

Effect of Personality Differences in Shaping Entrepreneurial Intention

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Abstract

Few studies have empirically examined how individual differences interactively influence the entrepreneurial intention amongst students enrolled in information and communication technology (ICT) programmes. To fill this research gap, this paper reports the findings of two studies. The first study confirmed the factor structures of personality traits and entrepreneurial intention based on a sample of 274 ICT students. The second study examined how these personality traits interact to influence the entrepreneurial intention of 415 ICT students. The results revealed that entrepreneurial intention comprises two dimensions: conviction and preparation. The traits of openness and conscientiousness positively influenced both dimensions, whereas extraversion and neuroticism did not influence them significantly. Only agreeableness negatively influenced entrepreneurial preparation. Moreover, openness and conscientiousness interacted to influence entrepreneurial intention.

Keywords: Entrepreneurial intention; information and communication technology; interactive effects; personality traits

1. Introduction

Taiwan has long been a world leader in high-tech hardware manufacturing. Taiwanese companies hold a large share in the market of critical information and communication technology (ICT) products, including computer chips, smartphones, and personal computers. Taiwan's most valued technology companies, like Foxconn and TSMC, are the original equipment manufacturers and design manufacturers for various global consumer electronic brands. Taiwanese firms account for more than 90% of the global notebook and tablet production (Yee, 2014). This industrial development has profoundly affected the choice of programmes selected by students at Taiwanese universities. In the past 10 years, the percentage of students enrolled in bachelor degree ICT-related programmes has remained stable at 42%–46% per year (Ministry of Education, 2015). An increasing number of these students have graduated from universities to create new ventures that are based on their creative ideas and innovative techniques for ICT and become technology entrepreneurs.

Szirmai, Naude, and Goedhuys (2011) indicated that entrepreneurship is a primary source of economic growth that creates business opportunities and reduces unemployment. Specifically, ICT sectors have been amongst the major drivers of economic growth in numerous countries over the past decades. Although numerous ICT entrepreneurs have begun ventures at college, student entrepreneurship remains understudied in business research.

In addition, behaviours consistently identified as relating to individual differences in entrepreneurship are opportunity exploitation, creative innovation, and value creation (Ahmetoglu, Leutner, & Chamorro-Premuic, 2011). Personality traits have been discussed frequently amongst the individual differences; however, few studies have empirically examined how these traits interactively influence the entrepreneurial intention amongst ICT students.

To fill this research gap, this paper presents the findings of two studies. The first study confirmed the factor structure of personality traits (Goldberg 1992; Thompson 2008) and entrepreneurial intention (Wang, Peng, & Liang, 2014), and the second study examined how these personality traits interact to influence the entrepreneurial intention of ICT students. In the present study, personality traits referred to extraversion, openness, neuroticism, conscientiousness, and agreeableness, whereas entrepreneurial intention referred to the self-acknowledged conviction and preparation for establishing a new business venture, adding value to an existing organisation, or consciously planning to do so.

2. Personality Traits

The five-factor model (FFM) of personality is a widely accepted model (Ariani, 2013). While developing 100 items for the structure of the model, Goldberg (1992) noted that relatively small sets of variables could serve as FFM adjective markers. Accordingly, Saucier (1994) developed the 40-item Mini-Marker subset of variables relatively close to the prototypical cores of the FFM of personality. Subsequently, Thompson (2008) developed the International English Big-Five Mini-Markers (IEBFMM) model and confirmed the invariance of the FFM structure across several cultures. The structure of the FFM comprises the five dimensions of extraversion, openness, neuroticism, conscientiousness, and agreeableness.

Extraversion characterises people who are assertive, dominant, energetic, active, talkative, gregarious, enthusiastic, ambitious, and sociable (Ariani, 2013; Costa & McCrae, 1992). People who exhibit high levels of extraversion are typically cheerful and optimistic, enjoy interacting with people and large groups, and seek excitement and stimulation (Liang, Chang, & Hsu, 2013). *Openness* refers to the tendency of having an active imagination, preference for variety, aesthetic sensitivity, intellectual curiosity, and independent judgment and being attentive to inner feelings, flexible, autonomous, and unconventional (Ariani, 2013; Rothmann & Coetzer, 2003). People who exhibit high levels of openness typically seek new experiences and explore novel ideas. They can be described as creative, innovative, reflective, and untraditional (Liang et al., 2013).

