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## Entrepreneurial innovation among international students in the UAE: Differential role of entrepreneurial education using SEM analysis

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### Abstract

This paper explores the impact of entrepreneurial education among international students studying higher education in the UAE. The authors examine the role of entrepreneurial education as an independent variable and as a moderating variable in the relationship between external factors (measured by the economy, institutions and society) and internal factors (measured by entrepreneurial orientation, entrepreneurial capabilities and achievement) on entrepreneurial innovation. A survey approach was used in which predesigned questionnaires were distributed to the targeted respondents. We employed *Structural Equation Modelling* (SEM) analysis to analyze the collected data. The result reveals that exposing international students to entrepreneurial education is crucial to their entrepreneurial innovation. We also found the external and internal environments to be crucial factors that predict entrepreneurial innovation among the sample surveyed. Further findings revealed that entrepreneurial education significantly moderates the relationship between the external environment and entrepreneurial innovation whereas the moderating effect of entrepreneurial education on the relationship between the internal environment and entrepreneurial innovation was found to be insignificant. The findings provide valuable insight for not just higher education institutions offering entrepreneurial education courses in the UAE. Nevertheless, for entrepreneurship stakeholders globally understanding how to enhance the significant role of entrepreneurial education on external and internal factors will ensure higher innovativeness among international students in the host country.

**Keywords:** Entrepreneurial education, Entrepreneurial innovation, External factors, Internal factors, International students.

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## **1. Introduction**

Scholars have long been interested in entrepreneurship among immigrants. The increase in migration was spurred by several factors such as searching for a greener pasture, fleeing conflicts and war zones and the pursuit of new opportunities [1-5]. Previous studies show that entrepreneurship, innovativeness, ideas and engagement flourish more among immigrants than the locals [6-9]. However, these immigrants sometimes need help implementing innovative ideas [10, 11]. Nevertheless, against all odds, these immigrants tend to succeed through unexplained entrepreneurial innovativeness that turns them into local entrepreneurs. Efforts to explain the traits responsible for immigrants' entrepreneurial innovativeness led to the identification of some crucial factors that include networks, informal relationships, ties to their home cultural associations and a desire for local food in their host countries [11-17].

Investigations on immigrants' entrepreneurship have been geared towards the gender dimension and contextual factors [18] personality traits, individual achievement and entrepreneurial capabilities [19]. Brieger and Gielnik [18] identified external environmental factors that include institutional, social and economic in the host nation that influence entrepreneurial innovativeness among immigrant entrepreneurs. Meanwhile, scholars including Brieger and Gielnik [18] and Rametse, et al. [19] believed that factors such as entrepreneurial orientation, capabilities, proactiveness and risk-taking influence entrepreneurial innovativeness.

Immigrant entrepreneurship is a topic that has been investigated previously. There are indications of those investigations among international students when considering the role of exposure to entrepreneurial education as a factor that instigates entrepreneurial innovativeness among these students. Findings on the contributions or influence of entrepreneurial education on entrepreneurial innovativeness, opportunity recognition and entrepreneurial intention seem saturated [20-24]. Nevertheless, there is no unanimity among the numerous available investigations. Nevertheless, the rate of entrepreneurship education on a global scale keeps increasing because it is believed to be a reliable channel to communicate entrepreneurship to the targeted audience (students of higher education institutions). The rationale is that the positivist school believes that teaching entrepreneurial education can instill entrepreneurial skills, knowledge and attitude in students [20, 25, 26].

Most of the available studies reveal that scholars are keen to investigate immigrants' entrepreneurship among established businesses. Studies of international students exposed to entrepreneurial education in host countries also known as "nascent entrepreneurs" received less attention. The objective of this investigation is to fill the existing literary gap and examine the significant role of entrepreneurial education in the relationship between external factors measured by (institution, economy and society) and internal factors (measured using entrepreneurial orientation, capabilities and individual achievement) on international students' entrepreneurial innovativeness among international students studying in the UAE.

## **2. Literature Review**

### *2.1. Summary of Entrepreneurship among Immigrants*

Scholars have developed an interest in entrepreneurship among immigrants [27-29]. The migrating immigrants brought ideas, knowledge and skills needed mostly for survival during the migration process. Hence, they tend to engage in jobs that the locals never imagined. The migrants directly and indirectly alter the host environment's socio-economic concentration by adding value to the host and home communities [30]. Immigrant entrepreneurship is as old as human migration history. However, the concept was brought back to attention. Therefore, themes such as corporate social responsibilities, business performance among immigrants, resource acquisition, opportunity exploitation, the importance of networks, entrepreneurial propensity and perception of the host country are a few factors that have been investigated over time [11, 13-17].

### *2.2. Theoretical Discussions and Hypothesis Development*

To investigate the intention towards entrepreneurial innovativeness or entrepreneurial engagement, one of the most famous adopted theories is the theory of planned behavior [31, 32] especially when entrepreneurial education is included in the research model [20, 33, 34]. The rationale justifying this scenario is that entrepreneurial education is viewed as a psychological tool while the theory of planned behavior is also a psychological theory. Therefore, the positivist school of thought believes that exposing students to entrepreneurial education will alter their psychology in terms of attitude, perceived behavioral control, subjective norm and intent [35-37].

Entrepreneurial education has been widely used in entrepreneurial studies as an independent variable that alters intention towards entrepreneurial intent (innovativeness or engagement) after exposure. Entrepreneurial education has been adopted as a moderator capable of altering students' views of their immediate or extended environment (external environment) [38-41].

Additionally, exposure to entrepreneurial education has been documented by earlier scholars to influence entrepreneurial opportunity identification and exploitation [42-44]. According to these scholars, exposure to entrepreneurial education influences students' ability to alter their internal convictions or perception concerning their internal convictions (internal environment) to entrepreneurship in terms of orientation, ability, capability and individual orientation. The TPB theory is adopted as a conceptual underpinning.

