneurial potential: Evidence from the United Arab Emirates. *International Journal of Business and Management*, 8(1), 60-72.
- Zhang, Y., Duysters, G. & Cloudt, M. (2014). The role of entrepreneurship education as predictor of university students' entrepreneurial intention. *International Entrepreneurship and Management Journal*, 10(3), 623-641.