Neuroticism is the tendency of experiencing negative emotional states, such as anxiety, depression, fear, sadness, hostility, anger, guilt, disgust, and vulnerability (Major, Turner, & Fletcher, 2006; Rothmann & Coetzer, 2003). People who exhibit high levels of neuroticism are prone to irrational thoughts, impulsive behaviour, and applying poor coping strategies in stressful situations (Liang & Lin, 2015). *Conscientiousness* refers to a person's degree of organisation, persistence, self-control, hard work, active planning and performing of tasks, and motivation to accomplish goals (Barrick, Mount, & Strauss, 1993; Zhao & Seibert, 2006). People who exhibit high levels of conscientiousness are purposeful, responsible, reliable, ambitious, determined, and achievement-oriented (Liang et al., 2013). *Agreeableness* refers to a person's interpersonal orientation (Zhao & Seibert, 2006). People who exhibit high levels of agreeableness are altruistic, cooperative, trusting, compliant, caring, gentle, and warm. They prefer positive interpersonal relationships (Liang & Lin, 2015).

3. Entrepreneurial Intention

The entrepreneurial decisions of ICT students can be determined by studying their entrepreneurial intentions. Thompson (2009) defined entrepreneurial intention as "a self-acknowledged conviction by a person that they intend to set up a new business venture and consciously plan to do so at some point in the future." Previous studies have indicated that entrepreneurial intention is a strong predictor of a planned behaviour (Krueger, Reilly, & Carsrud, 2000) and functions as a mediator or catalyst for action (Fayolle, Gailly, & Lassas-Clerc, 2006).

Entrepreneurs who establish firms differ considerably from those who are promoted or hired. Those who inherit or purchase a firm fall between these two extremes and represent a diverse mix of people in their underlying motivations and attitudes (Cooper & Dunkelberg, 1986).

Lans, Gulikers, and Batterink (2010) defined three types of intentions to create a business: classical entrepreneurial intention, alternative entrepreneurial intention, and intrapreneurial intention. These three types of intentions indicate that learning goals and professional requirements differ amongst entrepreneurs.

Pittaway and Cope (2007) emphasised the importance of developing and implementing diverse approaches to study entrepreneurial intention. A previous study revealed that the personality traits of engineering students strongly influence their attitudes towards self-employment. The entrepreneurial attitude is strongly associated with the intention to start a new venture (Lüthje & Franke, 2003).

Another study indicated that both narrow traits (such as innovativeness) and broad traits (such as Big Five) predict entrepreneurial behaviour (Leutner, Ahmetoglu, Akhtar, & Chamorro-Premuzic, 2014).

4. Personality Traits Related to Entrepreneurial Intention

Zhao and Seibert (2006) indicated that entrepreneurs typically must interact with diverse external constituents, including venture capitalists, partners, employees, and customers. In addition to these constituents, the minimal structure of a new venture and the lack of a developed human resource function suggest that entrepreneurs may spend considerable time in direct interpersonal interaction with their partners and employees. Extraversion is a reliable predictor of interpersonal interaction and relationship (Rothmann & Coetzer, 2003).

A new venture requires exploring new ideas, using creativity to solve problems, and applying innovative approaches to develop products, services, and business strategies (Zhao & Seibert, 2006). A previous study showed that openness is related to successfully adapting to change (Yap, Anusic, & Lucas, 2012). Open people are curious about both inner and outer worlds, and their lives are experientially rich. These attributes are crucial for entrepreneurs (Rothmann & Coetzer, 2003).

Entrepreneurs typically have a substantial financial and personal stake invested in their ventures. The work environment, workload, work-family conflict, and financial risk of starting and running a business venture can produce more physical and psychological stress than that resulting from typical managerial work (Zhao & Seibert, 2006). In addition, entrepreneurs are described as highly self-confident people (Chen, Greene, & Cricke, 1998) with strong beliefs in their ability to control outcomes in their environment (Simon, Houghton, & Aquino, 2000). These traits define low levels of neuroticism.

Conscientiousness is manifested in achievement orientation (a quality of being hardworking and persistent), dependability (a quality of being responsible and careful), and orderliness (a quality of being planful and organised) (Rothmann & Coetzer, 2003). Those who are less conscientious may not necessarily lack moral principles, but they are less exact in applying such principles than are those who are more conscientious. Previous studies have indicated that entrepreneurs are highly motivated to achieve goals. Thus, they exhibit high levels of conscientiousness (Collins, Hanges, & Locke, 2004; Stewart & Roth, 2004).