### *2.3. Influencing Factors of Immigrant Entrepreneurship*

Over the past few decades, scholars including Adelaja [10]; Aliaga-Isla and Rialp [45]; Dabić, et al. [27]; Duan, et al. [46] and Kerr and Kerr [47] have shown interest in understanding the nature, scope and factors that contribute to or

influence immigrants' entrepreneurship. Factors such as government institutional policy, laws, politics, individual personalities, the economy, technologies and taxes significantly influence immigrant entrepreneurial innovativeness and activities. It is evident that countless factors contribute to entrepreneurial innovativeness. For simplicity, these factors are divided into two distinct but interrelated groups: internal and external. External factors are those factors beyond the control of entrepreneurs whereas internal factors are those the entrepreneur has total control over.

#### *2.4. External Factors and Entrepreneurial Innovativeness*

According to entrepreneurship scholars, the external environment dictates entrepreneurial activities. An enabling environment will enhance entrepreneurial innovation and vice versa [48, 49]. Several scholars have great interest in investigating the role and perceived role of the external environment on entrepreneurial innovativeness. Examples of these are not limited to [Gabrielsen \[50\]](#), [Guerrero, et al. \[51\]](#); [Marcocchia \[52\]](#) and [Veciana and Urbano \[49\]](#).

Before diving deeper into the influencing factors of entrepreneurial innovativeness, the construct needs a clear definition. One significant issue facing entrepreneurship is the need for a unified definition of its construct. For example, [Bessant and Tidd \[53\]](#) described entrepreneurship as recognizing and capitalizing by exploiting the identified opportunities. [Veeraraghavan \[54\]](#) describes entrepreneurial innovation as having unique entrepreneurial features. On the other hand, [Kurkkio \[55\]](#) highlights innovation as an efficiency gain through cost reduction and enhanced productivity. From these definitions of entrepreneurial innovation, the one that best matches the context of this investigation is that of [Bessant and Tidd \[53\]](#). The rationale is that the investigated target samples, the international students, innovate by recognizing the opportunities in the host country to capitalize on and exploit them.

Several factors contribute to international students' opportunity recognition and exploitation. Examples include the findings from the [Guerrero, et al. \[56\]](#) study arguing that the institution through policy and politics shaped entrepreneurial thinking that influences students' entrepreneurial innovation.

[Veciana and Urbano \[49\]](#) found a significant relationship between entrepreneurial policy and innovativeness. A conceptual investigation by [O'Connor \[48\]](#) posits a direct relationship between the institution and entrepreneurial innovativeness.

Similarly, there are countless scholarly investigations to determine the effect of the social environment and economy on entrepreneurial innovativeness. These are not limited to [Gabrielsen's \[50\]](#) conclusion of a significant influence of the economy on entrepreneurial innovativeness. Similarly, [Marcocchia \[52\]](#) and [Sheridan, et al. \[57\]](#) note that the economy plays a significant role in students' entrepreneurial innovativeness to create an un-existing market needed by people.

Furthermore, an earlier study by [Miller, et al. \[58\]](#) and [Miles, et al. \[59\]](#) found a significant relationship between environmental, social composition and entrepreneurial innovativeness. Similarly, a recent study by [Muangmee, et al. \[60\]](#) noted a significant relationship between the social environment and entrepreneurial innovativeness. We propose the following hypothesis.

*H1: External factors (institution, economy and social environment) significantly influence international students' entrepreneurial innovativeness.*

#### *2.5. Relationship between Internal Factors and Entrepreneurial Innovativeness*

Similar to the role of external factors in influencing entrepreneurial innovation among students, the importance of internal factors was evident in the literature. For example, [Ertuna and Gurel \[61\]](#) argue that there is a significant relationship between personality traits and entrepreneurial innovation. In a similar study, comparing the effects of personality traits between traditional and social entrepreneurs, [Smith, et al. \[62\]](#) argue the significant influence of entrepreneurial personality traits in both social and traditional entrepreneurs that influence risk-taking abilities and innovativeness.

Delineating the personality trait dimensions, [Ove \[63\]](#) and [Ida Ketut \[64\]](#) note that the need for achievement and internal locus of control significantly influence entrepreneurial innovativeness. Similar arguments by [Lewrick, et al. \[65\]](#) and [Souto \[66\]](#) note that entrepreneurial personality traits have incremental value on entrepreneurial innovativeness and success.

*H2: Internal factors (capability, need for achievement and orientation) significantly contribute to entrepreneurial innovativeness among international students studying in the UAE.*

#### *2.6. Relationship between Entrepreneurial Education and Entrepreneurial Innovativeness*

Entrepreneurial education is any formal knowledge acquisition program that the university management board exposes the students to in anticipation that the students gain entrepreneurial skills, knowledge and the right attitude to become entrepreneurs. This education could be in the form of active learning, peer education or online education [68, 69].

The significant effect of entrepreneurial education has been examined. Despite numerous investigations, scholars had no unanimity on its contribution to entrepreneurial innovativeness, intention, engagement and entrepreneurial success [20, 70-74]. Nevertheless, the acceptance of entrepreneurial education, its introduction and its implementation among educational institutions keep increasing globally. The observed phenomenon might be because of its potential to enhance economic development through income generation, reduce the rate of social vices as a pathway to business start-ups and create a positive attitude for those who are exposed to it [68, 69, 75-78].

Despite these significant potentials of entrepreneurial education, abundant evidence argues that the available entrepreneurial education failed to achieve its desired outcomes. For example, [Olorundare and Kayode \[79\]](#) present a missing link between entrepreneurial giving to students and the needed skills and knowledge to innovate. Similarly,

Adelaja and Minai [21] discussed the negative influence of entrepreneurial education on students' entrepreneurial intentions (the foundation of entrepreneurial innovativeness) [80].

