

# **An Investigation of Factors that Influence Student and Team Outcomes in Entrepreneurship Education**

A Thesis submitted to Dublin City University Business School in  
Partial Fulfilment of the Requirements for the Degree of Doctor of  
Philosophy

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November, 2018

## **DECLARATION**

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of Doctor of Philosophy is entirely my own work, and that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

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# ACKNOWLEDGEMENTS

I am indebted to a number of people who have helped me professionally and personally during this time. Without these exceptional people at my side guiding, teaching, encouraging, comforting, and challenging me at every turn, this thesis would not exist.

I owe a great deal to my institution Dublin City University, particularly the Business School. I count myself extremely fortunate to have grown, worked, and studied in such a dynamic atmosphere. Over the years, I have encountered many who have shaped my thinking, but a few whom have been instrumental: Prof. Colm O’Gorman, Emeritus Prof. Kathy Monks and statistician Gerry Connyngham. In addition, Dr. Teresa Hogan, who has been a guiding force, mentor, and a support throughout. I cannot thank these people enough – but over the coming years, I intend to try! To Graham Hunt, Laura Ferry, and my long-standing officemate and fellow radiator fan, Dr. Grace Fox - for all they had to burden themselves with to give me moments of study. I would also like to thank Dr. Ann Largey, Dr. Audrey Nichols, and Dr. Anne Morrissey, my colleagues on the DCU programme in Riyadh where I spent three semesters; their devotion to our students and programme is a constant inspiration.

I thank my supervisors, Professor Theo Lynn and Dr. Ciarán Mac an Bhaird, for their endless support, guidance, and patience over the years. The energy with which Ciarán discusses research is remarkable, and helped to bolster me in times of strain. His insight and candour was refreshing, and he was always willing to meet and discuss my numerous minute thesis concerns! My primary supervisor, Theo has had a fundamental impact on my research and career path. He has helped countless people find their way, academically and professionally, and this is something I hope to emulate in my career. Throughout my PhD process, Theo has been a committed mentor, and has provided me unwavering support. It was a solace to know that a discussion of frameworks and theories over coffee was always an option, and I hope this continues.

I had the fortune in having two incredible study companions, each on a different continent. Caroline McGroary – during my semesters in Riyadh she kept me focused, and it meant everything to have someone to study, laugh, and talk with. I am however grateful to be finished with the military break-time regime! To the hero of the piece, Jenny Kennedy. It has been a pleasure to work with Jenny over the years, and her friendship is one of the most important outcomes of this entire process. She is the one of the strongest and kindest people I have ever had the good fortune of meeting.

To my friends outside the academic bubble, thank you for keeping me sane and helping me have a semblance of balance in my life. To Ciarán, thank you for your patience and kind words throughout. It cannot have been easy to deal with, and your infallible positivity kept me going through the worst of times. My family has been incredible during the entire duration, and I owe them everything. Eamon, for bringing me back to reality with a joke and a story. To my dad, John, for helping me with anything and everything in his power - just to make my day a little easier. To my mother, Julie who could defend this thesis as well as I, and has been a true friend and confidante. I feel extremely lucky to be so supported by these wonderful people. Though the process has been arduous and gruelling at times, I have never felt alone in the journey.

Lastly, I would like to thank my students. They are the true inspiration of this thesis, and provide me with insight and motivation daily.

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## LIST OF ABBREVIATIONS

AVE	Average Variance Extracted	IRR	Inter-Rater Reliability
CR	Composite Reliability	MGA	Multi-Group Analysis (MGA)
DICE	Digital Innovation Creativity and Enterprise	Nach	Need for Achievement
DCU	Dublin City University	NVC	New Venture Creation
EE	Entrepreneurship Education	NGM	Next Generation Management
EEI	Interest in Entrepreneurship Education	PEP	Project Entrepreneurial Separation
EEP	Entrepreneurship Education Programme	PEP-SEP	Project Entrepreneurial Passion Separation
EI	Entrepreneurial Intentions/Intentionality	PCA	Principle Components Analysis
EP	Entrepreneurial Passion	PLS	Partial Least Squares
EP-M	Entrepreneurial Passion (Murneiks Scale)	SCT	Social Cognitive Theory
EP-C	Entrepreneurial Passion (Cardon Scale)	SCCT	Social Cognitive Career Theory
ESE	Entrepreneurial Self-Efficacy	SEE	Shapero Entrepreneurial Event
ESE-SEP	Entrepreneurial Self-Efficacy Separation in a team	SEM	Structural Equation Modelling
ET	Entrepreneurial Traits/Trait theory	SET	Student Team in Entrepreneurship Education
GET	General Enterprise Tendency test	SPSS	Statistical Package for the Social Sciences
HEA	Higher Education Authority	T1/T2	Time one/Time two
HTMT	Hetero-trait Mono-trait matrix	TBP	Theory of Planned Behaviour
IC	Individual Creativity	TCI	Team Climate Inventory
ICC	Intraclass Correlation Coefficient	TPIS	Team Passion Intensity Separation
IMO	Input Mediator Output	USI	University Support for Innovation
IMO-SET	Conceptual Framework for the Student Entrepreneurship Team	USI-SEP	Team member separation for University Support for Innovation
IPO	Input Process Output	VIF	Variance Inflation Factor



# PUBLICATIONS DEVELOPED FROM THE THESIS

## Publications

Lyons, R., Lynn, T., and Mac an Bhaird, C. (2015). Individual Level Assessment in Entrepreneurship Education: An Investigation of Theories and Techniques. *Journal of Entrepreneurship Education*, 18 (1), pp. 136-156

## Book Chapters

Lyons, R., Lynn, T. and Mac an Bhaird, C. 2017. Social loafing in student entrepreneurship teams. IN: Santos, S., Caetano, A., Mitchell, C., Landström, H and Fayolle, A. (Eds), *The emergence of Entrepreneurial Behaviour: Intention, Orientation, and Education. European Research in Entrepreneurship*, Edward Elgar Publishing, Cheltenham, pp.140-165.

## Conference Proceedings

Lyons, R., Lynn, T. and Mac an Bhaird, C. (2018, October). Encouraging Innovation in the Student Team of Entrepreneurship Education. Entrepreneurship Summer University 2018 Conference, Lodz, Poland.

Lyons, R., Lynn, T. and Mac an Bhaird, C. (2017, November). A Study of Changing Student Entrepreneurial Self-Efficacy in Entrepreneurship Education. ISBE Conference 2017, Belfast, N. Ireland. (Best Paper Award)

Lyons, R., Lynn, T. and Mac an Bhaird, C. (2016, October). The Effect of Gender Diversity in Student Entrepreneurship Teams. ISBE Conference 2016, Paris, France.

Lyons, R., Lynn, T. and Mac an Bhaird, C. (2016, May). An Exploration of Passion: The Effect of Entrepreneurship Education. 3E Conference - ECSB Entrepreneurship Education Conference, Leeds, UK.

Lyons, R., Lynn, T., & Mac an Bhaird, C. (2015, September). Aligning Passion in Student Entrepreneurship Teams. Irish Academy of Management, Galway, Ireland.

Lyons, R., Lynn, T., & Mac an Bhaird, C. (2014, August). Social loafing in student entrepreneurship teams. Entrepreneurship Summer University 2014 Conference, Lund, Sweden. (Best Paper Award)

Lyons, R., Lynn, T., & Mac An Bhaird, C. (2012, September). Evaluating the General Enterprise Tendency Test as a Viable Instrument for Assessing an Enterprise Module within a Student Population. British Academy of Management 2012, Cardiff, United Kingdom.

Lyons, R., Lynn, T., & Mac An Bhaird, C. (2012, September). Evaluating The General Enterprise Tendencies Of Students Undertaking An Enterprise Module: A Comparison Between Postgraduate And Undergraduate Students. 15th Annual Irish Academy of Management Conference 2012, Maynooth, Ireland.

# ABSTRACT

## **An Investigation of Factors that Influence Student and Team Outcomes in Entrepreneurship Education**

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This thesis investigates the impact of individual, team and pedagogical factors on individual and team level outcomes in the context of entrepreneurship education. Despite the growth in research focused on entrepreneurship education in recent decades, there are on-going concerns about methodological rigor within the domain. Furthermore, few researchers have explored the student team in entrepreneurship education. Drawing primarily on Social Cognitive Career Theory and the Input-Mediator-Output framework, this study explores the influence of factors such as entrepreneurial self-efficacy, entrepreneurial intentionality, creativity, and entrepreneurial experience on individual and student team outcomes. A series of four quantitative studies were conducted, drawing on 1004 third-level students and 185 student teams. In synthesising the findings with extant knowledge, a definition and research framework for the student team in entrepreneurship education is presented.

The key findings indicate that in entrepreneurship education, students with entrepreneurial experience have higher entrepreneurial intentionality and founding passion, while student teams with entrepreneurship experience are associated with better team processes, higher performance, and more innovative outcomes. Furthermore, entrepreneurial self-efficacy predicts entrepreneurial intentions, subject interest, and reduces social loafing. In addition, perceptions of creativity, creativity training, and supportive climates for innovation (team and institutional) are positive predictors of individual and team outcomes.

The study provides a critical review of prominent entrepreneurship theories, and provides a contextual revision of an individual trait-based measure of entrepreneurial tendencies. By using novel operationalisations of key constructs the team-level studies, greater insight into team emergent states and misalignment is provided. It is the first study to examine cognitive team separation variables in context. Pedagogically, the four studies provide actionable insights for the educator in areas such as training, team selection, and mitigation of social loafing, thus enhancing the delivery of entrepreneurship education, and supporting a stronger ecosystem conducive to student entrepreneurial development.

In 400 B.C., Thucydides spoke of a society and a people entrepreneurial in nature, with ambition, and goals and hopes for the future.

He wrote:

*We are lovers of beauty without extravagance, and lovers of wisdom without unmanliness. Wealth to us is not mere material for vain glory but an opportunity for achievement; and poverty we think it no great disgrace to acknowledge but a real degradation to make no effort to overcome. But the bravest are surely those who have the clearest vision of what is before them, glory and danger alike, and yet notwithstanding go out to meet it.*

# CHAPTER 1: Introduction

## 1.1 Introduction

Extant academic literature and empirical analysis have found entrepreneurship to positively affect economic growth, increase the efficiency of innovative action, create employment, enhance productivity, and aid macroeconomic stability (van Stel, Carree and Thurik, 2005; Van Praag and Versloot, 2007; Valliere and Peterson, 2009; Lundin, 2015). These contributions are of interest to government and academia, who want to understand and encourage entrepreneurial endeavour (Kuratko, 2005; Matlay, 2005). Governments can assist by supporting the shared interest of public and private parties in their commercial entrepreneurial pursuits (Minniti, 2008). In academia, entrepreneurship is fostered through education, training, and auxiliary support, encouraging the development of entrepreneurial skill, cognition, and motivation in students. Its most common method is through the delivery of entrepreneurship education in academic institutions. Entrepreneurship education (EE) is defined as:

*“Any pedagogical programme or process of education for entrepreneurial attitudes and skills, which involves developing certain personal qualities”*

(Fayolle, Gailly and Lassas-Clerc, 2006, p.702).

The fundamental goal or *raison d'être* of EE at its inception was to catalyse the flow of entrepreneurs to the market by transferring knowledge, skills, and competencies germane to new venture creation (Garavan and O'Connell, 1994a; 1994b; Fleming, 1996; Varela and Jimenez, 2001; McMullan, Chrisman and Vesper, 2002; Matlay, 2006; McHugh and O'Gorman, 2006; Nilsson, 2012; Rideout and Gray, 2013). The subject can also help to create positive perceptions of entrepreneurship as a career (Krueger, 1993; Kolvereid and Moen, 1997; McStay, 2008; Nabi *et al.*, 2016; Nabi *et al.*, 2017). While it was long debated whether entrepreneurship could be taught, the general consensus is now that entrepreneurial competencies, knowledge and attitudes can indeed be instilled in an academic setting (Kantor, 1988; Gorman, Hanlon and King, 1997; Kolvereid and Moen, 1997; Kuratko, 2005; Henry, Hill and Leitch, 2005; Winkel, 2013).

Entrepreneurship education is predominantly taught via traditional business lectures blended with experiential activities and assignments (Hynes, 1996; Bird, 2002; Hytti and O’Gorman, 2004; Birdthistle, Hynes, and Fleming, 2007; Jones and Iredale, 2010). The span of topics considered pertinent to EE has caused much curricular breadth and ambiguity for universities and instructors (Matlay, 2006c). Consequentially, EE as a taught subject is widely disparate, and driven more by general educational norms than research-based theory (Rideout and Gray, 2013). Both the academic study and teaching of EE is hampered by conflicting recommendations for curricula and pedagogy, due to studies that are limited in convergence and methodological rigor (Gorman *et al.*, 1997; Matlay, 2006; Pittaway and Cope, 2007a; Rideout and Gray, 2013; Lorz *et al.* 2013; Nabi *et al.* 2017).

*“The psychological, social and cultural constraints, coupled with questions of timing and the very nature of skills or competency development, make the teaching of entrepreneurship a rather difficult proposition when compared to other disciplines*

(Potter 2008, p. 55)

Accordingly, this research thesis is set against the backdrop of diverging research on the appropriate pedagogical techniques to employ in EE. In turn, the need for methodological rigor and focus in these investigative studies is palpable. This thesis is methodologically beneficial as it examines EE from both the perspective of the individual and the team. It starts with the student of EE, and the effect of their perceptions and experience on individual outcomes within a course. It progresses to an examination of the effect of these tendencies and perceptions on the student entrepreneurship team in entrepreneurship education (referred to herein as the SET), and the resultant outcomes. The thesis comprises of four studies, which explore the individual entrepreneurial tendencies, and team innovativeness and performance. Following the separate individual and team level analyses, the quantitative findings are integrated to deepen the understanding of the student entrepreneurship team. A definition and a conceptual framework for the SET is presented, based on the review of extant literature and the empirical findings of the studies.

The cumulative findings provide empirical support for the influence of individual student antecedent perceptions and experience relating to entrepreneurship, as well as the impact that pedagogical choices relating to team selection and training can have in context. This introductory chapter sets the context and outlines the research questions for the study. The next section provides an overview of EE in the Irish context.

## **1.2 Background and Context**

### **1.2.1 Entrepreneurship Education in Ireland (National Level)**

This thesis is contextualised within the third-level level education system in Ireland, focusing on EE at undergraduate level. Ireland rose from 11<sup>th</sup> position in the 2014 Global Innovation Index to seventh in 2016, a success in part credited to governmental foresight and Higher Education Institutes (Dutta, Lanvin, and Wunsch-Vincent, 2016). Historically named ‘the island of scholars’, Ireland has seven universities, fourteen institutes of technology and seven colleges of education. It is predicted that due to its large youth base, student numbers at third level will grow by nearly 30% over the next 15 years, from a current base of 215,000 (HEInnovate Ireland, 2017).

To spur more towards enterprising action, EE is often discussed at policy level (Goodbody Report, 2002; Fitzsimons and O’Gorman, 2005; Cooney and Murray, 2008; Forfás Ireland, 2010; Hunt, 2011; O’Gorman and Fitzsimons, 2012; National Policy Report on Entrepreneurship in Ireland, 2014; HEA, 2015). Increasingly, it is recognised that skills and competencies related to enterprise and innovation are of benefit to graduates:

*“The need to embrace change as an opportunity explains the growing importance of entrepreneurial imagination in recent years. Whether as employees of established leading companies, as entrepreneurs in new start-up enterprises, or as social innovators, Irish graduates need to be job shapers and not just job seekers”*

(Hunt Report, 2011, p.37)

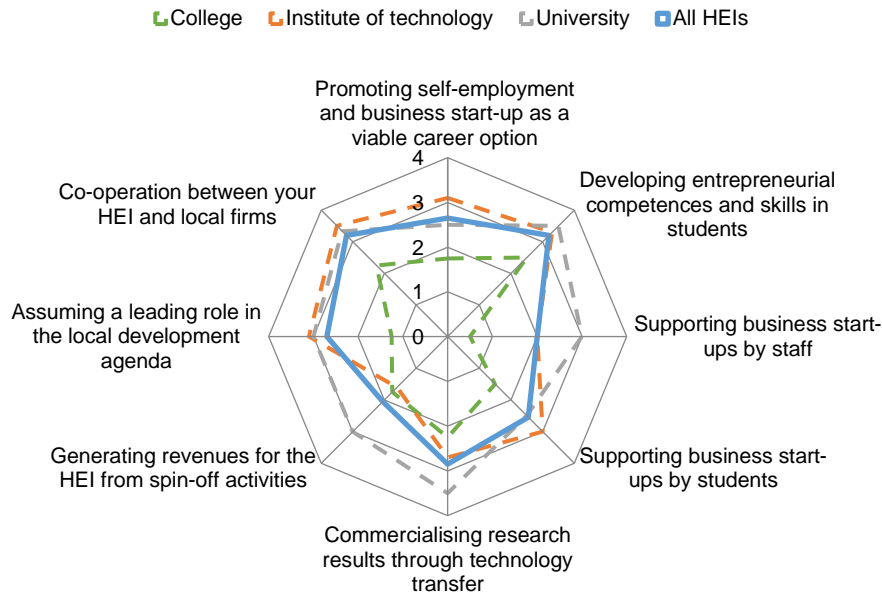
The National Entrepreneurship Policy Statement (2014) planned its assistance to the entrepreneurial ecosystem along key pillars: (i) culture, human capital and education; (ii) business environment and support; (iii) access to finance; (iv) entrepreneurial networks and mentoring; (v) access to markets; and lastly, (iv) innovation. Its objectives for 2020 are to increase the number, survival rate, and scale of startups by 25%. The report places emphasis on the effective delivery of education and training to entrepreneurs, and the development of enterprising skills and competencies in citizens. The start-up community in Ireland have flagged a need for training and assistance in finding co-founders, obtaining external support and investors, and understanding internationalisation; aspects, which could be helped by the teaching of entrepreneurship skills and knowledge (HEInnovate Ireland, 2017). The policy implications of the above highlight the positive climate for the delivery of EE within Ireland presently. At primary and post-primary level, the Action Plan for Education (2018) sets out key plans to encourage the effective delivery of initiatives (such as an entrepreneurship national competition and the Creative Youth programme) which will structure and boost entrepreneurial development in students prior to university.

### **1.2.2 Entrepreneurship Education in Ireland (University Level)**

In 2009, 42% Irish 3<sup>rd</sup> level institutions highlighted entrepreneurship in their mission statement, and 58%, reported institute-wide entrepreneurship/innovation-related policies (ACE, 2009). A recent review indicates the majority of these are now in place (See Figure 1.1, n = 20) (HEInnovate Ireland, 2017). The majority of institutes concentrate on delivering entrepreneurship at undergraduate level, and through specialised taught postgraduate programmes (HEInnovate, 2017). Increasingly more programmes of science, engineering, technology and arts include entrepreneurship (Priyadarshini, 2015). Preedy and Jones (2015) note that, as well as education, institutions can provide other ‘enterprise supports’ such as networking events, incubators, societies and awards. Some of the policies and practices that Irish institutions have implemented are indicated in Table 1.1 (not an exhaustive list).



**Figure 1-1: Entrepreneurial Objectives of Irish Higher Education Institutes**



(From the OECD HEI Leader Survey Ireland 2015, cited in HEInnovate, 2017)

This progress in developing experiential-based EE courses and other supports is valued nationally, indicated by the HEInnovate Ireland Report (2017, p.7):

*“There is no doubt that the Irish higher education system as a whole values the importance of developing awareness of entrepreneurship as a key transversal competence, and actively encourages individuals to develop the attitudes, skills and knowledge to become entrepreneurs. The wide and rich range of initiatives include undergraduate and postgraduate programme modules, work based learning, business start-up and business incubation programmes, mentoring initiatives and access to research and development facilities to mention but a few”*

Of late, growing support and emphasis is placed on strategy set to enhance student innovation and entrepreneurship. The Education and Innovation Fund 2018 launched by the Irish Higher Education Authority (HEA) provides large funding supports for areas which include the development of innovation, transformation and quality improvement in teaching and student learning outcomes.

**Table 1-1: Measures Undertaken by Irish Third Level Institutions to Encourage Entrepreneurship**

<b>Method</b>	<b>Examples</b>	<b>Respective Institution</b>
The establishment of centres for entrepreneurship	<ul style="list-style-type: none"> <li>- Hincks Centre for Entrepreneurship Excellence</li> <li>- Ryan Academy</li> <li>- Centre for Entrepreneurship Development</li> <li>- Enterprise Ladder</li> </ul>	<ul style="list-style-type: none"> <li>- Cork Institute of Technology (CIT)</li> <li>- Dublin City University (DCU)</li> <li>- Institute of Technology Tralee (ITT)</li> <li>- Limerick Institute of Technology (LIT)</li> </ul>
The establishment of centres for innovation and technology transfer	<ul style="list-style-type: none"> <li>- Invent Centre</li> <li>- Campus Innovation Centre</li> <li>- DIT Hothouse</li> <li>- Nexus Innovation Centre</li> </ul>	<ul style="list-style-type: none"> <li>- Dublin City University (DCU)</li> <li>- National University of Ireland (NUI) Galway</li> <li>- Dublin Institute of Technology (DIT)</li> <li>- University of Limerick (UL)</li> </ul>
Through the establishment of centres and hubs for business incubation <sup>1</sup>	<ul style="list-style-type: none"> <li>- Rubicon Centre</li> <li>- DCU Alpha</li> <li>- Innovation Hub</li> <li>- Learning and Innovation Centre (LINC)</li> <li>- Synergy Centre</li> <li>- Greenway Hub</li> <li>- Centre for Social Engagement Incubation Hub</li> <li>- Tom Crean Business Incubation Centre</li> </ul>	<ul style="list-style-type: none"> <li>- Cork Institute of Technology (CIT)</li> <li>- Dublin City University (DCU)</li> <li>- Galway-Mayo Institute of Technology (GMIT)</li> <li>- Institute of Technology Blanchardstown (ITB)</li> <li>- Institute of Technology Tallaght (ITT)</li> <li>- Dublin Institute of Technology (DIT)</li> <li>- Trinity College Dublin (TCD)</li> <li>- Institute of Technology Tralee (ITT)</li> </ul>
The development of accelerator programmes for early stage entrepreneurs	<ul style="list-style-type: none"> <li>- SPRINT</li> <li>- VentureLaunch</li> <li>- Hartnett Enterprise Acceleration Centre</li> </ul>	<ul style="list-style-type: none"> <li>- University College Cork (UCC)</li> <li>- University College Dublin (UCD)</li> <li>- Limerick Institute of Technology (LIT)</li> </ul>
The development of accelerator programmes for students	<ul style="list-style-type: none"> <li>- USTART</li> <li>- Student Inc.</li> <li>- Discover ITT</li> <li>- LaunchPad</li> <li>- I-Cubed</li> </ul>	<ul style="list-style-type: none"> <li>- Dublin City University (DCU)</li> <li>- Cork Institute of Technology (CIT)</li> <li>- Institute of Technology Tralee (ITT)</li> <li>- Trinity College Dublin (TCD); NUI Galway; UCC</li> <li>- Dublin Institute of Technology (DIT)</li> </ul>
The development of competitions for student innovation	<ul style="list-style-type: none"> <li>- CIT Prize for Innovation</li> <li>- Student Enterprise Awards</li> <li>- Inventor of the Month Competition</li>   <li>- Inventor of the Year Competition</li> <li>- President's Awards for Innovation</li> </ul>	<ul style="list-style-type: none"> <li>- Cork Institute of Technology (CIT)</li> <li>- Galway-Mayo Institute of Technology (GMIT)</li> <li>- DIT, ITTD, ITB, IADT, NCI (led by the Institute of Technology Tallaght, Dublin)</li> <li>- Dublin Institute of Technology (DIT)</li> <li>- Dublin City University (DCU)</li> </ul>

*Table 1.1: Measures Undertaken by Irish Third Level Institutions to Encourage Entrepreneurship (ctd.)*

Hosting of 'entrepreneurship' and 'innovation' days or weeks on campus	<ul style="list-style-type: none"> <li>- CIT's Innovation Week</li> <li>- Entrepreneurial &amp; Innovation Week</li> <li>- Startup Weekend Limerick</li> </ul>	<ul style="list-style-type: none"> <li>- Cork Institute of Technology (CIT)</li> <li>- Athlone Institute of Technology (AIT)</li> <li>- University of Limerick (UL)</li> </ul>
Events relating to entrepreneurship with industry speakers	<ul style="list-style-type: none"> <li>- #GET Started Conference</li> <li>- Wild Atlantic StartUP – WASUP</li> </ul>	<ul style="list-style-type: none"> <li>- Dublin City University (DCU)</li> <li>- University of Limerick (UL)</li> </ul>
Support of entrepreneurship student clubs and activities	<ul style="list-style-type: none"> <li>- Enterprise Societies</li> <li>- Enactus Club and Team Support</li> </ul>	<ul style="list-style-type: none"> <li>- Dublin City University (DCU); National University of Ireland (NUI) Galway</li> <li>- CIT, DCU, DIT, IADT, Maynooth, NUIG, TCD, UCC, UCD and UL.</li> </ul>
Specialist undergraduate degree programmes focused on entrepreneurship	<ul style="list-style-type: none"> <li>- Bachelors of Business Studies in Entrepreneurship &amp; Management (Level 8)</li> <li>- Bachelors of Business Studies in Entrepreneurship &amp; Management (Level 8)</li> <li>- Bachelors of Business Studies in Enterprise &amp; Innovation (Level 8)</li> </ul>	<ul style="list-style-type: none"> <li>- Dun Laoghaire Institute of Art, Design and Technology (IADT)</li> <li>- Maynooth University</li> <li>- Limerick Institute of Technology (LIT)</li> </ul>
Elective and compulsory entrepreneurship modules	<ul style="list-style-type: none"> <li>- Entrepreneurial Endeavour (5 ECTS)</li> <li>- Digital Innovation Creativity and Enterprise (5 ECTS)</li> </ul>	<ul style="list-style-type: none"> <li>- University College Cork (UCC)</li> <li>- Dublin City University (DCU)</li> </ul>
Specialist postgraduate degree programmes focused on entrepreneurship	<ul style="list-style-type: none"> <li>- Masters in International Entrepreneurship Management</li> <li>- Masters of Business in Digital Entrepreneurship</li> <li>- Masters of Business and Entrepreneurship</li> </ul>	<ul style="list-style-type: none"> <li>- University of Limerick (UL)</li> <li>- Dun Laoghaire Institute of Art, Design and Technology (IADT)</li> <li>- Dublin Institute Of Technology (DIT)</li> </ul>
Additional certificates or training for students and staff in entrepreneurship	<ul style="list-style-type: none"> <li>- Postgraduate Certificate in Innovation &amp; Entrepreneurship</li> </ul>	<ul style="list-style-type: none"> <li>- Trinity College Dublin (TCD)</li> </ul>
Entrepreneurship Summer Camps for secondary school students	<ul style="list-style-type: none"> <li>- Innovation Academy</li> <li>- AIT Summer School</li> <li>- START ME UP Summer Camp</li> </ul>	<ul style="list-style-type: none"> <li>- University College Dublin (UCD)</li> <li>- Athlone Institute of Technology (AIT)</li> <li>- National University of Ireland (NUI) Galway</li> </ul>
Additional certificates or training for the general public in entrepreneurship	<ul style="list-style-type: none"> <li>- Springboard+ Postgraduate Certificate in Innovation, Entrepreneurship and Enterprise (for job-seekers)</li> </ul>	<ul style="list-style-type: none"> <li>- University College Dublin (UCD)</li> </ul>

<i>Table 1.1: Measures Undertaken by Irish Third Level Institutions to Encourage Entrepreneurship (ctd.)</i>		
Encouraging the development of an entrepreneurship culture or climate within the University	- Blackstone LaunchPad co-working space	- Trinity College Dublin (TCD)
Forming research communities and disseminating entrepreneurship related research output	- Initiative on Social Entrepreneurship - Entrepreneurship and Enterprise Education Academy - Campus Entrepreneurship Enterprise Network (CEEN) - INTRE (Ireland's Network of Teachers and Researchers in Entrepreneurship)	- Trinity College Dublin (TCD) - Institute of Technology Tralee (ITT) - Multiple Institutions - Multiple Institutions
Specialist centres of research related to aspects of entrepreneurship	- Family Business Research Centre - Cantillon Research Centre for Entrepreneurship, Design and Innovation	- Dublin City University (DCU) - University College Dublin (UCD)
Developing more entrepreneurially minded teaching strategies	- Entrepreneurship Educators Module (Level 9)	- Dublin City University (in conjunction with Campus Entrepreneurship Enterprise Network)
<sup>1</sup> Comprehensive list of incubation centres available at <a href="https://www.enterprise-ireland.com/en/Researchers/Spin-Outs/Incubation-Centers-Maps-and-Contacts.html">https://www.enterprise-ireland.com/en/Researchers/Spin-Outs/Incubation-Centers-Maps-and-Contacts.html</a>		

(Source: Own)

### 1.3 Thesis Overview

The thesis focuses on the following two key research questions:

RQ1: What factors influence the entrepreneurial tendencies of individual students participating in entrepreneurship education?

RQ2: What factors influence the performance and innovation of student entrepreneurship teams participating in entrepreneurship education?

These questions necessitate the student experience of EE be studied at the individual and team level, involving a number of personal, team, instructional and institutional factors. The research design incorporates four quantitative studies, using annual cohorts of undergraduate students who complete a compulsory EE module in their first year of university (See Figure 1.2). The four studies are discussed below.

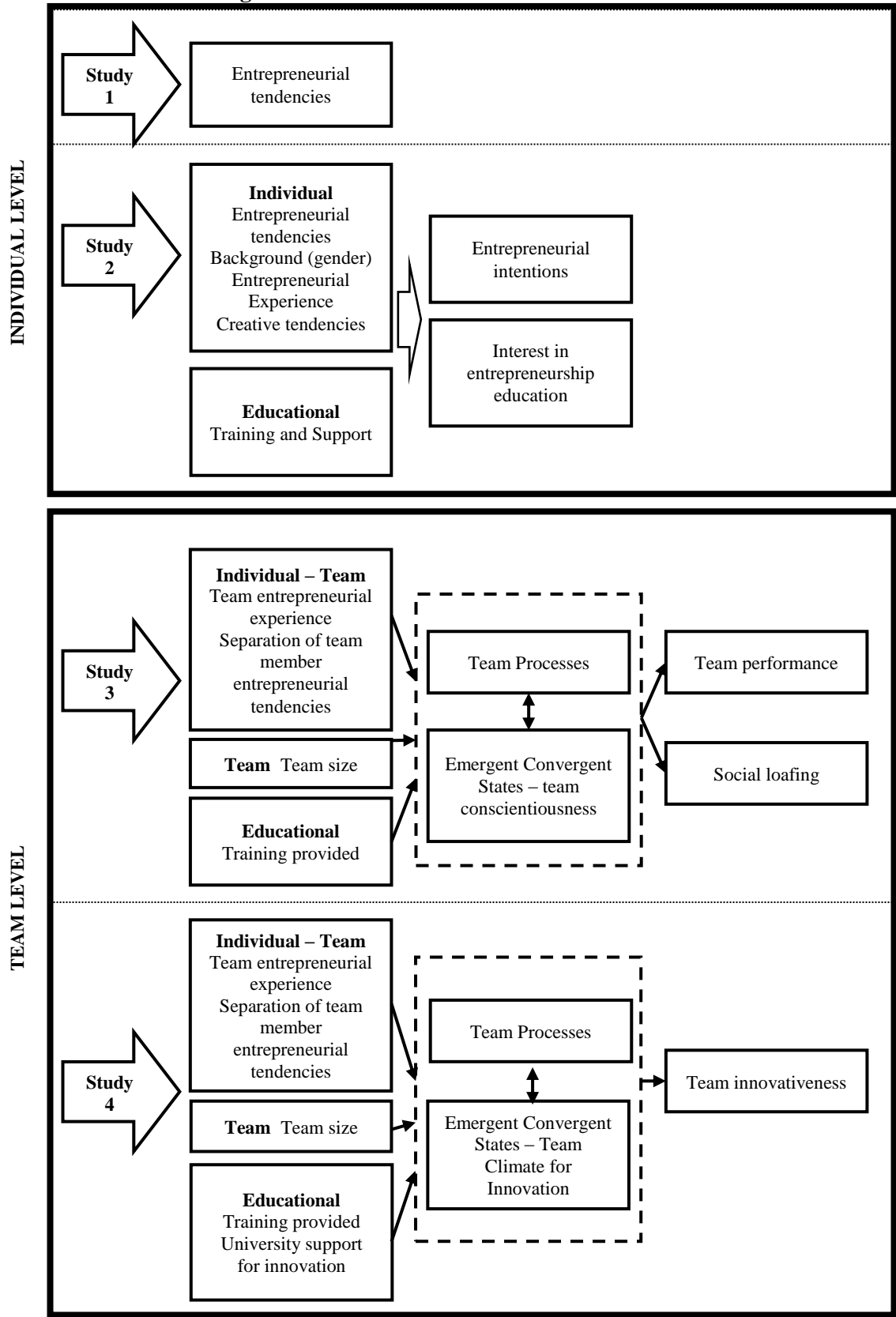
First of all, the current manner which EE is assessed at the individual level is reviewed, focusing on prominent theories that explain the tendencies of the entrepreneur, and their use in this context. A review of extant literature stemming from fields of entrepreneurship and EE is conducted, examining past works and theoretical arguments pertaining to the determination of entrepreneurial tendencies. Study 1 (Chapter 5) seeks to quantitatively examine a number of measures used to test entrepreneurial tendencies in entrepreneurship, for their comparative reliability, validity and factor structure in the domain of EE.

The second study (Chapter 6, Study 2) uses the Social Cognitive Career Theory (SCCT) to investigate student development of entrepreneurial interest, intentions, and self-efficacy at the individual level (Lent, Brown, and Hackett, 1994; 2002). This theory has previously been recommended to study entrepreneurship education (Kassean, Vanevenhoven, Liguori, and Winkel, 2015), and an adapted framework proposed by Bernstein and Carayannis (2012) is empirically tested for the first time in the

study. Many students now pursue entrepreneurship before third level education, independently or within a school setting, which may be developing entrepreneurial skills and tendencies (Do Paco *et al.*, 2011, 2013; Volery *et al.*, 2013; Huber, Sloof and Van Praag, 2014). For example, in 2016 the JA Europe network, which focuses on youth entrepreneurial development, had an involvement of 31,380 primary and secondary schools in Europe alone. A study of students in over fifty countries found 21.9% of students were in the process of creating their own business, while 8.8% were already running one (Sieger, Fueglistaller and Zellweger, 2016). Given these opportunities for entrepreneurial priming prior to university, Study 2 (Chapter 6) examines the impact of a number of antecedent entrepreneurial tendencies and attitudes on the EE student. Thus, the entrepreneurial experience and self-efficacy of students before they begin EE are considered important factors and are explored. With the exception of Fayolle and Gailly (2015) study, there is a lack of extant literature on this topic (Lorz, Mueller and Volery, 2013; Bae *et al.*, 2014; Nabi *et al.*, 2016).