Entrepreneurs work in small organisations and are less likely to be constrained by dense and interlocking social relationships (Burt, 1992). Entrepreneurs typically operate with little access to legal protection and with a thin financial margin of error because they have limited resources and tend to be self-centred and competitive. Agreeableness can inhibit willingness of entrepreneurs to negotiate aggressively, protect self-interests, and influence or manipulate others for personal gain (Ariani, 2013). Thus, they exhibit low levels of agreeableness (Zhao & Seibert, 2006).

Recent meta-analytic studies have reported a strong association between personality traits and entrepreneurial intention, indicating that entrepreneurs or people with entrepreneurial intentions are more extraverted, open, and conscientious and less neurotic and agreeable (e.g., Zhao, Seibert, & Lumpkin, 2010). Previous studies have determined that extraversion and openness are related to entrepreneurial intentions amongst university graduates (Ismail et al., 2009; Saeed et al., 2013). In addition, Chen, Jing, and Sung (2012) showed in a study on university graduates that extraversion influences entrepreneurial intention through entrepreneurship; openness directly influences entrepreneurial intention and also exerts an indirect effect through entrepreneurship; and conscientiousness directly influences entrepreneurial intention and also exerts an indirect effect through entrepreneurial attitude.

Regarding the interactive effects of personality traits on the entrepreneurial intention, Chang (2015) determined that openness and conscientiousness interact to influence conceived imagination. Entrepreneurial intention can be perceived as a type of conceived imagination.

Rothmann and Coetzer (2003) indicated that high levels of conscientiousness may lead to annoying fastidiousness, compulsive neatness, or workaholic behaviour, which may be disadvantageous to entrepreneurial intention. According to the aforementioned studies, the following three hypotheses are proposed:

H1. Extraversion, openness, and conscientiousness positively predict entrepreneurial intention.

H2. Neuroticism and agreeableness negatively predict entrepreneurial intention.

H3. Openness and conscientiousness interact to predict entrepreneurial intention.

5. Study1: Confirmatory Factor Analysis

5.1 Method

This study adopted a 40-item IEBFMM (Thompson, 2008) and 9-item Entrepreneurial Intention Scale (EIS, Lans et al., 2010; Liñán & Chen, 2009; Wang et al., 2014), which were measured using a 6-point Likert type scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). The scale items are shown in the Appendix.

This study recruited 274 students from ICT related programmes (i.e., Information Management, Information Communication, Computer Science, Telecommunication Engineering, and Electronic Engineering) in two universities of Northern Taiwan. The participants were recruited as a validation sample to confirm the factor structures of the two scales by performing a confirmatory factor analysis (CFA). Most participants were men (67.15%); 23.72% were freshmen, 29.93% were sophomores, 24.82% were juniors, and 21.53% were seniors.

A paper-and-pencil questionnaire was administered by trained graduate assistants, either during or immediately following regular class time. Thus, any problems that participants faced when answering the questions could be directly resolved. Identical survey procedures were used to administer the survey in each target program in the absence of class instructors to decrease social desirability bias (i.e., students may attempt to project a positive self-image to adapt to social norms while answering the questions if class instructors are present). Participation was voluntary, confidential, and anonymous.

5.2 Results

In this study, the factorial validity of the factor structures was tested using LISREL (Version 8.80) by performing CFA with maximal likelihood estimation. The indicators recommended by Hu and Bentler (1999) and Tabachnick and Fidell (2001) were adopted to assess the goodness-of-fit of the model. Regarding the IEBFMM, the five-factor solution yielded an acceptable fit ($\chi^2 = 2982.40$, $df = 730$, $p < .005$, RMSEA = .091, SRMR = .098, CFI = .90, NFI = .91, TLI = .90).

Construct validity was determined based on convergent and discriminant validity. The convergent validity of each factor was tested against the standardized factor loadings (Hair, Black, Babin, & Anderson, 2010). Discriminant validity was tested by calculating the confidence intervals of the inter factor correlation estimates, denoted as ϕ (Bagozzi & Phillips, 1982). The results indicated that each factor achieved convergent validity (factor loading $> .5$) and discriminant validity ($1 > \phi > -1$).