Examining previous investigations, Matthews and Santos [81] argued that the relationship between entrepreneurial education and activities is complex. Focusing on its contribution to entrepreneurial activities is a snippet with a short-term effect. Hence, entrepreneurial education has lots of potential to offer. Nevertheless, scholars and practitioners are yet to determine its role, contents and effects after exposure. The authors have an insight into the scientific role of entrepreneurial education as an independent variable and moderator.

Unconsciously, evidence from the available literary works reveals that exposing students to entrepreneurship has two distinctive effects on their entrepreneurial innovativeness. These are: the role of entrepreneurial education as an independent variable [22-24, 82] an intervening variable and a moderating variable role [83-85].

### *2.7. Relationship between Entrepreneurial Education and Entrepreneurial Innovation (Independent Variable)*

The effect of entrepreneurial education has been done by employing the construct as a separate independent variable. For example, Wei, et al. [24] examining the mediating role of entrepreneurial opportunity recognition, argue a significant mediating effect of individual opportunity recognition on the relationship between entrepreneurial education and entrepreneurial innovation. Cho and Joo-Heon [22] explain its significant role among nascent entrepreneurs in pursuing entrepreneurial innovativeness by employing entrepreneurial education as an independent variable. On the other hand, entrepreneurial education failed to contribute to entrepreneurial innovativeness among professional entrepreneurs. Similar findings from the Hanandeh, et al. [23] study reveal the effectiveness of entrepreneurial education in enhancing innovation start-ups among higher education students.

The findings suggest that exposing students to entrepreneurial education will increase their ability to identify entrepreneurial opportunities in their environment thus affecting innovative ways to identify the identified opportunities. This study posits the following hypothesis:

*H<sub>3</sub>: Exposing international students to entrepreneurial education significantly contributes to their entrepreneurial innovation.*

### *2.8. Entrepreneurial Education and Entrepreneurial Innovation (Moderating Variable)*

Scholars believed that entrepreneurial education acts as a moderating variable that enhances students' entrepreneurial innovativeness in both external and internal factors. Exposing students to entrepreneurial education will increase their innovative capabilities, give them the skills and knowledge to navigate the economic, societal and institutional hurdles and be creative enough to create an un-existing but needed market [83-85].

Meanwhile, findings from scholars such as Entrialgo and Iglesias [83]; Shah, et al. [85] and Fernández-Pérez, et al. [84] employing the theory of planned behaviours (TPB) to assess and affirm the moderating role of entrepreneurial education on the antecedents of intention argue entrepreneurial education to be among the vital sources for entrepreneurship motivation. Similarly, evidence from a recent investigation by Fernández-Pérez, et al. [84] reveals that exposing students with higher emotional competence to entrepreneurial education creates significant and positive attitudes towards entrepreneurial innovation.

### *2.9. The Moderating Role of Entrepreneurial Education on the Relationship between External Factors and Entrepreneurial Innovation*

The moderating role of entrepreneurial education on the external environment and innovation has received attention from scholars.

For example, Seyoum et al. [81] argued that introducing entrepreneurial education as a moderator strengthens the relationship between external support and innovation. A similar investigation by Anwar et al. [82] concluded a significant moderating effect of entrepreneurial education and antecedents of the theory of planned behaviours. Shamsudin et al. [83] developed a conceptual model that attests to the significant moderating role of entrepreneurial education on students' entrepreneurial innovation.

Findings from the studies of Seyoum et al. [81] and Anwar et al. [82] indicated that entrepreneurship education plays a significant moderating role in the relationship between external support and innovation. Supporting these observations, the conceptual model of Shamsudin et al. [83] demonstrates the significant moderating role of exposure to entrepreneurship education on entrepreneurial innovation.

Further evidence from the studies of Prajogo and Oke [84] and Yan and Guan [85] demonstrates the significant role of entrepreneurial education in allowing students to navigate society, the economy and the institution by gaining the required skills, competence and knowledge needed to survive.

Therefore, the findings of these reviews thus reveal that exposing students to entrepreneurial education will enhance their entrepreneurial innovativeness in their immediate external environment. The following hypothesis was posited:

*H<sub>4</sub>: Entrepreneurial education significantly moderates the relationship between external factors (institution, environment and social) and entrepreneurial innovation.*

### *2.10. The Moderating Role of Entrepreneurial Education on the Relationship between Internal Factors and Entrepreneurial Innovation*

Prior empirical investigations included Chang, et al. [39]; Piperopoulos and Dimov [40]; Alaali, et al. [86]; Taryam, et al. [87]; Makki, et al. [88]; Mouzaek, et al. [89] and Twum, et al. [41] conduct extensive investigation on the possible

moderating role of entrepreneurial education on the relationship between internal (personality traits) and entrepreneurial innovativeness. From their various investigations, these authors believe entrepreneurship education significantly moderates the relationship between personality traits and entrepreneurship innovation. Further studies from [Anwar, et al. \[86\]](#) support the idea that exposing students to entrepreneurship education enhances the relationship between personality trait dimensions and entrepreneurial innovativeness. An earlier study by [Zampetakis, et al. \[87\]](#) argues that exposing students to entrepreneurial education triggers innovativeness through self-confidence and the need for achievement. The following hypothesis was proposed:

*H<sub>5</sub>: Entrepreneurial education significantly moderates the relationship between internal factors and entrepreneurial innovation.*

### **3. Methodology**

This research adopts a quantitative research methodology in which sets of predesigned questionnaires were distributed to the identified samples. The samples consist of international students exposed to entrepreneurial education in the UAE. The sampling approach follows a multistage sampling technique that combines probability and non-probability sampling approaches. This method is widely used in marketing and entrepreneurship investigations to narrow the targeted population [\[88\]](#). The non-probability sampling approach is used to group the entire population into strata and a probability (simple random) sample is used to select samples from each stratum.