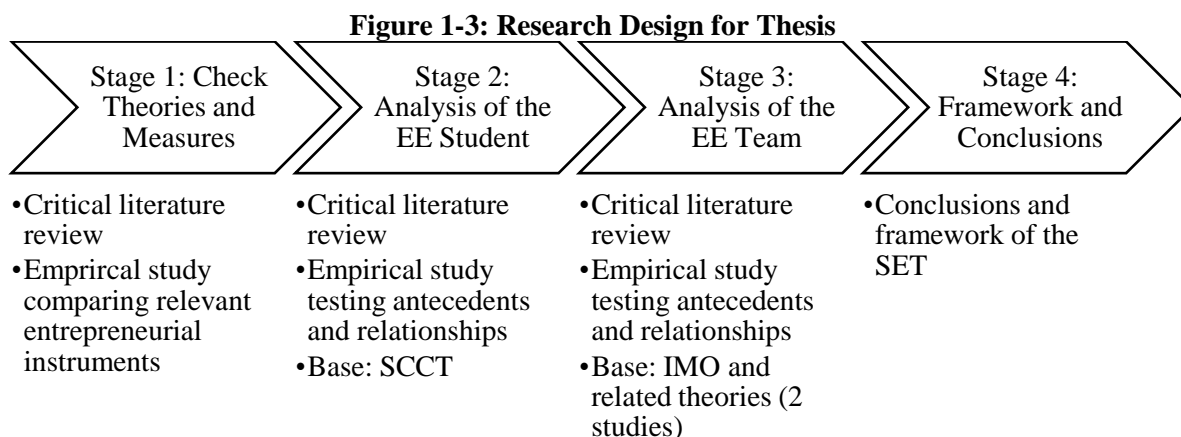
Studies 3 and 4 examine the EE teamwork experience in an Irish University. Exploration of the team in general entrepreneurship literature has generated much attention, as findings indicate many successful ventures emanate from teams rather than individuals (Kamm *et al.*, 1990; Chandler, Honig, and Wiklund, 2005; Klotz *et al.*, 2014; Zhou and Rosini, 2015). However, while teamwork is commonly used as a pedagogical feature in EE delivery (Hytti and O’Gorman, 2004), there is a dearth of existing literature examining how these teams function. Most theoretical and empirical work in the area is conducted at the individual level (Walter and Block, 2016). Based on extant literature and the empirical study findings, a framework of the Student Entrepreneurship Team (SET) is proposed, following the Input-Mediator-Outcome (IMO) format (Marks *et al.*, 2001; Ilgen *et al.*, 2005, Mathieu *et al.*, 2008) and incorporating key insights of Harrison and Klein (2007) pertaining to team diversity.

**Figure 1-2: Overview of Research Studies**



(Source: Own)

Acknowledging calls for a more holistic assessment of the subject and field (Fayolle *et al.*, 2006), team performance, social loafing and team innovative output are examined. The third study (Chapter 7) analyses the effect of team input factors on team performance and social loafing (free-riding), mediated by team processes (87 teams). Lastly, Chapter 8 (Study 4) examines the factors, which effect student team behaviour (processes) and subsequent EE team innovative output (68 teams). As demonstrated in Figure 1.3 the thesis moves through a number of stages: it begins with an analysis and critical review of current literature and instrument measures, then moves to an in-depth examination of the individual EE student (stage 2) and the student EE team (stage 3), before consolidating the research findings and extrapolating conclusions.



(Source: Own)

### 1.3.1 Research Sample and Data Employed

The empirical studies within this thesis are drawn from three iterations of a compulsory yearlong (two semester) taught EE module taken in the first year known as *DICE* or Digital Innovation Creativity and Enterprise. Data is obtained through a series of surveys disseminated to these students from 2012-2016 at pre-module and post-module stages. Variable information is also sourced via instructor reports relating to teamwork selection and performance information. The ‘innovativeness’ of the team output is obtained using a panel of independent experts who rated the student team projects. Lastly, a number of the team-level variables are obtained via individual level response data, brought to the team level using a series of data aggregation and operationalisation techniques. The empirical analysis



was conducted using IBM Statistical Package for Social Sciences (SPSS), and variance-based structural equation modelling using the partial least squares path modelling method in Smart-PLS3.

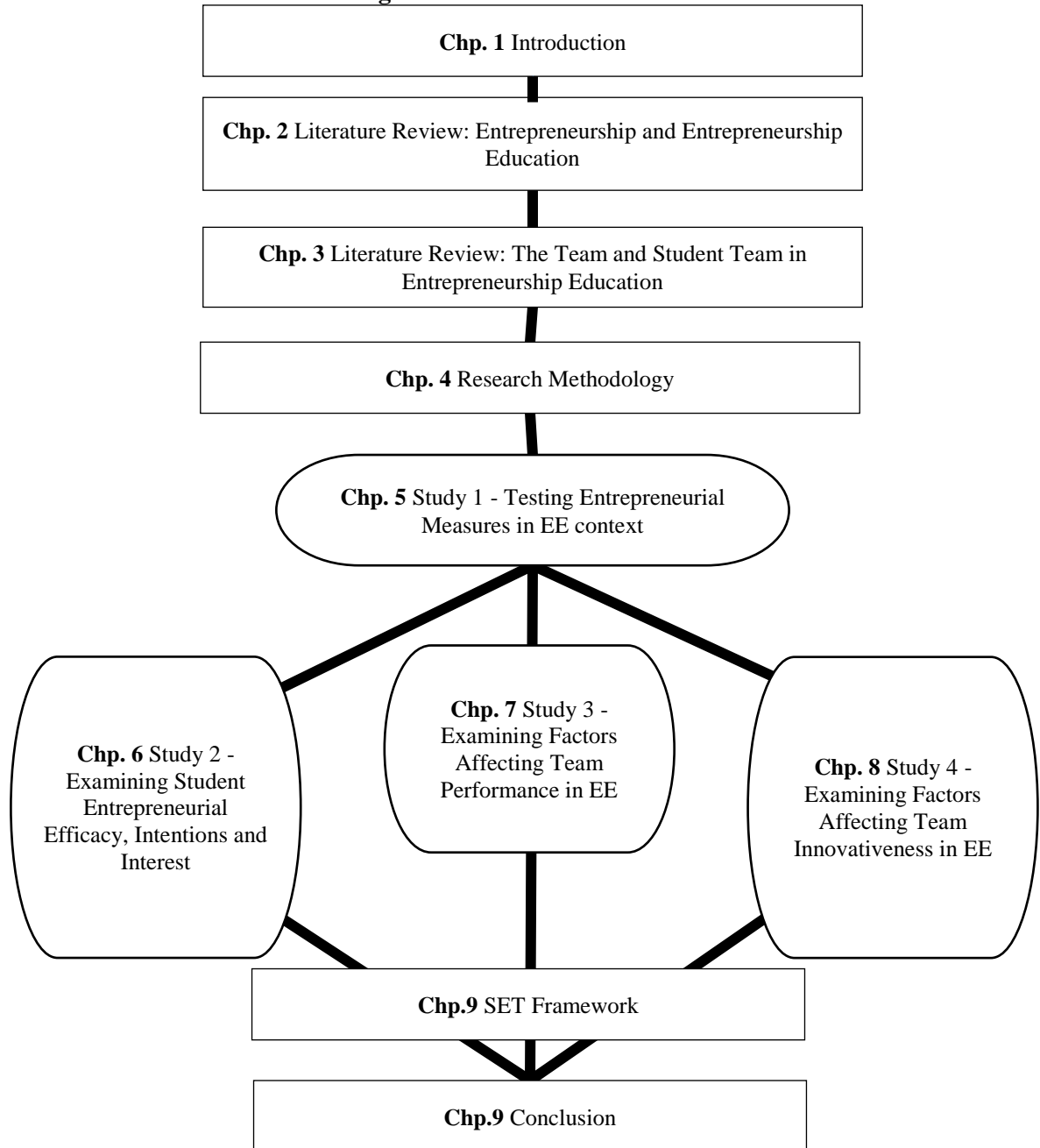
## 1.4 Thesis Structure

The thesis structure is represented in Figure 1.4 below. It is structured in a hybrid format, which contains a critical literature review and a discussion/concluding chapter, but also has four chapter studies which are structured in academic paper form. Sharmini (2016) in an analysis of thesis types noted that hybrid thesis forms may have a lot of repetition. Efforts have been made to limit this repetition by grouping the methodological commonalities of the studies in one methodological chapter.

From this introductory chapter, the thesis continues with a critical literature review of the field of entrepreneurship and EE in *Chapter 2*. A second literature review chapter is presented in *Chapter 3*, relating to teamwork and student teamwork, focusing on frameworks and factors pertaining to performance and innovativeness. *Chapter 4* presents the research methodology used in the current studies. The chapter includes an exploration of the philosophical underpinning of the thesis, and the research tools and data analysis procedures used in the subsequent studies.

*Chapter 5* presents an empirical study, which compares and validates a number of key entrepreneurial constructs recommended for use in EE. *Chapter 6* discusses the second study in its entirety from hypotheses development to research findings, examining the impact of individual level entrepreneurial tendencies and instructor controlled factors on individual entrepreneurial interest, intentionality, and self-efficacy. *Chapter 7* discusses the third study in its entirety, examining the impact of entrepreneurial tendencies and instructor controlled factors on team performance. *Chapter 8* examines the impact of entrepreneurial tendencies and instructor controlled factors on team innovativeness. Finally, *Chapter 9* draws conclusions from the discussion of the research findings. It presents the full conceptual framework proposed for the student entrepreneurship team based on the studies conducted. The thesis concludes by discussing the contributions, limitations, and recommendations for future research.

**Figure 1-4: Thesis Structure**



## **CHAPTER 2: Literature Review - Entrepreneurship and Entrepreneurship Education**

## 2.1 Introduction

During the 1980's, there was an 'explosion' of academic interest in entrepreneurship, causing the field to extend and diversify (Nodoushani and Nodoushani, 2000; Katz, 2003; Wiklund *et al.*, 2011; Audretsch, 2012). Linked to economics, sociology, psychology, and management, entrepreneurship has been related to a broad range of perspectives and methodological approach (Fleming, 1999; Audretsch, 2012; Van Burg and Romme, 2014). Many consider entrepreneurship to be legitimised as an independent research field (Teixeira, 2011; Landström, Harirchi and Åström, 2012; Rehn *et al.*, 2013; Busenitz *et al.*, 2014). As such, it has many dimensions and sub-domains such as intrapreneurship, minority entrepreneurship, social entrepreneurship, team entrepreneurship, and the focus of the thesis: entrepreneurship education (referred to as EE).

To situate the thesis within the field of entrepreneurship, this chapter firstly provides a select overview of entrepreneurship theory, focusing on key themes and constructs also used in EE research discourse. Landström and Benner (2010) consider the evolution of entrepreneurship theory to be linked to the academic disciplines of economics (era 1870-1940); social science (era 1940-1970); and management (era 1970-1990). It is necessary to study this academic journey *ab initio* to get a fundamental understanding of scope (Minniti, 2008). A brief summary of entrepreneurship theory in each discipline is presented, introducing pertinent theories to EE. Entrepreneurship education is defined, and a literature review of its classification, delivery, and evaluation presented. The chapter concludes with an identification of research gaps in the current literature, and an examination of key frameworks used to inform the thesis research design.

## 2.2 Entrepreneurship: Definition and Historical Roots

Hisrich, Peters and Shepherd (2007, p. 8) define entrepreneurship as:

*“Entrepreneurship is creating something new with value by devoting the necessary time and effort, assuming the accompanying financial, psychic, and social risks, and receiving*

*the resulting rewards of monetary and personal satisfaction and independence”*

This definition notes opportunity recognition, venture creation, innovation, and risk-taking, all elements commonly used in defining the entrepreneur (Gartner, 1990; Carland *et al.*, 1984; Chell, 2007). An ‘enterprising’ or ‘entrepreneurial’ individual is considered part of a wider classification, in which the entrepreneur is sub-set (Caird, 1990b). Described by Ball (1989, p. 36) as:

*“An enterprising individual has a positive, flexible and adaptable disposition towards change, seeing it as normal, and as an opportunity rather than a problem. To see change in this way, an enterprising individual has a security borne of self-confidence, and is at ease when dealing with insecurity, risks, difficulty, and the unknown. An enterprising individual has the capacity to initiate creative ideas, and develop them, either individually or in collaboration with others, and see them through into action in a determined manner. An enterprising individual is able, even anxious, to take responsibility, and is an effective communicator, negotiator, influencer, planner and organiser. An enterprising individual is active, confident and purposeful, not passive, uncertain and dependent”*

While this description aptly fits both the entrepreneur and the enterprising individual, they may be differentiated by the actual creation of a venture (Caird, 1991; Sewell and Dacre Pool, 2010). Thus, the individual can be enterprising in any context, but an entrepreneur is actively engaged in new venture creation (Cromie, 2000). The distinction between these terms is pertinent in this thesis as students of EE may display many entrepreneurial and enterprising tendencies. However, until they begin a new venture, they may only be described as enterprising, entrepreneurial, or *nascent* student entrepreneurs, where nascence in entrepreneurship implies that an individual is attempting or intending to start a new venture but has not yet (Wagner, 2006).

### 2.2.1 Early Entrepreneurship Theory in Economics

The term ‘entrepreneur’ originated in France, and is derived from the verb *entreprendre* (to undertake) which loosely meant to do something, or to act. Richard Cantillon, the Irish economist, is credited with first use of the term in published literature in 1755, describing a person who worked at his own risk to make a profit based on market demands (Long, 1983; Hébert and Link, 1989; Landström and Benner, 2010). The study of entrepreneurship in economic theory grew as it was observed that individuals could enact change on an economic system. For example, Jean-Baptiste Say suggested an entrepreneur operates both at development and production phases of business, catalysing the flow of value to the economy (Hébert and Link, 1989; Landström and Benner, 2010).

Entrepreneurship research moved through the economic schools of thought, encouraged by pioneers such as Smith, Thünen, and Mangoldt (Wadhvani and Jones, 2006; Hébert and Link, 2009). In the 19<sup>th</sup> century, the neo-classical theory of economics focused on market equilibrium; in particular, outcome-based processes, where uncertainty was eliminated (Kyrö, 1996). This left little room for the consideration of change-agents within the process i.e. the entrepreneur (Fleming, 1999). Unconvinced by this diminished role, Knight gave prominence to the entrepreneur once again, postulating that this individual works with uncertainty (as distinct from risk) and solely bears its consequence (Landström and Benner, 2010). In Austria, Schumpeter proposed ‘creative destruction’, believing innovations in business could cause surges within the capitalist system, destroying obsolete firms earlier and yielding new ones faster (Brouwer, 2002). Businessmen creating new combinations through innovative action disrupted market equilibrium and created *new* wealth, leading to the belief that an entrepreneur created something original and innovative (Bull and Willard, 1993; Wadhvani and Jones, 2006). By placing the entrepreneur as the cog in the economic development process, Schumpeter evoked an upsurge of interest in the field of entrepreneurship and innovation.

### 2.2.2 Early Entrepreneurship Theory in Social Science

Entrepreneurship research studies rooted in sociology tend to examine the contextual and cultural conditions affecting the associated behaviour of an individual to start a new venture (Low and McMillan, 1988). Max Weber suggested that the rise of business in regions of England, America, and Holland were due to the values and work ethic instilled by the Calvinist and Protestant religions (Brouwer, 2002). This inferred that an entrepreneur is developed by a social environment, and in turn can affect this environment (Mueller and Thomas, 2001).

In psychology literature, the early focus was on the *traits* of the entrepreneur (Sexton, Van Auken and Ireland, 1981; Rauch and Frese, 2007), where a trait is defined as “*a disposition to behave, expressing itself in consistent patterns of functioning across a range of situations*” (Pervin, 1994, p.108). This approach assumes the entrepreneur has discernible psychological characteristics or dispositions, and by identifying these characteristics, researchers could locate entrepreneurs in a sample (McClelland, 1961; Timmons, 1978; Low and McMillan, 1988; Driessen and Zwart, 1999).

**Table 2-1: Common Traits in Entrepreneurship Literature**

<b>Trait</b>	<b>Description</b>	<b>Selected Findings</b>	<b>Source</b>
<i>Need for achievement (NacH)</i>	The motivation felt by an individual to accomplish a task to a certain standard of excellence “ <i>for the sake of an inner feeling of personal accomplishment</i> ” (McClelland, 1961, p. 205)	Successful entrepreneurs display higher NacH to other occupational groups.  Link between NacH and 1) choosing an entrepreneurial career and 2) performance	Begley and Boyd (1987); Hansemark, (2003); Gürol and Atsan (2006)  Collins, Hanges and Loche (2004)
<i>Risk taking propensity</i>	An individual with a high propensity for risk taking will work at his/her own risk to make a profit while bearing the responsibility of the consequences (Landström and Benner, 2010).	Positively related to other characteristics of the entrepreneur	Sexton and Bowman, (1980); Schwer and Yucelt (1984); Begley and Boyd (1987); Lee and Tsang (2001); Gürol and Atsan, (2006)
<i>Internal locus of control</i>	An individual’s perception of control over his or her own career path or life (Miller <i>et al.</i> , 1982). A belief that it is not luck or destiny that causes successes or failures, but the result of personal effort.	Positively related to entrepreneurial activity and new venture growth Some doubts expressed for predicting entrepreneurial behaviour or motivation	Brockhaus (1982); Mueller and Thomas (2001); Lee and Tsang (2001); Gürol and Atsan (2006); Cromie and O’Donoghue (1992); Kaufman, Welsh and Bushmarin (1995)

(Source: Own)

Three commonly cited traits in entrepreneurship are presented in Table 2.1. Others of merit could be stress tolerance, need for autonomy, proactiveness, passion for work, endurance, flexibility, and goal-setting (Rauch and Frese, 2007).

Trait theory has been criticised for its simplicity, rigidity, lack of situational context and inconsistent findings (Gartner, 1989a/b; Robinson, Stimpson, Huefner and Hunt, 1991; Collins *et al.*, 2004). Gartner (1989b, p. 57) suggested that the trait-based conceptualisation of the entrepreneur has so many varying characteristics, and is so “*full of contradictions,*” that it is no longer discernible. In fact, Kilby (1971) likened the search for the entrepreneur to the ‘*hunt for the Heffalump!*’ the ambiguous and mysterious character in the famous Winnie the Pooh children’s stories.

As a result, academic focus began to wane around the 1970’s, and authors moved to behavioural and cognitive themes (Wadhvani and Jones, 2006; Fayolle, Liñán and Moriano, 2014). However, there has been a renewed interest in trait theory where research methodologies including structural equation modelling have enabled more complex relationships to be found (Baum and Locke, 2004; Zhao and Seibert, 2006; Rauch and Frese, 2007; Zhao, Seibert and Lumpkin, 2010; Schjoedt and Shaver, 2011; Caliendo and Kritikos, 2012; Ngwoke, Oyeoku and Obikwelu, 2013; Sánchez, 2013). For example, Rauch and Frese (2007) found entrepreneurial business creation and success significantly correlated with an entrepreneurs need for achievement, generalized self-efficacy, innovativeness, stress tolerance, need for autonomy, and proactive personality.

Moving from trait theory, three constructs will be described herein, often used in the social sciences to study the entrepreneur and EE student: entrepreneurial intentionality, self-efficacy, and passion. These were selected due to their frequency of application in the study of EE, and/or their recommendation for further study in this research field.



### 2.2.2.1 Entrepreneurial Intentions/ Intentionality

Boyd and Vozikis (1994, p. 64) defines Entrepreneurial Intentionality/Intentions (EI) as the “*state of mind that directs and guides the actions of the entrepreneur toward the development and implementation of the business concept*”. It is an individual’s self-acknowledged conviction and desire to set up a new business venture imminently, or at an indeterminate time (Thompson 2009). Intentionality toward entrepreneurship is the result of socialisation processes in which personal perceptions, attraction to entrepreneurship, and perceived behavioural control are necessary contributors (Santos, Roomi, and Liñán, 2016). It has been recognised a key construct in predicting future entrepreneurial activity (Krueger, Reilly and Carsrud, 2000; Kautonen, van Gelderen and Fink, 2015). Such is its popularity and perceived legitimacy that the Global Entrepreneurship Monitor (GEM), one of the most comprehensive studies of entrepreneurship internationally (Wagner, 2006), relies heavily on EI as a suggested precursor to entrepreneurial activity.

Two intention-based models are popularly used in entrepreneurship research: Azjen’s Theory of Planned Behaviour (TPB) and the Shapero Entrepreneurial Event (SEE) model (Shapero and Sokol, 1982; Liñán, 2004; Fretschner and Weber, 2013). The TPB suggests intentions comprise motivational triggers influencing behavioural dispositions, and these dispositions affect the likelihood of action by the individual (Ajzen and Fishbein, 1980). Intentions are driven by: 1) the attitude to the behaviour, 2) subjective norms (individual perception of social pressure to act), and 3), perceived behavioural control (the perception of how challenging the action will be). Intention captures the intended effort and motivational factors, which contribute to future action (Liñán, 2004).

The SEE of Shapero and Sokol (1982) suggests that any action relating to an entrepreneurial event is related to the perceived desirability (attraction to behaviour), perceived feasibility (assessment of capacity to undertake behaviour), and the propensity of the individual to act (Shapero and Sokol, 1982; Krueger *et al.*, 2000). Within this theory, many factors including resource

distribution, family and social cues, are considered to influence ones' view of desirability and feasibility (Shapero, 1982).

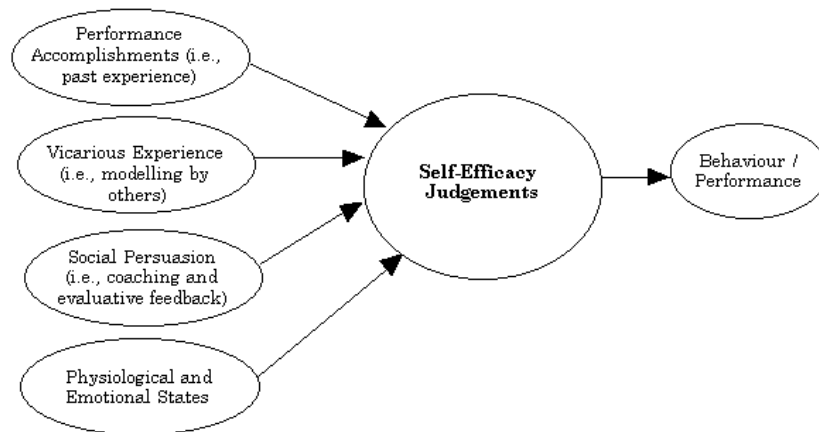
Both models have advanced knowledge of EI significantly and are considered robust (Krueger *et al.*, 2000), and more similar than different (Bird, 2015). In their meta-analytic review, Schlaegel and Koenig (2014) found both theories predicted EI well, but recommend a deeper exploration of contingent and contextual factors. Despite its support and popularity, inconsistent findings regarding determinants and consequences of EI have been highlighted (Liguori, 2012; Fayolle *et al.*, 2014; Bird, 2015). Deeper exploration of the connection of EI to decision-making and mental prototypes, and contextual factors are recommended, and it may be a useful evaluative tool in educational research inquiry (Fayolle *et al.*, 2014). Liguori (2012) has suggested that the Social Cognitive Career Theory (SCCT) may be an interesting alternate lens by which to study intentions (outlined in Section 2.5.3).

#### *2.2.2.2 Entrepreneurial Self-Efficacy*

Self-efficacy is defined as “*a judgement of one's ability to execute a particular behaviour pattern*” (Bandura 1977, p. 240). Embedded in Social Cognitive Theory, efficacy constructs relate to future-orientated perceptions pertaining to the perceived ability to execute a specific course of action to produce an outcome (Goddard *et al.*, 2004). Positive efficacy beliefs are suggested to increase general adjustment and behaviour (Bandura, 1997). Bandura (1986) suggested four main sources of self-efficacy: mastery experience (developed through hands-on experience); vicarious experience (developed from observing the completion of tasks e.g. work shadowing); social persuasion developed through interaction and feedback of others; and psychological/emotional states developed from within (See Figure 2.1). Due to the positive effect caused by the demonstration of others, practical applications and feedback, self-efficacy is considered a malleable construct, likely advanced through training and education (Zhao, Seibert and Hills, 2005). Entrepreneurial Self-Efficacy (ESE) is based on an individual's belief in their own capability to attain success and manage challenging goals during the new venture creation (Chen, Greene and Crick, 1998; McGee, Peterson, Mueller and

Sequeira, 2009). As a contextualised version of the self-efficacy construct, ESE acknowledges that environment and context can affect a person's cognitive and affective reasoning in determining individual ESE (Drnovšek, Wincent, and Cardon, 2010).

**Figure 2-1: Bandura Self-Efficacy Model**



(Driscoll 2004, p. 318)

Research has related ESE to entrepreneurial intentionality on many occasion (Boyd and Vozikis, 1994; Wilson *et al.*, 2007; Sánchez, 2013; Bullough, Renko and Myatt, 2014), and to the likelihood of new venture creation (Rauch and Frese, 2007). A meta-analysis by Miao, Qian, and Ma (2017) found a moderate but significant correlation between ESE and firm performance. Concerns have been expressed that the construct is not conceptually dissimilar to general self-efficacy, and that the moderating effects of cultural and contextual factors are underexplored (Miao, Qian, and Ma, 2017). Relating the construct to likely dependant variables, Kasouf, Morrish, and Miles (2015) suggest that there is a marked difference between ESE and tangible entrepreneurial outcomes or ability:

*“ESE is a necessary, but not sufficient, condition for the initiation of successful entrepreneurial action and that high levels of ESE do not ensure success when it is not a realistic assessment of true abilities”*

(Kasouf *et al.*, 2015, p. 3)

Kasouf, Morrish, and Miles (2015) also discuss the ‘perfect storm’ of antecedent factors such as experience, training, and relationships, which, due to cognitive bias could affect ESE, and which remain under-explored in research

### 2.2.2.3 Entrepreneurial Passion

Entrepreneurial Passion (EP) is the intense positive emotion or joy felt by an individual when undertaking entrepreneurship related activities (Cardon *et al.*, 2005; Murnieks, 2007; Cardon, 2008; Cardon *et al.*, 2012). Cardon, Wincent, Singh, and Drnovšek (2009) developed their EP construct from identity and self-regulation theory, focusing on how an individual attains self-meaning, and prioritises characteristics according to a perceived value of self-worth or identification. Yitshaki and Kropp (2016) suggest EP is related to the entrepreneur’s self-concept and perception of role identity. Sources of EP include growth, people, the product/service, inventing, competition, or social cause (Cardon, Glauser, and Murnieks, 2017; Warnick *et al.*, 2018). It is suggested that in some instances, passion can lead to more negative consequences such as obsession and excessive persistence, to the point of denial of reality (Vallerand *et al.*, 2003; Vallerand *et al.*, 2007; Mageau *et al.*, 2009).

Once EP has been activated, an individual will attempt to regulate internal feelings by developing coping strategies according to an identity they align with (Murnieks, 2007; Cardon *et al.*, 2009; Murnieks Mosakowski and Cardon, 2014). These identities have been suggested to be oriented about the role of inventor, founder, or developer (Cardon *et al.*, 2009). Through these coping behaviours, the individual is said to become more engaged, creative and persistent (Cardon *et al.*, 2009; Cardon and Glauser, 2010; Murnieks *et al.*, 2014; Cardon and Kirk, 2015).

Using this conceptualisation, the inventing identity role relates to an individual who experiences intense enthusiasm for opportunity seeking, creative thought, and problem solving (Cardon *et al.*, 2009; Cardon *et al.*, 2013). The passion for founding pertains to planning, strategy, and the accumulation of networks and resources required for creating a new venture (Nasiru *et al.*, 2015). Lastly, passion for developing centres on sustaining the business beyond the new venture stage, focusing on growth and expansion (Cardon *et al.*, 2013). It is suggested that the EP and self-

identity to the role can be perceived differently according to the type of entrepreneurship (high tech, social etc.), and the context (Yitshaki and Kropp, 2016).

Examination of EP in multiple contexts has shown indications of its robustness and research potential (e.g. Cardon and Kirk, 2015; Cardon, Post and Forster, 2017). For example, Bagheri and Yazdanpanah (2017) found ESE predicted levels of EP (for inventing) of Iranian novice food entrepreneurs.

### **2.2.3 Early Entrepreneurship Theory in Management Science**

Scholarly research has also investigated entrepreneurship from a more macro perspective; integrating aspects of management and organisational science (Landström, 2005). Themes of corporate entrepreneurship, entrepreneurial ethics, family entrepreneurship, minority entrepreneurship, team entrepreneurship, venture financing and strategic entrepreneurship are all notable research domains emanating from academic discourse (Kuratko, 2007; Discua Cruz *et al.*, 2013). Of particular importance to this thesis, is the study of the team, which was introduced within management and small group research themes, before its examination in the field of entrepreneurship. This is explored in depth during Chapter 3.

## **2.3 Defining Entrepreneurship Education**

Since its emergence in US business schools during the 1960's and 70's, EE and training has spread internationally and vigorously (Solomon, Weaver and Fernald, 1994; Fleming, 1999; Rasmussen and Sørheim, 2006; Kuratko, 2007; Carey and Matlay, 2011). It is a popular component of business school programmes with growth in optional and mandatory courses (Rasmussen and Sørheim, 2006, Cooney and Murray, 2008). However, inconsistencies occur in delineating entrepreneurship education due to related terms of 'enterprise education', 'entrepreneurial education', 'entrepreneurship training', and 'education for/of/about/through entrepreneurship' (Gibb 1993; Garavan and O'Cinneide, 1994; Henry *et al.*, 2005; Matlay, 2008). Lackéus (2015) recommend authors clarify their definition at the outset, as it has ramifications for the corresponding objectives, audience, curriculum, and assessment.

This section will elucidate an understanding of entrepreneurship education by discussing four related typologies: 1) entrepreneurship in business education; 2) enterprise education; 3) entrepreneurship education and 4) entrepreneurship training. It is proposed that rather than consider these disparate, they form a spectrum depicted in Figure 2.2.

*1. Business Education:* Topics relating to entrepreneurship are sometimes integrated into business subjects of accounting, finance, innovation, management and marketing among others. These subjects provide an awareness of entrepreneurship and its relevance, but rarely delve into theoretical knowledge of the entrepreneur and the field. With the objective of developing enterprise and business soft skills, these subjects may introduce applied entrepreneurial aspects into projects (e.g. accounting, information systems) (Hynes, 1996).

*2. Enterprise Education:* Entrepreneurship education can also be viewed as a subject geared at developing business-related soft skills and competencies in a wide range of students, not just those intent on starting a venture (Gibb, 1993; Hynes, 1996; Lewis and Massey, 2003). Aimed at creating ‘entrepreneurs’, ‘entrepreneurial’ and ‘enterprising individuals’ (Heinonen and Poikkijoki, 2006), this conceptualisation of EE is also referred to as ‘enterprise for life’ (Bridge, Hegarty and Porter, 2010). This typology aims to develop a self-reliance and enterprising mind-set regardless of career path (Gibb, 1993; Cromie, 2000; Lewis and Massey, 2003), thus benefits a wide range of stakeholders (Jones and Iredale, 2010). Lackéus (2017) suggests that enterprise education allows a student to become more creative and innovative, and the subject is based on a conceptualisation of entrepreneurship as opportunity-based recognition and action. However, enterprise education may not have as many trigger emotional (competency developing) events as entrepreneurship education (Lackéus, 2017). Enterprise education is delineated from EE in the recent QAA guidelines (2018, p.7) and is defined as:

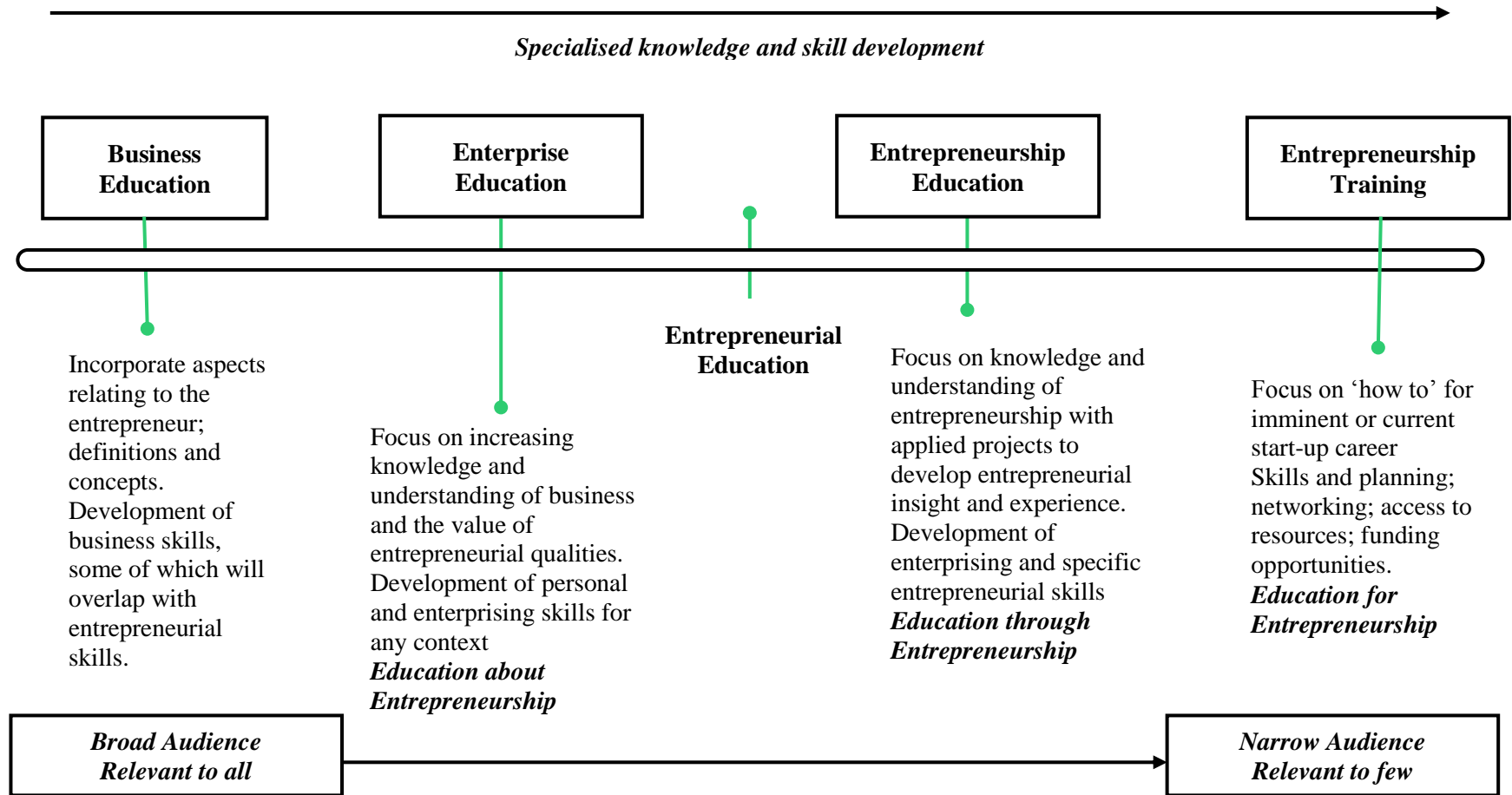
*“the generation and application of ideas, which are set within practical situations during a project or undertaking. This is a generic concept that can be applied across all areas of education and professional life. It combines creativity, originality, initiative, idea generation, design thinking, adaptability and reflexivity with problem identification, problem solving, innovation, expression, communication and practical action”*

Jones and Iredale (2010, p. 10-11) note that enterprise education relates to:

- An active learning education pedagogy
- Knowledge needed to function effectively as a citizen, consumer, employee or self-employed person in a flexible market economy
- Development of personal skills, behaviours, attributes for use in a variety of contexts
- Development of the person as an enterprising individual – in the community, at home, in the workplace or as an entrepreneur
- Encouragement of the use of enterprising skills/behaviours/attributes throughout life
- Knowledge relating to business planning and running.

*3. Entrepreneurship Education:* This category or conceptualisation is focused on both ‘value and venture creation’, aiming to make students more practically and motivationally entrepreneurial. This would pertain to modules or courses focused on entrepreneurship and new product/service development, and would usually teach both theory and practical information relating to starting a business, as well as developing skills to prepare them for entrepreneurial or intrapreneurial endeavours (Fayolle *et al.*, 2006; Lackéus, 2017). All students are considered to benefit, not exclusively nascent entrepreneurs (Hynes and Richardson, 2007). The recent QAA Enterprise and Entrepreneurship Review (2018, p.3) consider that after enterprise education, entrepreneurship education takes the *“next leap, introducing and developing business competencies that enable the journey towards start-up and new business development”*.

**Figure 2-2: Demarcation of Entrepreneurship Education**



(Source: Own)



*“Entrepreneurship education is not just about educating people to start a business, rather effective entrepreneurship education programmes equip graduates with the knowledge, skills and competencies to engage in a more enterprising, innovative and flexible manner in a changing workplace”*

(Hynes and Richardson, 2007, p. 732)

The introduction of the term enterprise education to demarcate the broader skills-focused typology has had some success (Gibb, 2002; Henry *et al.*, 2005). However, while *entrepreneurship education* is the most commonly used term (Mwasalwiba, 2010), many still use these two terms interchangeably (Henry and Lewis, 2018). Geography may have had a slight bearing as ‘entrepreneurship education’ was more popularly used in the USA, while in UK and Irish contexts, the term ‘enterprise education’ became more established (Gibb, 1993). Some authors have more recently oriented towards the term entrepreneurial education, intending it to encompass elements of both enterprise and entrepreneurship education (Lackéus, 2015; 2017). It is hoped that the term entrepreneurial education will be used as a “catch all term” (QAA, 2018, p. 9) but it remains to be seen whether this will become the status quo.