Regarding the EIS, the two-factor solution yielded a good fit ($\chi^2 = 186.56$, $df = 26$, $p < .005$, RMSEA = .099, SRMR = .062, CFI = .97, NFI = .96, TLI = .96). Based on the aforementioned criteria, each factor achieved convergent validity and discriminant validity, thereby confirming construct validity. Table 1 shows the CFA results of IEBFMM and EIS.

Table 1: The CFA of IEBFMM and EIS (n=274)

Variable	IEBFMM					EIS	
Item/Factor	Extraversion	Openness	Neuroticism	Conscientiousness	Agreeableness	Conviction	Preparation
1	.83	.50	.89	.70	.81	.83	.91
2	.66	.53	.84	.53	.70	.84	.90
3	.78	.52	.52	.76	.61	.80	.65
4	.71	.61	.52	.73	.52	.79	
5	.72	.50	.50	.72	.50	.78	
6	.63	.53	.53	.64	.53	.76	
7	.86	.74	.52	.65	.64		
8	.55	.76	.51	.53	.61		
Composite Reliability	.893	.755	.800	.854	.767	.915	.864

6. Study 2: Testing the Interaction Model

6.1 Method

The 415 students who participated in this study were recruited from the same programmes in Study 1. Most participants were men (66.27%); 28.43% were fresh men, 26.99% were sophomores, 23.62% were juniors, and 20.96% were seniors. This investigation was identical to the process used in Study 1. Similarly, participation was voluntary and anonymous. In Study 2, personality traits and entrepreneurial intention were treated as independent and dependent variables respectively.

6.2 Results

In Study 2 ($n = 415$), the interactive effect between openness and conscientiousness on entrepreneurial intention was identified based on the literature review and through multiple regression analysis. The interaction hypotheses were tested by using LISREL 8.80. In this study, conscientiousness was treated as a moderator. Simple slopes and regression lines for each level of the moderator were calculated to further examine the form of interaction for interpreting the interactive effects (Hayes & Matthes, 2009).

The results revealed that the levels of entrepreneurial conviction increased with increasing levels of openness, regardless of high (one standard deviation above the mean) or low (one standard deviation below the mean) levels of conscientiousness. The entrepreneurial conviction of students with high conscientiousness (high-CO) was higher than that of students with low conscientiousness (low-CO) when levels of openness were low. However, when levels of openness were high, the entrepreneurial conviction of students with both high-CO and low-CO was the same (Figure 1). In response to the increased levels of openness, the levels of entrepreneurial conviction of students with low-CO increased more rapidly than the levels of entrepreneurial conviction of students with high-CO did. A similar pattern was observed in the interactive effects on entrepreneurial preparation. However, amongst students with low-CO, the levels of entrepreneurial preparation of increased less than did the levels of entrepreneurial conviction (Figure 2). Therefore, H3 was supported.

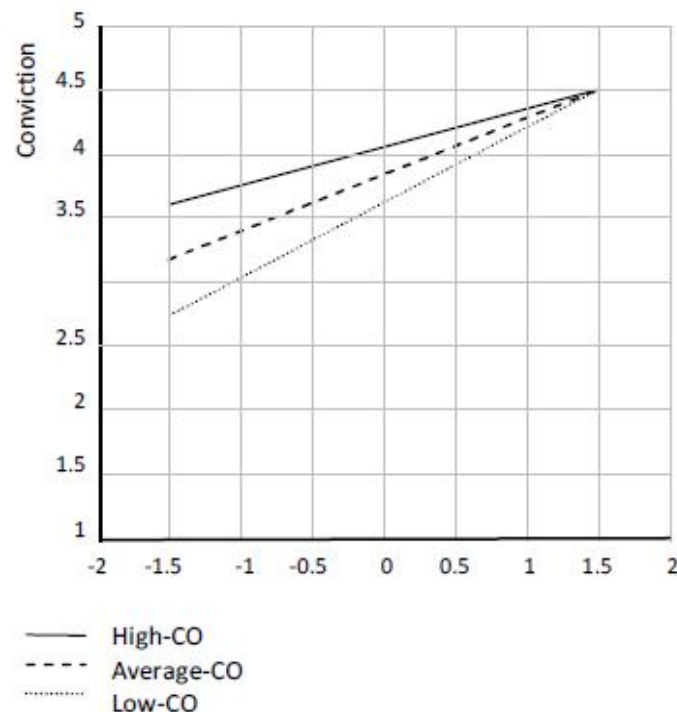


Figure 1: Plots of Interactive Effects of Openness and Conscientiousness on Entrepreneurial Conviction (N = 415)