The researcher must determine a definite number for the total population. Hence, the population is regarded as an infinite population [\[89\]](#). Therefore, a power analysis tool was employed in estimating the needed sample size by using the proposed suitable analysis type, the number of exogenous constructs, the use of effect size ( $f^2$ ), power ( $1-\beta$  err prob), and  $\alpha$  (err prob) [\[90\]](#). The power analysis software estimates a sample size of 250. Meanwhile, to avoid a situation where non-responses and incomplete questionnaires would affect the analysis and its findings, the researchers targeted a large enough sample of about eight hundred (800) responses from international students studying at various universities in the UAE. After three months, three hundred (300) usable questionnaires were retrieved from the targeted respondents making it a 37.5% response rate. Since the observed number is greater than the estimated sample size needed (250). We precede the data analysis stage.

#### *3.1. Construct Measurements and Instrument Development*

Entrepreneurial innovation: Before measuring entrepreneurial innovation in this study, the construct adopts a definition given by [Bessant and Tidd \[53\]](#) where innovation is defined as “the process by which nascent entrepreneurs spot opportunities, connect with them and exploit the identified opportunities.” The rationale is that international students studying in UAE universities could recognize, connect and exploit the recognized opportunities to innovate entrepreneurially. Entrepreneurial innovation is measured through opportunity recognition and exploitation.

A total of twelve (12) items were initially developed to measure entrepreneurial innovation. However, ten (10) items were retained after pre-testing the developed items. The retained items capture entrepreneurial opportunity recognition and exploitation.

Like entrepreneurial innovation, entrepreneurial education has yet to have an agreed upon definition. For example, it is said to prepare students for entrepreneurial start-ups [\[91\]](#). Meanwhile, the definition given by [Fayolle and Klandt \[92\]](#) covers a broader scope that includes methods, context, an approach to teaching and the aim of the subject or course. [Fayolle and Klandt \[93\]](#) described entrepreneurship education in a broader sense as any pedagogical program or process of educating for entrepreneurial attitudes and skills that involves developing certain personal qualities.

Therefore, factors such as entrepreneurial attitude, skills and personal qualities were considered to measure entrepreneurial education. Ten (10) items were initially adapted from the works of [Liñán Alcalde and Chen \[93\]](#); [Colley, et al. \[94\]](#); [Mueni \[95\]](#) and [Neneh \[96\]](#). However, these were reduced to eight (8) after the pre-testing process. The remaining six items were used to collect the needed data.

Concerning the predictors of entrepreneurial innovativeness, the external and internal factors are measured in three dimensions: economy, society and institution. Items measuring the three dimensions were adapted from the studies of [Gabrielsen \[50\]](#); [Guerrero, et al. \[51\]](#); [Marcocchia \[52\]](#) and [Veciana and Urbano \[49\]](#). Twelve items passed the pre-test stage and were used for data collection.

Meanwhile, the internal factors influencing entrepreneurial innovation among international students studying in the UAE were measured by entrepreneurial orientation, individual achievement and individual entrepreneurial capability. Twelve items from the studies of [Ove \[63\]](#) and [Ida Ketut \[64\]](#); [Lewrick, et al. \[65\]](#); [Koe Hwee Nga and Shamuganathan \[67\]](#) and [Souto \[66\]](#) were used to measure the constructs' dimensions that form the internal factors.

#### *3.2. Instrument Reliability and Validity*

The developed items were subjected to item reliability and validity through a pretest. Assessing the questionnaire helps the researcher limit ambiguous, unnecessary and “double-barreled” questions. It enhances readability, reliability and validity (+-). On the reliability part, a composite reliability (CR) measure was employed.

### **4. Data Analysis and Findings**

#### *4.1. Data and Demographic Statistics*

We used SPSS software to analyze the gender and the regions of the participants. The results show that there are more male participants than females, 62% (186) and female respondents at 38% (114). Furthermore, students from Asia took the

lead when asked about their continent of origin followed by European and African students with 47% (141), 37% (111) and 13.7% (41). At the same time, students from America have 1.3% (4) responses in this survey.

4.2. Inferential Statistics

This section presents the data analysis. The data gathered using the predesigned questionnaire was analysed using a structural equation modeling tool (SEM). The rationale for using it is based on the complexity of the investigated model, i.e. higher-order constructs. This was in line with the proposition by Chin [97]. Besides, a repeated modeling approach was used where some first-order constructs were repeated (grouped) to form a higher-order construct.

4.3. Measurement Model Assessment

The measurement model was assessed using convergent validity consisting of item loading, composite reliability and average variance extracted (AVE). Meanwhile, Fornel Larcker and the Heterotrait- monotrait ratio were observed for discriminant validity. Concerning the structural equation, modeling construct collinearity (VIF), path coefficient (r2, f2) and predictive relevance were observed as proposed by Henseler, et al. [98] and Ringle, et al. [99].

The rationale behind convergent and discriminant validity is to assess the data's internal consistency , seek agreement between a specific measuring instrument and the theoretical concept, verify if the measurement scales truly represent their attributes and provide meaningful inferences [100, 101].