*“Entrepreneurial education is the process of providing individuals with the ability to recognise commercial opportunities and the insight, self-esteem, knowledge and skills to act on them. It includes instruction in opportunity recognition, commercialising a concept, marshalling resources in the face of risk, and initiating a business venture. It also includes instruction in traditional business disciplines such as management, marketing, information systems, and finance”*

(Jones and English, 2004, p.416)

*4. Entrepreneurship Training:* This form of entrepreneurship education is positioned specifically to develop nascent and current entrepreneurs (Hynes, 1996). It is consistent with the definition of Walter, Parboteeah, and Walter (2013, p.178) as *“the scope of curricular lectures or courses that*

*primarily aim at sensitizing and qualifying students for an entrepreneurial career*". Often labelled as 'entrepreneurship training' or 'education for entrepreneurship', this typology involves the delivery of industry-specific knowledge and skills training, and is a concerted effort to aid the entrepreneur through the start-up process (Sewell and Dacre Pool, 2010).

While these demarcations between terms are important, this thesis will consider the term entrepreneurship education as encapsulating the descriptions of enterprise education, entrepreneurial education and entrepreneurship education<sup>1</sup>. Entrepreneurship education within this thesis considers the educational delivery to a general, non-specialised audience, which aims to develop practical business, personal and entrepreneurial skills, knowledge, and acumen; to nurture general societal competencies, and increase the propensity for future entrepreneurship. The typology that delivers a focused and specific curriculum to the upcoming entrepreneur is referred to as entrepreneurial or entrepreneurship training. In this thesis, the primary sample group (namely those taking the DICE module) are considered to be taking a module which would be placed somewhere in the spectrum between enterprise and entrepreneurship education, as is described in Chapter Four (Section 4.5.1). This would be reflective of the focus of the university which aim to develop entrepreneurial and innovative tendencies and positive attitudes towards entrepreneurship in its student cohort, but has a lesser role in providing specific entrepreneurial training to undergraduate students at present.

### **2.3.1 Content and Curriculum**

*"The components of the ideal structure include the following: a focus on the attributes and skills as well as tasks, an element of concrete experience derived from active participation through projects and the like, and content directed to stage of venture development, and emphasising functional integration"*

(Gorman *et al.*, 1997, p. 36)

<sup>1</sup> Studies referred to may have used the term 'enterprise education' but will be classified based on the demarcation outlined above.

It has been suggested that there is both a *science* and *art* involved in the teaching of entrepreneurship (Henry *et al.*, 2005). The ‘science’ relates to business skills and knowledge, feasible to teach using conventional methods (e.g. lectures). Aspects taught may include business planning, communication skills, commercialisation, idea generation, market research/marketing, management skills, managing growth, product and process development, resources marshalling and risk management (Rasmussen and Sørheim, 2006; Costin, Birdthistle and Hynes, 2007; Gibb, 2007). The ‘art’ of teaching entrepreneurship aims to instil competencies and skills related to creativity and innovation, employing non-conventional, experiential pedagogical means (techniques as emotional exposure, situated learning, action-orientation and discontinuity) (Pittaway and Cope, 2007b; Mwasalama 2010). As an example of these pedagogies, Neck and Greene (2011) noted the use of a ‘pedagogical portfolio’ incorporating topics such as starting a business, simulation games, design-based learning, and reflective practice. Using guest speakers from industry to provide talks and act as role models is also commonly used to inspire, motivate, and build self-efficacy in students (Bosma, Hessels, Schutjens *et al.*, 2012). It is believed that these applied and experiential activities give students exposure to pseudo real-world experience of entrepreneurship, wherein the cost of failing is relatively low (Kirby, 2004; Neck and Greene, 2011). This sense of realism is hoped to increase ownership of learning, problem solving, decision making based on incomplete information, and generally enhance the learning experience (Kirby, 2004); providing students with skills which was once labelled by an OECD report as the ‘third passport’ (Ball, 1989, p. 8-9):

*“Personal dispositions, abilities and competences related to creativity, initiative, problem-solving, flexibility, adaptability, the taking and discharging of responsibility and knowing how to learn and relearn”*

Gibb (2005) recommends a future-orientated holistic teaching perspective that acknowledges the importance of entrepreneurial competencies as well as networking and relationship building. Recognising the importance of holistic EE objectives, Shi and Sewell (2011, p. 68) recommend

focusing on motivational development (i.e. studying and harnessing entrepreneurial spirit and attributes) as well as cultural dimensions of creativity, innovation and the entrepreneurial environment. Their vision of an entrepreneurial module was broken into four themes:

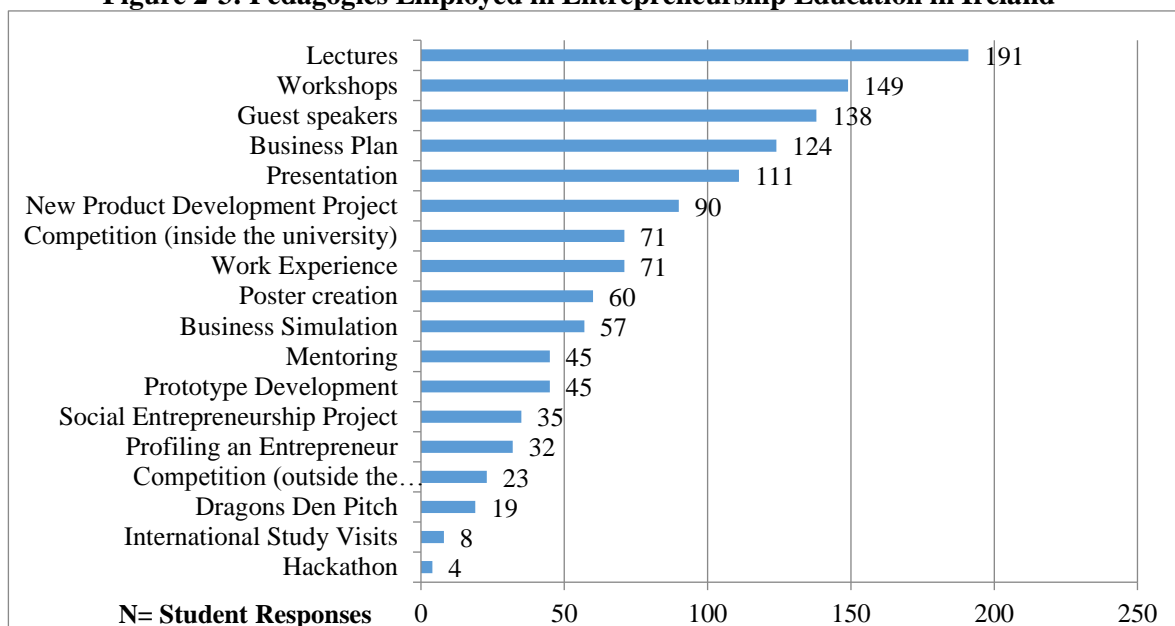
1. Technical (business awareness and how to set up/run a business),
2. Skills (focusing on employability and enterprise skills),
3. Motivation (studying and harnessing entrepreneurial spirit and attributes), and
4. Culture (focused on creativity, innovation and the entrepreneurial environment).

Recent developments see courses which include themes such as effectuation, business model canvas, lean start-up and design thinking (Lackéus, 2015; Ramsgaard and Christensen, 2016); hackathons (Clinton and Lyons, 2016); and mentorship (Hägg and Politis, 2017). At the curriculum level, the majority of Irish entrepreneurship courses use the creation of a business-plan as the major focus (ACE, 2009, Clinton and Lyons, 2016). However, students have also indicated engagement with numerous activities such as workshops, business simulations, and competitions (See Figure 2.3). As a best practice, Nabi *et al.* (2016, p.5) followed a UK-inspired format in their curricular design, incorporating the following in their first year EE programme:

- a. A taught component which focuses on entrepreneurial opportunities,
- b. A practical component which focuses on the tools and skills needed for the entrepreneurial journey,
- c. A group-based component which allows students select their best idea, turn it into a business plan and pitch to tutors,
- d. A reflective component incorporating an individual portfolio of activities and development,
- e. A broader business management component which includes topics, e.g. finance, international business, etc.

This structure from Nabi *et al.* (2016) is mirrored in the delivery of entrepreneurship education in the DICE module which represents the primary sample group in the quantitative thesis studies.

**Figure 2-3: Pedagogies Employed in Entrepreneurship Education in Ireland**



(Clinton and Lyons, 2016, p.36)

In consideration of the curriculum of EE, there is a need also to consider the teacher and their role in delivering the subject. Ruskovaara and Pihkala (2015) studied Finnish teachers of EE at the vocational level (n= 1359), noting that the teacher impacts the teaching of entrepreneurship in a number of ways. They found that female teachers were more likely to incorporate non-traditional aspects like company visits and experiential games, teachers with an increased business background were more likely to teach EE, and teachers with more entrepreneurial training engaged in more effective EE practices. The effect of these instructor factors are considered to be worthy of research consideration, as are institutional (top-down) influences.

## **2.4 Evaluation of Entrepreneurship Education**

According to Van Dyk *et al.* (1997), the evaluation of an educational programme should be carried out as an ongoing process; be directed towards specific objectives; use appropriate measures and instruments; be a form of quality control; and be concerned with more than the evaluation of the individual student. EE can be assessed at the course level by causal means, noting the number of students who have developed entrepreneurial skills and confidence, or who start a venture thereafter

(Duval-Couetil *et al.*, 2010; Rae, 2010; Von Graevenitz *et al.*, 2010; Mwasalwiba 2010). Individual performance indicators in education can involve assessing knowledge, or the evaluation of student satisfaction.

#### **2.4.1 Benefits of Entrepreneurship Education**

The recent QAA (2018) report considers that enterprise and entrepreneurship education are inclusive, have a positive influence on student creativity, flexibility and the innovation process, active citizenship, student attainment and grades, stakeholder engagement, career opportunities and career success, and can improve start-up rates. Studies highlighting the benefits of EE to the student are shown in Table 2.2. Charney and Libecap (2000) found entrepreneurship graduates are three times more likely to start their own business; three times more likely to be self-employed; have annual incomes 27% higher, own 62% more assets; and are more satisfied with their jobs.

As noted in Table 2.2, studies have shown that EE can create a positive perceptions of entrepreneurship and encourage students towards entrepreneurship, develop entrepreneurial competencies, and improve entrepreneurial success. Martin, McNally, and Kay (2013) studied 42 articles, associating EE with higher levels of total entrepreneurship-related human capital assets, knowledge, and skills, and intentions of entrepreneurship. Outcomes of entrepreneurial behaviour (even nascent), start-up behaviours and entrepreneurial performance and success, were all empirically related to EE and training in their analysis:

*“Entrepreneurship education is likely to be a significant contributor to the improved quality of graduate start-ups, as well as societal and intellectual attitudes to entrepreneurship, in the longer term”*

(Galloway and Browne, 2002, p. 398)

**Table 2-2: Benefits of Entrepreneurship Education**

<b>Benefit</b>	<b>Detail</b>	<b>Reference</b>
Entrepreneurial Intentions	EE creates positive perceptions of entrepreneurship and encourages students towards entrepreneurship/ Increases entrepreneurial intentions	Krueger (1993); Kolvereid and Moen (1997); McStay (2008); Fretschner and Weber (2013); Martin <i>et al.</i> (2013); Nabi <i>et al.</i> (2017)
Job Creation/ Employability	Increases self-employment or likelihood of self-employment; benefits self-employment  Enhances employability skills	Charney and Libecap (2000); Matlay and Westhead (2005); Matlay (2008); Athayde (2009); Sánchez (2013); Jones, Pickernell, Fisher <i>et al.</i> (2017) De Faoite, Henry, Johnston, and Van der Sijde (2003); Rae (2007); Sewell and Dacre Pool (2010)
New Venture Creation	Increases levels of new venture creation	Fleming (1996); Varela and Jiminez (2001); McMullan <i>et al.</i> (2002); Matlay (2006a)
Entrepreneurial Performance	Linked to the development of successful entrepreneurial behaviour and performance	Fleming (1996); Varela and Jiminez (2001); Charney and Libecap (2000); McMullan <i>et al.</i> 2002; Matlay (2006c); McHugh and O’Gorman (2006); Nilsson (2012); Martin <i>et al.</i> (2013); Rideout and Gray (2013)
Career Success	As entrepreneurs and within management roles	Matlay (2008); Martin <i>et al.</i> (2013)
Long term strategy in Business	Greater strategic emphasis on business planning, strategy and research	McHugh and O’Gorman (2006)
Entrepreneurial traits, skills, competencies, knowledge	Higher levels of proactiveness and risk taking Entrepreneurial skills and knowledge	Sánchez (2013) Martin <i>et al.</i> (2013) Lackéus (2017)
Addressing societal issues	Aids in strengthening social inclusion; encourages social entrepreneurship	Global Education Initiative (2009)
Other academic benefits	Helps to integrate various business subjects and topics and improve decision making in students	De Faoite <i>et al.</i> (2003)

#### **2.4.2 Challenges in the Evaluation of Entrepreneurship Education**

Despite the benefits highlighted, there are aspects of the extant literature considered limiting. As a research field, Duval-Couetil (2013) notes that EE has many characteristics making its assessment challenging. Firstly, it is a young discipline and not wholly defined; its heterogeneity limits standardization across students, faculties, and institutions; it places emphasis on practical elements; has much stakeholder involvement; and has an external focus on economic development. Henry and Lewis (2018) in their review of studies suggested that most studies of EE lack theoretical complexity, or rely on a scant number of recurring theoretical frameworks. As a result, attaining guidance on pedagogy and assessment has been a convoluted issue for scholars. Challenges to the field and its research inquiry include the need for methodological rigor, and the impact of antecedent factors and self-selection (Fayolle and Gailly, 2015).

Firstly, while EE has been assessed on many levels (e.g. course-wide, programme-wide, and countrywide), there are few similarities in methods used which makes comparisons challenging (Cooney and Murray, 2008). Studying works from 1997 to 2011, Rideout and Gray (2013) noted the field was weakened by studies which lack empirical rigour and strong theoretical grounding. This lack of rigor is considered a key weakness in the EE field from theoretical, methodological, and empirical perspectives (Lorz *et al.*, 2013; Henry and Lewis, 2018). Lorz *et al.* (2013) recommend that attention is paid to the theoretical foundations, measurement logistics, validity and reliability procedures, sample size and pre/post techniques (See Appendix A for a list of all recommendations). Theorising about EE is mainly conducted at the individual level, with little emphasis on contextual factors (Walter and Block, 2016).

Second, studies have found the number of students wishing to pursue a career in entrepreneurship may decrease or remain static after EE (Von Graevenitz *et al.*, 2010; Nabi *et al.*, 2016). Studying entrepreneurial intentions of students in their meta-analytic review (73 studies), Bae *et al.* (2014) found that when student pre-course EI was controlled for, EE did not lead to significant increases in intentions. Essentially, by allowing for the antecedent student levels of intention, the



studies were more effectively benchmarked and calibrated, leading to more accurate findings (Bae *et al.*, 2014). Fayolle and Gailly (2015) also found the impact of EE on student EI was strongly affected by the students' initial level of intention and prior exposure to entrepreneurship. A mixed methods study by Nabi *et al.* (2016) found the EI of first year entrepreneurship students to increase at differing rates according to their past entrepreneurial experience. Accordingly, researchers could further study the impact of experience and changing student development over the course of an EE module or programme.

Lastly, Bae *et al.* (2014) highlight the effect that self-selection can have on empirical studies. For example, Nilsson (2012) found that past students of EE reported more established new venture creation, however noted that perhaps the students more likely to set up companies were more likely to choose the course from the outset. Following from the previous point, the implication is that a student may have previous experience or attitudes about EE or being an entrepreneur, which will influence their choices to pursue such a course, or perform within it.

### **2.4.3 Gender and Entrepreneurship Education**

Sieger, Fueglistaller and Zellweger (2016) noted a 'gender gap' in university students whereby females were found to have weaker intentions for entrepreneurship, than males. In a review of articles from the Education and Training journal (2010-2015), it was noted that gender was a common causal or reported variable in quantitative studies in EE (Henry and Lewis, 2018). For example, in studying the Theory of Planned Behaviour, Karimi *et al.* (2013) noted gender differences in antecedent factors of EI using an Iranian EE student population. Kickul, Marlino and Barbosa (2008) found that the relationship between the effect of having an entrepreneurial parental role model and EI was significant for female but not male EE students. Despite its popularity in empirical study, consensus remains fragmented on gender effects.

It has been suggested that this gender gap in entrepreneurial perceptions and proclivity is explained for more by perceptual factors than any other contextual reasoning (Koellinger *et al.*, 2013). In terms of EI, the relative gender gap was found to be 36.6% directly after studies, but only 10.8%

five years later. Considering the GUESSS 2016 results within Ireland, Clinton and Lyons (2016) found<sup>2</sup> that 41.8% of males had intentions to start a company 5 years after graduation, compared to a female rate of 30.5% (global average was 46.8% males to 43.3% females). Kickul *et al.* (2008) noted that female students who have reasonable levels of ESE are less likely to favour an entrepreneurial career, perhaps believing it to have less professional prospects than other industry careers. Camelo-Ordaz *et al.* (2016) the relationship between gender and EI was mediated by (non-entrepreneur) student perceptions of their own abilities relating to ESE, the ability to recognise opportunities and fear of failure.

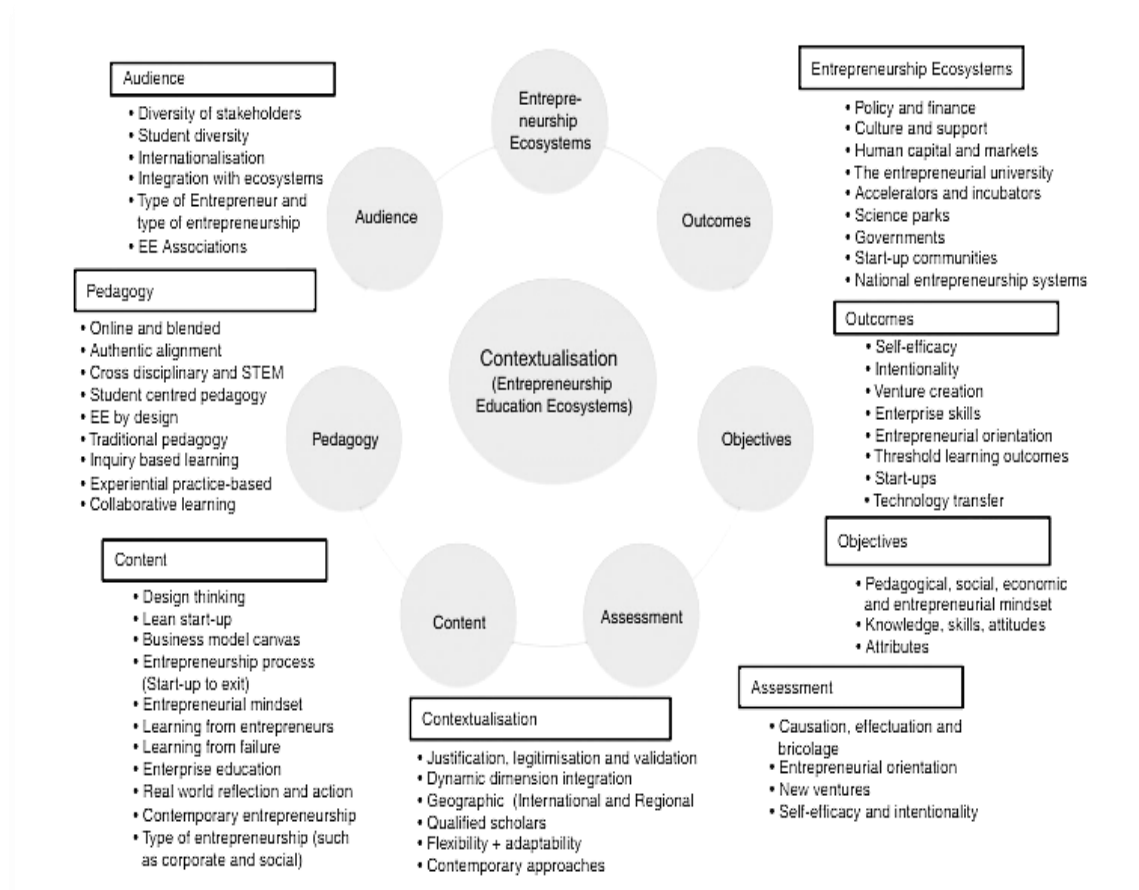
Studying the antecedent factors contributing to student perceptions of the entrepreneurial career, a number of aspects have been examined. Clinton and Lyons (2016) studied how university students perceived their social circle would react if they pursued a career in entrepreneurship. Female students were found to perceive a higher 'very' positive reaction to their entrepreneurial pursuits than males did. The results indicate a more negative perceived reaction by the male students i.e. male students expected their friends to be less positive about their company initiation. Structuring their study based on Social Feminist Theory, Camelo-Ordaz *et al.* (2016) noted that their female students considered creativity to be the most important factor for creating a business, while males opted for risk-taking and other factors. This theory considers that males and females have different world views, perspectives and behaviours due to differences in their socialisation processes. Considering the theme from a more macro perspective, Bae *et al.* (2014) studied the effects of gender egalitarianism (the extent that a community minimises gender role differences while promoting gender equality), finding EE to mitigate student perceptions of gender inequality for entrepreneurship in low gender egalitarian countries.

<sup>2</sup> Sample size of 304 male students and 503 female student respondents

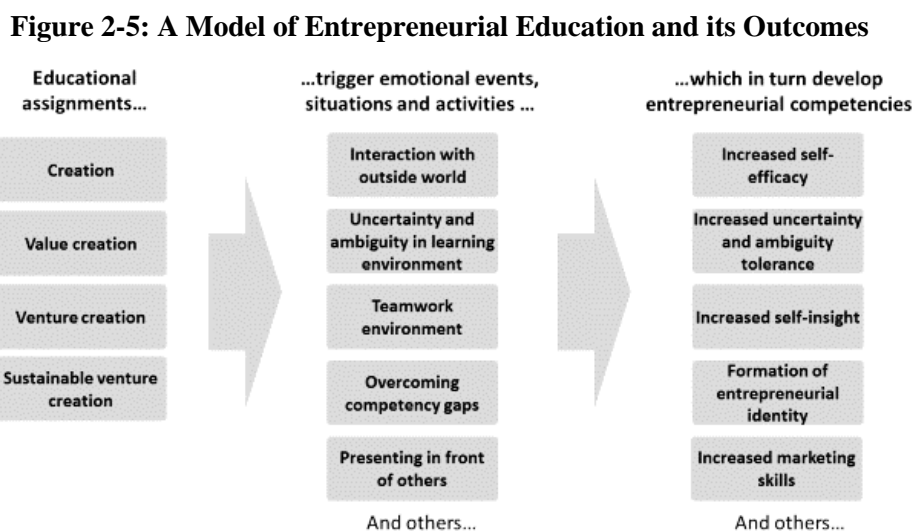
## 2.5 A Selection of Frameworks Depicting Entrepreneurship Education

Frameworks depicting the many layers and factors affecting EE are growing in number (Henry and Lewis, 2018). Fayolle *et al.* (2006) found contextual and education-centric factors (institutional setting, audience, EE type, objectives, course contents, teaching methods and approaches) impact the course, and student EI (via the Theory of Planned Behaviour). Their framework and propositions informed further research studies (e.g. Hamzah *et al.*, 2016) and paved the way for further considerations of factors affecting EE on more macro levels. In Figure 2.4, Maritz (2017) presents a comprehensive overview of multiple dimensions and influencing factors of EE (initially developed by Maritz and Browne in 2013).

**Figure 2-4: Dimensions of Entrepreneurship Education**  
(Maritz, 2017, p. 477)



This was developed based on analysis of the recommendations of international scholars, and includes eight dimensions: assessment, audience, content, context, eco-system outcomes, objectives and pedagogy, which are said to lead to stronger empirical studies and a consideration of novel and emerging factors (Maritz, 2017). While being future-oriented and comprehensive, it should be noted that aspects such as entrepreneurial emotion or passion, innovation of output, student teams, or entrepreneurial experience are not explicitly noted. Lackéus (2014; 2015) made a number of propositions regarding the effect of emotion on the student of entrepreneurship. These highlight the relationship between educational assignments, emotional events, situations, activities and developed entrepreneurial competencies (Lackéus, 2014). There is a focus on EE assignments as input factors, which trigger emotional and behavioural student responses, leading to transformational change in student entrepreneurial competencies and tendencies towards entrepreneurship (self-efficacy, identity, and related skills). Lackéus (2014; 2015) suggest that emotional activity occurring during EE could be tested as a means of formative assessment, and created a model noting emotional triggers (events) such as social interaction, presentations, teamwork, and uncertainty (Figure 2.5).



(Lackéus, 2015)

### 2.5.1 The Social Cognitive Career Theory

A theory gaining momentum in EE is the Social Cognitive Career Theory (SCCT). Connected to Social Cognitive Theory (Bandura, 1986), and integrating aspects of the career self-efficacy theory

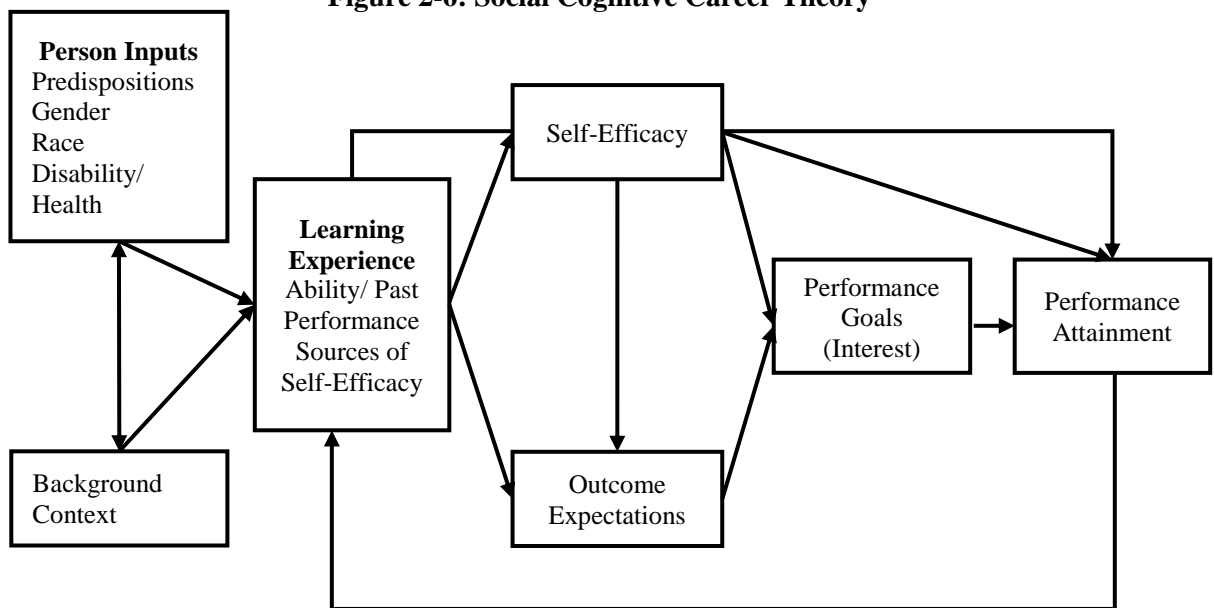
(Hackett and Betz, 1981), the SCCT embraces many constructivist assumptions and theories of career development (Lent *et al.*, 1994; Lent *et al.*, 2002).

*“SCCT seeks to provide a unifying framework for understanding, explaining, and predicting the processes through which people develop educational and vocational interests, make academic and occupational choices, and achieve varying levels of success and stability in their educational and work pursuits”*

(Brown, Lent, Telander, and Tramayne, 2011, p.81)

The theory has received significant attention in literature of many domains, and is dependent on the premises of self-referent thought and social processes guiding individual action (Flores, Navarro and Ali, 2017). It consists of a triadic-reciprocal view of person-behaviour-situation interaction, where major dimensions of the SCCT influence one another bi-directionally over time. Triadic-reciprocity as suggested by Bandura (1986) is an interconnected mechanism of interrelated factors: personal attributes (physical and affective states), external/contextual factors, and overt behaviour (Lent *et al.*, 1994).

**Figure 2-6: Social Cognitive Career Theory**



*(Integrating performance and career factors - Lent et al., 1994; Lent et al., 2002)*

The theory was conceptualised as four ‘interlocking’ models which share the main elements of social cognitive theory; self-efficacy, outcome expectations and goals, but with differing outcome orientations (interests, career choice, performance and satisfaction) (Lent *et al.*, 1994; 2002). It is considered applicable to the academic student perspective from both a theoretical and empirical perspective (Lent *et al.*, 2002; Sheu and Bordon, 2017). Figure 2.6 displays the performance variant of the SCCT theory, with the additional person input and contextual factors discussed by Lent *et al.* (1994). The SCCT performance model studies the interplay of experience (or ability), self-efficacy and outcome expectation on the development and execution of performance goals. Depending on the perceived level of ability and self-efficacy, the individual will set their performance goals accordingly (low if the individual perceives the task to be difficult and him/herself to be inexperienced).

**Self-Efficacy:** It is suggested that an individual’s occupational or academic interests manifest as performance goals, and are reflective of his/her concurrent self-efficacy beliefs and outcome expectations (Lent *et al.*, 1994). Within the SCCT, self-efficacy is seen as static: it can interact with personal, behavioural, and environmental factors (Lent *et al.*, 2002), and can be developed by the four main sources of personal performance: mastery experience, vicarious experience, social persuasion and physical/emotional states (Bandura, 1986). Self-efficacy is said to have a direct effect (and indirect) effect on performance (while outcome expectations are not necessarily linked to performance). Personal and environmental inputs would be mediated by self-efficacy in such a model (Lent *et al.*, 1994; Liguori, 2012).

**Outcome Expectations:** Outcome expectations are personal beliefs about the consequences of performing a particular behaviour (Lent *et al.*, 2002). This aspect of SCCT links conceptually with the expectancy-value theory by Vroom (1964) used in literature dealing with the social loafing (free-riding) phenomenon (Karau and Williams, 1993; McMullen and Shepherd, 2006). The theory suggests individuals are motivated by three main factors: value (the perceived benefit that is gained by the completion of the task); expectancy (the extent to which an individual believes their input will affect the performance), and instrumentality (the extent an individual believes his performance will

affect the outcome). As highlighted in Figure 2.6 outcome expectations are said to be affected by past experiences and self-efficacy levels (Lent *et al.*, 1994).

**Goals:** Lent *et al.* (1994; 2002) note that the proper setting of appropriate and relevant goals can have a significant impact on how an individual will perform and develop self-efficacy beliefs. However, Brown *et al.* (2011) could not find a unique significant relationship between the goal challenge variable tested and performance, and questioned the directionality of this relationship.

The SCCT theory acknowledges a wide range of affecting factors, noting these to be a ‘second layer’ of theoretical propositions (Lent *et al.*, 1994, p.101). Gender, ethnicity, educational access opportunities, beneficial social conditions (e.g. availability of role models), and even potentially genetic pre-dispositions may be influencing factors (Lent *et al.*, 1994). Other factors which have been linked in studies to versions of the SCCT model include conscientiousness (Brown *et al.*, 2011); social supports and barriers (Jiang and Zhang, 2012; Sheu and Bordon, 2017); personality traits (extra-version and emotional stability), positive affect and academic supports (Sheu and Bordon, 2017). It has been studied in a multitude of contexts and is considered applicable to entrepreneurship literature in integrating entrepreneurial constructs (Tran and Von Korfflesch, 2016; Lent and Brown, 2017).

*“SCCT provides a unifying framework that unites conceptually similar constructs (e.g. entrepreneurial outcome expectations, and entrepreneurial self-efficacy), offers rationale to explain entrepreneurial outcomes (e.g. entrepreneurial intentions, behaviour and performance), and allows for the inclusion of other seemingly diverse constructs (e.g. generalised self-efficacy, gender, prior family business experience, work experience [...]) that previous models of entrepreneurial intentions do not fully or directly include”*

(Liguori, 2012, p.28)

The framework has also been used successfully in EE and is considered a worthwhile avenue for exploration in the thesis (Segal, Borgia and Schoenfeld, 2002; Liguori, 2012; Bernstein and Carayannis, 2012; Kassean *et al.*, 2015).

## **2.6 Chapter Summary**

In discussing entrepreneurial research, Bygrave and Hofer (1991, p.15) commented: “*good science has to begin with good definitions*”. To provide a comprehensive definition of the entrepreneur and EE, it was necessary to briefly discuss the ontology of entrepreneurship research, and introduce key theories and variables of relevance to both. The entrepreneurial tenacity of certain individuals has led to innovation in start-ups and existing businesses, which generates revenue and employment (Chowdhury, 2005; Lundin, 2015). Throughout history, the entrepreneur has been thought of as a change agent, an innovator, a function of the market, an intermediary, even a Heffalump! Researchers have studied the entrepreneur using a wide array of theoretical perspectives including trait, cognitive, attitude, intentionality, efficacy and outcome based methods. Nevertheless, the findings from this body of research remain fragmented and dispersed (Shook *et al.*, 2003; Nabi *et al.*, 2017).

This chapter provides a summary of extant findings and current theories and frameworks of note in EE. A number of research gaps become apparent, including the need to evaluate entrepreneurship education using a strong research design and careful consideration of the measurement and constructs. Given the increasing opportunities for entrepreneurial priming prior to their university experience, support was provided indicating that more research investigation needs to be placed on the effect of antecedent entrepreneurial tendencies and attitudes on the EE student. The next chapter (Chapter 3) forms the second literature review which introduces the topic of teamwork to the thesis. The chapter discusses teamwork in the context of education and provides a definition and a justification for its specific study in the academic field of EE. In developing a proposed conceptual framework for the student team in EE, a number of related teamwork frameworks are examined, and relevant teamwork behaviours and outcomes discussed.



**CHAPTER 3: Literature Review - Teams and Student  
Teams in Entrepreneurship Education**

### 3.1 Introduction

Teamwork is used within most industries, systems, sports and communities; based on the fundamental belief that by integrating more than one individuals' skillset and knowledge, the resulting process and output is synergistically enhanced (Beal *et al.*, 2003; Rico *et al.*, 2010).

*“Teams provide diversity in knowledge, attitudes, skills and experience, whose integration makes it possible to offer rapid, flexible and innovative responses to problems and challenges, promoting performance and improving the satisfaction of those making up the team”*

(Rico, de la Hera and Taberero, 2010, p. 57)

In commercial settings, teamwork can enhance productivity (Beal *et al.*, 2003), help deal with complex problems (Kagan, 1994); encourage collective decision-making (Knight, Durham and Locke, 2001); and improve overall competitiveness (English, Griffith and Steelman, 2004). The effect of the team has been studied in many disciplines including computer science, communications, management, education, organisational sciences and engineering (Salas, Cooke and Rosen, 2008).

In entrepreneurship literature, while the study of teams was once an underexplored topic (Gartner *et al.*, 1994; Busenitz *et al.* 2003), the rise in academic interest has been substantial (Busenitz *et al.*, 2014; Klotz *et al.*, 2014), fostered by the suggestion that team ventures may perform more effectively than individual (Chandler *et al.*, 2005; West, 2007). However, while teamwork is commonly used in the EE delivery (Hytti and O’Gorman, 2004; Clinton and Lyons, 2016), there is scant theoretical or empirical focus. Accordingly, this chapter discusses the team generally and specifically in EE, using extant knowledge from themes of education, performance and innovation.

### 3.2 Defining the Team and the Entrepreneurial Team

Reviewing definitions of teamwork (Table 3.1), it is suggested a team contains no fewer than two members, with an upper limit of twenty (Katzenbach and Smith, 1993; Cooke and Hilton, 2015).