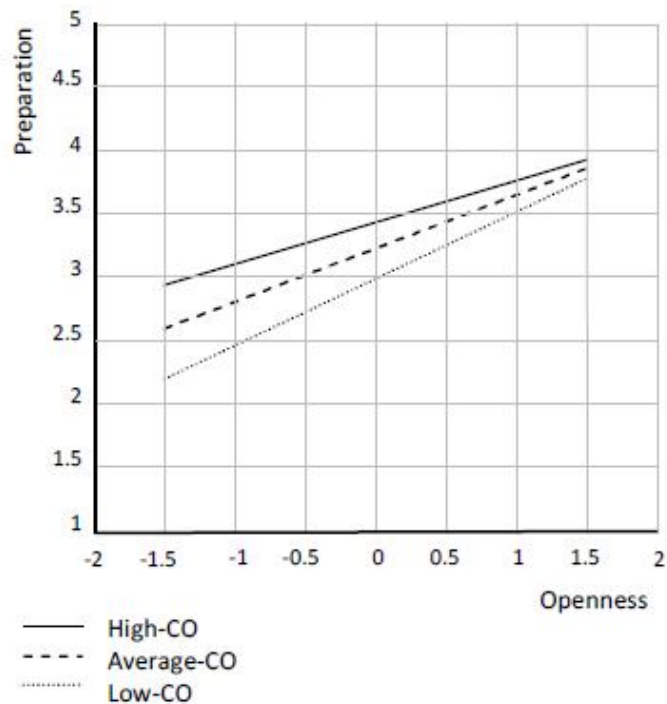


Figure: Plots of Interactive Effects of Openness and Conscientiousness on Entrepreneurial Preparation (N = 415)

The proposed hypotheses were statistically analysed using LISREL (Version 8.80) and structural equation modelling (SEM) with maximal likelihood estimation. The results revealed that the model fit was acceptable ($\chi^2 = 1412.12$, $df = 478$, $p < .005$, root mean square error of approximation = .069, standardised root mean square residual = .056, comparative fit index = .94, normed fit index = .92, Tucker-Lewis index = .94). The results of SEM explained a substantial level of variance for the dimensions of entrepreneurial conviction ($R^2 = .23$) and entrepreneurial preparation ($R^2 = .15$).

The structural model in Figure 3 shows that openness and conscientiousness positively predicted both dimensions of entrepreneurial intention. Extraversion nonsignificantly influenced entrepreneurial intention; thus, H1 was partially supported. The results also indicated that neuroticism nonsignificantly influenced entrepreneurial intention. Agreeableness negatively predicted entrepreneurial preparation. Consequently, H2 was partially supported. In Figure 3, the solid line indicates that the effect was statistically significant, whereas the dotted line indicates that the effect was statistically nonsignificant. Table 2 shows the correlation coefficients of the latent independent variables.