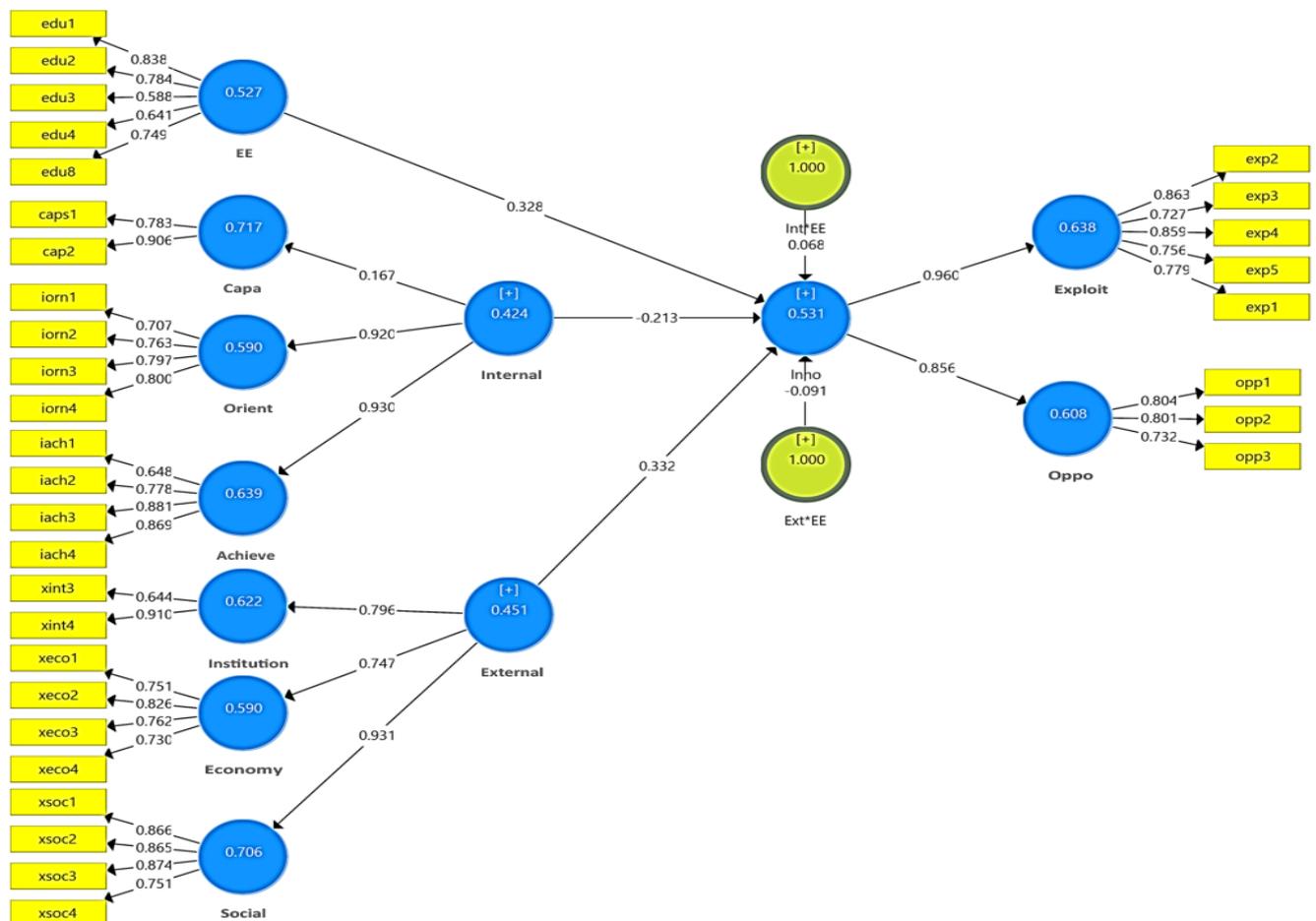


Figure 1. Measurement model.

4.4. Convergent Validity

The model adopts a reflective measurement approach. The items' reliability was measured using the composite reliability parameter which is favored by Cronbach alpha based on the argument of Ringle, et al. [99] who argue that CR is more reliable than Cronbach alpha. Therefore, a value greater or equal to 0.7 was proposed. In this study, the CR values were between 0.762 and 0.905. Hence, it is believed that the condition for achieving internal consistency was attained.

Meanwhile, some items were dropped to achieve the required minimum threshold of 0.5 for the construct's AVE. For example, items five, six and seven were dropped from the construct of entrepreneurial education (EE). Items three and four were dropped from the construct capability. One item from opportunity exploitation (exploit) was deleted and items one and two from items measuring institution because they had item loadings less than 0.4 which reduced the overall AVE. The summary of these values is presented in Figure 1 and Table 1.

**Table 1.**  
Loadings, composite reliability and average variance extracted for the constructs.

Construct	Items	Items loading	CR	AVE	Discriminant validity
EE	Edu1	0.838	0.846	0.527	Yes
	Edu2	0.784			
	Edu3	0.588			
	Edu4	0.641			
	Edu8	0.749			
Opportunity	Opp1	0.804	0.823	0.608	Yes
	Opp2	0.801			
	Opp3	0.732			
Achievement	Iach1	0.648	0.875	0.639	Yes
	Iach2	0.778			
	Iach3	0.881			
	Iach4	0.869			
Capability	Caps1	0.783	0.834	0.717	Yes
	Cap2	0.906			
Economy	Xeco1	0.751	0.852	0.59	Yes
	Xeco2	0.826			
	Xeco3	0.762			
	Xeco4	0.73			
Exploitation	Exp2	0.863	0.898	0.638	Yes
	Exp3	0.727			
	Exp4	0.859			
	Exp5	0.756			
Institution	Xint3	0.91	0.762	0.622	Yes
	Xint4	0.714			
Orientation	iorn1	0.707	0.851	0.59	Yes
	iorn2	0.763			
	iorn3	0.797			
	iorn4	0.8			
Social	xsoc1	0.866	0.905	0.706	Yes
	xsoc2	0.865			
	xsoc3	0.874			
	xsoc4	0.751			

Note: EE= Entrepreneurial éducation; CR = Composite reliability ; AVE = Average variance extracted.