**Table 3-1: Selected Definitions of the Team**

Definition	Author
A distinguishable set of two or more people who are assigned specific roles or functions to perform dynamically, interdependently, and adaptively toward a common and valued goal/objective/mission, who have each been assigned specific roles or functions to perform, and who have a limited life span of membership	Salas <i>et al.</i> , (1992, p. 126)
A team is a small group of people (typically fewer than twenty) with complementary skills committed to a common purpose and a set of specific performance goals. Its members are committed to working with each other to achieve the team's purpose and hold each other fully and jointly accountable for the team's results	Katzenbach and Smith (1993, p. 112)
Teams are collectives who exist to perform organizationally relevant tasks, share one or more common goals, interact socially, exhibit task interdependencies, maintain and manage boundaries, and are embedded in an organisational context that sets boundaries, constrains the team and influences exchanges with other units in the broader entity	Kozlowski and Bell (2003, p.334)
Teams are social entities composed of members with high task interdependency and shared and valued common goals. They are usually organised hierarchically and sometimes dispersed geographically; they must integrate, synthesise, and share information; and they need to coordinate and cooperate as task demands shift throughout a performance episode to accomplish their mission.	Salas, Cooke and Rosen (2008, p.541)
Two or more individuals with different roles and responsibilities, who interact socially and interdependently within an organizational system to perform tasks and accomplish common goals.	Cooke and Hilton (2015, p. 22)

Members must interact with each other, and there is a common focal point or purpose for these actions and interactions, which can lead to the development of a shared climate and unified purpose (Karau and Williams, 1993; Anderson and West, 1998; Kozlowski and Bell, 2003). Most definitions note contextual factors of teamwork; be it a temporal element (i.e. a limited lifespan) (Salas *et al.*, 1992; Salas *et al.*, 2008), or a recognition that a team is embedded within an organisational context (Katzenbach and Smith, 1993). This context can be responsible for the delivery of support, resources, feedback and rewards that affect team functioning directly or indirectly (Rico *et al.*, 2011).

Entrepreneurial team research may be skewed by studies that do not distinguish between the entrepreneurship teams and top management teams (Rehn *et al.*, 2013). However, it is suggested that

entrepreneurial teams face a higher degree of uncertainty and personal risk to general organisational teams (Chan, 2009). They may have simpler organizational structures, and can be more homogeneous compared to teams in larger organizations (Chan, 2009). In an attempt to be explicit in their definition of an entrepreneurial team, Schjoedt and Kraus (2009, p.515) state:

*“An entrepreneurial team consists of two or more persons who have an interest, both financial and otherwise, in, and commitment to a venture’s future and success; whose work is interdependent in the pursuit of common goals and venture success; who are accountable to the entrepreneurial team and for the venture; who are considered to be at the executive level with executive responsibility in the early phases of the venture, including founding and pre-start up; and who are seen as a social entity by themselves and by others”*

Entrepreneurial teams are said to have a shared entrepreneurial purpose (Harper, 2008), and a financial stake in the company (Kamm *et al.*, 1990; Cooney, 2005). The team members of an entrepreneurial team actively participate in the development of the company (Cooney, 2005; Harper, 2008); and are responsible for strategic decision-making and on-going operations of the venture (Klotz *et al.*, 2014). Kamm *et al.* (1990) suggested members had to be linked to the team at pre-start-up phase; however, this was disputed by Cooney (2005) as members can join at various stages and still be integral.

### **3.3 Student Teams in Entrepreneurship Education**

In education, teamwork is considered a collaborative approach to learning, where students share skills and knowledge in an interactive setting (Laal and Ghodsi, 2012). Students are usually placed into teams of 4-8 members who meet at intervals to work towards a specific course deliverable or assignment (Druskat and Kayes, 2000). Student teamwork experiences differ in duration and intensity, usually coinciding with the academic calendar (Chiocchio and Essiembre, 2009). They are considered analogous to project teams due to their temporal and temporary nature of collaboration (Bravo, Lucia-Palacios and Martin, 2016).

From a psychological standpoint, collaborative learning increases academic self-esteem, motivation, student satisfaction, and social responsibility, reduces anxiety among students, and develops trust and a positive attitude toward educators (Johnson and Johnson, 1989; Panitz, 1999; Oakley *et al.*, 2004; Gillies, 2004; Hytti *et al.*, 2010). It is also positively linked to attendance, an ability to recognise errors, critical thinking, cognitive learning, engagement with academic content, problem solving, retention and general student achievement (Cook, 1991; Steinbrink and Jones, 1993; Qin *et al.*, 1995; Nowak, Miller and Washburn, 1996; Terenzini *et al.*, 2001). Teamwork is associated with higher student achievement rates than competitive or individualistic approaches (Johnson and Johnson, 1989; Johnson, Johnson and Stanne, 2000). In addition, from the perspective of the institution, teamwork has an administrative benefit as it is said to reduce an instructor's workload (Pfaff and Huddleston, 2003).

The benefits outlined above however are dependent on the success of the teamwork initiative which is not guaranteed (Eva, 2002; Holtham *et al.*, 2006). Ineffective student teams can experience numerous problems ranging from minor issues such as scheduling difficulties and miscommunication, to larger challenges such as the poor attendance of members, lack of leadership including role confusion, low trust, clashing personalities and the social loafing phenomenon, where certain members of the group do not participate fully (Baldwin, Bedell and Johnson, 1997; Burdett, 2003; Hansen, 2006).

A focus of this research thesis is the student team of entrepreneurship education at third level; students who are placed into a team in order to complete the course requirements for an EE course or module. Following the format of entrepreneurial team definitions (Harper 2008; Schjoedt and Kraus, 2009), a student entrepreneurship team (SET) is defined in this thesis as:

*“A group of students working together towards a common goal in an entrepreneurship education related activity or project, which necessitates the combination of individual member entrepreneurial actions and interactions”*

A student team of entrepreneurship education may differ from another student team typology (a student group in an accounting course for example) for a number of reasons that make it a worthy theme for specific research inquiry:

- a) Teamwork is expected to develop student interpersonal skills in the educational context (Collins and Robertson, 2003). It is proposed that a SET interacts with an above-average range of stakeholders (teammates, mentors, clients, business people etc.), resulting in increased networking skills and development opportunities (Duval-Couetil, 2013; Wing Yan Man, 2015; Neumeyer and McKenna, 2016). Lackéus (2014) noted the positive impact of external stakeholders on student entrepreneurial competencies and engagement. More studies investigating these factors are required.
- b) Due to the nature of the subject, SET's study and practice idea generation and opportunity seeking as core themes. It has been suggested that teamwork in EE could develop creativity in its students (Hamidi, Wennberg and Berglund, 2008), however, while there have been numerous studies studying innovation in small group research, this has not been applied to the EE context to any great extent.
- c) Experiential and novel pedagogical techniques are commonly employed in EE (Neck and Greene, 2011; Pittaway and Cope, 2007b; Mwasalwiba, 2010; Lackéus, 2015; Hägg and Politis, 2017). These may affect a student team in terms of engagement, stress, or interpersonal relationship conflict (Chen and Agrawal, 2018). In turn, there may be heightened emotional responses (Lackéus, 2017), and team member exit or social loafing.
- d) Due to the nature of the projects employed in EE, attempts are made to create a sense of realism throughout (Kirby, 2004; Neck and Greene, 2011; Nabi *et al.*, 2016). Teamwork in EE provides more authentic experiences of the reality of new venture endeavours (Wing Yan Man, 2015). These scenarios may affect the team dynamic and student development, and could be further studied.

- e) Academic research has called for investigation of the entrepreneurial team, to understand the effect of team dynamics and processes (Birley and Stockley, 2000; Ucbasaran, Westhead and Wright, 2001), as well as deciphering the effect of contextual, demographic and team composition factors (Shepherd and Krueger, 2002; Chowdhury, 2005; Schjoedt and Kraus, 2009; Discua Cruz *et al.*, 2013; Klotz *et al.* 2014). Accordingly, the study of the SET is warranted to determine whether mirrored findings occur. This is particularly relevant due to the increasing use of interdisciplinary teams in EE (Neumeyer and McKenna, 2016).
- f) Attitudes towards entrepreneurship as a career, and constructs such as ESE and EP have been investigated from a team-level perspective in entrepreneurship research (Drnovšek, Cardon and Murnieks, 2009; Tasa, Taggar and Seijts, 2007). It is considered that exploring these and individual development due to the SET may provide interesting avenues of research. To date, Canziani *et al.*, (2015) found indications that teamwork in EE led to lower achievement orientation in students, while Wing Yan Man and Wai Mui Yu (2007) failed to find a relationship between team interaction and individual student competency development (but noted their culture of didactic teaching may have skewed findings). Nabi *et al.* (2016) noted that the group-work element of their EE programme may have developed practical inspiration in the student sample, and called for further investigation.

### **3.4 Determinants of Success in the Student Entrepreneurship Team**

There are many ways to consider success, and it is at times, relative (Eliot, 2013). The term ‘team effectiveness’ encapsulates both outcome and output elements, and is used commonly in team research. Cooke and Hilton (2015, p.2) describe it as:

*“A team’s capacity to achieve its goals and objectives. This capacity to achieve goals and objectives leads to improved outcomes for the team members (e.g., team member satisfaction and willingness to remain together), as well as outcomes produced or influenced by the team”*

Thus, while performance is an aspect of team effectiveness, other indicators such as satisfaction, speed, innovativeness or profit for example could be considered (Salas *et al.*, 2008). These can relate to (a) the level of effort group members collectively expend carrying out the task; (b) the performance strategies the group use; and (c) the amount of knowledge and skill members demonstrate (Hackman and Wageman, 2005, p. 41). In an educational setting, the performance of a team often refers to the final product or tangible resultant output (e.g. project or report), and/or whether the team meets or exceeds required standards to achieve this (Antoni and Hertel, 2009). This performance criterion can relate to ‘housekeeping’ facets such as conformity to structure, the quality of academic writing, the research process used, use of references etc. Thus, while performance is an effective measure of team (and individual) functioning, it may not be an accurate gauge of entrepreneurial-oriented factors such as the innovative merit of the idea, the feasibility of the idea, or the increase in student entrepreneurial development. It is therefore suggested that a framework for the SET should consider numerous outcomes/outputs. Accordingly, this research thesis focuses on two main outcome themes: one that considers performing/non-performing team behaviours (social loafing) and performance output; the second that considers team innovative behaviour, and innovative output.

### **3.4.1 Team Performance and Social Loafing**

Social loafing or ‘free-riding’ refers to the reduced or non-participation of team-members (Gagne and Zuckerman, 1999), and is a prevalent issue at third level; observed as individual or collective absenteeism, disengagement, and poor or incomplete output (Karau and Williams, 1993). Social loafing was first conceptualised as the ‘Ringlemann effect’, a phenomenon where the efficiency of a group task was less than the sum of each individual contribution (Latané, Williams and Harkins, 1979). This anomaly was explained by Latané, Williams and Harkins, (1979), suggesting that social pressure to complete a task is reduced in a group, with each individual feeling decreased pressure to contribute. Based on Vroom’s (1964) Expectancy-Value theory, the Collective Effort Model (CEM) was developed to conceptualise social loafing in a team setting (Karau and Williams, 1993; 2001).



**Table 3-2: Collective Effort Model – Dimensions**

<b>Factor</b>	<b>Description</b>	<b>Detail/Description</b>
<i>Value</i>	The perceived benefit gained by task completion task will support the motivation to perform.	Allows the students to consider ‘Is it really worth it to me?’
<i>Expectancy</i>	The extent to which an individual believes their input will affect their performance.	Allows the students to consider ‘Will my individual efforts ultimately make that much of a difference to the final performance?’
<i>Instrumentality</i>	The extent to which an individual believes their performance will affect the outcome: Individual impact on team, team impact on output, output impact on individual.	Allows the student to consider 1) ‘Will my individual efforts make a difference to the group performance?’ 2) ‘Will the performance of the group lead to a good group output?’ and 3) ‘How does the group performance affect me?’

(Source: Own)

The framework notes three perceptual factors influencing individual motivation to act/contribute (Table 3.2). If a team member has a poor perception of these factors, they may reduce their effort in the collective task, and engage in social loafing (Hart *et al.*, 2004). To consolidate findings and theoretical knowledge, Karau and Williams (2001) noted the linkages the CEM has to a number of related theories. Table 3.3 below notes these linkages and includes study findings pertaining to other related theories to strengthen knowledge about social loafing.

Studies have shown that social loafing has a negative effect on performance (Latané Williams and Harkins, 1979; Karau and Williams, 1993; Hart *et al.*, 2004), and adversely affects student perceptions of teamwork (Pfaff and Huddleston, 2003). However, some suggest the true negative extent is buffered due to the actions of other members, who may increase their effort when social loafing is detected (social compensation) (Gagne and Zuckerman, 1999). An individual known as a ‘*diligent isolate*’ will do more than their fair share of the workload to compensate for less productive members to reach task completion (Pieterse and Thompson, 2010).

**Table 3-3: Theories related to Social Loafing**

<b>Theory/Source</b>	<b>Proposition of Theory</b>	<b>Application to CEM Model</b>	<b>Contributing/Supporting Research in the Area</b>	<b>Source</b>
Evaluation Potential <i>Williams, Harkins and Latané (1981)</i>	<i>Social loafing is reduced when there is more individual evaluation and when there is a mechanism to compare group performance to others</i>	If an individual feels they are <i>instrumental</i> and this will be noticed or needed, it will motivate them to contribute, thus reducing the temptation to loaf.	<ul style="list-style-type: none"> <li>- To reduce social loafing within teams, individual efforts must be transparently seen and justly rewarded.</li> <li>- Evaluation potential had a linear effect on performance i.e. the more a person thought himself or herself to be evaluated, the greater the effort in terms of productivity.</li> <li>- The degree to which individual contributions are rewarded must be monitored carefully as it may be antithetical to the team spirit.</li> </ul>	Hunsaker <i>et al.</i> (2011)  Gagne and Zuckerman (1999)  Bailey <i>et al.</i> (2005)
Social Impact Theory <i>Latané (1981)</i>	<i>The impact of an external influence (e.g. manager/teacher) is diluted in terms of strength, immediacy, and targets present when in a group leading to a reduced effort per additional member</i>	There is a stronger perceived contingency between individual effort and valued outcomes when working in a smaller group.	<ul style="list-style-type: none"> <li>- Students are more productive in smaller groups as they are more cohesive and fewer problems develop.</li> <li>- In smaller groups, individuals put forward an increased quantity and quality of work.</li> <li>- Teams should be limited to five or under members to reduce incidences of social loafing.</li> <li>- There is an acceptable range from two to ten members, and any number within this range will not affect team performance significantly.</li> <li>- The ideal number of members in a team depends on the context and project itself.</li> </ul>	Wheelan (2009)  Chidambaram and Tung (2005)  North, Linley and Hargreaves (2000); Pieterse and Thompson (2010) Deeter-Schmelz, Kennedy and Ramsey (2002) Steiner (1972)
Dispensability of Effort <i>Kerr (1983)</i>	<i>Social loafing is reduced when individuals believe their input is unique</i>	If an individual believes their contribution is redundant, it will affect their perceived instrumentality in the group.	<ul style="list-style-type: none"> <li>- Students who shared a judgement-making task with other members felt more dispensable than students working alone or in pairs causing them to increase their levels of social loafing.</li> </ul>	Weldon and Mustari (1988)
Arousal Reduction <i>Harkins and Szymanski (1989)</i>	<i>Social loafing is reduced when the task is meaningful or interesting</i>	If the task is meaningful, it relates to the <i>value</i> aspect, in that the individual will feel the benefit inherent in completing the task.	<ul style="list-style-type: none"> <li>- A group task that is challenging may motivate the individual to contribute, despite the possibility that he/she may not be credited for the efforts.</li> </ul>	Harkins and Petty (1982); Harkins, and Szymanski (1989)

Table 3.3: Theories related to Social Loafing (ctd.)

Theory/Source	Proposition of Theory	Application to CEM Model	Contributing/Supporting Research in the Area	Source
Social Identity Theory <i>Tajfel (2010)</i>	<i>Social loafing is reduced when individuals work with those they respect (group value)</i>	Relating to the <i>value</i> aspect of the CEM, if a person respects his team members then supporting them is a beneficial outcome in itself (Rutte, 2005).	<ul style="list-style-type: none"> <li>- Cohesion significantly affects the amount of social loafing present in a team, with the level of loafing reduced with increased bonding between members.</li> <li>- Cohesion can be improved when the group members are aligned in academic ability, skill-sets, and/or goals. They suggest that an unaligned group can lead to frustration between members and may cause greater social loafing to occur.</li> <li>- There are specific team-level variables that can compensate for the effects of social loafing.</li> <li>- When there are levels of agreeableness and conscientiousness present in a team, it will counteract and affect the influence that social loafing has on performance.</li> </ul>	<p>Karau and Williams, (1993)</p> <p>Pieterse and Thompson (2010)</p> <p>Schippers (2014)</p>
Self-Efficacy <i>Sanna (1992)</i>	<i>Social loafing is reduced when the individual believes that he/she has the capacity to complete the task well</i>	If an individual expects that they can complete the task to a high standard they will work harder as their expectation of the outcome (individual and/or group) will be positive.	<ul style="list-style-type: none"> <li>- Evidence supported the rationale that self-efficacy had a mediating effect on performance in-group settings.</li> <li>- Collective efficacy was positively correlated to group performance, and had an effect on the level of perceived social loafing of the teams tested.</li> </ul>	Sanna (1992)
	<i>Individual demographics</i>		<ul style="list-style-type: none"> <li>- Females display more consistent work ethics than males. Social loafing is more prevalent in Western cultures and in college students more than school students.</li> <li>- Students attributed psychological make-up and social disconnectedness to a ‘free-riders’ lack of participation. Student teams did not necessarily relate poor quality work from one member with poor performance of the team, but they did relate it to disruptive behaviours of the social loafer.</li> <li>- An individual’s need for cognition (the tendency to engage in enjoy effortful cognitive endeavours) moderates the effects of social loafing.</li> </ul>	<p>Karau and Williams (1993)</p> <p>Jassawalla <i>et al.</i> (2009)</p> <p>Smith, Kerr, Markus and Stasson (2001)</p>

Thus, the presence of these individuals in a team may skew the true negative impact of social loafing on performance (Schippers, 2014).

Jassawalla, Sashittal, and Malshe (2009) found disengaged loafers who ‘slacked off’ did not hinder team performance, as other members compensated for their failings. However, these individuals caused disruptive behaviours, indirectly affecting performance. While not explicitly highlighted by Fang, Chang and Wen-Ching (2014), a similar significant positive increase in performance was found in teams who perceived co-workers were loafing. Schippers (2014) found student teams with high conscientiousness and agreeableness compensated for social loafing tendencies, which positively affected performance . To date, social loafing has received minimal attention in studies of EE, however has been flagged as a particularly relevant aspect affecting teams (Neumeyer and McKenna, 2016).

### 3.4.2 Innovation and Creativity in Teams

Innovation is an activity-based term relating to the *implementation* of creative ideas in a successful way (Rogers and Rogers, 1998; Amabile, 2013). The terms ‘creativity’ and ‘innovation’ are sometimes used interchangeably and rhetorically by researchers, educators and professionals (Berglund and Wennberg, 2006), though considered separate in some academic discussion (see overview in Amabile 1996, p.126-127).

**Table 3-4: Definitions of Innovation**

Author/s	Definition/Description
Schumpeter, (1947, p. 151)	The doing of new things or the doing of things that are already being done in a new way
West and Farr (1990, p.9)	The intentional introduction and application of ideas, process, products or procedures, new to the relevant unit of adoption’ to describe the concept
Rogers and Rogers (1998, p.5)	To extract value from ideas
Oslo Manual (2005; p. 46)	The implementation of a new or significantly improved product/service, or process, a new marketing method, or a new organisational method in business practices, workplace organisation, or external relations
Baregheh, Rowley and Sambrook (2009, p. 1334)	The multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace

Many definitions of innovation apply an ‘idea and action’ format, where innovation is synonymous with verbs such as ‘doing’, ‘application’, and ‘implementation’. It usually infers added value, a tangible benefit disseminating from the new concept or idea, and an element of originality or novelty (See Table 3.4). For the purposes of this thesis, it is considered that innovation and creativity are conceptually linked, echoing Table 3.5. Thus, innovation and creativity are considered part of the same process, with creativity/creative thinking acting as a precursor to innovative behaviours and outcomes (Cummings and Oldham, 1997; Hülsheger, Anderson and Salgado 2009; Anderson, Potočnik and Zhou, 2014). Within social science, academics discuss creativity as the “*complex product of a person’s behaviour in a given situation*” (Woodman, Sawyer and Griffin, 1993, p.294), including ideas that relate to products, services and processes (Woodman and Schoenfeld, 1989; Zhou and Shalley, 2003).

**Table 3-5: Literature linking Innovation and Creativity**

<b>Author/s</b>	<b>Definition/Description</b>
Cummings and Oldham (1997)	Creativity is the ‘raw material’ for innovative ideas
Clapham (2003, p.366)	Sometimes the term creativity has been used to refer exclusively to the process of ideation, and at other times, it has been used synonymously with innovation to refer to both the development and implementation of new ideas [...] in either case it is clear that creativity is closely linked to the process of innovation
West and Sacramento (2006, p.25)	Innovation is a two-component non-linear process, encompassing both creativity and innovation implementation. At the outset of the process, creativity dominates, to be superseded later by innovation implementation processes
Saroghi, Libaers and Burkemper (2015, p.714/ 715)	Creativity involves the generation of novel and useful ideas while innovation entails the implementation of these ideas into new products and processes; Creativity is the seed of all innovation
Anderson <i>et al.</i> (2014, p. 2)	They are integral parts of essentially the same process
Anderson <i>et al.</i> (2014, p. 4)	Creativity and innovation at work are the process, outcomes, and products of attempts to develop and introduce new and improved ways of doing things. The creativity stage of this process refers to idea generation, and innovation to the subsequent stage of implementing ideas toward better procedures, practices, or products

Considering theories of innovation/creativity, the **interactionist** perspective (Woodman and Schoenfeldt, 1989) proposed that the individual/unit has an interacting effect on creative behaviour, through their relative antecedent factors, cognitive abilities, traits and personality and organisational

innovation (Woodman, Sawyer and Griffin, 1993). Creativity is considered multi-level, occurring at the individual, team, and organisational sense, and affected by contextual and social aspects (Woodman, Sawyer and Griffin, 1993).

The **componential theory of creativity** (Amabile, 1988) is the most popularly cited model of creativity. It is found particularly useful due to its integration of innovation and creativity aspects, and its exploration and integration of multi-layered and team elements (Amabile 1988; Amabile, 2013). The theory states the creative process has five stages: (1) task presentation (identifying and understanding of the project), (2) preparation (preparation with learning or memory), (3) idea generation, (4) idea validation (testing ideas), and (5) outcome assessment (introducing the ideas). Model additions have acknowledged the influence of extrinsic motivators on the intrinsic task motivation factor, if the extrinsic motivators were supportive of the creative process (Hauser, Tellis and Griffin, 2006). A further revision of the componential model acknowledged that an affective state can significantly influence individual creativity (Amabile and Mueller, 2008; Anderson *et al.* 2014).

While a key aim of EE is to aid the development of creative thinking and innovation in students (Garavan and O’Cinneide, 1994a), there is a lack of knowledge surrounding how this can be facilitated in an academic setting (Henry *et al.*, 2005). In devising a model that relates to the SET, aspects relating to the innovative output and the preceding behaviour must be included. Kramer (2013) points out that when conducting research on students, particularly students of entrepreneurship, it is difficult to study them in relation to project innovativeness as the projects devised by the students are rarely commercialised or launched in reality i.e. they are not fully implemented. In an effort to address this in the thesis, student projects studied required research to be conducted among industry experts and/or the target market relating to the novelty and value of the product/service. In addition, the resulting projects were assessed solely on their innovative potential for the current market, as reported by academic experts (outlined in Section 8.5.3).

### 3.5 Team Effectiveness Frameworks

In considering an appropriate framework for the SET, it is necessary to examine related models frameworks of team effectiveness. A review by Shuart *et al.* (2007) of over 138 team effectiveness models and frameworks recommended that future work follow the Input-Process-Output (IPO) conceptualisation due to its simplicity in comprehension and preponderance in extant literature. Shuart *et al.* (2007) also suggest that future researchers explore the ‘black box’ of intervening team processes, and be cognisant of contextual factors.

#### 3.5.1 The Input-Process-Output / Input-Mediator-Output Framework

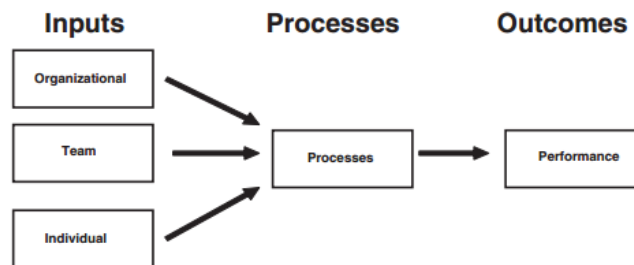
The IPO model introduced by McGrath (1964) and further developed by Steiner (1972) and Hackman (1987), is the most common over-arching and influential framework depicting team effectiveness (Ilgen *et al.*, 2005; Cooke and Hilton, 2015). It is based upon a linear process of teamwork participation wherein:

- **Inputs** relate to the individuals themselves, the manner in which the team is chosen and the task at hand. Inputs also relate to member composition, such as demographic variables (e.g. age, education), team composition inputs (e.g. team size), or organisational (e.g. organizational culture).
- The throughput or **process** relates to the activity itself, the event, activities/behaviours or stages during which inputs are converted to outputs (e.g., communication, coordination).
- The **output** relates to the outcome of the team in terms of the exiting or resultant opinions, product, or consequences. These can range from expected results e.g. completion of a report, and can include by-products of the teamwork project (e.g. affective reactions such as pride, team, job, personal satisfaction).

The IPO framework has been used extensively, and paved the way for further developments in the area (Rico *et al.*, 2010; Klotz *et al.*, 2014). However, it has received criticism for its simplicity, particularly its lack of complexity regarding team processes (Grossman, Friedman, and Kalra, 2017).

As a result, numerous researchers have contributed to theory, and have recommended developmental aspects over time (See Table 3.6).

**Figure 3-1: Input-Process-Output Framework**



(Salas *et al.*, 1992)

Considering the throughput or process stage, Ilgen *et al.* (2005) suggested relabelling it as the **Mediating/Mediator** stage, which led to a re-conceptualisation of the IPO, reclassified as IMO (Input-Mediator-Output)<sup>3</sup>. Mediators are divided into two categories: 1) team processes, and 2) emergent states by Mathieu *et al.* (2008).

**Table 3-6: Selected Advancements of the IPO**

<i>Element Proposed</i>	<i>Detail</i>	<i>Referred to by</i>
Temporal (time-based)	A team moves through the stages according to time; recommends the presence of feedback loops from output to inform subsequent inputs; feedback loops placed in episodic cycles	Tannenbaum, Beard and Salas (1992); Mathieu <i>et al.</i> (2008); Ilgen <i>et al.</i> (2005)
Levels of analysis	There are levels of input and output variables (e.g. individual outcomes and team outcomes) The team unit is nested within an organisational (or university) unit; teams exist in multi-level nested arrangements	Gladstein (1984); Tannenbaum <i>et al.</i> (1992) Cohen and Bailey (1997); Kozlowski and Klein (2000); Kozlowski and Ilgen (2006)
Evolution of Process Stage to Mediating Stage	The process stage is complex and multi-faceted and requires more depth. It is necessary to acknowledge and focus on shared and emerging constructs within team processes.	Marks, Mathieu and Zaccaro (2001); Ilgen <i>et al.</i> (2005); Mathieu <i>et al.</i> (2008); Humphrey and Aime (2014); Waller Okhuysen and Saghafian (2016); Grossman <i>et al.</i> (2017)
Exploration of composition	Acknowledge the impact that diversity of members (heterogeneity) may have on team functioning	Gladstein (1984); Tannenbaum <i>et al.</i> (1992)

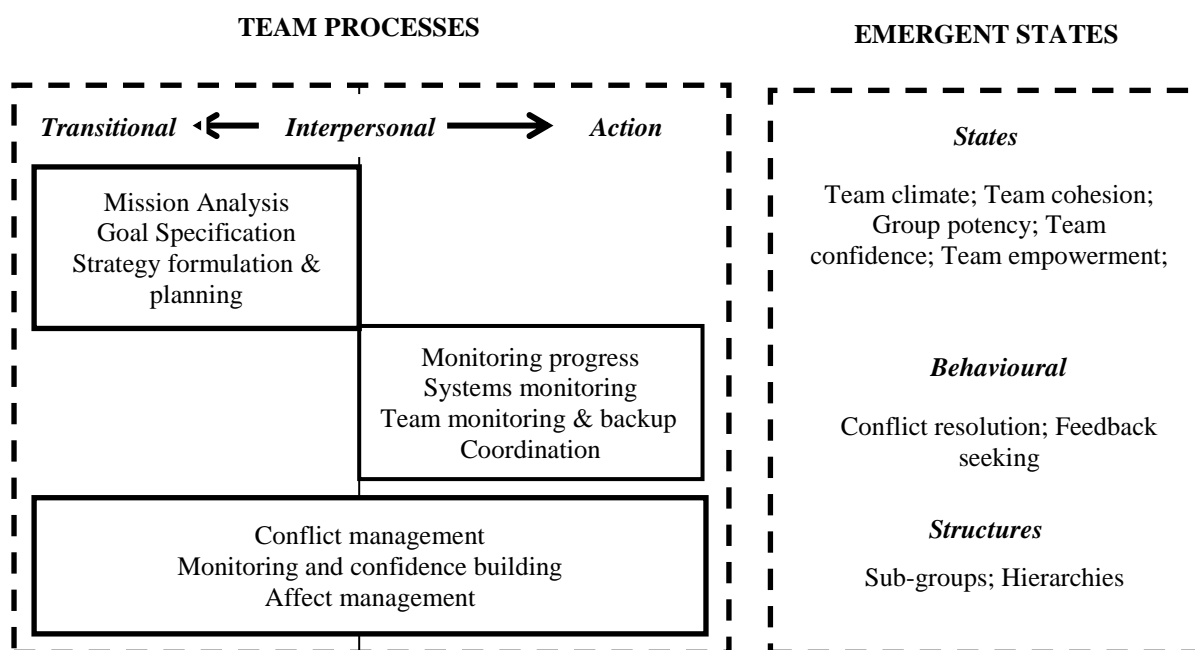
<sup>3</sup> The IMO (Input-Mediator-Output-Input) is also used, which also underlines a feedback loop inherent.



Within these groupings, team processes often relate to behaviours and actions inherent, while emergent states can relate to affective and cognitive factors (Grossman *et al.*, 2017). It is inferred these categories are not distinct but can overlap depending on the construct (Kozlowski and Ilgen, 2006). Team processes represent action and behavioural mechanisms; Marks *et al.* (2001) consider these transitional, interpersonal and active, occurring in a linear order that blend into one another (as shown in Figure 3.2).

1. **Transitional processes** relate to planning, strategy creation and goal-setting behaviours (Marks *et al.*, 2001; Mathieu *et al.*, 2008), usually occurring at the outset of a team project, but which can emerge if realignment is needed or at post-task reflection periods (Kozlowski and Ilgen, 2006).
2. **Action processes** are “*periods of time when teams are engaged in acts that contribute directly to goal accomplishment (i.e. task work)*” (Marks *et al.*, 2001, p.360). These pertain to monitoring, goal tracking, assisting behaviours, co-ordination, and any other aspects that functionally work towards task completion.

**Figure 3-2: Team Mediator Stage and Related Constructs**



*Adapted from Marks et al. (2001, p. 364), incorporating Waller et al. (2016)*

3. ***Interpersonal processes*** are behaviours involved in maintaining relational team functioning, for example, by undertaking conflict management and confidence building techniques. These occur at many points during teamwork and may induce emergent states as well as influencing performance outcomes (Le Pine *et al.*, 2008).

Emergent states usually refer to shared psychological states or characteristics of a team (Cohen and Bailey, 1997; Marks *et al.*, 2001; Ilgen *et al.*, 2005). Team confidence, team empowerment, team trust and collective cognition are examples of emergent states (Mathieu *et al.*, 2008), They do not describe member interaction and are less tangible than most constructs; defined as:

*“Constructs that characterize properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes”*

(Marks *et al.*, 2001, p.357)

Emergent states can be formed through a pattern of member interaction within the team or relating to the task (Cronin, Weingart and Todorova, 2011); or as by-products of team processes (Marks *et al.*, 2001). For example, if a group is poor at conflict management (team interpersonal process), a weaker team trust could ensue (emergent state). Waller *et al.* (2016) suggest that constructs display emergent qualities if they are:

- 1) Global (progress from lower levels to higher),
- 2) Coherent (develop over time and display a level of inertia which endures),
- 3) Ostensive (able to be discerned and experienced by team members),
- 4) Radically novel (not perfectly predicted from their lower levels).

Waller *et al.* (2016) suggest emergent states exist on a structural spectrum ranging from: states (e.g. team climate, cohesion, group potency, collective efficacy); behavioural patterns (e.g. conflict resolution, feedback seeking); and structures (e.g. sub-groups, hierarchies).

### 3.5.2 Homogeneity and Heterogeneity in teams

Before analysing specific studies and relevant variables of the IPO/IMO framework, it is necessary to discuss the conceptualisation of constructs from the individual to the team level. Teamwork constructs can display in-group agreement and thus homogeneity between members (e.g. team consensus, team cohesion), or a level of in-group disagreement and heterogeneity (e.g. team conflict, team member exit). Which are more successful – homogenous or heterogeneous teams? In support of homogenous teams, social identity theory suggests that individuals are more comfortable when engaged with individuals who belong to their perceived or evidential social category (Tajfel, 2010). In addition, literature on social categorization theory contend that certain demographic differences in team members disrupt group processes, and negatively affect attitudes and performance, as members will feel disassociated from each other (Pearsall, Ellis, and Evans, 2008).

Heterogeneity in teams can lead to more developed perspectives, constructive debate, and enhanced critical thinking (Rentsch and Klimoski, 2001; Gielnik, Frese, Graf and Kampschulte, 2012). Team diversity literature classifies variables in terms of *surface-level* demographic variables such as age, gender, background or education, or *deep-level* relating to cognitive or affective differentiators (Mohammed and Angell, 2004; Tekleab and Quigley, 2014; Zhou and Rosini, 2015). In examining entrepreneurial teams, demographic or surface-level variables are commonly studied (Chowdhury, 2005; Horwitz and Horwitz, 2007). Phillips and Lount (2007) found surface-level demographic heterogeneity made it difficult for teams to collaborate, whereas aspects of deep-level diversity led to positive outcomes.

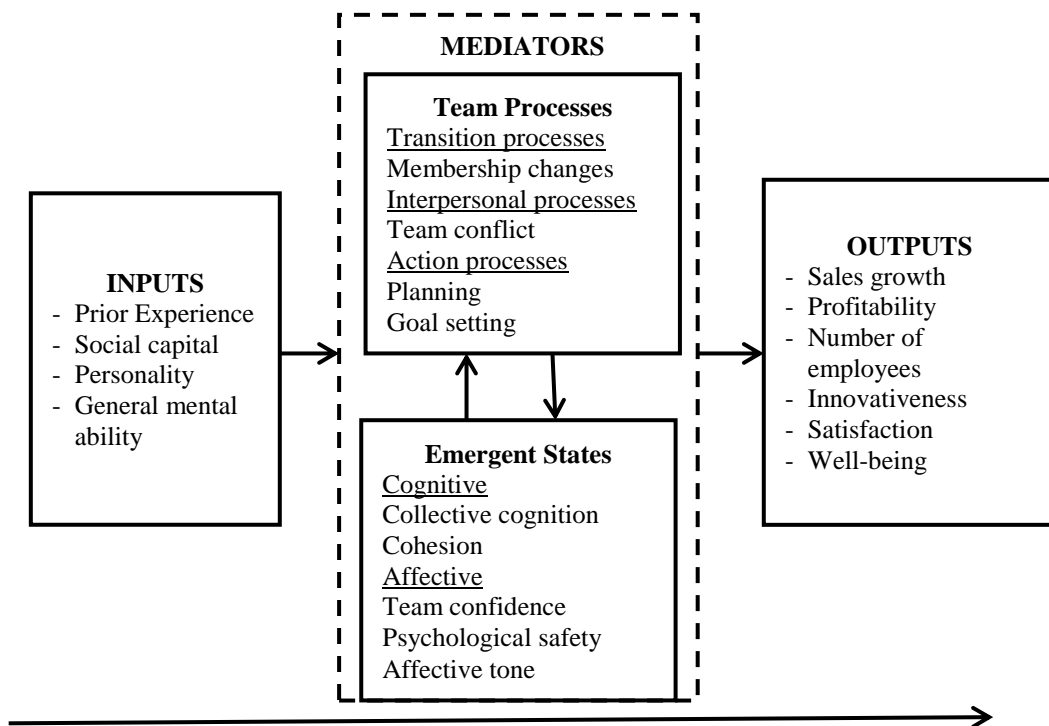
A meta-analysis of the team diversity literature by Horwitz and Horwitz (2007) found no relationship between demographic diversity and entrepreneurial team outcomes. Zhou and Rosini (2015) studied the impact of demographic diversity, informational diversity and personality diversity on entrepreneurial team performance as mediated by team processes (strategic planning, decision-making, shared leadership, conflict, cohesion, and membership changes). They suggest a team might concurrently move through the developmental phases of new venture creation and team processes. In considering a SET framework and subsequent studies, consideration must be given to the

conceptualisation of constructs and the importance of team alignment, dissention, and the effect of homogenous/heterogeneous teams along relevant criteria.