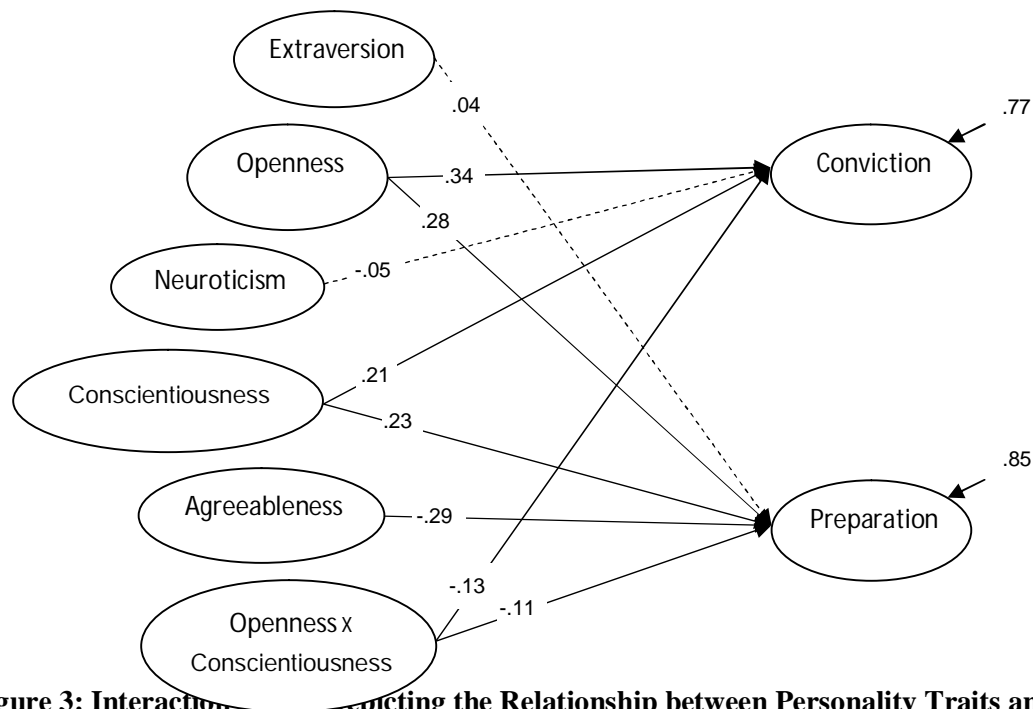


Figure 3: Interaction depicting the Relationship between Personality Traits and Entrepreneurial Intention (N=415)

Table 2: The Correlation of Latent in Dependent Variables (n=415)

Independent variables	1	2	3	4	5	6
1. Extraversion	1					
2. Openness	.47	1				
3. Neuroticism	-.05	-.05	1			
4. Conscientiousness	.31	.56	-.09	1		
5. Agreeableness	.24	.40	-.03	.44	1	
6. Openness x Conscientiousness	.06	.21	-.07	.15	.04	1

* $p < .05$.

7. Discussion

In this study, confirmatory factor analysis was conducted to confirm the factor structures of the IEBFMM and entrepreneurial intention scale, which were both used to assess the personality traits and entrepreneurial intention of ICT students. The results indicated that personality traits comprised five dimensions (i.e., extraversion, openness, neuroticism, conscientiousness, and agreeableness). Entrepreneurial intention was categorised into two dimensions (i.e., conviction and preparation). In this study, “conviction” referred to a strong belief or opinion towards commitment to an entrepreneurial career, and “preparation” referred to the activities or processes that prepare a person to become an entrepreneur.

Regarding the direct effects of personality traits, the results revealed that openness and conscientiousness positively influenced both the dimensions of entrepreneurial intention, an influence that was consistent with those noted in previous studies (Brandstätter, 2011; Zhao et al., 2010). Extraversion and neuroticism did not exert effects either on entrepreneurial conviction or on entrepreneurial preparation in the present study, possibly because of cultural differences and socio-psychological adaptation (Schmitt, Allik, McCrae, & Benet-Martínez, 2007; Ward, Leong, & Low, 2004). The results of the present study also indicated that agreeableness negatively influenced entrepreneurial preparation, but did not influence entrepreneurial conviction significantly. This implies that agreeableness influenced action-based preparation rather than entrepreneurial conviction.

Regarding the interactive effects of personality traits, the results showed that the levels of entrepreneurial intention of high-CO and low-CO students increased with the levels of openness. Specifically, amongst low-CO students, the levels of entrepreneurial conviction increased more with increasing levels of openness than did the levels of entrepreneurial preparation. Rothmann and Coetzer (2003) indicated that people who are less conscientious do not necessarily lack moral principles, but they are less exact in applying such principles than are those who are more conscientious. The results of the present study found that low-CO ICT students may apply moral principles less in action-based preparation and have lower levels of attitude-based conviction in entrepreneurship.

These results have several crucial practical implications, and these findings may be used for educational purpose and career counselling. ICT educators should emphasise openness and conscientiousness as personality traits associated with entrepreneurial intention in students. Openness seems to be particularly critical, because it appears to influence entrepreneurial intention the most. ICT educators may also less emphasise certain traditional entrepreneurial personality traits, particularly extraversion. The classic image of an entrepreneur as an extrovert may discourage some students from becoming ICT entrepreneurs. In addition, neuroticism does not necessarily influence the entrepreneurial intention negatively, particularly amongst ICT students. Accordingly, the mutual influence of openness and conscientiousness should be considered when developing educational interventions or providing career counselling. ICT educators should advise students that personality traits are only a set of variables that influence entrepreneurial success; students should focus on acquiring other types of critical entrepreneurial competencies.