#### 4.5. AVE and CR for Higher-Order Construct

The AVE and CR for the higher order constructs of entrepreneurial innovation, external and internal factors were computed manually using the formula below.

$$AVE = \sum_{i=1}^M \frac{l_i^2}{M}$$

Where  $l_i$  = items loadings of lower construct measured with M lower-order components. It ranges from 1 to M

Therefore,

$$AVE_{Inno} = \frac{0.960^2 + 0.856^2}{2} = 0.827$$

$$AVE_{Ext} = \frac{0.796^2 + 0.747^2 + 0.931^2}{2} = 0.686$$

$$AVE_{Int} = \frac{0.167^2 + 0.920^2 + 0.930^2}{2} = 0.580$$

Whereas the CR for the higher order construct is calculated using the formula

$$CR_{Inno} = \frac{0.960 + 0.856}{2} = 0.908$$

$$CR_{Ext} = \frac{0.796 + 0.747 + 0.931}{2} = 0.824$$

$$CR_{Int} = \frac{0.167 + 0.920 + 0.930}{2} = 0.70 \text{ approx to 2.dp.}$$

#### 4.6. Discriminant Validity

Discriminant validity measures the uniqueness between constructs [102] i.e. the extent to which a construct measures attributes different from other constructs. Discriminant validity is measured using the Fornel Larcker and Heterotrait-Monotrait (HTMT) ratios presented below. Sequel to the suggestions by Ab Hamid, et al. [103], the discriminant validity is

determined using the Fornel Larcker in which the bold diagonal path relates to the square root of AVE. Looking at Table 2, the value bolded at the diagonal is more significant than other values in the row and columns. Therefore, using this parameter discriminant validity is achieved.

**Table 2.**  
Fornel Larcker criterion.

Construct	EE	Oppo	Achieve	Capa	Eco	Exploit	Orient	Social
EE	<b>0.726</b>							
Opportunity	0.479	<b>0.78</b>						
Achieve	0.184	-0.017	<b>0.799</b>					
Capability	0.008	-0.065	0.081	<b>0.847</b>				
Economy	0.369	0.166	0.500	0.081	<b>0.768</b>			
Exploit	0.502	0.679	-0.034	-0.032	0.204	<b>0.799</b>		
Orientation	0.138	-0.018	0.719	0.108	0.472	-0.061	<b>0.768</b>	
Social	0.494	0.41	0.100	0.016	0.505	0.531	0.154	<b>0.84</b>

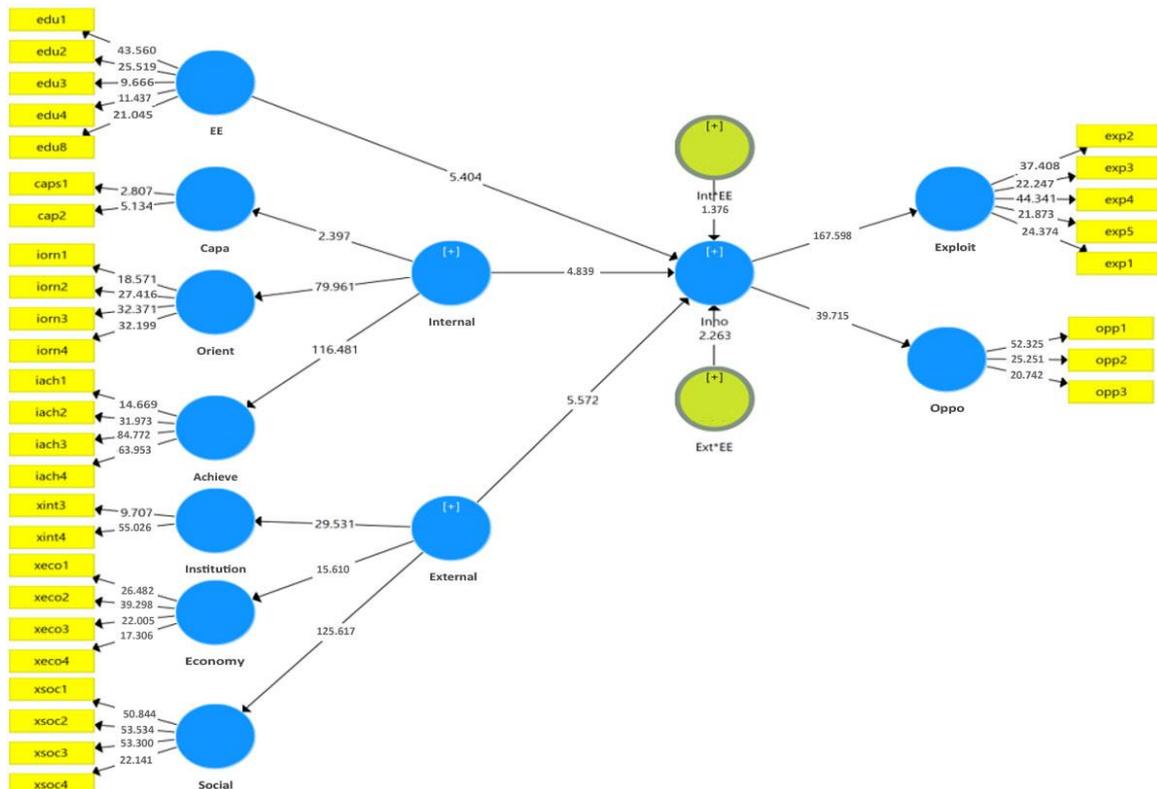
Note: EE = Entrepreneurial education; Capa = Capability; ECO = Economy; Orient = Orientation; Achieve = Achievement.