### 3.6 Team Effectiveness Frameworks in Entrepreneurship

Before a framework for the SET is proposed, it is beneficial to examine prior use of the IMO in entrepreneurship studies. For example, using the IMO to study entrepreneurial teams, Zhou (2016) found the relationship between shared leadership and entrepreneurial team performance was moderated by the personality diversity of the team, such that, when relationship-oriented personality diversity was high, the shared leadership to performance relationship was stronger. The frameworks and findings presented above assist in consolidating and highlighting relevant constructs in entrepreneurship research, which will be subsequently considered for the SET and team behaviour. These are drawn upon and applied to the SET context where appropriate (see Section 3.8).

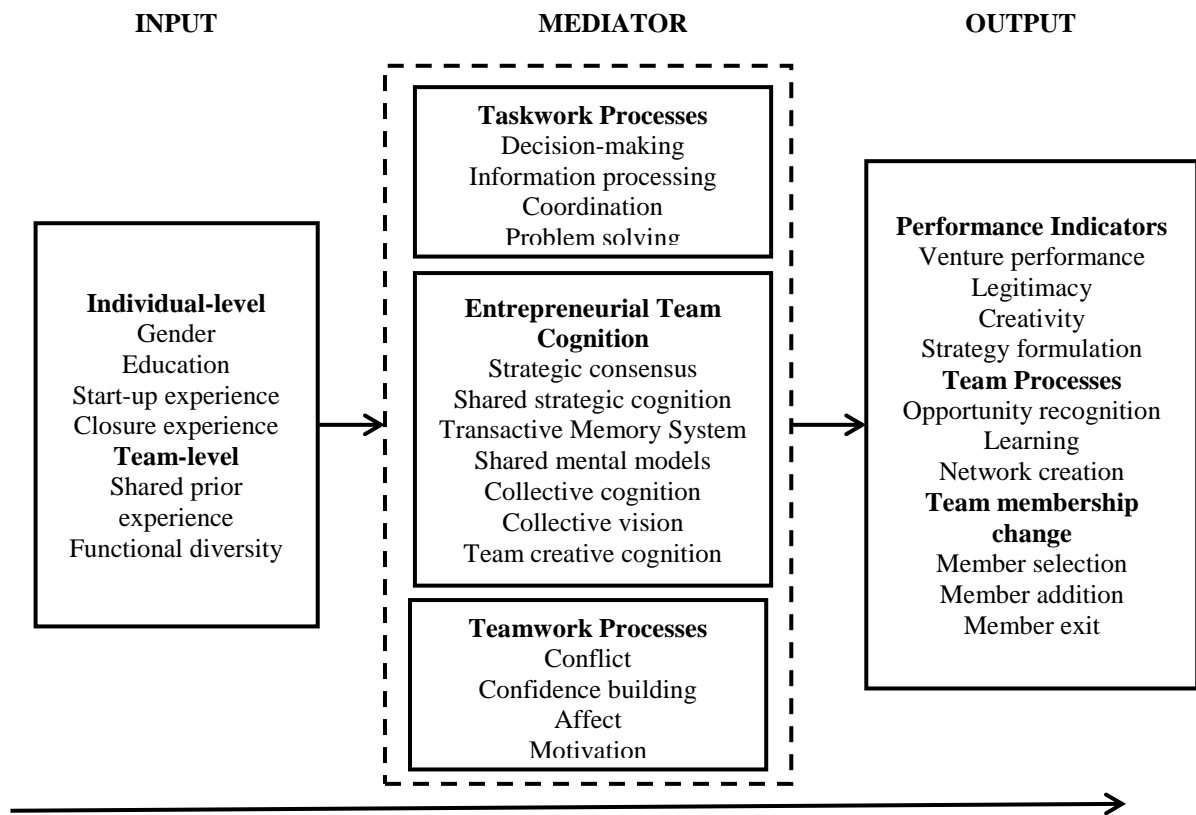
**Figure 3-3: Proposed Research Directions for the IMO in Entrepreneurship Studies**



*(Klotz et al., 2014, p. 230)*

Klotz *et al.* (2014) used the IMO framework to centralise team entrepreneurship research, summarising existing findings, and proposing key research directions (Figure 3.3). The figure includes outcome variables related to new venture success (sales growth, profitability, employee count, innovativeness, satisfaction, and well-being). It places a large significance on the emergent and shared collective states that may occur within an entrepreneurial team, such as team cohesion and confidence. Notably, the framework highlights innovativeness and prior experience, and divides the team processes according to the classification of transitional, interpersonal and action, as prescribed by Marks *et al.* (2001). De Mol, Khapova, de Jong and Elfring (2015) reviewed past studies of team cognition, and also mapped their proposals for entrepreneurial team cognition onto an IMO framework (Figure 3.4) describing entrepreneurial team cognition as an emergent state, embedded in team processes and involving sharing content-related knowledge (De Mol *et al.*, 2015).

**Figure 3-4: IMO Framework in Entrepreneurship**



(De Mol *et al.*, 2015, p.239)

The framework divides the team processes into taskwork and teamwork rather than transitional, interpersonal and action processes. The authors acknowledge differing operationalisations of team input variables, including both a collective/aggregated variable (shared prior experience), and a diversity variable (functional diversity).

**Table 3-7: Team-level Factors in Entrepreneurship Theory**

	<b>Variable</b>	<b>Description</b>
Team level inputs	Shared prior experience	The effect that common prior company (or otherwise) affiliations may have on a team dynamic (Beckman, 2006)
	Functional diversity	Team-members who have differing tasks or areas of expertise in fulfilling their assigned role
Taskwork Processes	Decision making	The thought process of selecting a logical choice from a selection of options based on the information available
	Information processing	Information-processing activity pertains to gathering, interpreting, and synthesizing information cues
	Co-ordination	Ensures a team functions as a unified whole, planning and communication are the basic mechanisms of coordination
	Problem-solving	Involves discovering and analysing a potential issue and then coming up with the best possible action to remedy it
Entrepreneurial Team Cognition	Strategic consensus	The extent to which individual mental models of strategy overlap
	Shared strategic cognition	The extent to which strategic mental models held in the hearts and minds of the new venture team members overlap or agree
	Transactive memory systems	The sum of the individual knowledge and shared understanding of the location of expertise among team members, i.e. 'who knows what'
	Shared mental models	An organized understanding or mental representation of knowledge that is shared by team members (Mathieu <i>et al.</i> , 2000)
	Collective cognition	Emerges when two type of perspectives, differentiation and integration of strategic perspectives, merge within the team
	Collective memory	Emerges through iterative feedback processes, the collective mind-set of a founding team becomes embedded in organizational culture and founders' values and beliefs become imprinted onto the venture's culture and norms of behaviour
	Collective vision	The extent a team has a shared clarity of, and commitment to their objectives (West and Anderson, 1996)
	Team creative cognition	The shared repertoire of cognitive processes (e.g. ideas related to solving problems, new practices, new procedures or ideas about new products/ services) among entrepreneurial team members that provide a framework for approaching problems creatively

(De Mol *et al.*, 2015, p. 242/245)

De Mol *et al.* (2015) also suggest that the teamwork processes (conflict, confidence building, affect and motivation) are related to the interpersonal processes discussed by Marks *et al.* (2001). In designing the framework, the authors sub-divide the inputs, mediator and output categories for enhanced clarity, proposing 32 variables in total. A brief description of a number of the mediating variables is presented in Table 3.7 above

### **3.7 Team Innovation and Creativity**

Most models and frameworks depicting the innovative and creative process are linear and follow a process consisting of the development of ideas at the initial periods, and the selection, development and implementation of these ideas thereafter leading to an output (Kramer, 2013). Both innovation and creativity have been studied on the individual, team, and organisational level (Woodman *et al.*, 1993; Anderson *et al.*, 2014). In the last point of investigation before addressing a conceptual framework of the SET, an examination of the studies of creativity and innovation is sought. The IPO/IMO framework has been used to study team level innovation on a number of occasion (shown in Table 3.8). In an analysis of 91 studies of innovation at the team level, Hülshager *et al.* (2009) used the IPO framework to structure their discussion of the proposed variables affecting team-level innovation. A number of factors highlighted to affect team innovation noted by Hülshager *et al.* (2009), West and Anderson (1996) and Mathisen *et al.* (2008) are shown in Table 3.9.

**Table 3-8: Selected Innovation studies incorporating the IPO/IMO model**

<i>Source</i>	<i>Type</i>	<i>Model</i>	<i>Team type</i>	<i>Purpose/Outcome</i>
West and Anderson (1996)	Quantitative	IPO	Top management teams	The number of innovators per team positively related to innovation radicalness; group processes found to be the best predictor of innovation
Currall, Forrester, Dawson, and West (2001)	Quantitative	IPO	Cross-industry teams	Teams with a high innovation requirement reported higher levels of participation and support for innovation; team size related to poorer team processes; pressure to innovate considered a factor
Mathisen, Martinsen and Einarsen (2008)	Quantitative	IPO	Organisational teams	Found a relationship between creative personality composition and team innovativeness, mediated by team climate
Hülshager <i>et al.</i> (2009)	Meta-analysis	IPO/ IMO	Multiple	Investigated team-level predictors of innovation
McEwan and Beauchamp (2014)	Conceptual	IMO	Sporting teams	Highlighted team innovation as an important factor within team effectiveness studies
Wang and Yang (2015)	Quantitative	IMO	IT development teams	Collective team cognition and problem solving mediated the relationship between task interdependence and team creativity
Weiss and Hoegl (2016)	Conceptual	IMO	Teams working on innovative tasks	Considered the complexity inherent in the effect of team size (relative and absolute) on innovative output, in accordance with task type
Maynard <i>et al.</i> (2015)	Meta-analyses	IMO	Multiple (conceptual)	Noted creativity an important factor in model of team adaptation
Dlugoborskyte and Petraite (2016)	Quantitative	IPO/ IMO	Student teams	Found increased innovative output according to high personality diversity
Açıköz, and Günsel (2016)	Quantitative	IPO	Software development teams	Found individual creativity improved the quality of team decision processes; team decision processes are positively associated with team climate; team decision processes partially mediate between individual creativity and team climate



**Table 3-9: Predictors of Team-level Innovation (Description)**

	<b>Variable</b>	<b>Description</b>
Inputs	<i>Job relevant diversity</i>	When a team differs in terms of factors directly related to the project or process at hand, for example if the team differs in terms of their level of education, knowledge, experience or skillset
	<i>Background diversity</i>	When a team differs in terms of demographic factors not directly related to the task at hand but which may alter their world view or approach, such as age, gender, religion or nationality
	<i>Creative personality composition</i>	Relating to the blend of creative personality types and the manner by which each member approaches thinking, problem solving, and social preferences
	<i>Task interdependence</i>	The level of dependence which is required between team members in order to accomplish allocated tasks
	<i>Goal interdependence</i>	The level of dependence which is required between team members in order to reach their goals i.e. how much reliance exists within a team to reach their outcome
	<i>Team size</i>	Refers to the number of members per team
	<i>Team longevity</i>	Refers to the length of time the team has been in existence and working together
Processes	<i>Participative safety</i>	Refers to the extent that team members feel they can participate in decision making without fear of rebuttal (Kivimaki and Elovainio, 1999)
	<i>Support for Innovation</i>	A perception of an atmosphere supportive to innovation in how ideas and risk are dealt with, and the use of creative approaches and novel solutions to problems at work (Gumusluoglu and Ilsev, 2009)
	<i>Task orientation</i>	The extent to which a team works to a high standard, and in doing so continuously reflects on their objectives and processes to maintain efficiency (Hülshager <i>et al.</i> , 2009)
	<i>Cohesion</i>	A shared sense of the commitment a team feels in maintaining their team which relates to interpersonal connection, task commitment, and a sense of shared pride (Hülshager <i>et al.</i> , 2009)
	<i>Communication</i>	Conveying information and meaning between members of a team is considered to be a fundamental process in determining the resultant innovation
	<i>Task and relationship conflict</i>	The extent to which members disagree on aspects pertaining to the completion of tasks related to the goal, and also socio-emotional conflicts which occur between members
	<i>Team Climate Inventory</i>	Pertains to the environment within and around the team in terms of innovative assistance and conduciveness to healthy and productive innovative action

## 3.8 Proposed Framework for the Student Team in Entrepreneurship

### Education

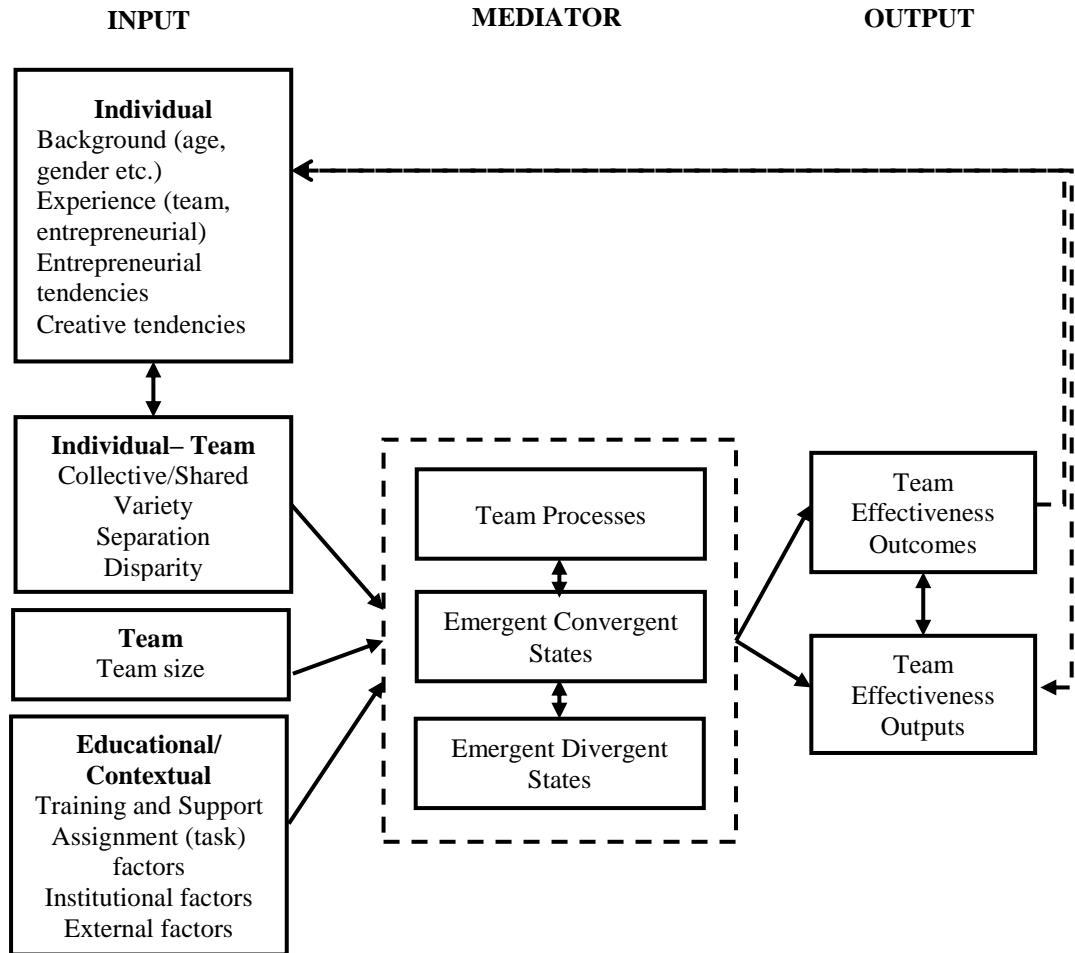
Based on the theoretical works relating to the study of the IMO in both entrepreneurship and innovation, Figure 3.5 is a proposed version for the student entrepreneurship team in entrepreneurship education (which will be called the IMO-SET). It is a multilevel framework noting the impact that individual level factors have on team constructs and in turn, team processes and outputs. It includes a feedback loop to demonstrate the effect that the teamwork experience may have in altering subsequent student perceptions and entrepreneurial tendencies. The elements of the proposed SET framework are discussed below. It is intended that this framework will be studied within the thesis empirical team studies, and findings will assist in confirming a final framework in the concluding chapter.

**Individual level factors:** These relate to demographic factors (such as age, gender, and education), relevant experience, and perceptions of competencies in entrepreneurship and creativity. They are noted to influence multiple outcomes in EE, and many were included in the entrepreneurial team suggestions by De Mol *et al.* (2015).

- **Operationalisation of individual level to team level factors:** Based on the operationalisation of factors to the team level (aggregated/mean, separation, variety etc.), the hypotheses and proposed relationships are developed. Team level operationalisations pertain to *collective or shared* structures that reflect of convergence, homogeneity or consensus in their composition (Kozlowski and Klein, 2000. Operationalisations reflecting team diversity or heterogeneity conform to typologies of *disparity, separation and variety* [Harrison and Klein (2007), as is outlined during Chapter 4]. The choice of which operationalisation to use will affect the subsequent relationships in any model tested. For example, certain facets of demographic diversity in a team are thought to disrupt group processes and negatively affect attitudes and

outcomes (Pearsall *et al.*, 2008). This consideration of the team-level construction or operationalisation of factors adds breadth for research inquiry.

**Figure 3-5: Initial Proposed Conceptual SET Framework**



- **Team-level factors:** In line with previous iterations of the IMO framework and related studies, it is considered that team-related input factors such as size and longevity will be predictors of SET outcomes.
- **Contextual and Educational factors:** It is considered that the university or instructor will influence team functioning through support and training offered, and the task itself (Fayolle *et al.*, 2006; Ruskovaara and Pihkala, 2015). Thus, factors such as the EE type, curriculum or pedagogical approaches and institutional setting are worthy of inquiry. In addition, external factors such as the national economic or social climate may have an impact on the

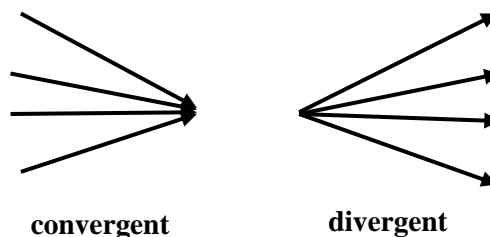
manner in which teams in EE form or interact. Studying the contextual impact of the external factors affecting EE is considered a worthy area of future research (Walter and Block, 2016; Henry and Lewis, 2018). For example, Bae *et al.* (2014) found a number of cultural factors (gender egalitarianism, in-group collectivism and uncertainty avoidance) moderated the relationship between EE and EI.

-

**Team Mediators:** Team processes and emergent states have been noted as key dimensions in recent frameworks, and many are linked to entrepreneurial and innovative studies (Klotz *et al.*, 2014; De Mol *et al.*, 2015). Shared emergent states (e.g. cohesion, collective efficacy) and constructs pertaining to diversity or division in teams (e.g. conflict) are labelled as emergent convergent and divergent states respectively.

- ***Emergent Convergent and Divergent States:*** It is proposed that specific team outcomes and relationships are noted based on the manner by which constructs are operationalised, and by classifying team constructs as convergent and divergent, a clearer picture is formed. The terms divergent and convergent are usually discussed in the science of optics to describe rays of light (See Figure 3.6). When the rays move towards a common point, they are said to converge, but when proceeding away from a fixed or focal point, they diverge. This is considered an apt way of describing team members and their relationship to an emerging state, and will be explored for its usefulness in the empirical studies to follow.

**Figure 3-6: Representation of Divergent and Convergent Rays**



**Team Output:** The dependent factors in the model may fall under categories of output (e.g. grades, innovativeness of the final artefact) or outcomes (e.g. team satisfaction, team member exit). Lastly,

in line with the temporal aspect of recommended IMO models (Mathieu *et al.*, 2008) and their inherent multilevel nature (Kozlowski and Ilgen, 2006), it is considered that the result (or resultant perception) of team effectiveness will have an effect on the individual student also.

### **3.9 Chapter Summary**

This chapter provided a review of the extant literature of teamwork in research fields considered relevant to the student team in EE. A justification for the need for increased critical research inquiry pertaining to the student team in EE was provided, as well as a proposed definition for the student team in entrepreneurship education (referred to as the SET).

Based on the review of extant teamwork literature and theory, the IMO framework was considered a robust and suitable option for a proposed conceptual framework for the SET. The nature of team effectiveness, team-level operationalisations (homogeneity, heterogeneity, diversity), and teamwork studies in entrepreneurship research were examined, based on prior empirical and theoretical studies. Following this, two teamwork themes were explored, deemed relevant to the SET: performance and innovation. Lastly, a proposed structure for a conceptual framework for the SET (referred to as the IMO-SET) was presented and discussed. In Chapters 7 and 8, empirical studies related to this proposed framework will be conducted, focusing on team performing behaviours and resultant performance, and secondly team innovative behaviour and resultant innovative output.

In the next chapter (Chapter 4) a discussion of the research methodology employed in the thesis is provided. The research philosophy and design framing the thesis and empirical work is explored, before detail relating to the sample group, data collection and data analyses is presented.

## CHAPTER 4: **Research Methodology**

## 4.1 Introduction

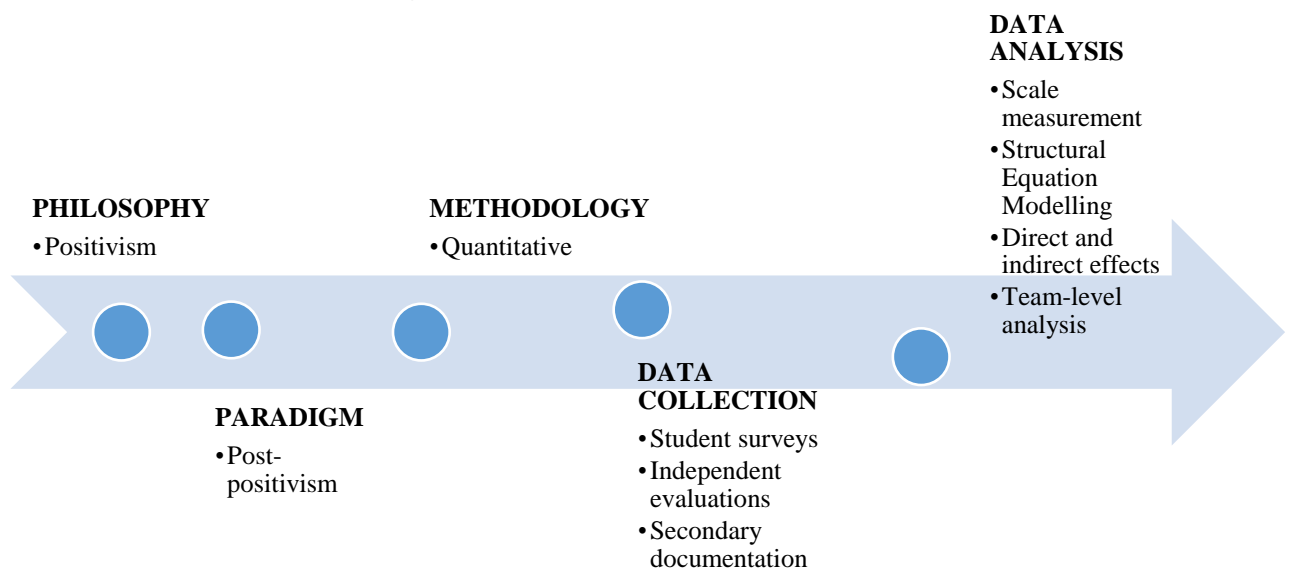
There are two main research questions to be explored in this thesis:

*RQ1: What factors influence the entrepreneurial tendencies of individual students participating in entrepreneurship education?*

*RQ2: What factors influence the performance and innovation of student entrepreneurship teams participating in entrepreneurship education?*

In examining the effect the student has on their own EE experience, and on their respective team, a number of methodological aspects must be considered. This chapter provides an overview of the philosophical underpinning of the research methodology for the series of studies to follow and the research stance taken for the thesis (as shown in Figure 4.1). It discusses the justification for following a positivist approach, and describes the contextual and methodological aspects considered in conducting the research. From this, the research design framing the empirical studies is discussed, providing details about the sample group and data collection. The chapter outlines the statistical approaches and techniques underpinning the four studies of the proceeding chapters. This provides a comprehensive account of the tests and processes to be undertaken, to avoid repetition of methodological detail in subsequent chapters.

**Figure 4-1: Research Stance Taken**



## **4.2 Research Stance Applied**

It is vital that researchers are aware of their own philosophical assumptions, which can influence how they may perceive information, adopt methodological approaches, and/or deduce and transmit findings (Saunders, Lewis, and Thornhill, 2009). Karatas-Ozkan *et al.* (2014, p. 590) note choices of research philosophy and methodology are crucial in “*capturing the complexities of the entrepreneurial process, contexts, and actors through robust research*”.

### **4.2.1 Research Philosophy**

To be cognisant of influencing factors, and to understand one’s own stance about research, it is necessary to make clarifications regarding the research philosophy and paradigm.

It is considered that the positivist philosophical position would be most suitable for the empirical research of this thesis. Positivism is thought to explain acts in the social world by searching for regularities and causal relationships between its constituent elements (Burrell and Morgan, 1979). It is characterised by a belief in absolute truths; assuming implicitly or explicitly that reality can be objectively measured, and is free of value-bias (Quinn-Patton, 2002; Sobh and Perry, 2006). A positivist believes himself separate to the world he studies, and through measured and careful study, empiricism, and repeated examination, the ‘truth’ will be attained (Krauss, 2005).

In the first instance, this thesis aims to investigate the factors which influence the entrepreneurial tendencies of both students and student teams in EE. Accordingly, the author attempts to investigate the existing entrepreneurial tendencies or perceptions of the student, and note the manner in which these can be changed or altered. Inherent in this aim, is the need to quantify or benchmark tendencies to note changes. In positivist entrepreneurship research, the goal is to understand entrepreneurship and the entrepreneur, based on consensual objectivity, by uncovering general conditions and patterns from empirical data (Van Burg and Romme, 2014). Thus, it is considered that the positivist approach lends itself well to the needs of the study.



A researchers view and stance is affected by the discourse and status quo of the academic field they are in. Studying the entrepreneurial tendencies of students, quantitative based studies in the field of entrepreneurship education which all reflect a positivist stance. In addition, calls for rigor and more stringent methodologies relating to sample size, measurement, benchmarks, timing etc. reflect a positivist approach (e.g. Lorz *et al.*, 2013). In addition, a considerable amount of work conducted on the entrepreneurial team tends towards realism and positivist in attempting to establish that enduring traits at the intra-personal level (or impersonal/compositional) may be found as static truths about team outcomes (Campbell, 2014).

Lastly, Forsström-Tuominen (2015) suggest positivism is applicable to entrepreneurship research when there is extant knowledge gained from other fields, which could be applied to entrepreneurship, to build and quantitatively test a conceptual model. As this thesis purloins from the fields of entrepreneurship, education, innovation, and small group research, the positivist perspective is chosen as the main philosophical underpinning.

#### **4.2.2 Research Paradigm**

Due to their common use and application in entrepreneurship and educational research, this thesis considers the research paradigms of positivism, post-positivism, constructivism, and pragmatism. Table 4.1 outlines key features of these research paradigms and their relationship to entrepreneurship research. Guba and Lincoln (1994, p.107) define a paradigm as a

*“...basic set of basic beliefs that guide action. Paradigms represent a worldview that defines the nature of the world, the individual’s place in it, and the range of possible relationships to that world and its parts”*

A research paradigm clarifies aspects of the research inquiry in terms of the research epistemology, ontology and axiology. Based on the stance taken on these dimensions, research paradigms emerge which manifest as shared beliefs within research communities, helping to guide researcher action, choice and approach when studying any phenomenon.

- **epistemology** focuses on what is known, how we come to know and what constitutes accepted knowledge in the research field
- **ontology** is related to the assumptions researchers have about the way the world operates, and the commitment held to particular views
- **axiology** is concerned with the role that a researchers own values may affect or subvert the research process (Saunders *et al.*, 2009).

Constructivism or social constructivism assumes that the world is shaped or ‘constructed’ by individuals, social settings and contextual influences; where reality emerges through interaction of these agents. Constructivists believe that individuals seek understanding of the world, and develop subjective meanings of their experiences within it. It is understood that these constructed realities are salient enough to influence an individual’s behaviour, though there is no clear way of comparing the multiple constructed realities of different people (Sobh and Perry, 2006). Information obtained by researchers is dependent on the participant view of the situation, and their interpretation of the context, thus this approach is usually aligned with qualitative research methods; gaining insight through engagement and interaction (Creswell, 2014). Entrepreneurial research adopts constructivism to portray, understand, and critically reflect on the values, experience, and imagination of entrepreneurs, and the environments they operate in (Van Burg and Romme, 2014).

Pragmatism follows the premise that the meaning of any event is encapsulated in the moment itself, and centres on the ramifications of an action or experience within a social situation (Denzin, 2012). The pragmatic approach to research focuses on beliefs more directly connected to actions, and on the fundamental research questions; the ‘what and why’ which influence research behaviours and choices (Morgan, 2014). Pragmatic researchers use their own volition to choose research methods that serve their needs and purpose (Saunders *et al.*, 2009; Creswell, 2014). Pragmatism is a practical, applied research philosophy that uses logical argument and process to move iteratively from deductive to inductive reasoning. However, it has met some scepticism due to its ‘action over philosophy’

approach, causing some to question its legitimacy (Teddlie and Tashakkori, 2009). Within this perspective, the research design can be iterative and can examine problems, devise solutions, and then test these in a continual manner similar to design thinking approaches (Amiel and Reeves, 2008).

It is considered that this research thesis draws mainly from the research paradigms of positivism and post-positivism. Stemming from the discussion of positivism as a research philosophy, the positivist paradigm orients around objectivity, measured and rigorous study, empiricism, and repeated examination. The ontological position is one of realism and objectivism – objects exist independent of the knower, and the researcher and the researched are independent entities (Scotland, 2012). A positivist believes himself separate to the world he studies, and through measured and careful study, empiricism, and repeated examination, the ‘truth’ will be attained (Krauss, 2005). The epistemological perspective of positivism is described as dualist and objectivist, assuming the existence of an objective reality, independent of the knower (Holton, 1993). Studies adopting this approach tend to describe empirical objects as causal relationships among variables and will apply inferential statistics to quantitative data to test hypotheses. Hypotheses are stated in prepositional form and subjected to empirical testing for verification (Guba and Lincoln, 1994).

While often used, positivism’s functionality in the social sciences has been queried, with doubts expressed about its usefulness in dealing with self-reflective, complex human beings (Sobh and Perry, 2006). Inconsistent confirmatory replication of findings hinders the premise that researchers are ‘value-free’ (Sobh and Perry, 2006). In post-positivism, the idea of falsification of data or the invent of more refined methodological tools considers that science may not be proven true, thus every result is then tentative. In this, hypotheses are not proven but rejected. Creswell (2013) notes that one cannot have absolute claims of knowledge when dealing with or researching the actions and behaviours of people.

**Table 4-1: Research Paradigms of Relevance in Thesis**

	<b>Positivism</b>	<b>Post-positivism</b>	<b>Constructivism</b>	<b>Pragmatism</b>
<b>Ontology:</b> Researcher view of the nature of reality	External, objective, independent of social actors	External, assumed to exist but imperfectly apprehensible	Socially constructed, subjective, may change, multiple	External, multiple, chosen to best answer of research question
<b>Epistemology:</b> Researcher view of what constitutes acceptable knowledge	Only observable phenomena provide credible data/facts. Focus on causality, reducing phenomena to simplest elements	Objectivity remains as ‘regulatory ideal’. Replicated findings probably true but subject to falsification	Subjective meanings and social phenomena. Focus upon details of the situation, a reality behind these details, subjective meanings	Observable phenomena and subjective meanings can provide acceptable knowledge. Focus on practical applied research, integrating different perspectives to interpret data
<b>Axiology:</b> Researcher view of the role of values	Research is undertaken in a value-free way, the researcher is independent of data, objective	Research should be undertaken in a value-free way yet true objectivity may not be possible	Research is value bound, part of what is being researched, cannot be separated and is subjective	Values play a large role in interpreting results, the researcher adopting both objective and subjective points of view
<b>Common data collection</b>	Highly structured, large samples, measurement, usually quantitative	Highly structured, large samples, measurement, usually quantitative	In-depth investigations, qualitative interview, focus group, case study, narratives	Mixed or multiple method designs, quantitative and qualitative, expert interviewing, usability testing
<b>Common data analysis</b>	Quantitative – sampling, measurement and scaling, regression analyses, SEM	Controlled experiment, case study, survey	Qualitative thematic analysis phenomenological research, discourse analysis.	Mixed – design-based interpretation, lead user testing, Delphi-method, data mining
<b>Related to Entrepreneurship research</b>	Entrepreneurial phenomena as empirical objects with defined observable descriptive properties. Describe empirical objects as causal relationships among variables; collect quantitative data and use inferential statistics to test hypotheses. Conclusions stay within boundaries of the analysis.	Describe empirical objects as causal relationships among variables; collect quantitative data and use inferential statistics to test hypotheses.	Entrepreneurial action and sense-making (in their broader contexts) as creative acts.  Interpret and assess particular entrepreneurship narratives in their specific contexts: Do they involve radical shifts in thinking, legitimacy problems, fair outcomes, and so forth? Conclusions may go beyond the boundaries of the study.	Entrepreneurial processes and outcomes as artefacts with descriptive and interpretive (possibly ill-defined) properties. Develop principles (“real helps” for entrepreneurs) by observing experiences entrepreneurs in action, reading their diaries etc.; then extract and codify principles to develop pragmatic tools and mechanisms that can possibly be refined in the laboratory or classroom.

*Adapted from Saunders, Lewis and Thornhill (2009; 2012); Van Burg and Romme (2014); Biedenbach (2015)*

There is precedence to consider applying a multi-paradigm approach to a multi-study thesis, and selecting a dominant philosophical research approach for each study (Venkatesh, Brown and Bala, 2013; Forsström-Tuominen, 2015). However, while the research questions posed are multi-level, and require considerable investigation, they collectively focus on determining credible knowledge from observable facts, and developing conclusions through the discovery of causal relationships between variables. While many aspects of positivism are agreed with, it is noted that a key research aim of this thesis is to study and explore entrepreneurial tendencies and student perceptions. It is considered that post-positivism is more suited to accept human behaviour relating to attitude and perception in a management or social science research context (Johnson and Duberley, 2000)

Secondly, the thesis also aims to study factors which affect the outcomes of performance and innovation in student teams. Admittedly, in an exploratory area such as the SET, a constructivist philosophy may acknowledge the benefit of insight to gained through member engagement and interaction, or the pragmatic approach could aid the development of useful and beneficial information sourced by observation analyses and other means (Van Praag and Romme, 2104). Nevertheless, as the performance and innovative output outcomes can be quite objectively attained and studied, and performance (e.g. grades) can be easily understood by the beneficiaries of the study (teachers, academic researchers), the post-positivist stance may allow for the thesis findings to be understood and used more readily.