The present study provides several contributions to entrepreneurial literature. First, this study developed a novel approach for researching ICT education and discussed practical implications of the findings. Second, enhancing student interest and technology-related career choices is amongst the primary goals of ICT educators. This study elucidated alternative approaches for selecting students, offering them career counselling, and enabling academic success by studying ICT. Third, entrepreneurship is crucial because it enables economic efficiency, innovative product and service development, and new employment opportunities. However, the importance of entrepreneurship remains unacknowledged by current ICT programmes. This study clarified the facilitative role of and interactions amongst specific personality traits in enhancing entrepreneurial intention.

The economic efficiency generated by ICT majors is more crucial than previously anticipated. The number of students majoring in ICT who contribute to technology services or become technopreneurs is considerably higher than that of students majoring in other fields. Entrepreneurial intention can function as a catalyst for action (Fayolle et al., 2006); hence, this study considered the following questions to direct future research. First, how do ICT educators account for various personality considerations when creating diverse entrepreneurial activities? Second, regarding the relationships amongst personality and entrepreneurial intention, do domains differ amongst ICT programmes, and, if so, what are the implications of these differences? Third, how do distinct types of contextual and psychological factors interact with the personality traits of students to influence entrepreneurial intentions? The answers to these questions might yield insights into developing educational strategies for entrepreneurial education.

Certain limitations were encountered in this study. First, the entrepreneurial intention examined in this study was not necessarily linked to entrepreneurial behaviour. The degree to which the personality traits examined were associated with the intentions and behaviour traits involved in becoming technopreneurs warrants further research. Second, although the structural models achieved an acceptable goodness of fit, the predictive validity could have been stronger. Personality is only one variable influencing the entrepreneurial intention of students. Future studies should examine additional contextual and psychological variables. Third, the opinions of technopreneurs were not considered in this study. The influence of real-world experience on student attitudes was not examined. Future research should address this research gap.

8. Conclusion

Despite the limitations, the results of the present study reflected the value of examining specific personality traits and elucidated the mutual influence of such traits on entrepreneurial intention. In summary, openness and conscientiousness positively influenced entrepreneurial conviction and preparation, whereas extraversion and neuroticism did not influence these two dimensions of entrepreneurial intention. Only agreeableness negatively influenced entrepreneurial preparation.

In addition, the results showed that openness and conscientiousness interacted to influence entrepreneurial intention. The entrepreneurial conviction of low-CO students increased more with the level of openness than entrepreneurial preparation did.

Entrepreneurship is crucial role in a dynamic modern economy, and entrepreneurial intention is central to explaining new business start-ups and is conducive to influencing entrepreneurial action. Therefore, developing a deeper understanding of entrepreneurial intention and the variables that attract people to entrepreneurship is crucial. This study revealed that personality constructs are central in developing this understanding.

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Appendix**The items of the International English Big-Five Mini-Markers**

Factor/item
Extraversion
1. Shy
2. Talkative
3. Energetic
4. Quiet
5. Extraverted
6. Outgoing
7. Reserved
8. Untalkative
Openness
9. Creative
10. Intellectual
11. Unimaginative
12. Artistic
13. Intelligent
14. Philosophical
15. Deep
16. Uncreative
Neuroticism
17. Envious
18. Emotional
19. Anxious
20. Unworried
21. Jealous
22. Unenvious
23. Moody
24. Unanxious
Conscientiousness
25. Efficient
26. Disorganized
27. Careless
28. Untidy
29. Neat
30. Inefficient
31. Systematic
32. Organized
Agreeableness
33. Kind
34. Sympathetic
35. Harsh
36. Cooperative
37. Unkind
38. Warm
39. Rude
40. Inconsiderate

The items of entrepreneurial intention

Factor/item
Conviction
I am going to do anything to become an entrepreneur.
My professional goal is to become an entrepreneur.
I will make every effort to establish and operate my own business.
I have seriously considered starting a business.
I am determined to become a profession business manager.
I am determined to develop my business into a high-growth enterprise.
Preparation
I prepare to start my own business within 2 years. Activity
I prepare to start my own business within 5 years. Activity
I am going to inherit my family's business in the future.