Table 2 presents the constructs' discriminant validity. According to the postulations by Ab Hamid, et al. [103], the first value (loadings) on the diagonal under a given construct must be greater than other recurring values on the same line and underneath. From the table above, it is observed that the loading under each construct is greater than the subsequent constructs.

Following the proposition of Henseler, et al. [104], the HTMT ratio was used. Henseler, et al. [104] suggest that discriminant validity is achieved if the construct correlation is less than 0.9.

**Table 3.**  
HTMT correlation.

Construct	EE	Oppo	Achieve	Capa	Economy	Exploit	Orient
Opportunity	0.604						
Achieve	0.255	0.127					
Capability	0.073	0.106	0.12				
Economy	0.459	0.216	0.671	0.127			
Exploit	0.58	0.838	0.144	0.103	0.26		
Orient	0.206	0.102	0.304	0.148	0.644	0.135	
Social	0.595	0.497	0.155	0.139	0.59	0.61	0.204



**Figure 2.**  
Structural model presentation.

4.7. Structural Model Presentation (Hypothesis Testing)

We employed the bootstrapping method using the setti5000 resampling to achieve the objective of the hypotheses testing. The choice of a significant level was left at default (0.05) two-tailed as proposed by Hair Jr, et al. [105]. The results are presented in Figure 2 and Table 4.

Meanwhile, before observing the constructs' relationships, we checked the common method bias using the variance inflated factor (VIF) to test the data collinearity, a method proposed by Kock and Lynn [106], and Kock [107]. Using this method, a VIF value of less than 3.3 shows the data is free from common method bias [106], [107]. The VIF values generated from the PLS-SEM software show that the data is free from the common method bias issue by having values less than 3.3.

**Table 4.**  
Variance inflated factor (VIF).

Construct	Innovation
EE	1.625
Ext*EE	1.903
External	1.651
Int*EE	1.392
Internal	1.093

Note: \* Implies significant at 0.05.  
EE = Entrepreneurial education; Ext = External; Int = Internal.

R<sup>2</sup>: The purpose of r<sup>2</sup> in a research model is to measure the degree of variance that the exogenous variables explain for the endogenous variable under investigation. In this study, the r<sup>2</sup> measure was .406. This implies that the constructs, including the moderating effect of entrepreneurial education explain 40.6% of the variance in entrepreneurial innovativeness among international students studying at higher education institutions in the UAE. The r<sup>2</sup> value is presented in Table 5.

4.8. Effect Size (F<sup>2</sup>)

The effect of each construct such as entrepreneurial education and internal and external factors was measured on the endogenous variable entrepreneurial innovation using Cohen's [108] effect size postulated values where f<sup>2</sup> values of 0.02, 0.15 and 0.35 are described as weak, moderate and strong respectively.

**Table 5.**  
Effect size and r<sup>2</sup>

Construct	(f <sup>2</sup> ) Innovation	R square	R square adjusted
Innovation		0.406	0.398
EE	0.112		
Ext*EE	0.02		
External	0.113		
Int*EE	0.008		
Internal	0.07		

Note: \* Implies significant at 0.05.  
EE implies Entrepreneurial Education; Ext implies External; Int implies Internal.

From Table 5, the effect size table, table xx, internal factors, the moderating effect of entrepreneurial education on the relationship between internal and external factors and entrepreneurial innovation was observed to exert a weak effect on students' entrepreneurial innovation with 0.07, 0.008 and 0.02 effect sizes respectively. Contrarily, entrepreneurial education and external factors moderate students' entrepreneurial innovation having 0.112 and 0.113 effect sizes, respectively.

Table 6 presents the summary of the analyzed hypotheses. These include the direct and the moderating hypotheses.

**Table 6.**  
Relationship between observed variables (hypotheses testing).

Hypothesis	Relationship	β	St. dev.	T stat	P values
H <sub>1</sub>	EE -> innovation	0.328	0.061	5.404	0***
H <sub>2</sub>	External -> innovation	0.332	0.06	5.572	0***
H <sub>3</sub>	Internal -> innovation	-0.213	0.044	4.839	0***
H <sub>4</sub>	Ext*EE -> innovation	-0.091	0.04	2.263	0.024*
H <sub>5</sub>	Int*EE -> innovation	0.068	0.049	1.376	0.169

Note: \*\*\* implies significant at 0.001; \* implies significant at 0.05.  
EE implies Entrepreneurial Education; Ext implies External; Int implies Internal.

H<sub>1</sub>: The first hypothesis in this study posits a significant relationship between entrepreneurial education and entrepreneurial innovation among international students studying in the UAE. Using a SEM tool to analyse the collected data, the result shows that exposure to entrepreneurial education significantly influences entrepreneurial innovativeness among students studying in the UAE with entrepreneurship education = ( $\beta = 0.328$ , t-value = 5.404),  $p < .05$ . We accept the first hypothesis.

H<sub>2</sub>: The second hypothesis posits a significant relationship between external factors (measured by institution, economy and society) and entrepreneurial innovation among international students studying in the UAE. As expected, the result reveals a significant relationship between external factors and entrepreneurial innovation with external = ( $\beta = 0.332$ , t-value = 5.572),  $p < .05$ . Hence, we accept the second hypothesis.

H<sub>3</sub>: The third hypothesis also predicted a significant relationship between perceived internal factors (individual capability, needs for achievement and entrepreneurial orientation) and entrepreneurial innovation. The result shows that the posited hypothesis has internal = ( $\beta = -0.213$ , t-value = 4.839),  $p < .05$ . However, despite the significant nature of the result, there is a negative beta ( $\beta$ ) value. This signifies that the higher the perceived internal factors, the lower the entrepreneurial innovativeness among the surveyed sample.