#### **4.2.3 Research Approach: Quantitative Surveys**

Once the paradigm is considered, the researcher must choose a methodological approach, evaluating between quantitative, qualitative or a mixed methods approach. Qualitative research analysis allows for a deep understanding of phenomenon studied, through the views and experiences of participants (Creswell, 2014). In EE research, interviews are the most common qualitative form, where entrepreneurs and/or EE students share their experiences (Blenker *et al.*, 2014). Qualitative studies

are challenged by criticisms of subjectivity, bias and the inherent challenges of replication, validation, and generalisability (Bryman and Bell, 2007).

Quantitative studies allow researchers to study differences in the perceptions of individuals, develop repeatable measures of a phenomenon, and gain insight about relationships of interest (Bryman and Bell, 2007). This method provides a level of detachment and natural objective distance from the study, aiding reliability and replicability (Blenker *et al.*, 2014). Surveys are the most common method of quantitative data collection in EE research (Blenker *et al.*, 2014; Van Burg and Romme, 2014; Liñán and Fayolle, 2015). They are considered a relatively quick, inexpensive, efficient, and accurate means of collecting information about a population (Saunders *et al.*, 2009). However, quantitative studies can be affected by errors in sampling, coverage, measurement and non-responses (Dillman and Smyth, 2007).

In EE research, quantitative studies are sometimes criticised for their simplicity, relying only on descriptive analyses (Blenker *et al.*, 2014). Blenker *et al.* (2014) notes it is predominantly the instructor who conducts the quantitative EE analysis, which can aid study specificity and comprehensiveness, but may also add bias. A quantitative approach is selected for the thesis to gain insight about individual and teams within EE, using a representative population of corresponding students. Specific hypothesis testing and causal relationships are sought, aided by a robust quantitative research design.

### **4.3 Research Design and Strategy**

A research design acts as a framework or blueprint for conducting the research study, specifying the planned methods and procedures for collecting and analysing information (Malhotra, 1999; Burns and Bush, 2010). Research design selection depends on the purpose of the research (e.g. gain early insight or validate a hypothesis); the amount already known about the topic; and the current existing research in the field (Burns and Bush, 2010). Lorz *et al.*, (2013) urges EE scholars to pay more attention to the research design in terms of the theoretical foundations, the time of measurement, validity and reliability procedures, structured sampling procedures, and adequate sample size.

Pre/post measurement to avoid self-selection bias and extraneous factors is also recommended (Lorz *et al.*, 2013).

This thesis follows a descriptive research strategy to study proposed hypotheses, focusing on multiple antecedent and outcome factors relating to students and student teams in EE. Descriptive research designs, which test EE as the independent variable, are common (Blenker *et al.*, 2014). Specifically, the hypothetico-deductive process method is used, wherein a theory or model is proposed, related hypotheses are developed, and then tested through appropriate research techniques (Colquitt and Zapata-Phelan, 2007). The first focus of this process involves establishing the validity of the theory's main propositions. Next, the mediating and moderating relationships of an existing relationship are checked and tested. Finally, further tests are conducted by which explore new antecedents and outcome variables (Colquitt and Zapata-Phelan, 2007).

Figure 4.2 presents an overview of the specific studies of the thesis. It notes the key variables included in each study, namely the proposed dependent or outcome variable (*DV*), the proposed mediating variables denoted (*MV*), and other hypothesised predictors. Major analyses procedures and outcomes expected from each study are included. The findings from each study inform and develop the framework for the SET presented in Chapter 9.

## **4.4 Research Process and Data Collection**

### **4.4.1 Sample Group**

The principle sample group for the study belongs to a compulsory yearlong course (5 ECTS module) known as Digital Innovation Creativity and Enterprise (DICE) taken in the first year of business, international business, and enterprise computing degree programmes in Dublin City University (DCU). The course falls between enterprise education and entrepreneurship education in its classification, as while it covers a range of topics and competency development areas, it brings together elements of innovative thinking, entrepreneurial knowledge, and enterprise experiences.

**Figure 4-2: Research Design for Thesis**

Study One	Study Two	Study Three	Study Four
<p><b>Individual level</b></p> <p><i>Key Variables</i></p> <ul style="list-style-type: none"> <li>- Entrepreneurial Self Efficacy</li> <li>- Entrepreneurial Intentionality</li> <li>- Entrepreneurial Passion</li> <li>- Entrepreneurial Traits</li> </ul> <p><i>Analysis:</i></p> <ul style="list-style-type: none"> <li>- Validity</li> <li>- Reliability</li> <li>- Factor Analysis</li> </ul> <p><i>Result:</i> Validation of entrepreneurship instruments in EE context</p>	<p><b>Individual level</b></p> <p><i>Key Variables:</i></p> <ul style="list-style-type: none"> <li>- Entrepreneurial Intentions (<b>DV</b>)</li> <li>- Interest in Entrepreneurship Education (<b>DV</b>)</li> <li>- Ent. Self-Efficacy (<b>MV</b>)</li> <li>- Individual Creativity</li> <li>- Creativity training</li> <li>- Entrepreneurial Experience</li> <li>- Gender</li> </ul> <p><i>Analysis:</i></p> <ul style="list-style-type: none"> <li>- Comparison of groups</li> <li>- Testing of causal relationships</li> <li>- Indirect relationships</li> </ul> <p><i>Result:</i> Accepted/Rejected Hypotheses</p>	<p><b>Team level</b></p> <p><i>Key Variables:</i></p> <ul style="list-style-type: none"> <li>- Performance (<b>DV</b>)</li> <li>- Social Loafing (<b>DV</b>)</li> <li>- Team Processes (<b>MV</b>)</li> <li>- Team Conscientiousness (<b>MV</b>)</li> <li>- Entrepreneurial Experience</li> <li>- Team separation of ESE (ESE-SEP)</li> <li>- Teamwork training</li> <li>- Gender</li> <li>- Team size</li> </ul> <p><i>Analysis:</i></p> <ul style="list-style-type: none"> <li>- Team level aggregation</li> <li>- Comparison of groups</li> <li>- Testing of causal relationships</li> <li>- Indirect relationships</li> </ul> <p><i>Result:</i> Accepted/Rejected Hypotheses</p>	<p><b>Team level</b></p> <p><i>Key Variables:</i></p> <ul style="list-style-type: none"> <li>- Innovative Output (<b>DV</b>)</li> <li>- Team Climate Inventory (<b>MV</b>)</li> <li>- Entrepreneurial Experience</li> <li>- Team Passion Intensity Separation (TPIS)</li> <li>- University Support for Innovation</li> <li>- Individual Creativity</li> <li>- Team Norming processes</li> <li>- Team size</li> </ul> <p><i>Analysis:</i></p> <ul style="list-style-type: none"> <li>- Team level aggregation</li> <li>- Testing of causal relationships</li> <li>- Indirect relationships</li> </ul> <p><i>Result:</i> Accepted/Rejected Hypotheses</p>

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**Proposed model of the Student Entrepreneurship Team (SET) in EE**



This mirrors the format discussed by Nabi *et al.* (2016) in Chapter 2 as it is experiential, and focused on developing skills and knowledge pertinent for both wider business and entrepreneurship alike. A description of the DICE module and its delivery is available in Appendix B. It is taught to over 500 students annually, and includes a number of pedagogical approaches including teamwork, asynchronous and synchronous e-learning, project work, and conferences with industry speakers.

**Table 4-2: Elements of the DICE Module**

<i>Semester 1</i>	<i>Semester 2</i>
Lectures	
Project Management Training (Prince2)	
Conferences	
Online Reflective Blog	
Mobile App Development	Mobile App Conceptual Poster

#### **4.4.2 Questionnaire Design and Data Collection**

Marks *et al.* (2001) recommend the use of multiple forms of assessment to reflect true indications of teamwork, and survey data supplemented with more creative forms of research. Blenker *et al.* (2014) recommend research panels to evaluate performance metrics, and multiple data sources to triangulate research consensus. However in education, the student is dependent on the researcher for subsequent grades, the research investigation may be biased (Blenker *et al.*, 2014). Thus, while survey data is the main data source used, additional sources including performance (grade) scores, and a measure of project innovative output constructed by an external panel is also incorporated.

The majority of the data was collected from the DICE sample group using online surveys via SurveyMonkey (See Table 4.3). The surveys were automated to indicate all study questions were compulsory (students could not move on until answered adequately). Prior to release, all surveys were tested for face validity and comprehensiveness by staff and either a number of postgraduate students (who tested it as part of a quantitative research class) or using a panel of teaching assistants (former students). On the basis of feedback comments and survey testing, certain minor adjustments were made relating to sentence phrasing or question/measure placement within the survey.

**Table 4-3: Summary of Data Collection**

Time Period	2012/2013	2013/2014	2014/15
Used in Studies:	1	3	1/2/4
<b>INDIVIDUAL LEVEL (TIME ONE)</b>			
<i>Released time one survey</i>	November 2012	May 2014	November 2014
<i>Number of students in class group</i>	365 (DICE) 145 (NGM) = 510	343	356 (DICE); 50 (Accounting); 135 (NGM) = 541
<i>Number who completed survey</i>	355	236	413
<i>Final after screening (useable)</i>	342 (67.06% of DICE)	225 (65.60% of DICE)	409 (75.60% of total)
<b>INDIVIDUAL LEVEL (TIME TWO)</b>			
<i>Released time two survey</i>	April – May 2013	N/A	April – May 2015
<i>Number who completed survey</i>	306 (85% of DICE)		257 DICE (72.2% of DICE)
<i>Final respondent rows in dataset (after screening)</i>	456 (time one & time two)		409 in T1 (DICE, NGM, Accounting).
<i>Matched pairs</i>	205 DICE matched (56.16% of DICE)		177 DICE matched (49.7% of DICE); 317 DICE unmatched (89% of DICE)
<b>TEAM LEVEL</b>			
<i>Number of DICE teams in total</i>	N/A	88 (21 teams of three, 67 teams of four)	68 (7 x four member teams, 52 x five member and 9 x six member teams)
<i>Number of teams after screening (useable)</i>		79 (89.7% of DICE teams)	68 (100% of DICE teams)
<i>Member responses per team</i>		43 teams with complete responses, 23 teams missing a single team member response, and 12 teams missing two	45 teams had full team-member survey completion, 21 teams had one missing member response, and two teams were missing two member responses.
DICE = Digital Innovation Creativity and Enterprise (undergraduate 1 <sup>st</sup> year cohort); NGM = Next Generation Management (postgraduate 1 <sup>st</sup> year cohort); T1= Time one survey collection; T2 = Time two survey collection.			

In addition, at the release of the survey online it was carefully monitored on the initial day of release to detect any patterns of answering. For example, on one occasion, it was noted that an item was not a mandatory/compulsory question and was skipped, thus this was corrected. Specific amendments and detail relating to questionnaire modifications are noted in each independent study.

Ethical approval was received through the DCU Research Ethics Committee (see Appendix C), before distribution online via SurveyMonkey by course instructors. The students were contacted by email, and the DICE cohort was given participation marks for survey completion. The students were assured their answers had no bearing on progression in the module. In some cases, the questionnaires were redistributed after approximately five months to gather retest data. As shown in Table 4.3, the data collected between November 2014 and May 2015 was used to test EP for Study 1, Study 2, and Study 4. As this involved three cohorts and was taken at two time intervals (pre/post), it is not considered that this weakened the legitimacy of the studies. In total, 1004 students reached survey completion during the thesis.

#### **4.4.3 Quantitative Data Preparation**

A number of statistical analyses are conducted during the thesis that help to understand the data and generate conclusive findings. Aspects pertaining to data screening and initial analysis are discussed below.

##### ***Data Screening and Missing Data***

Missing data can affect the results of quantitative analysis as it may imply low external validity (only engaged students filling the survey), or provide low statistical power (Newman, 2009). It is dealt with in a series of ways according to the level of absent data and the reason for its absence (Newman, 2009). In making determinations about missing data, Hair, Black, Babin, and Anderson (2010, p.42) recommend a four-step process:

1. Determine the type of missing data – was the missing data expected based on the study or research design?
2. Determine the extent of missing data – is the missing data extensive enough to affect the results?

3. Diagnose the randomness of the missing data processes – is the data missing truly random, or does it form a pattern?
4. Select the imputation or deletion method

The impact of missing data is both practical (affecting the sample size), and substantive (if data is not randomly missing the study will be biased by its absence). Hair *et al.* (2010) recommend ignoring missing data under 10%. Above this, the options include listwise deletion, pairwise deletion, mean substitution, or data imputation. Relating to the treating of missing data, each study was considered individually as differing statistical tools and techniques were in use. In some studies it was not necessary to remove entire student response rows if the student had answered the necessary questions for that particular study. For example, matched pairs were needed for the Chapter 5 (Study 2) examination so more stringent missing data steps were taken. Before further analysis, each dataset was examined using the countblank formula in Microsoft Excel to calculate the percentage of row responses missing, and rows were accordingly deleted (listwise deletion) if they had excessive missing data. For all studies, any surveys which were missing in excess of 10% per study-period were removed (many in this category were survey responses who only completed the initial questions and exited).

The use of compulsory-fixed questions in the online survey reduced the impact of missing data significantly, as if a student reached the end of the survey, it indicated they completed it fully (no missing data). Once excess (over 10%) missing cases were removed, the datasets were checked for percentage row missing data (via row countblank formulae), and missing item data (via column countblank formulae) in Microsoft Excel. They were also analysed in SPSS where decisions were made regarding data imputation or manipulation. Where it was detected that the data was missing at random and to a reduced extent (less than 2% per item/column per study period), it was ignored.

In addition, all datasets must be scrutinised for aberrant cases or unengaged responses (straight-lining/bee-lining), in order to detect students who answered the survey hastily with little engagement. Aberrant cases were identified and removed, as they had an exceptionally low standard deviation in

their answers across all variables. Relating to non-response bias, while there was limited information available to detect differences between responding/non-responding students in the analysis, alternative indications were sought. Instead, comparatory split group independent samples t-tests were run between students who participated in the T1 (time one) and not in the T2 (time two) studies to ascertain whether there were demographic differences. No significant differences were noted across the studies (excluding age which was found to be significant but this was due to most students indicating they were a year older at T2). A summary of the cases removed is found in Table 4.4.

**Table 4-4: Missing Data Removal and Reason**

	<i>Time</i>	<i>Missing cases over 10% (removed)</i>	<i>Unengaged responses</i>	<i>Other</i>
Study 1 (Chapter 5) ESE/EI/ET	1	13		
Study 1 (Chapter 5) ESE/EI/ET	2	20	10	24 duplicate ID numbers
Study 1 (Chapter 5) EP	1			4 (outlier years 2 <sup>nd</sup> /3 <sup>rd</sup> noted)
Study 1 (Chapter 5) EP	2	12		
Study 2 (Chapter 6)	1&2	160*	2	
Study 3 (Chapter 7)	2	10	1	9 teams (only 1 member response)
Study 4 (Chapter 8)	1&2			None removed
<i>*Row responses removed if only T1 or T2 was answered as matched pairs needed</i>				

Another consideration of missing data in the study pertained to the team-level level of analysis. In the two studies of team-level variables (Chapter 7 and 8), teams were checked for the quantity of respondents per team who filled the survey. As a consequence, teams were removed if they had single team-member responses, and would not be reflective of the full team. The treatment of missing data is discussed in more detail within each study chapter.

### ***Testing Multivariate Assumptions***

The research design includes four quantitative studies, two of which pertain to an investigation of individual level factors affecting the EE student, and two that focus on the SET. In conducting

quantitative analysis, it is important to assess the datasets robustness and the test key assumptions, as outlined in Table 4.5.

**Table 4-5: Testing Multivariate Assumptions**

<b>Assumption</b>	<b>Description</b>
<i>Normality</i>	Assessed to ensure the data is valid for the intended analysis. The distribution of each variable can be visually explored using histograms to detect any deviation from linearity. Studying the skewness and kurtosis of the data variables also enable the researcher to determine whether the study variables are normally distributed (Saunders <i>et al.</i> , 2009). An acceptable range for skewness or kurtosis is said to be between +1.5 and -1.5 (Tabachnick and Fidell, 2013). George and Mallery (2010) have indicated a kurtosis threshold of +/- 2.2 is required for proving normal univariate distribution.
<i>Multicollinearity</i>	Implies variables are too closely correlated, which may distort findings (Hair <i>et al.</i> , 2017). Authors have suggested correlations above 0.75 (Ashford and Tsui, 1991) or 0.90 (Saunders <i>et al.</i> , 2009) imply multicollinearity. The Variance Inflation Factor (VIF) score indicates how much higher the error variance is for the unique effect of a predictor, relative to a situation where there is no multicollinearity. VIF is calculated as 1/Tolerance, and a score of 5 or lower (Tolerance level of 0.2 or higher) is recommended (Wong, 2013). If VIF value exceeds 4.0, multicollinearity may be an issue (Hair <i>et al.</i> , 2010). Kock and Lynn (2012) would recommend a VIF cut-off of 3.3 for variance based SEM (which Smart-PLS falls under).
<i>Common Method Bias</i>	Relates to the amount of spurious covariance shared by measures, mainly due to the common context they are collectively elicited (Podsakoff, MacKenzie, Lee <i>et al.</i> , 2003). Can pose an issue when all variables in a study are assessed using similar self-report measurement scales.
<i>Homoscedasticity</i>	Observed when the variance of dependent variables is unequal across the range of the independent variable (Hair <i>et al.</i> , 2010). Detected by studying the residual distribution displayed as a scatterplot.

## 4.5 Statistical Concepts of Note in the Studies

Due to the nature of the studies, a number of predictions are made which require an inherent understanding of some statistical concepts outlined in this section. A description of how these will be tested is provided in Section 4.6.

### 4.5.1 Reliability, Validity and Factor Structure

Within these studies, the reliability, validity, and factor structure of the measures used are studied with concerted rigor, and a number of comparative tests are undertaken.

- **Reliability** is a measure of true scores, stability and equivalence, and the ability of an instrument to measure an attribute consistently, a property essential to its descriptive power (DeVon *et al.*, 2007). The extent to which a questionnaire, test, observation, or measurement

procedure produces the same results on repeated trials to indicate reliability (Miller, 2005).

Test-retest reliability observes the repeatable consistency of the scale.

- **Validity** considers the amount an experimental treatment causes an effect in an experimental setting i.e. the degree to which something does what it was designed to (Dimitrov and Rumrill, 2003). Often overlooked in EE (Von Graevenitz *et al.*, 2010), there are a number of ways to assess the validity of a scale measure (See Table 4.6).
- Lastly, the purpose of **factor analysis** is to define the underlying structure among variables, by finding sets of highly interrelated items or factors. It is used to determine whether scale items tie together to represent the construct intended (DeVon *et al.*, 2007; Hair *et al.*, 2010).

**Table 4-6: Validity types**

<b>Type</b>	<b>Description</b>
<i>Construct</i>	As constructs are not directly observed, construct validity relates to the testing of psychological theories and measures used to represent theoretical constructs (Strauss and Smith, 2009). This is met if measure items are related to its operationally defined theory and concepts (DeVon <i>et al.</i> , 2007). Can be tested through a ‘contrasted-groups’ approach where the measure is tested against known differences relating to the construct (DeVon <i>et al.</i> , 2007).
<i>Content and Face</i>	Relate to “ <i>the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose</i> ” (Haynes, Richard and Kubany, 1995, p. 238). This involves investigating whether scale items are comprehensible and reflective of the construct. Face validity assesses whether the measure appears valid to its audience, thus is more surface orientated and subjective (DeVon <i>et al.</i> , 2007). Content validity necessitates a consideration of the deeper construction of the measure, to check it is inclusive of all relevant facets.
<i>Criterion</i>	Assesses how the instrument or scale correlates with a specified measurable piece of information or criteria, usually an outcome e.g. measuring student perceptions of achievement versus performance (DeVon <i>et al.</i> , 2007).
<i>Concurrent or Predictive</i>	Refers to a comparison between the measure and an outcome assessed at the same time, while predictive is at a later time, both usually measured through a correlation analysis.
<i>Convergent and Discriminant</i>	Convergent validity assesses whether the measure react in a similar way to related measures, assessing its connection to constructs that are theoretically similar (DeVon <i>et al.</i> , 2007). Discriminant validity studies the measures ability to be witnessed as distinct to other constructs, e.g. differentiating general self-efficacy from ESE. Both are determined by examining the correlations between scale items and measures, considering that scales that show multicollinearity do not indicate clear demarcation from one another.

#### **4.5.2 Mediation and Moderation (Indirect Effects)**

In EE quantitative studies, more work is needed in considering moderating and mediating relationships which are considered to add depth in understanding relevant constructs (Shahab *et al.*,

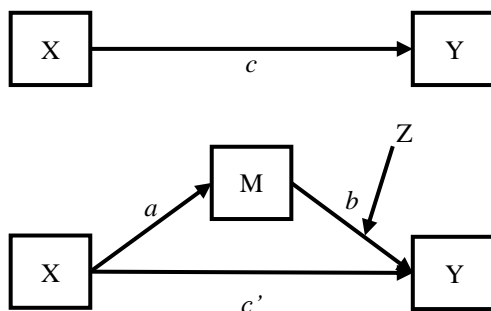
2018). Due to the frameworks chosen for examination in the thesis, it is proposed that a number of indirect effects will be noted. In a direct effect relationship, the independent variable (X) has a direct effect on the dependent variable (Y) (See Figure 4.3), however indirect relationships are noted when other variables intervene or affect this relationship and/or its strength.

Moderation as described by Hair *et al.* (2017, p. 243):

*“When moderation is present, the strength or even the direction of a relationship between two constructs depends on a third variable, referred to as a moderator variable”*

A moderator can be thought of as a catalyst, in that its addition to a model will strengthen or weaken a relationship between an independent and dependant variable (as demonstrated by ‘Z’ in Figure 4.3 above). Moderators can be categorical (e.g. age, gender) or continuous (e.g. income) variables, though it is recommended that variables are not devised of single item measures due to issues in predictive validity. It can be examined using the two-stage approach, where the model is run without the interaction (moderating term) initially and then the interaction term is added to detect the difference. It is considered that moderators may be helpful in understanding the reason why the relationships between EE and outcomes are inconsistent and ambiguous (Bae *et al.*, 2014).

**Figure 4-3: Direct and Indirect Relationships**



When researchers explore the effect of a third variable in a model, the goal is to understand the causal process by which an independent variable affects a dependent variable, via another variable known as a mediator (MacKinnon *et al.*, 2000). A mediator is a variable that allows researchers to understand



the mechanism through which a predictor influences an outcome, establishing how or in some cases why an independent variable predicts an outcome variable (Baron & Kenny, 1986). A mediator (labelled as 'M' in Figure 4.3) may completely explain the relationship between two constructs (*complete mediation*), or *partial mediation* if a relationship remains outside of the mediator (Hair *et al.*, 2017). Depending on the strength and direction of relationships, the type of mediation is determined. See Appendix K for an extended description of mediation types.

#### **4.5.3 Team Level Quantitative Analysis**

It is imperative that the manner which variables are conceptualised from the individual level to the team level is considered, as this affects the level of measurement; representation (i.e. how the data is represented at the higher level; and the level of theory and analysis (i.e. level for model testing, inference, and generalization) (Kozlowski *et al.* 2013). Variables can be operationalised by aggregation or referent-shift questioning to attain shared or collective team constructs; or studied in terms of the diversity between member responses. When operationalising team-level factors from individual-level data, one approach is to aggregate the responses where it is reasonable and justified.

The assumption is that:

*“agreement among members regarding a given aspect of group functioning (whether cognitive, affective, or motivational, whether conscious or not) provides strong evidence that a group-level phenomenon exists”*

(Waller *et al.*, 2016, p. 570)

Studies investigate aggregated constructs as team level convergence, consensus or composition forms (Kozlowski and Klein, 2000), and assume that groups are adequately homogenous on this aspect or attitude (Waller *et al.*, 2016). Before aggregation is allowed, analyses must be conducted to ensure within-team agreement (by assessing interrater reliability and interrater agreement). Within the thesis, these statistics are checked using a computational tool devised by Biemann *et al.* (2012). Using this excel-based tool, the individual level data is used to compute  $r_{wg}$ -based estimates for determining interrater (within-team) agreement and interrater reliability estimates.

- *The Interrater Reliability (IRR)* is commonly assessed through the calculation of the Intraclass Correlation Co-efficient (ICC). Both within-group and between-group variance is used in its calculation, and is interpreted as “*the proportion of observed variance in ratings that is due to systematic between-target differences compared to the total variance in ratings*” (LeBreton and Senter, 2008, p. 822). The ICC (1) provides an estimate of the proportion of the total variance explained by team membership (Bliese, 2000). If teams have similar scores along a construct and low ICC values, it may be concluded that it is not suitable for differentiating between these teams. It is computed as:

$$ICC (1) = \frac{MSB - MSW}{MSB + [(k-1)*MSW]}$$

where MSB is the between-group mean square, MSW is the within-group mean square, and k is the group size (Bliese, 2000). The ICC (2) provides an estimate of the reliability of the group means and is computed as:

$$ICC (2) = \frac{MSB - MSW}{MSB}$$

where MSB is the between-group mean square, and MSW is the within-group mean square (Bliese, 2000). Biemann *et al.* (2012) recommend the determination of the appropriate cut-off values be decided in line with other empirical works in the area. Accordingly, the works of Standifler *et al.* (2015) and Guchait, Lei and Tews (2016) who used student team samples are acknowledged (Table 4.7).

**Table 4-7: Recommended Cut-Off Values**

	<i>ICC (1)</i>	<i>ICC (2)</i>	<i>r<sub>wg</sub></i>
James <i>et al.</i> (1984)	median = .12, range .0 - .50	n/a	n/a
Bliese (2000)	.05 - .30	n/a	n/a
LeBreton and Senter (2008)	.01 small effect, .10 medium effect, .25 large effect.	.70 - .85	.70 - .85
Standifler <i>et al.</i> (2015)	.13 - .61	.41 - .88	.75 - .83.
Guchait <i>et al.</i> (2016)	.21 - .30	.61 - .68	.80 - .91.

- *The Interrater Agreement* refers to “*the absolute consensus in scores furnished by multiple judges for one or more targets*” (LeBreton and Senter, 2008, p. 816). When multiple judges rate a single target on a single variable using an interval scale of measurement, interrater agreement may be assessed using the  $r_{wg}$  index, which defines agreement in terms of the proportional reduction in error variance on a single-item.

It is computed as:  $r_{wg} = 1 - s_x^2 / \sigma_E^2$  however the  $r_{wg(j)}$  for variables with multiple items is computed as:

$$r_{wg(j)} = \frac{J \left( 1 - \frac{s_{x_j}^2}{\sigma_E^2} \right)}{J \left( 1 - \frac{s_{x_j}^2}{\sigma_E^2} \right) + \left( \frac{s_{x_j}^2}{\sigma_E^2} \right)},$$

where  $r_{wg(j)}$  is the within-group interrater reliability based on J items,  $\sigma_E^2$  is the mean of the observed variances on the J items, and  $s_x^2$  is the expected error variance based on a uniform distribution (James, Demaree, and Wolf, 1984).

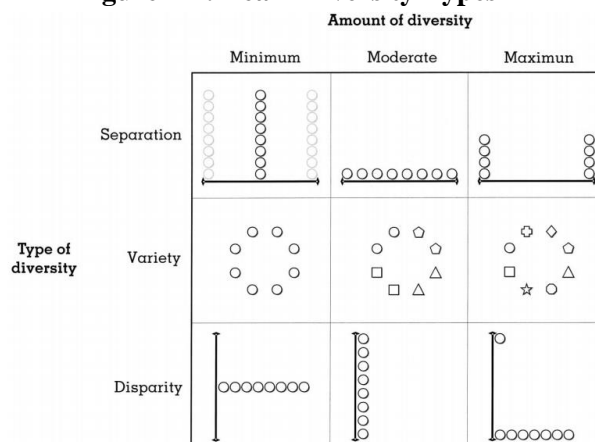
Instead of studying teams along shared or collective factors, a researcher can alternatively examine differences of the team along a key factor (e.g. Kramer, 2013; Zhou and Rosini, 2015). For example, in some instances it may be more fruitful to investigate the difference between income earners (highest income to lowest) in a group rather than aggregating the income of the team. These are often referred to as ‘team diversity’ factors, however these can be better delineated to variety, disparity, and separation (Figure 4.4) (Harrison and Klein, 2007; Solanas *et al.*, 2012). While these operationalisations could be based on the same individual level dataset, they would lead to very different relationships in a research model (Bell *et al.*, 2011).

**Team Variety:** Variety refers to categorical differences among team members, where the number of represented categories contributes to team diversity (Harrison and Klein, 2007). For example, a student team of differing degrees would be reflective of fully varied on this factor. Examples of variables in this category could include skill variety, functional variety, nationality etc.

**Team Disparity:** Disparity is an asymmetric measure, and indicates possible inequality in a group. It is related to the equal or unequal balance of assets or resources in the team such as pay, power etc. Maximum disparity is reached when one team member is high on a dimension, and separated on a continuum from all other team members. For example, if four members of the group attended one team meeting and one member attended ten there would be a wide disparity. Configuration models

that examine the structural representation of lower-level responses in detail can study disparity (Waller *et al.*, 2016). Examples of variables that could fall into this category could include experience disparity, social capital disparity or decision-making disparity.

**Figure 4-4: Team Diversity Types**



(Harrison and Klein, 2007, p. 1201)

**Team Separation:** refers to differences among team members in their lateral position on a continuum, such as a value, attitude, or belief, i.e. their absence of agreement (Harrison and Klein, 2007). Maximum separation is evident when two sub-groups or members are placed at opposing ends of a horizontal continuum (e.g. high versus low ESE). In this instance, the distance between two members in terms of their viewpoint is at its greatest, and it is not relevant how many members are on either side (Bell *et al.*, 2011). Examples of variables that could fall into this category could include creative personality separation, engagement separation or entrepreneurial passion separation. The variable is attained by calculating the standard deviation scores of individual responses in order to determine the asymmetry at the team level (Waller *et al.*, 2016).

This system while fruitful in many studies has been criticised due to the assumption of homogeneity among team members which is thought tenuous at times, and a lack of complexity of research design studying the dynamic interaction occurring in teams (Humphrey and Aime, 2014; Waller *et al.*, 2016). The calculation of the separation diversity variables is calculated from the non-aggregated individual items, as per the method used by Khan, Breiteneker, and Schwarz (2015).

## 4.6 Quantitative Techniques and Tools Employed

### 4.6.1 Partial Least Squares Analysis

This statistical modelling-based technique, using structural equations, enables the simultaneous estimation of a group of equations by measuring the concepts (the measurement model testing stage), and the relationships between them (the structural model testing stage) (Hair *et al.*, 2011). The PLS procedure is used to estimate the latent variables as an exact linear combination of their indicators with the goal of maximising the explained variance for the indicators and constructs. PLS-SEM does not assume that the data is normally distributed, which implies that parametric significance tests (e.g., as used in regression analyses) cannot be applied to test whether coefficients such as outer weights, outer loadings and path coefficients are significant. Instead, PLS-SEM relies on a nonparametric bootstrap procedure (Efron and Tibshirani, 1986; Davison and Hinkley, 1997) to test the significance of estimated path coefficients in PLS-SEM. The Partial Least Squares (PLS) technique is used to test the study models using the Smart PLS3 software.

**Table 4-8: Key Characteristics of Smart PLS (PLS-SEM)**

Sample Size	No issues with small sample sizes (35-50) Generally high levels of statistical power (35-50) Larger sample sizes (250+) increases the precision of estimations
Data Distribution	No distributional assumptions
Missing Values	Highly robust if missing less than 15% (MCAR) Can employ techniques such as mean replacement during analyses
Measurement scales	Works with metric, quasi-metric (ordinal) scaled data and binary exogenous factors Limitations in using categorical data to measure latent endogenous variables
Number of items	Handles constructs measured with single and multi-item measures Easily handles 50+ items
Relationship between latent and indicators	Easily incorporates reflective and formative measurement models
Model Complexity	Handles complex models with many relationships Large numbers of indicators are helpful in reducing consistency at large
Model Set-up	Causal loops not allowed in structural models (only recursive models)

(Hair *et al.*, 2017; p.18)

Smart-PLS is considered a second-generation technique, moving from techniques such as regression analyses, factor analyses and clustering, improving the inclusion of unobservable variables measured indirectly or reflexively (Hair *et al.*, 2017). However, unlike covariance-based methods such as

LISREL and Amos, Smart-PLS maximizes the variance explained by indicators and latent variables, through the estimation of ordinary least squares and principal component analysis (Hair *et al.*, 2017). Smart-PLS may be used on smaller sample sizes, complex models with many indicators, and makes no assumptions about normal distribution. Table 4.8 outlines its key characteristics. In bootstrapping, subsamples are created with randomly drawn observations from the original dataset, which are used to estimate the PLS path model. This process is repeated until a large number of random subsamples are created. The parameter estimates (e.g. outer weights, outer loadings, path coefficients) estimated from the subsamples help to derive the standard errors. With this information, t-values are calculated to assess each estimate's significance (Hair *et al.*, 2017).

**Table 4-9: Smart-PLS Procedure**

<b>Stage 1: Specifying the Structural Model</b>	
<b>Stage 2: Specifying the Measurement Model</b>	
<b>Stage 3: Data Collection and Examination</b>	
<b>Stage 4: PLS Path Model Estimation</b>	
<b>Stage 5: Evaluation of the Measurement Models</b>	
<b>5a : Reflective Models</b>	<b>5b : Formative Models</b>
<ul style="list-style-type: none"> <li>• Internal consistency (Cronbach’s alpha, composite reliability)</li> <li>• Convergent validity (indicator reliability, AVE)</li> <li>• Discriminant validity (Fornell Larcker/HTMT)</li> </ul>	<ul style="list-style-type: none"> <li>• Convergent validity</li> <li>• Collinearity between indicators</li> <li>• Significance and relevance of outer weights</li> </ul>
<b>Stage 6: Evaluation of the Structural Models</b>	
<ul style="list-style-type: none"> <li>• Coefficients of determination (<math>R^2</math>)</li> <li>• Predictive relevance (<math>Q^2</math>)</li> <li>• Size and significance of path coefficients</li> <li>• <math>f^2</math> effect sizes</li> <li>• <math>q^2</math> effect sizes</li> </ul>	
Stage 7: Advanced PLS-SEM Analysis	
Stage 8: Interpretation and Conclusions	

Smart-PLS is considered an effective choice when attempting exploratory or theory-building research objectives (Chin, Marcolin, and Newsted, 2003). It has been successfully used in EE empirical studies (Do Paco *et al.*, 2011; Ferreira *et al.*, 2012; Dinis *et al.*, 2013; Nasiru *et al.*, 2014; 2015; Yarima and Hashim, 2016; Lanero, Vazquez and Aza, 2016; Santos, Roomi, and Liñán, 2016), and it is considered

a robust and advanced technique suitable for the thesis studies. As seen in Table 4.9 (from Hair *et al.*, 2017, p.30), there are a number of stages in using Smart PLS3.

**Stage 1 and 2** relate to the consideration and proposal of both the structural and measurement model to frame the study. The data collection, screening, and examination is conducted at **Stage 3**. **Stage 4** involves planning, running and interpreting the initial path analysis.

Next, the measurement model is evaluated at **Stage 5**, which, for reflective measurement approaches, is conducted by looking at item reliabilities, internal consistency, discriminant, and construct validity. The consistent PLS (PLSc) algorithm performs a correction of reflective constructs' correlations to make results consistent with a factor-model. **Stage 6** focuses on the estimation of the fit parameters for the structural model (inner model) and produces information pertaining to the research hypotheses. This determines the predictive capability of the model and its respective relationships, and examines the variance of the endogenous constructs explained by the exogenous constructs and variables.

**Stage 7** relates to advanced statistical techniques such as multi-group analysis (MGA). In the PLS-SEM, analyses the simple effect (which incorporates the relationship between the two constructs when moderated by the selected third variable) is used to detect significant moderation in the model (Hair *et al.*, 2017). Mediation will be examined in Smart-PLS by studying the indirect effects versus the total effects in the PLS estimates. To confirm mediation, the PLS-SEM method applies bootstrapping to the sampling distribution to the indirect effect in Smart-PLS3. Lastly, **Stage 8** focuses on interpretation of the results and drawing of conclusions.

#### **4.6.2 Summary of Statistical Analyses**

While it is necessary to discuss the major statistical approach taken, an outline of each particular examination technique was deemed excessive for the body of the thesis. Instead, these are listed in Table 4.10 with a detailed description of each found in Appendix J.

**Table 4-10: Statistical methods used**

		<b>Study 1 (Chapter 5)</b>	<b>Study 2 (Chapter 6)</b>	<b>Study 3 (Chapter 7)</b>	<b>Study 4 (Chapter 8)</b>
1	Pearson Correlation	Y	Y	Y	Y
2	Internal consistency (Cronbach's alpha- $\alpha$ )	Y	Y	Y	Y
3	Intra-class Correlation Coefficient (ICC)	Y		Y	Y
4	T-tests (independent, paired)	Y	Y		
5	Factor Analysis (PCA)	Y	Y		
6	Inter-rater Agreement ( $r_{wg}$ )			Y	Y
7	Composite Reliability (CR)		Y	Y	Y
8	Average Variance Extracted (AVE)		Y	Y	Y
9	Hetero-trait Mono-trait matrix (HTMT)		Y	Y	Y
10	Fornell-Larcker matrix		Y	Y	Y
11	Coefficients of determination ( $R^2$ )		Y	Y	Y
12	Predictive relevance ( $Q^2$ )		Y	Y	Y
13	Multi-Group Analysis (MGA)			Y	

## 4.7 Chapter Summary

This chapter discusses the philosophical and methodological aspects involved in the thesis research approach and studies. It outlines the study sample, and discusses a number of methodological considerations pertaining to the data collection and research design. A survey-based, quantitative research strategy was selected, studying the EE student at both the individual (two studies) and team level (two studies). The empirical analysis is conducted over four studies, with all model relationships being explored using structural equation modelling. The conclusion of this chapter marks a distinct point in the thesis as Chapters 5 to 8 are framed as independent studies, each with hypotheses development, data analysis, and a discussion of the corresponding results and findings. The conclusions for each of the four studies will be drawn upon in the concluding chapter (Chapter 9). In the next chapter (Chapter 5), a number of popular entrepreneurial psycho-social constructs will be scrutinised for their applicability of use on the EE student, using a review of studies in the field and an empirical quantitative analysis of measurement reliability, validity and factor structure.



**CHAPTER 5: Investigating Entrepreneurial Measures  
in Entrepreneurship Education**

## 5.1 Abstract

**Aim:** To focus on a number of commonly used theories and constructs used to investigate the entrepreneur, and explore their legitimacy and applicability for use on the student of entrepreneurship education. For each theory discussed, an existing measure was selected and investigated within the context of entrepreneurship education, reflecting on past empirical research, and through a quantitative investigation and analysis.

**Methodology:** To examine entrepreneurial 1) trait theory, 2) self-efficacy, 3) intentionality, and 4) passion, a measure for each construct was administered to students taking an entrepreneurship education module. Reliability, validity, internal consistency, and factor structure analyses were conducted on each measure. This allows a comparison to be made of the measures in a controlled environment. It is accepted that the measures are not reflective of their respective theory as a whole, and alternative measurement instruments could have been selected.

**Results:** Theoretically, there is justification for each of the constructs use in entrepreneurship education. Based on past research, trait theory has been criticised for inconsistent empirical findings, and this was echoed in the quantitative study as the trait measure, the General Enterprise Tendency (GET) test displayed worrisome reliability and structural validities. Accordingly, a revision of the GET test for the entrepreneurship education context is proposed and presented. Empirical analysis supported the use of the entrepreneurial intentionality, self-efficacy, and passion measures.

**Contribution:** There have been repeated calls to systematise the assessment of entrepreneurship education, to converge existing knowledge and research. This paper provides educators with a comparative review of theoretical and empirical insight, to aid future research and assessment approaches.

## 5.2 Introduction

The first research question of this thesis focuses on the effect of entrepreneurial tendencies on the EE student, and necessitates that these entrepreneurial tendencies can be accurately measured. Thus, before exploration of the antecedents of entrepreneurial tendencies, the assumption that entrepreneur-related constructs can be applied to the EE context must be examined.

*“Using student entrepreneurs in research that is intended to be descriptive of and generalize to the entrepreneurial population as a whole is a questionable practice”*

(Robinson, Huefner and Hunt, 1991, p.48)

Robinson *et al.* (1991) argue that entrepreneurs and student entrepreneurs (individuals that have a new venture while concurrently in school/college) are sometimes measured without clear

consideration of the demarcation between the two groups, or that researchers study student entrepreneurs as representative of the wider entrepreneurial population. From a methodology perspective, students are sometimes used as the base group when creating entrepreneurial measures, and are thought to be a representative sample group (Wilson *et al.*, 2007). Hemmasi and Hoelscher (2005) note this may be due to the ease of access to the student population, and student time availability. In addition, EE students often exhibit nascent entrepreneurial behaviour (McGee *et al.*, 2009), and practically speaking, the effect of training and education can be more easily measured on a student sample (Peterman & Kennedy, 2003).

Despite this, it is suggested that entrepreneurs and student entrepreneurs may react differently under examination, perhaps due to their role disparity and experience levels (Robinson *et al.*, 1991). Hemmasi and Hoelscher (2005) studied the differences between students displaying high and low nascent entrepreneurial inclinations, and entrepreneurs. Their analysis observed a large distinction between low and high nascent students, and between low nascent and actual entrepreneurs, but a weaker set of differences between high nascent students and entrepreneurs. It is suggested that constructs and measures created for one group might not be fully representative of the other, and should be checked before embarking on a research study. Additionally, students may lack the experience and resources required to make informed decisions about their entrepreneurial preparedness, thus could be an inappropriate group for survey creation (McGee *et al.*, 2009).

Accordingly, in the next section a number of prominent individual level entrepreneurship constructs are examined for their use in past studies of EE. A measure pertaining to each construct is selected and an empirical comparative analysis will be conducted, and the results reviewed to gauge each measures applicability to the EE student. This answers calls for related scholars to pay more attention to validity and reliability procedures (Lorz *et al.*, 2013).

### **5.3 The Use of Entrepreneurship Constructs and Measures in EE**

Theories of entrepreneurial self-efficacy, entrepreneurial intentionality, entrepreneurial traits, and entrepreneurial passion have been defined and discussed in Chapter 2. A review of their use and relevance to EE is presented in this next section, before they are empirically examined.

#### **5.3.1 Entrepreneurial Self Efficacy (ESE)**

Entrepreneurship education has been suggested to raise ESE in students, as it relates to many of the efficacy determinants (mastery experience, vicarious experience, social persuasion and psychological/emotional states) (Wilson *et al.*, 2007; Kreicar and Coric, 2013; Bae *et al.*, 2014).

Shinnar, Hsu, and Powell (2014) highlight the delivery of EE can raise ESE in students by:

- Allowing students to replicate entrepreneurial tasks and thus develop confidence in its completion henceforth e.g. conducting a market analysis, pitching an idea, or writing a business plan (enactive mastery).
- Exposing students to entrepreneurs and industry role models through guest speakers or case studies (vicarious experience, emotional arousal) (Bosma *et al.*, 2012).
- Providing social persuasion through feedback from others (instructors or peers) through in-class discussion, or performance on course assignments (verbal persuasion, emotional arousal).

While it is thought that the student level of ESE should rise during an entrepreneurship course or module, it is not well known what explicit factors affect this (Nabi *et al.*, 2017). Instruments to measure ESE are commonly Likert scales, and contain items related to opportunity recognition, managerial skills and tolerance (Barbosa, Gerhardt and Kickul, 2007; Maritz and Brown, 2013). There are many ESE measures which limit comparability (Maritz and Brown, 2013), and it has been conceptualised as both a multi-dimensional and unidimensional construct (Chen, Greene and Crick, 1998; Zhao *et al.*, 2005; McGee *et al.*, 2009). De Jung, Noble, and Ehrlich (1999) used a study sample of undergraduate business, graduate business, and MBA students for their ESE scale creation. Their

measure contained items recommended by entrepreneurs, including *defining core purpose*, *coping with unexpected challenges* and *building an innovative culture*. McGee *et al.* (2009) used students in the initial scale development process but relied on nascent entrepreneurs and a general populace for the scale analysis and testing phase. Moberg (2013) developed and validated a scale using postgraduate students; testing between student entrepreneurs and students with no entrepreneurial experience. Krekar and Coric (2013) studied the effect of EE on individuals who were students at time one, and graduates at time two.

The measure chosen for this study is a unidimensional four-item construct devised by Zhao *et al.* (2005), previously found to display discriminant validity, when compared to Chen *et al.* (1998)'s general self-efficacy construct. The scale consists of items relating to an individual's perception of self-efficacy regarding specific entrepreneurial tasks; *successfully identifying new business opportunities*, *creating new products*, *thinking creatively in business*, and *commercializing an idea or new development*. It is marked on a five point Likert scale from 1 (no confidence) to 5 (complete confidence). Morris, Shirokova, and Tsukanova (2017) found it to be positively related to the frequency of student start-up activities. Shinnar *et al.* (2014) focused on undergraduate students taking an entrepreneurship course, using a pre-test, post-test research design, where the ESE measure displayed strong reliabilities and factor structure in context.

### **5.3.2 Entrepreneurial Traits**

There have been opposing findings relating to the study of trait theory in EE student samples. Students aspiring toward entrepreneurship have been found to have higher levels of risk-taking, opportunity seeking, need for achievement and locus of control (Scott and Twomey, 1988; Gürol and Atsan, 2006. Ngwoke *et al.* (2013) found a positive relationship between locus of control and certain entrepreneurial student qualities, while Nga and Shamuganathan (2010) found aspects of the Big Five personality trait typology influenced students on dimensions of social entrepreneurship. Conversely, Oosterbeek, Van Praag, and Ijsselstein (2010) found no difference in entrepreneurial traits between

EE and non-EE students, while Fagbohunge and Jayeoba (2012) found no relationship between locus of control and the entrepreneurial ability of students.

Measurement instruments such as the General Enterprise Tendency (GET) test (Caird, 1988, 1990) and the Escan test (Oosterbeek *et al.*, 2010) have been used to detect the presence of entrepreneurial traits in student populations. The GET test was chosen as a proxy for trait theory in this chapter, due to its integration of some of the most commonly discussed trait features (risk-taking, locus of control) and its frequent use on the student population (Table 5.1)<sup>4</sup>. It is a 54-item questionnaire made up of five traits: Need for Achievement, Need for Autonomy<sup>5</sup>, Locus of Control, Calculated Risk Taking, and Creative Tendency<sup>6</sup> (Caird, 1988; 1990; 1991). It has demonstrated criterion and predictive validity across various sample groups and countries (Cromie and O'Donoghue, 1992; Din, 1992), and was deemed by Cromie (2000, p. 22):

*“Comprehensive, accessible, easy to administer and score, and, though additional work is needed to verify its psychometric properties, some studies have found that the GET test has criterion and convergent validity and good internal consistency”*

The GET test has found students to be less enterprising than managers and teachers (Caird, 1991; Cromie and O'Donoghue, 1992; Cromie, 2000; Kirby, 2004). Kirby and Honeywood (2007) found students with ADHD had higher GET scores than the norm, and Kirby and Ibrahim (2011) noted Egyptian undergraduate students had higher GET results than their British counterparts. Din (1992) found a positive relationship between GET scores and student employment experience in Malaysia.

Despite these studies, concern has been expressed about its internal consistency (Stormer, Kline and Goldenberg, 1999), and Cromie (2000, p.22) called for more confirmatory validity and reliability testing.

<sup>4</sup> For the purposes of this thesis, only the GET test is described. A second edition online version known as the GET2 test is now available.

<sup>5</sup> *The tendency to speak and act devoid of concern for consequence or authority*

<sup>6</sup> *The tendency to be imaginative, innovative, curious and versatile*

**Table 5-1: Use of the GET Test in Previous Studies**

Authors	Study location	Sample size	Type	Validation of GET	Results
(Kirby and Ibrahim, 2011)	Egypt/ Britain	55 students	Empirical	No	The Egyptian students scored higher GET test scores. After eight weeks, GET rose by 7.6%.
(Hemantkumar <i>et al.</i> , 2010)	India	4 entrepreneurs	Case study	No	All scored on or above the average scores for the test.
(Swanepoel, Strydom and Nieuwenhuizen, 2010)	South Africa	Not stated	Empirical	No	Use of instrument noted – no results provided. Used GET test to reduce start-up applicants from 1000's to 40.
(Kirby and Honeywood, 2007)	Surrey, UK	60	Empirical	Some	Students with ADHD had higher GET test scores (35.27) than the traditional university student.
(Henry, Hill and Leitch, 2004)	Ireland	38	Empirical	Some	GET study revealed no statistically significant results.
(Kirby, 2004)	UK	76 students	Mixed	No	Students had lower GET and sub-scale scores than managers.
(Evans and Jones, 2001)	UK	19 students	Empirical	No	Student sample were lower than the student average for GET test on entry to course.
(Stormer <i>et al.</i> , 1999)	Canada	128	Empirical	Yes	Overall CA = 0.86. N for autonomy correlated positively with 'plans to expand the businesses'. Relative independence of subscales but low internal consistencies (Cronbach's alpha range 0.14-0.54). Test-retest reliability was weak (n=15).
(Cromie and O'Callaghan, 1997)	Northern Ireland	101 students	Empirical	Yes	Moderate construct validity for 2 of the GET sub-scales. Some criterion validity found between entrepreneurs and non-entrepreneurs with significant results along 3 of 5 measures.
(Din, 1992)	Malaysia	393 students	Empirical	Some	Found that there was a positive relationship between GET scores and number of previous employments.
(Cromie <i>et al.</i> , 1992)	N. Ireland	194 managers	Empirical	Some	No significant differences for NaCH or locus of control.
(Cromie and O'Donoghue, 1992)	Northern Ireland		Empirical	Yes	GET test held internal consistency (correlated positively) but no correlation between locus of control and autonomy.
(Caird, 1991)	UK	262	Empirical	Yes	Individuals with a business owner-manager experience displayed statistically higher enterprise tendency than other groupings.

The 54 dichotomous item measure is alternately reverse coded and contains items such as *'I will take risks if the chances of success are 50/50'*; and *'Before I make a decision I like to have all the facts no matter how long it takes'*. The items are divided into dimensions of Need for Achievement (12 items), Need for Autonomy (six items), Creative Tendency (12 items), Risk Taking (12 items) and Locus of Control (12 items). In the analysis, the measure is adapted from its original dichotomous form to a six-point Likert scale. This allows for enhanced choice variation, but without a neutral point is in keeping with the original GET test. A comparison of five and six-point scales using locus of control and achievement motivation found the six-point showed higher discriminant validity and reliability (Chomeya, 2010).

### **5.3.3 Entrepreneurial Intentionality (EI)**

Entrepreneurial intentions (EI) are considered a key predictor of future entrepreneurial activity (Krueger *et al.*, 2000; Kautonen *et al.*, 2015), and are often used on student samples (Peterman and Kennedy, 2003; Souitaris *et al.*, 2007; Fayolle and Gailly, 2015). It has been recommended as a means of assessing EE (Fayolle *et al.*, 2006). There have however, been mixed results regarding the efficacy of EE courses in developing EI. Studies by Peterman and Kennedy (2003), Souitaris *et al.* (2007) and Le Poutre *et al.* (2010) have declared positive results, but Oosterbeek *et al.* (2010) and Bae *et al.* (2014) noted negative or no effect on students. Joensuu, Viljamaa, Varamäki and Tornikoski (2013) found that over three years in university, the EI of a student decreased. Studies have found factors such as pre-course experience, role-models, nationality and gender, interact with the effect of EE on these intentions for entrepreneurship as a career, and should be studied in more depth (Packham, Jones, Miller *et al.*, 2010; Karimi *et al.*, 2013; Fayolle *et al.*, 2014; Shinnar *et al.* 2014; Fayolle and Gailly, 2015, Nabi *et al.*, 2016).

EI has been constructed as both scale measures, and one-item identifiers (Krueger *et al.*, 2000, Peterman and Kennedy, 2003, Veciana *et al.*, 2005). The measure was taken from a larger Entrepreneurial Intention Questionnaire (EIQ) by Liñán and Chen (2009). It consists of six items on a seven point Likert scale such as *'I am determined to create a firm in the future'* rated from 1 (total



disagreement) to 7 (total agreement). It was used on students by Iakovleva, Kolvereid, and Stephan (2011) where students of developing countries recorded high EI levels.

#### **5.3.4 Entrepreneurial Passion (EP)**

The affective state of enjoyment has been found to be positively related to student motivation and performance (Pekrun, Elliot and Maier, 2009). Nabi *et al.* (2017) analysed 159 published articles from 2004-2016, noting a shortage in the study of emotion. The authors highlighted the lack of investigation into EP in EE studies, and called for more:

*“Although entrepreneurship is considered to be a ‘journey of the heart’ and the importance of understanding entrepreneurial emotion (affect, emotions, feelings), especially during the new venture creation process is acknowledged [...], there is surprisingly little empirical research in our review that focuses on emotion-based impact indicators”*

(Nabi *et al.*, 2017, p. 18)

Lepoutre *et al.* (2010) suggest emotion (including EP) may make crucial contributions to EE research. It has been mentioned in models relating to EE and entrepreneurial learning (Lackéus, 2014; 2015). Despite this, while other forms of passion and emotion have been tested successfully on student samples (De Clercq, Honig, and Martin, 2012; Zampetakis *et al.*, 2015); few empirical studies of EP have been conducted in entrepreneurship education to date. Cardon *et al.* (2013) used MBA students as part of their EP measure construction, finding them to react differently to entrepreneurs in passion for ‘founding’ a business. Using the Cardon scale, Nasiru *et al.* (2014) found a relationship between passion for founding and student EI. In an EE module, Fellnhofer (2017) found significant direct and indirect effects of entrepreneurial role models on EI, as mediated by EP.

Within the empirical analysis, two measures of EP are tested. The first was derived from a scale for harmonious passion by Vallerand *et al.* (2003), adapted for entrepreneurship by Murnieks *et al.* (2014). It is a six-item Likert scale including items such as ‘*For me, being an entrepreneur is a passion*’. One of the items was removed, as it was closely associated to entrepreneurial intentionality (‘*my intention is to become an entrepreneur*’). The second EP measure created by Cardon *et al.* (2013)

contains two dimensions (Intense Positive Feelings and Identity Centrality), across the three domain roles of inventing, founding, and developing. Only two of the three roles herein were used, as the ‘developer identity role’ was thought too future-oriented for first year students. This resulted in a five item (inventing role) and four items (founding), as per the Nasiru *et al.* (2014) study.

## **5.4 Methodology**

### **5.4.1 Survey Design and Pilot**

The survey measures described in the previous samples were integrated with a module feedback survey (see Appendix D). It was acknowledged that within the survey the measures had varying Likert scale point ranges were used. This was in keeping with the EI and ESE instrument forms, and to extend the GET measure while keeping the dichotomous (no mid-point) structure. Preston and Colman (2000) in studying varying scale (item and choice) types, found scale measures had similarly enhanced reliability, validity, and discriminating power when having between five to seven response points. To aid respondent clarity in answering, the entrepreneurial scale measures distanced from one another, placed between other open ended, demographic or feedback questions. All measures were positioned from a negative to a positive agreement spectrum (disagree to agree) to aid flow and conformity to the survey.

Before the surveys were released to the students they were piloted within the research team by asking a number of teaching assistants (six students who were formally students of the programme) to complete the survey. From their feedback, it was found that the 2012/13 survey (due to the 54 item GET test in large part) was perceived as quite long. In an effort to reduce the survey, the number of additional questions (feedback/demographic) was reduced.

### **5.4.2 Sample Group and Sampling**

There were two main datasets used within the analysis. Firstly, a questionnaire containing measures of ESE, EI, and trait constructs was disseminated in November 2012 to DICE and NGM students (See Appendix D). The second dataset was collected in November 2014 and pertained to a survey containing two versions of an EP measure (Murniek *et al.*, 2014 and Cardon *et al.*, 2013). This second study questionnaire (see Appendix H) was disseminated to the undergraduate DICE class group, the postgraduate management (NGM) students, and to a group of accounting undergraduate third year students taking a module of Business Strategy. The accounting class were thought to be an adequate control (or differentiating) group as it is a three year degree programme wherein the majority of students aim to be directly employed in accountancy firms and thus may have differing levels of entrepreneurial tendencies or expectancies to the DICE or NGM cohort. Both instances of data collection were followed up by a retest survey at the end of the course (May) as indicated in Table 5.2 and located in Appendix E and I.

### **5.4.3 Missing Data and Screening**

The surveys were downloaded to Microsoft Excel where the datasets were screened for completeness. A number of students viewed the survey or marginally attempted it, but did not complete fully. As a result, cases missing in excess of 50% missing data of either time-point were omitted during the screening process as invalid responses. Cases missing over 10% of timeone/two were scrutinised, considered MCAR (Missing Completely at Random), and were removed via listwise deletion. Despite this, the response rates were deemed acceptable for all iterations (See Table 5.2) and comparable to studies of this nature (Shinnar *et al.*, 2014). Missing data cases under 10% were examined in Microsoft Excel and the decision was made to ignore them as 1) they were minimal (less than 1% per item column); 2) the measurement instruments were the focus of the study more than the respondents. Once the datasets were screened, the time one and two results were matched and analysed using SPSS (Version 23)<sup>7</sup>.

<sup>7</sup> For the 2014/15 dataset only the DICE cohort were matched for the test-retest analysis.

**Table 5-2: Data Collection for Measure Comparison Study**

	<b>2012/13</b>	<b>2014/15</b>
<i>Main variables included in survey</i>	ESE, EI, GET test (trait)	EP (2 types)
<i>Released time one survey</i>	November 2012	November 2014
<i>Number of students in class group</i>	365 (DICE) 145 (NGM) = 510 students	356 (DICE); 50 (Accounting); 135 (NGM) = 541 students
<i>Number of students who viewed survey</i>	490 (96.08% of total)	539 (99.6%)
<i>Number of students who got to survey end</i>	355 (69.61% of total)	413 (76.34%)
<i>Cases removed during screening</i>	13 removed (over 10% missing data)	Four removed (outlier year groups indicated – 2 <sup>nd</sup> /3 <sup>rd</sup> years)
<i>Useable responses</i>	342 (67.06% of total)	409 (75.60% of total)
<b>Time Two Data Collection</b>		
<i>Released time two survey</i>	April – May 2013	April – May 2015
<i>Number attempted T2 survey</i>	No NGM did survey 360 (98.63% of DICE)	281 DICE (only DICE included in retest, 76.99%)
<i>Number completed T2 survey</i>	306 (85% of DICE)	257 DICE (72.19% of DICE)
<i>Cases removed during T2 screening</i>	20 cases with missing data over 10%; 24 duplicate ID numbers; ten unengaged responses.	12 cases with missing data over 10% / duplicate ID numbers. Final dataset 245 responses (68.82%)
<i>Matched pairs</i>	205 DICE matched (56.16%)	177 DICE matched (49.72%)
DICE = Digital Innovation Creativity and Enterprise (undergraduate 1 <sup>st</sup> year cohort); NGM = Next Generation Management (postgraduate 1 <sup>st</sup> year cohort); T1= Time one survey collection; T2 = Time two survey collection.		

The respondents of the 2012/13 questionnaire were predominantly in first year (75.4%) and from Ireland (82.9%). Students ranged in degree programme, with the highest number (47.9%) found to be in business studies. The majority time one respondents of the 2014/15 questionnaire were also in first year, and from Ireland. There were a higher percentage of students indicating a family connection to entrepreneurship and/or management in the 2014/15 sample, possibly due to the addition of the accounting class to the sample.

**Table 5-3: Demographic Characteristics**

		<i>2012/13 (N= 456)</i>		<i>2014/15 (N=409)</i>	
<i>Demographic</i>		<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
<b>Year</b>	1 <sup>st</sup>	344	75.4%	328	80.2%
	Postgraduate	112	24.6%	81	19.8%
<b>Gender</b>	Male	268	58.8%	222	54.3%
	Female	188	41.2%	187	45.7%
<b>Degree Programme</b>	Computer Applications	24	5.3%		
	International Business	39	8.6%		
	Business Studies	218	47.9%		
	Ecommerce	54	11.9%		
	Marketing	33	7.3%		
	Business Management	25	5.5%		
	E-Commerce	28	6.2%		
European Business	34	7.5%			
<b>Module</b>	DICE			310	75.8%
	NGM			58	14.2%
	Accounting			30	7.3%
	Other			11	2.7%
<b>Age</b>		Mean = 20.38	SD = 4.19	Mean = 19.87	SD = 3.995
<b>Nationality</b>	Ireland	378	82.9%	339	82.89%
<b>Family entrepreneur /management experience</b>	No	291	82%	245	59.9%
	Yes	64	18%	161	39.4%
<b>Teamwork Preferences</b>	Working on own	135	38.0%	201	49.1%
	Working in pair	99	27.9%	110	26.9%
	Working in a team	121	34.1%	98	24.0%

## 5.5 Results

### 5.5.1 Reliability Results

All scale measures were tested for internal consistency by calculating the Cronbach's Alpha values for each, and then for test-retest reliability, as discussed in Chapter 4.

*Internal Consistency:* The composite GET test had a Cronbach's Alpha coefficient of 0.779 (DICE) and 0.776 (NGM). Usually between 0.7 - 0.8 is deemed acceptable, however in order for the 54-item scale to attain the recommended base item-total correlations of .3, a Cronbach's Alpha value of .96 is required. Instead, the GET test noted extremely low mean inter-item correlations of .063/.062. In addition, the sub-scale Cronbach's Alpha values were under acceptable levels (see Table 5.4). The ESE scale obtained a Cronbach's Alpha value of .811 for the DICE cohort and .783 for NGM. To reach .8 (highly reliable), such a four-point scale would need mean inter-item correlations of .5. The measure scored values of .518 (DICE) and .474 (NGM) which are both acceptable. The EI measure which consists of six items was also found to be highly reliable as it attained a Cronbach's Alpha value of .811 (DICE) and .962 (NGM) with mean inter item correlations of .774 and .806 respectively. In the 2014/15 dataset, both EP measures showed reliability (Table 5.5) as they showed high Cronbach's alpha and inter-item correlations for both cohorts.

*Test-Retest Reliability:* The instruments were compared in terms of their test-retest reliability using the Intra-class correlation coefficient (ICC) (one way random). All instrument measures displayed significant scores (as shown to the right of Table 5.4 and Table 5.6), however the Need for Autonomy dimension was low, and not considered viable.

### 5.5.2 Validity Results

*Construct Validity:* Using T-tests, the construct validity of the entrepreneurial measures were examined by comparing their results by gender. As males tend to score higher on entrepreneurial measures than females, it was expected that this should be reflected in the measure results (Lee and Wong, 2003).

**Table 5-4: Internal Consistency and Test-Retest Reliability for ET, ESE and EI**

	No of items	Undergraduate (DICE)		Postgraduate (NGM)		T1 to T2 Comparisons		
		Cronbach's Alpha	Mean Inter-item Correlations	Cronbach's Alpha	Mean Inter-item Correlations	N	Intraclass correlation	95% Confidence interval
General Enterprise Tendency (T1)	54	0.779	0.063	0.776	0.062	205	.681**	600-.748
<i>NaCH T1</i>	12	0.547	0.094	0.546	0.090	205	.597**	.501-.678
<i>NforAuto T1</i>	6	0.294	0.064	0.296	0.068	205	.321**	.193-.439
<i>CreativeT T1</i>	12	0.527	0.090	0.480	0.077	205	.649**	.562-.722
<i>RiskT T1</i>	12	0.585	0.109	0.595	0.117	205	.655**	.570-.727
<i>LocusofC T1</i>	12	0.470	0.072	0.523	0.085	205	.541**	.437-.631
Entrepreneurial Self-Efficacy(T1)	4	0.811	0.518	0.783	0.474	205	.594**	.497-.676
Entrepreneurial Intentionality(T1)	6	0.954	0.774	0.962	0.806	205	.629**	.537-.706

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level (2-tailed)

**Table 5-5: Internal Consistency for EP Measures**

	Undergraduate (DICE)		Undergraduate (Strategy)		Postgraduate (NGM)	
	Cronbach's Alpha	Mean Inter-item Correlations	Cronbach's Alpha	Mean Inter-item Correlations	Cronbach's Alpha	Mean Inter-item Correlations
EP (Murnieks)	.920	.753	.874	.653	.938	.807
EP (Cardon)	.875	.438	.931	.602	.881	.451
<i>Founding</i>	.895	.678	.899	.688	.917	.744
<i>Inventing</i>	.796	.447	.887	.608	.795	.443

**Table 5-6: Test-Retest Reliability for EP**

		DICE T1 to T2	
	N	Intraclass correlation	95% Confidence interval
EP (Murnieks)	172	.782**	.545-.722
EP (Cardon)	167	.780**	.698-.839
<i>Founding</i>	167	.798**	.726-.851
<i>Inventing</i>	164	.722**	.622-.796

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level (2-tailed)

**Table 5-7: Independent Samples T-test of ET, ESE, and EI by Gender**

Measures (Time one)	Males		Females		Levene's Test for Equality of Variances			t-test for Equality of Means		
	M	Std Dev	M	Std Dev	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference M
General Enterprise Tendency	207.995	17.809	206.993	17.483	.000	.986	.527	353	.598	1.002
- <i>Need for Achievement</i>	45.612	5.528	47.705	6.393	1.623	.204	-3.295	353	.001	-2.093**
- <i>Need for Autonomy</i>	20.573	2.989	20.047	3.307	3.925	.048	1.539	299.2	.125	.526
- <i>Creative Tendency</i>	44.816	5.592	44.604	5.642	.071	.790	.350	353	.726	.212
- <i>Risk Taking</i>	47.767	6.279	46.275	5.213	3.400	.066	2.369	353	.018	1.492*
- <i>Locus of Control</i>	49.228	5.556	48.362	4.996	1.983	.160	1.511	353	.132	.866
Entrepreneurial Self-Efficacy	13.375	2.777	12.728	2.611	.646	.422	3.237	351	.001	.947**
Entrepreneurial Intentions	25.536	9.397	23.09	9.904	.508	.477	2.222	310	.027	2.447*

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level (2-tailed)



**Table 5-8: Independent Samples T-Test of ET, ESE, and EI by Course**

Measures (Time one)							Levene's Test for Equality of Variances			t-test for Equality of Means		
	<i>Undergraduate (DICE)</i>		<i>Undergraduate (Accounting)</i>		<i>Postgraduate (NGM)</i>		<i>F</i>	<i>Sig.</i>	<i>t</i>	<i>Df</i>	<i>Sig. (2- tailed)</i>	<i>Mean Difference</i>
	<i>M</i>	<i>Std Dev</i>	<i>M</i>	<i>Std Dev</i>	<i>M</i>	<i>Std Dev</i>						
EP Murnieks	18.874	5.784			17.357	6.621	2.414	.121	1.765	364	.078	1.517
EP Cardon	33.155	5.813			33.000	6.018	.257	.612	.184	351	.854	.155
- <i>Inventing</i>	<i>18.505</i>	<i>3.036</i>			<i>19.113</i>	<i>2.848</i>	<i>.003</i>	<i>.956</i>	<i>-1.423</i>	<i>358</i>	<i>.156</i>	<i>-.618</i>
- <i>Founding</i>	<i>14.660</i>	<i>3.539</i>			<i>13.931</i>	<i>3.959</i>	<i>7.861</i>	<i>.173</i>	<i>1.409</i>	<i>359</i>	<i>.160</i>	<i>.729</i>
EP Murnieks	18.874	5.784	16.167	5.086			.836	.361	2.472	338	.014	2.708*
EP Cardon	33.155	5.813	29.759	7.278			2.942	.087	2.932	323	.004	3.397**
- <i>Inventing</i>	<i>18.505</i>	<i>3.036</i>	<i>16.633</i>	<i>3.671</i>			<i>1.591</i>	<i>.208</i>	<i>3.157</i>	<i>331</i>	<i>.002</i>	<i>1.872**</i>
- <i>Founding</i>	<i>14.660</i>	<i>3.539</i>	<i>13.241</i>	<i>3.988</i>			<i>.439</i>	<i>.508</i>	<i>2.039</i>	<i>330</i>	<i>.042</i>	<i>1.419*</i>
EP Murnieks			16.167	5.086	17.357	6.621	3.060	.084	.858	84	.393	1.190
EP Cardon			29.759	7.278	33.000	6.018	1.225	.271	2.198	84	.031	3.241*
- <i>Inventing</i>			<i>16.633</i>	<i>3.671</i>	<i>19.113</i>	<i>2.848</i>	<i>1.327</i>	<i>.253</i>	<i>3.500</i>	<i>85</i>	<i>.001</i>	<i>2.489**</i>
- <i>Founding</i>			<i>13.241</i>	<i>3.988</i>	<i>13.931</i>	<i>3.959</i>	<i>.072</i>	<i>.789</i>	<i>.764</i>	<i>85</i>	<i>.447</i>	<i>.689</i>

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level (2-tailed)

However, because the link between gender and passion was been found to be insignificant (Mageau et al., 2009), EP was assessed for criterion validity using a course-level factor. The GET test in its composite form produced no significant results when tested against gender (Table 5.7), however, two dimensions did show significant differences, with Need for Achievement testing higher for females, and Risk Taking higher in males. The ESE measure was significantly higher in males ( $M = 13.375$ ,  $SD = 2.777$ ), than females ( $M = 12.728$ ,  $SD = 2.611$ ). Similarly, the EI measure found males ( $M = 25.536$ ,  $SD = 9.397$ ) to have higher scores than females ( $M = 23.09$ ,  $SD = 9.904$ ). As seen in Table 5.8, the undergraduate accounting students displayed a significantly lower EP score to the DICE students for both measures, and no significant differences were noted between NGM and DICE. The undergraduate Accounting students noted a significant difference to the postgraduate NGM group for the Cardon EP (inventing) role, but not the Murnieks EP nor EP (founding).

*Content and Face Validity:* As all the scales were previously conceptualised and created by scholars in the field who considered the themes and items in the scale, it was accepted that to some degree all scale measures have a previously established level of content validity. A small group of students (and teaching assistants) checked face validity during the questionnaire development stage. The group was asked to read the questionnaire and mark any aspects they did not understand or felt did not make sense. Based on their recommendations, a number of minor changes were made to the wording of the Cardon EP measure. The items were adapted slightly to make them more amenable to the student population, for example, the item '*owning my own company energises me*' was changed to '*the idea of owning my own company energises me*'.

*Criterion (Predictive/Concurrent) Validity:* The scale measures were compared to student grades to assess their predictive properties. In the 2012/13 dataset, the measures were compared to the performance grade to examine predictive validity. Both GET and ESE were positively correlated with performance, while EI was not (Table 5.9). In the 2014/15 sample, the scale measures were related

to 'expected grade' which students were asked in the survey. Both measures were significantly and positively related to expected grade, supporting concurrent reliability (Table 5.10).

**Table 5-9: Correlation Matrix of 2012/13 Sample**

	<i>Mean</i>	<i>SD</i>	<i>GET</i>	<i>ESE</i>	<i>EI</i>
General Enterprise Tendency test	207.57	17.65	-		
Entrepreneurial Self-Efficacy	13.28	2.75	.328**	-	
Entrepreneurial Intentionality	24.49	9.68	.388**	.464**	-
Performance	50.01	13.78	.195**	.147*	.029

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level (2-tailed)

**Table 5-10: Correlation of 2014/15 Measures (Time one dataset)**

	<i>Mean</i>	<i>Std. Dev</i>	<i>EPM</i>	<i>EPCI</i>	<i>EPCF</i>	<i>EPC</i>	<i>GSE</i>
EP Murnieks	18.51	5.937	-				
- EP Cardon Inventing	18.49	3.119	.604**	-			
- EP Cardon Founding	14.45	3.679	.827**	.557**	-		
EP Cardon	32.92	6.038	.824**	.860**	.903**	-	
General Self-Efficacy	32.24	3.698	.367**	.395**	.263**	.366**	-
Expected Grade	71.29	47.273	.244**	.233**	.179**	.229**	.258**

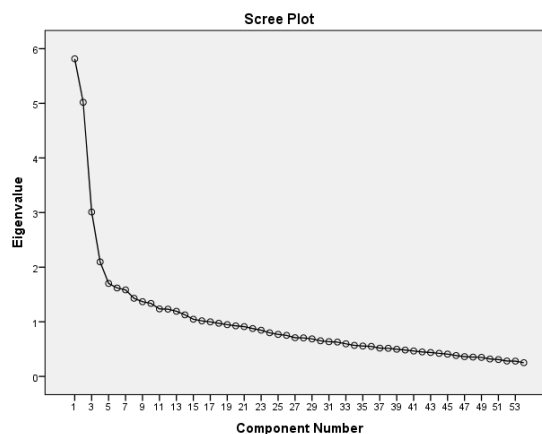
\* Significant at the 0.05 level; \*\* Significant at the 0.01 level (2-tailed)

*Convergent/Discriminant Validity:* Pearson product-moment correlations were used to determine relationships between variables (Table 5.9 and 5.10). In the 2012/13 dataset, all relationships between scales were positively significant, indicating convergence between the constructs yet not overly so (multicollinearity), which would indicate they are measuring the same construct. In the 2014/15, data sample, the total scores for both EP measure correlated, which indicates they measure similar constructs. They show discriminant validity, as they are not closely related to general self-efficacy.