H<sub>4</sub>: The fourth hypothesis posits a significant moderating effect of entrepreneurial education exposure on the relationship between external factors and entrepreneurial innovation among international students studying at higher education institutions in the UAE. As expected, the result shows a significant moderating effect of entrepreneurial education exposure on the said relationship with Ext\*EE = ( $\beta = -0.091$ , t-value = 2.263),  $p < .05$ . Meanwhile, the significant nature of the result displays a negative beta ( $\beta$ ) value.

H<sub>5</sub>: The last hypothesis in this study posits a significant moderating effect of entrepreneurial education exposure on the relationship between internal factors and entrepreneurial innovation among international students studying at higher education institutions in the UAE. The analysis observed in this regard failed to uphold the proposed hypothesis having ( $\beta = 0.068$ , t-value = 1.376),  $p > .05$ . The fifth hypothesis is unacceptable.

## **5. Discussion, Recommendation and Limitations**

In this study, we examine the influence of entrepreneurial education on international students' entrepreneurial innovativeness. Furthermore, we also examine the influence of external and internal factors on innovation intention. Lastly, we investigate the moderating effect of entrepreneurial education exposure on external and internal environment relationships.

This study's first hypothesis was to support the idea that exposing students to entrepreneurial education is significant to international students' entrepreneurial innovativeness. The findings are similar to previous literature which explains that exposing students to entrepreneurial education is vital to ensure and influence entrepreneurial innovation [22-24]. Hence, exposing international students to entrepreneurial education will enhance their psychological state of mind towards entrepreneurial innovation, affirming earlier scholars' rationale for justifying TPB adoption.

Furthermore, the posited second hypothesis in this study affirms the significant influence of the external environment (institution, economy and social) on international students' entrepreneurial innovativeness. The findings, having a positive  $\beta$  value imply that the availability of a conducive external environment which includes the role of the institution in making favorable policies, affordable taxes and a welcoming and habitable social society that supports business growth is capable of instigating entrepreneurial innovativeness among the surveyed samples of international students studying at higher education institutions in the UAE. Therefore, the findings in this regard conform to the notion presented by earlier scholars that positive and encouraging external factors significantly influence students' entrepreneurial innovativeness among international students [50-52, 60].

Similar to the significant effect of the external environment on international students' entrepreneurial innovativeness, the findings on the role of internal factors could not be undermined. The result shows that individual internal factors (measured by personal orientation, achievement, and capabilities) significantly contribute to students' entrepreneurial innovativeness. The findings thus imply that the individual orientation, the students' subjective belief in entrepreneurship, their immediate and potential entrepreneurial achievement and their perceived entrepreneurial capability are crucial factors that significantly contribute to entrepreneurial innovation. The finding in this regard is in line with the conclusion from earlier investigations [61, 64-66] where they are in favor of the significant influence of internal factors on entrepreneurial innovativeness.

Considering the moderating influence of entrepreneurial education on external factors measured in this study by the roles of host country institutions, society and economy, the findings uphold the stance of entrepreneurial education as a psychological factor capable of enhancing the relationship between the perceived influence of external factors and entrepreneurial innovativeness among the samples surveyed. The finding implies that by exposing international students to entrepreneurial education, they can quickly learn about and understand how their society works, the institutions and how to navigate the economic hurdles. The findings in this regard affirm the notion concluded by Anwar, et al. [86]; Shamsudin, et al. [109]; Prajogo and Oke [110] and Yan and Guan [111] who concluded a significant moderating role of entrepreneurial education on the relationship between external factors and students' entrepreneurial innovativeness.

Meanwhile, findings from the last hypothesis failed to be accepted because the result revealed that entrepreneurial education failed to moderate the relationship between the internal factors measured in this study (perceived achievement, capability and orientation). The finding in this regard disagreed with the earlier scholars' conclusion where they argue the significant moderating influence of entrepreneurial education on students' entrepreneurial innovativeness [39-41, 87].

Therefore, the hypothesis results depict that entrepreneurial education failed to have a significant moderating effect on their perceived internal factors and entrepreneurial innovativeness.

### 5.1. Practical Contribution

We identified that entrepreneurial education is an effective psychological tool crucial to entrepreneurial innovation among the surveyed samples. We recommend that the education ministry in the UAE and all stakeholders focus more on keeping the entrepreneurial education curriculum updated. It is hoped that more international students with innovative genius ideas will be attracted to study and reside in the UAE.

Concerning the insignificant moderating role of entrepreneurial education on the relationship between international students' internal factors and entrepreneurial innovativeness, we use this medium to suggest in charge of the entrepreneurship education curriculum that they include entrepreneurship education contents that focus on individual internal factors. We strongly believe that the students studying in higher education in the UAE could learn more about themselves and how they can use entrepreneurial education to innovate and gain a competitive advantage in their host country.

## 6. Conclusion

This study reveals a significant relationship between entrepreneurial education and internal and external factors affecting entrepreneurial innovation among international students studying at higher education institutions in the UAE. The results imply that exposure to entrepreneurial education and understanding of how the external environment operates as well as understanding one's entrepreneurial capabilities, entrepreneurial orientation are crucial to entrepreneurship's innovativeness among the samples surveyed, i.e. international students studying at various higher education institutions in the UAE. Furthermore, they believed that exposure to entrepreneurial education enhanced the relationship between external factors and entrepreneurial innovation among the samples surveyed. This means they better understand how their external environment operates after exposure to entrepreneurial education. On the other hand, the samples surveyed failed to perceive the significant moderating effect of entrepreneurial education exposure on the relationship between internal factors and entrepreneurial innovation. Suggestions were made for improving this relationship.

## 7. Limitations

Some of the significant limitations observed in this study include a low response rate from the respondents due to their limited access. Despite filling the identified gap in the literature, the scope of this research does not cover investigating gender roles in the examined relationship. Similarly, we implore future researchers to employ several research methodologies while investigating similar issues.

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