*Factor Structure:* All scale measures were examined using Principle Component Analysis (PCA) with Direct Oblim rotation in SPSS. Considering the GET test, the Kaiser-Meyer-Oklin value was acceptable at .768, and Bartlett's test of Sphericity reached significance. PCA revealed 16 components with eigenvalues greater than one, accumulating to 58.95% of the total variance. An inspection of the screeplot (Figure 5.1) indicates a break after the third and fourth component, but this is not evident. The factors that the test reduced to did not relate to the sub-dimensions in any clear

fashion (Need for Achievement, Need for Autonomy, Creative Tendency, Risk Taking, and Locus of Control). In fact, the first factor loading included a mix of all (found in Appendix L).

**Figure 5-1: Scree Plot of GET Test**



Taking each of the sub-dimensions separately using exploratory factor analysis all showed the presence of four components, except Need for Autonomy that noted three. This indicates that even within the specific dimensions of the GET test, the items do not converge.

**Table 5-11: Principal Components Analysis of ESE**

<i>No.</i>	<i>Items</i>	<i>Factor</i>
1	Successfully identifying new business opportunities	.808
2	Creating new products	.832
3	Thinking creatively in business	.757
4	Commercialising an idea or new development	.766
	Eigen Value	2.505
	% Variance explained	62.616%

Studying the ESE measure, the Kaiser-Meyer-Oklin value was .784 and Bartlett’s test of Sphericity reached significance. PCA revealed one component with an eigenvalues greater than one, accumulating to 62.62% of the total variance. The EI measure attained a KMO value of .898 and Bartlett’s test of Sphericity reached significance. PCA revealed one component with an eigenvalue greater than one, accumulating to 82% of the total variance and the scree plot confirmed this. In the 2014/15 dataset, the Murniek EP measure (four items) attained a KMO value of .817 and Bartlett’s test of Sphericity reached significance.

**Table 5-12: Principal Components Analysis of EI**

<i>No.</i>	<i>Items</i>	<i>Factor</i>
1	I'm ready to make anything to be an entrepreneur	.790
2	My professional goal is becoming an entrepreneur	.921
3	I will make every effort to start and run my own firm	.948
4	I'm determined to create a firm in the future	.943
5	I have very seriously thought in starting a firm	.892
6	I've got the firm intention to start a firm some day	.931
	Eigen Value	4.920
	% Variance explained	82.0%

**Table 5-13: Principal Components Analysis of EP (Murnieks) Scale**

<i>No.</i>	<i>Items</i>	<i>Factor</i>
1	I am passionate about entrepreneurship	.921
2	The more I find out about starting a new business the more I want to do it myself	.919
3	Thinking of new opportunities for business really excites me	.900
4	I am completely obsessed with the idea of having my own company	.877
	Eigen Value	3.271
	% Variance explained	81.78%

**Table 5-14: Principal Components Analysis of EP (Cardon) Scale**

<i>No.</i>	<i>Items</i>	<i>Factors</i>	
		1	2
1	I am motivated to figure out how to make an existing project better	.778	
2	Searching for new ideas for products/services to offer is enjoyable to me	.768	
3	It is exciting to figure out new ways to solve market needs	.732	
4	Inventing new solutions to problems is an important part of who I am	.729	
5	Looking for new opportunities really excites me	.718	
6	The idea of owning my own company energizes me		-.966
7	The idea of establishing a new company excites me		-.900
8	Being the founder of a business will be an important part of who am		-.878
9	The idea of nurturing a new business through its emerging success would be enjoyable		-.706
	Eigen Value	4.666	1.316
	% Variance explained	51.848%	14.622%

PCA revealed one component with an eigenvalues greater than one, accumulating to 81.78% of the total variance. An inspection of the scree plot supported a one-factor model. The Cardon EP scale is

conceptualised as identity roles (inventor, founder, developer), thus was expected to separate into these components. As outlined, two of the dimensions were used in the analysis EP (inventing) (five items) and EP (founding) (four items). The exploratory factor analysis split the items into these two factors, with a combined total variance of 66.47% (Table 5.14)

## **5.5 Measure Adaptation**

As outlined, the GET test displayed worrisome factor structure and reliability results. To improve the measure for the EE context, it was re-examined by studying its face and content validity (i.e. do the questions make sense to the student, and do they make sense theoretically), and then through an examination of the factor structure. It was considered that a number of items were quite ambiguously related to the factor proposed for them. For example, the item description '*I prefer doing things in the usual way rather than trying out new methods*' relates to the creative tendency dimension however '*I do not like to do things that are novel or unconventional*' (reverse scored) related to Need for Autonomy. In addition, recent extant literature and the current move toward competency-based traits were considered in the analysis.

A proposed revision to the test was created which utilised 14 of the original 54 items (Table 5.15). The revision proposes new factors dimensions for these items, namely: Personal Risk/Sacrifice (three items); Work ethic/Locus of Control (three items); and Entrepreneurial Spirit/Tenacity (eight items). The resulting factor structure explained 44.995% of the total variance ( $KMO = .854$ ). The Cronbach's Alpha value for the composite measure (14 item) was .797 with mean item-total correlations of .222 that is measurably better than the original. The Cronbach's Alpha values for the dimensions were improved at .550, .615, and .715 respectively. While this revision of the GET test may be more beneficial for use in the student context, further analysis and testing would be required to legitimise this revised scale measure.

**Table 5-15: Revised GET Test Items and Factor Loadings**

<i>Item</i>	<i>Initial Dimension</i>	<i>Pattern Matrix</i>		<i>Item Question</i>	<i>New Dimension</i>
<b>GET 38</b>	Risk taking			.541 <i>I would rather take an opportunity that might lead to even better things than have an experience that I am sure to enjoy</i>	Personal risk/sacrifice
<b>GET 20</b>	Risk taking			.678 <i>If I had a good idea for making some money, I would be willing to invest my time and borrow money to enable me to do it</i>	Personal risk/sacrifice
<b>GET 46</b>	Need for Achievement			.812 <i>I get up early, stay up late or skip meals if I have a deadline for some work that needs to be done</i>	Personal risk/sacrifice
<b>GET 24</b>	Need for Achievement		.663	<i>It is more important to do a job well than to try to please people</i>	Work Ethic/ Locus of Control
<b>GET 34</b>	Locus of Control		.814	<i>Being successful is a result of working hard, luck has little to do with it</i>	Work Ethic/ Locus of Control
<b>GET 52</b>	Locus of Control		.553	<i>I get what I want from life because I work hard to make it happen</i>	Work Ethic/ Locus of Control
<b>GET 42</b>	Need for Achievement	.473	.366	<i>When I am faced with a challenge I think more about the results of succeeding than the effects of failing</i>	Ent. Spirit/ Tenacity
<b>GET 2</b>	Risk taking	.713		<i>When I have to set my own targets, I set difficult rather than easy ones</i>	Ent. Spirit/ Tenacity
<b>GET 26</b>	Creative Tendency	.673		<i>Other people think that I ask a lot of questions</i>	Ent. Spirit/ Tenacity
<b>GET 54</b>	Risk taking	.566		<i>I like to start new projects that may be risky</i>	Ent. Spirit/ Tenacity
<b>GET 14</b>	Creative Tendency	.557		<i>I like to find out about things even if it means handling some problems whilst doing so</i>	Ent. Spirit/ Tenacity
<b>GET 10</b>	Need for Achievement	.549		<i>I like challenges that really stretch my abilities rather than things I can do easily</i>	Ent. Spirit/ Tenacity
<b>GET 18</b>	Risk taking	.391		<i>I will take risks if the chances of success are 50/50</i>	Ent. Spirit/ Tenacity
<b>GET 44</b>	Creative Tendency	.360		<i>I can handle a lot of things at the same time</i>	Ent. Spirit/ Tenacity
Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. Rotation converged in 6 iterations. Ent. = Entrepreneurial.					

## 5.6 Discussion

The aim of this empirical study was to measure the reliability, validity, and factor structure of a number of entrepreneur-related variables when applied to the context of EE. Entrepreneurial self-efficacy, intentions, traits, and passion were examined in the analysis (see summary of the key findings in Table 5.16).

All measures displayed high internal consistencies however the GET test (as a proxy for entrepreneurial trait theory) recorded a low internal reliability both as a composite measure, or separated into its dimensions, implying that the measure may be limited in its consistency and stability. Test-retest reliability was accepted for the majority of measures supporting their use in repeated trial or pre/post research designs. Construct validity was tested via the contrasting groups method, where the ESE and EI measures attained expected results in distinguishing between gender, while the GET(trait) test produced insignificant results. In studying the dimensions of the GET test separately, Risk Taking (higher in males) and Need for Achievement (higher in females) attained significant scores. Both of these traits are frequently tested in entrepreneurship and these results indicate they may be more discerning or reliable than the other dimensions. It could also be speculated that due to the social needs of students and sense of independence during this phase of their development, they may not react to 'Need for Autonomy' or 'Locus of Control' as expected. For the two scales measuring EP, parallels were found when comparing the class groupings (postgraduate EE course vs undergraduate EE course vs undergraduate non-EE course). While both EP measures displayed adequate construct validities, the Cardon measure noted differing results in its 'inventing' dimension between the postgraduate and undergraduate (non-EE) cohort, but this difference was not detected in the Murnieks EP scale or the EP (founding) dimension. This could be considered a strength in validity for the Cardon EP measure as it may show a more nuanced portrayal of the respondent. ESE and trait measures were significantly correlated to the performance variable, indicating predictive validity.



**Table 5-16: Comparison of Measures for Entrepreneurship Education Inquiry**

	(a) General Enterprise Tendency Test	(b) Entrepreneurial Self-Efficacy	(c) Entrepreneurial Intentionality	(d) Entrepreneurial Passion (Murnieks)	(e) Entrepreneurial Passion (Cardon)
<i>Type/Theory</i>	Trait	Self-Efficacy	Intentionality	Passion	Passion
<i>Source</i>	Caird (1991)	Zhao et al. (2005)	Liñán and Chen (2009)	Murnieks <i>et al.</i> (2012)	Cardon <i>et al.</i> (2009)
<i>No of items</i>	54	4	6	5 (1 omitted)	9 (developer role omitted)
<i>Type</i>	Likert	Likert	Likert	Likert	Likert
<i>Cronbach's Alpha</i>	Undergrad (.779); Postgrad (.776)	Undergrad (.811); Postgrad (.783)	Undergrad (.954); Postgrad (.962)	DICE (.920); (Acc) (.874); NGM (.938)	DICE (.875); Acc (.931); NGM (.881)
<i>Mean Inter-item Correlations</i>	Undergrad (.063), Postgrad (.062)	Undergrad (.518); Postgrad (.474)	Undergrad (.774); Postgrad (.806)	DICE (.753), Acc (.653); NGM (.807)	DICE (.438); Acc (.602); NGM (.451)
<i>Test-retest reliability</i>	ICC = .681**	ICC = .594**	ICC = .629**	ICC = .782**	ICC = .780**
<i>Construct Validity</i>	Did not differentiate between males and females (2 dimensions did)	Differentiated between males and females	Differentiated between males and females	Differentiated between DICE and Acc, but not between DICE and NGM, or Acc and NGM	Differentiated between DICE and Acc but not DICE and NGM, partially between NGM and Acc
<i>Content Validity</i>	Assumed	Assumed	Assumed	Assumed	Assumed
<i>Face Validity</i>	Considered appropriate	Considered appropriate	Considered appropriate	Considered appropriate	Considered appropriate, minor changes made
<i>Criterion validity</i>	Positive significant relationship to performance	Positive significant relationship to performance	Positive non-significant relationship to performance	Positive significant relationship to expected performance	Positive significant relationship to expected performance
<i>Convergent validity</i>	Positive significant relationship with other measures but no multicollinearity	Positive significant relationship with other measures but no multicollinearity	Positive significant relationship with other measures but no multicollinearity	Positive significant relationship with other measures but no multicollinearity	Positive significant relationship with other measures but no multicollinearity
<i>Factor analysis</i>	No convergence found	1 factor model	1 factor model	1 factor model	2 factor model

The EP measures were tested using the students expected grades and both were found to be concurrently and comparably related. All measures had adequate face and content validity, as well as convergent and discriminant properties.

The findings of the literary and empirical analysis support the use of the ESE and EE measures in context. It was observed that the ESE measure was stable and displayed good reliability, validity, and factor structure throughout, which supports the study of Shinnar *et al.* (2014). While EI did not display predictive abilities for grade performance, this theoretically may be rationalised. The measure has been recommended using student sample groups and displayed a strong factor structure. Thus, both ESE and EI are recommended for use on the EE student context, noting that these attained higher results for males during the analysis.

The GET test displayed poor reliability and structural validities and would not be recommended for future research without significant revision. To make the instrument more appropriate for use in this context, a revision of the GET test was developed and presented. Lastly, both measures of EP displayed good reliability and validity results in the EE context and would be recommended for use. As the Cardon EP, measure showed a potential ability to obtain a deeper, more discerning picture of the student; this could be a useful measure in understanding the affective responses of students. However, if a researcher required a strong, short composite measure, the Murnieks EP measure is appropriate.

Considering limitations of the study, the measurement instruments selected for analysis are admittedly not reflective of their respective theory in its entirety, and should not be viewed as such. In particular, the empirical concerns related to the GET test in the student context should not and does not discredit trait theory, merely recommends a revision. It is also acknowledged that there are other theories and instruments that could have been investigated (e.g. learning theory - the perceived learning scale by Rovai *et al.*, 2009). Secondly, the intention was to assess and present the measures in parallel for objective comparison, though it is known that some studies embed these constructs within integrated models (Krueger and Brazeal, 1994; Chen *et al.*, 1998; Zhao *et al.*, 2005; Wilson *et*

*al.*, 2007). Lastly, the empirical analyses of the EP construct at a second time point (i.e. not in the same data collection as ESE, EI and ET) reduced the ability of the study to be a direct comparison.

## **5.7 Chapter Summary**

This chapter investigated a series of four prominent entrepreneurial tendency indicators to ascertain whether they are ‘fit-for-purpose’ in the EE student context. The theoretical background and an overview of past works was provided, before an empirical study was conducted to evaluate each of these constructs reliability, validity, and factor structure. The study noted that the measures used to study ESE, EI and EP were amenable to the examination of the EE student, while the measure examining entrepreneurial trait theory displayed inconsistent results. The findings of this study help to strengthen the use of these measures in future studies of the thesis, and respective field. Conclusions pertaining to the findings of this study will be presented in Chapter 9.

In the next chapter (Chapter 6), an individual level analysis will be conducted based on Social Cognitive Career Theory, studying factors affecting student entrepreneurial intentions, and interest in EE. A number of the constructs examined in this current chapter (namely ESE and EI) will be again employed to understand their development in the EE student.

**CHAPTER 6: Determinants of Student  
Entrepreneurial Efficacy, Intentions, and Interest**

## 6.1 Abstract

**Aim:** To examine factors affecting student entrepreneurial intentions, and interest in entrepreneurship education, using the Social Cognitive Career Theory.

**Methodology:** The study was conducted using a sample group of undergraduate business students, surveyed at both the outset and conclusion of a yearlong entrepreneurship education module. Preliminary analysis was conducted using paired samples T-tests to study entrepreneurial tendency indicator changes, and gender effects. The model and hypotheses were tested using consistent PLS algorithm and bootstrapping analyses in Smart-PLS3, on a sample of 177 matched student responses. A number of mediated relationships were also examined in the analysis.

**Results:** Male students had significantly higher entrepreneurial self-efficacy (ESE) levels than females at time one, however only females recorded a significant increase between time points. The model analysis found that ESE predicted entrepreneurial intentionality and interest in the module. Entrepreneurial experience directly predicted entrepreneurial intentions, but was unrelated to ESE. Creativity training and individual creativity were both found to predict ESE, and indirectly had a significant effect on the two dependant factors (entrepreneurial intentions/ interest in the EE module) as mediated by ESE.

**Contribution:**

1. The exploration of creativity in the study of entrepreneurship education: It has been suggested that entrepreneurship education should be linked to creativity however much is still unknown (Berglund and Wennberg, 2006; Hamidi *et al.*, 2008; Book and Philips, 2013; Lewis and Elaver, 2014). Individual creativity as self-perceptions of idea generation was found to predict entrepreneurial self-efficacy, intentionality, and interest in EE, as did the delivery of creativity training.
2. Shaping entrepreneurial self-efficacy beliefs prior to third level: Much of the ESE level was predicted by antecedent factors to the entrepreneurship education module. Thus, students have entrepreneurial tendencies and attitudes prior to university and the study supports the continuing focus on entrepreneurship at second level.

**Keywords:** entrepreneurship education, self-efficacy, passion, social loafing, entrepreneurial experience.

## 6.2 Introduction

Given the increasing entrepreneurial opportunities open to youth, more research investigation of antecedent student factors affecting entrepreneurship education at third level is required (Lorz *et al.*, 2013; Bae *et al.*, 2014). Previously, Fayolle and Gailly (2015) studied the impact of EE on entrepreneurial career intentionality, using a research design which acknowledged student prior experience. Similarly, this study examines factors proposed to affect individual student

entrepreneurial self-efficacy (ESE), entrepreneurial intentionality (EI), and lastly, student interest in entrepreneurship education (EEI). The study is conducted using Social Cognitive Career Theory (SCCT) as the theoretical lens. The SCCT has been studied in a multitude of contexts (Lent and Brown, 2017), however as indicated from the meta-analytic study of Sheu and Bordon (2017) there does not appear to be any Irish study which applies it. The SCCT framework used is the adapted version proposed by Bernstein and Carayannis (2012) for entrepreneurship education, which has not empirically been studied to date. This chapter begins by examining the previous application of the SCCT in context. Next, the related hypothesised relationships are proposed and then tested in a quantitative survey analysis. Lastly, the results and a discussion of key findings are provided.

### **6.3 Theoretical Framework**

Introduced in Chapter 2, the Social Cognitive Career Theory (SCCT) consists of four interlocking models depicting interest development, career choice, performance attainment, and lastly, educational and work satisfaction (or well-being) in a given career domain (Lent and Brown, 1994; 2017). These models are said to highlight the interplay of cognitive, personality, affective and environmental variables in understanding complex behaviour (Sheu and Borden, 2017). It is thought applicable to entrepreneurship literature as it ties many entrepreneurial constructs together (Liguori, 2012).

*“SCCT provides a unifying framework that unites conceptually similar constructs (e.g. entrepreneurial outcome expectations, and entrepreneurial self-efficacy), offers rationale to explain entrepreneurial outcomes (e.g. entrepreneurial intentions, behaviour and performance), and allows for the inclusion of other seemingly diverse constructs (e.g. generalised self-efficacy, gender, prior family business experience, work experience [...]) that previous models of entrepreneurial intentions do not fully or directly include”*

(Liguori, 2012, p.28)

Studies of EE have used the SCT and SCCT models to explain student phenomenon, the majority using the performance model version. Segal *et al.* (2002) found significant relationships between self-efficacy, outcome expectations, and outcome goals (monetary rewards, financial security,

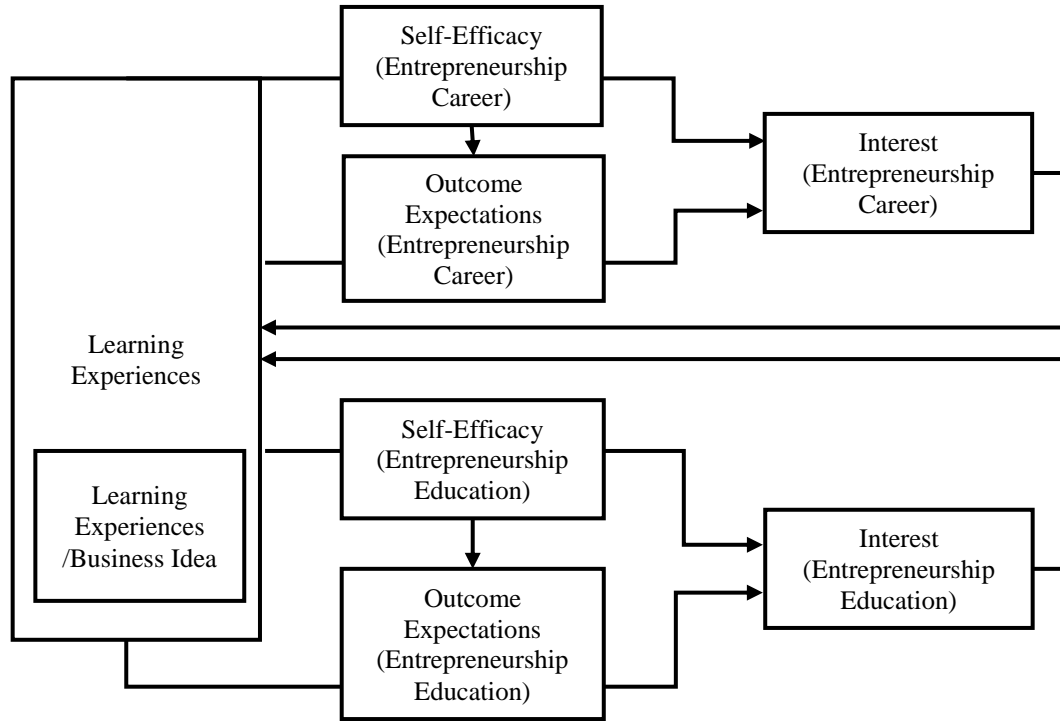
independence, and sense of achievement) on a sample of undergraduate business students studying entrepreneurship. Hemmasi and Hoelscher (2005) suggested the SCCT is a valid predictor of future entrepreneurial behaviour, and career choice in a student sample, but this was not undertaken empirically. Liguori (2012) found a relationship between EI and personal input factors (general self-efficacy, gender and minority status) in their study.

Kassean *et al.* (2015) applied the SCCT in hypothesising the effect of classroom activities on motivation using EE undergraduate students. The study found increases of experiential learning activities led to lower ESE scores, suggesting these activities may provide more realistic experiences of entrepreneurship to students thus reducing ESE levels, or it could have related to the efficacy of the classroom activities in the study. The study also found learning experiences predicted entrepreneurial outcome expectations (anticipated financial and personal rewards). Pfeifer, Šarlija, and Sušac (2016) found entrepreneurial identity, ESE, and personal business exposure were predictors of intentions towards entrepreneurship, and inferred that personal, situational, and contextual inputs were mediated in their model. Following these studies, the choice to use the SCCT in the individual study, is intended to provide solid theoretical foundation, echoing the sentiment of Kassean *et al.* (2015, p. 692):

*“In order to more fully understand the effectiveness of an entrepreneurship program, the authors use a well-established theoretical foundation (social cognitive career theory (SCCT) to study the linkages between educational experiences and the motivational processes underlying students’ movement into entrepreneurial behaviour”*

Bernstein and Carayannis (2012) studied the effects of self-efficacy and outcome expectations on the interest in applying for entrepreneurship majors, using a sample of undergraduate business students. Based on their findings, they proposed an adaptation to the SCCT model (See Figure 6.1) considering that interest development in EE was on two planes, career, and academic. This model has not been tested in an empirical study to date.

**Figure 6-1 Conceptual Adaptation of SCCT in Entrepreneurship Education**



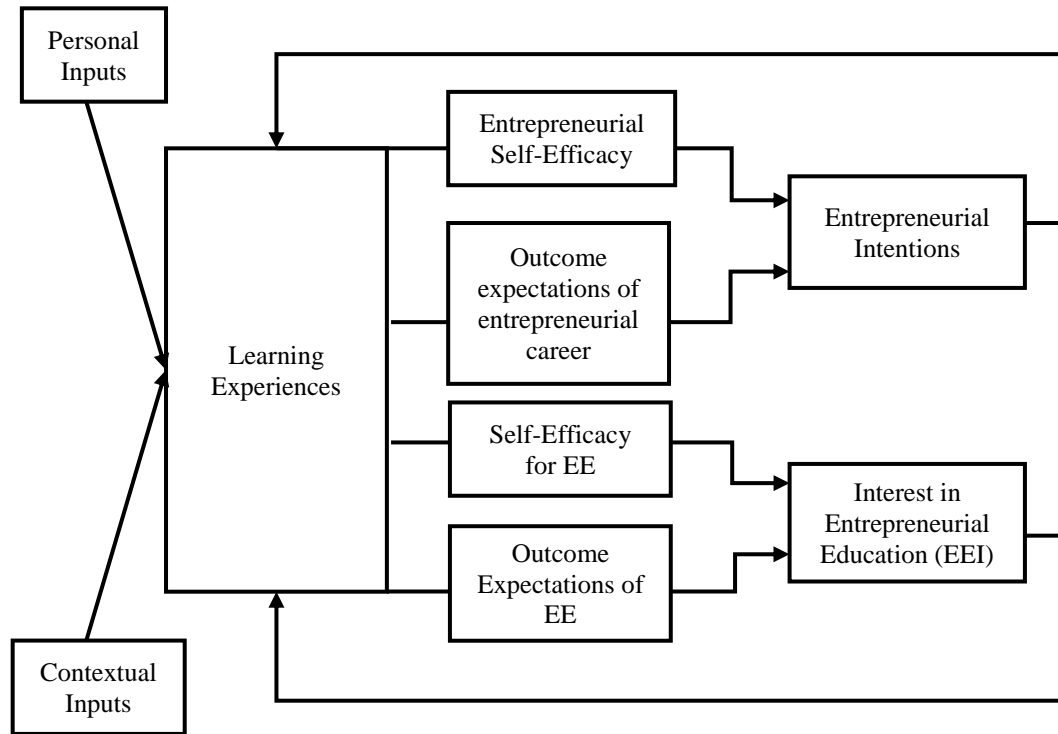
(Bernstein and Carayannis, 2012, p. 277)

This proposed adaptation of Bernstein and Carayannis (2012) highlights two parallel cognitive student interest processes occurring within EE: one leading to an outcome interest in the career of entrepreneurship, and one that leads to interest in the course itself (Figure 6.2). Bernstein and Carayannis (2012) did not explicitly include person and context input factors in their model adaptation, yet as these are significant in previous studies and propositions of the SCCT (e.g. Liguori, 2012; Pfeifer *et al.*, 2016) they were included (Figure 6.2). Many variables could be considered input factors. For example, the variables affecting the EE student suggested by Fayolle *et al.*, (2006) and Maritz (2017) (See Chapter 2, Section 2.7) could be examined. All versions of the SCCT are constructivist in nature and note a feedback loop within. It is expected that there will be an active response or process, which may manifest itself following a developed interest and opportunity for learning. The individual's perception of their resultant interest, action, or performance will reshape their appraisal of these experiences, based on a complex interplay of ensuing cognitive, affective, and behavioural influences (Lent *et al.*, 1994). Thus, an individual may attain negative performance feedback, but may perceive it neutral or even positive depending on perception, mood, or influencing



factors. The power of the individual in constructing and influencing the process therefore is paramount (Lent *et al.*, 2002).

**Figure 6-2: SCCT Framework in Entrepreneurship Education (SCCT-EE)**



*(Adapted from Bernstein and Carayannis, 2012)*

This study focuses on factors of student entrepreneurial self-efficacy (ESE), interest in entrepreneurship education (EEI), and entrepreneurial intentionality (EI). Similar to the works of Lent and Brown (2005) and Verbruggen and Sels (2010), the outcome expectations variable was omitted from the empirical model. Theoretically and empirically, the link between outcome expectations and student interest in this context has been examined previously, where EE increases student perceptions of the value of entrepreneurship (e.g. Krueger, 1993; Martin *et al.*, 2013; Peterman and Kennedy, 2003; Zhao *et al.*, 2005). In addition, the link between ESE, outcome expectations, and intentions has been found in past studies, offering support to the original model (Kassean *et al.*, 2015; Pfeifer *et al.*, 2016).. The factors affecting the EI and EEI of the student are discussed, and their respective hypotheses proposed in the next section.

## 6.4 Hypothesis Development

The specific hypotheses for the model are discussed below and stated in Table 6.6. It is considered that ESE will mediate the relationships between inputs and the dependant factors (EI, EEI) and while all will be tested in the model analysis, only the most prominent will be hypothesised below<sup>8</sup>. The hypothesised model is depicted in Figure 6.3 (direct relationships are notated with straight line arrows, while relationships hypothesised to be mediated by ESE are notated with dashed arrows).

### 6.4.1 Mediator: Entrepreneurial Self-Efficacy (ESE)

Based on previous studies (e.g. Kickul, Marlino and Barbosa, 2008; Liguori, 2012), it is considered that ESE will mediate the relationships between inputs, and outcomes of EI and EEI. However, the inclusion of two hypothesised outcome variables, and two iterations of ESE (pre and post) marks a new research contribution, and will allow for deeper understanding of the entrepreneurial constructs and model (See Figure 6.3).

Rather than a gain score variable (time two ESE minus time one ESE), it was chosen to use two iterations to examine ESE prior to, and during the experience itself. Using a similar research design, Verbruggen and Sels (2010) used a pre/post study to show (time two) perceived barriers, goal progress, and self-efficacy mediated the relationship between (time one) personality traits and self-efficacy on career satisfaction (Verbruggen and Sels, 2010). Their analysis found that self-efficacy (time one) negatively predicted perceived barriers (time two), suggesting that individuals with higher self-efficacy perceived fewer barriers to their career goals over time.

In line with previous studies, a relationship between ESE and EI is expected (Boyd and Vozikis, 1994; Carr and Sequeira, 2007; Wilson *et al.* 2007; Sánchez, 2013; Bernstein and Carayannis, 2012; Bullough, *et al.* 2014). Kickul, Marlino and Barbosa (2008) found the relationship between a number of entrepreneurial input factors and EI was mediated by ESE. Yarima and Hashim

<sup>8</sup> The decision not to hypothesise each relationship relates to the lack of empirical work noting the temporal (T1/T2) nature of the ESE variable, making it challenging to claim separate hypotheses for each measure, or to hypothesise double mediation (via ESE T1 and ESE T2).

(2016) also found that ESE mediated the relationship between entrepreneurial knowledge, skills, and the selection of the entrepreneurial career option. By providing student mastery experiences, social persuasion and vicarious experiences relating to new venture creation, students are expected to increase their perceived entrepreneurial capabilities (Stumpf, Dunbar and Mullen, 1991; Goddard, Hoy and Hoy, 2004). It is expected this development increases the desirability (attraction to behaviour), perceived feasibility (assessment of capacity to undertake behaviour), and the propensity of the individual to act (Shapero and Sokol, 1982; Krueger *et al.*, 2000).

H1a: Pre-module entrepreneurial self-efficacy increases entrepreneurial intentions

H1b: Post-module entrepreneurial self-efficacy increases entrepreneurial intentions

It is also expected that ESE will lead to enhanced student engagement in the module. ESE has been considered to be a significant predictor of performance and success (Rauch and Frese, 2007; Miao, Qian and Ma, 2017). This raised success and skill development could in turn enhance student enthusiasm and interest for the subject of EE itself. Bernstein and Carayannis (2012) found that EE students with higher levels of self-efficacy agreed that an entrepreneurship major would increase their likelihood of success as an entrepreneur. Swaim and Henley (2016) noted that rational persuasion by an instructor can increase student valence for a project, and recommend training as a means to enhance this. However, student perceptions of the quality of this training or support have a bearing on student engagement (Greene, Miller, Crowson *et al.*, 2004).

H2a: Pre-module entrepreneurial self-efficacy increases student interest in entrepreneurship education

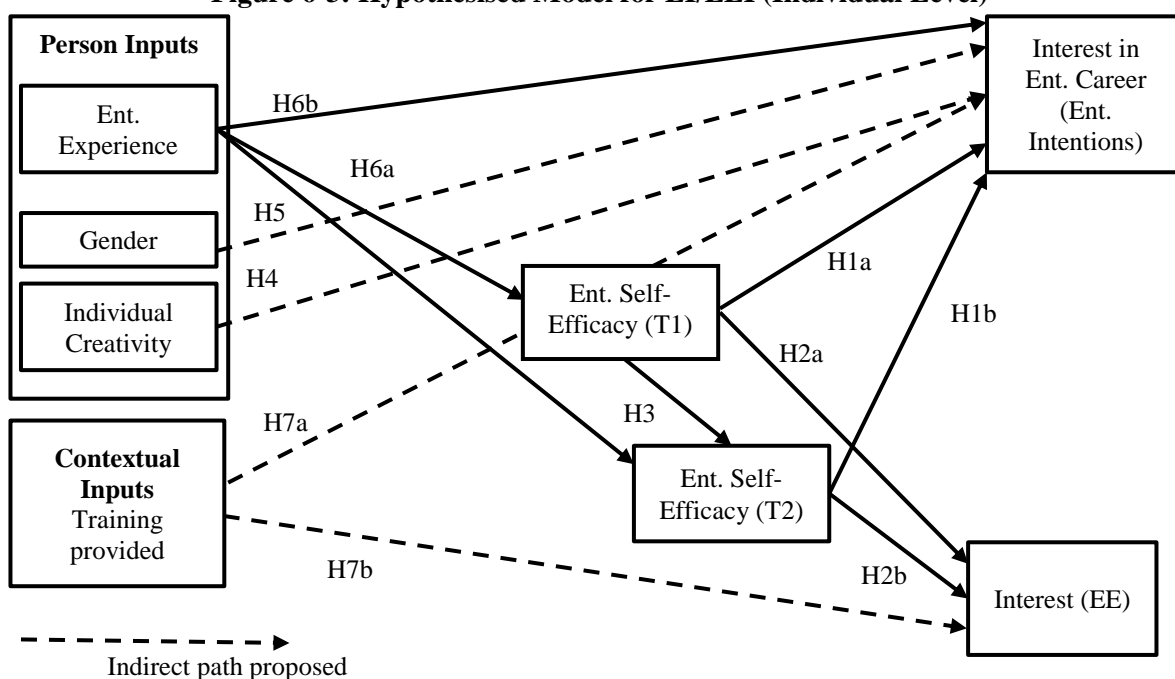
H2b: Post-module entrepreneurial self-efficacy increases student interest in entrepreneurship education

Self-efficacy is considered a malleable construct advanced through training and education (Zhao *et al.*, 2005). Within a delivery of EE, students are provided with opportunities pertaining to mastery experience (practical tasks, skill development), vicarious experience (observational), social persuasion (from others, teachers and speakers), and psychological/emotional states (from within);

all of which are contributing sources to developing the construct. Entrepreneurship education has thus been suggested to be a positive factor in developing ESE (Bae *et al.*, 2014; Moberg, 2014; Nabi *et al.*, 2016; Jerkku, Taajamaa and Kirjavainen, 2016). It is considered that any antecedent levels of ESE will relate positively to further development of the construct, as an individual believing themselves competent may engage more and thus enhance their level more within EE (i.e. from time one to time two). A qualitative study by Jerkku *et al.* (2016) found the team experience within an entrepreneurship module formed a key source of self-efficacy for the participants.

H3: Pre-module entrepreneurial self-efficacy increases post-module entrepreneurial self-efficacy

**Figure 6-3: Hypothesised Model for EI/EEI (Individual Level)**



#### 6.4.2 Person Input: Individual Creativity (IC)

Creativity enables the production of output that is novel and useful (Sternberg and Lubart, 1999), defined by Woodman *et al.* (1993, p. 294) as:

*“the complex product of a person’s behaviour in a given situation’ and that both the person themselves and the situation have an interacting effect on the subsequent behaviour”*

While Amabile (1983; 2001; 2013) notes creativity can be multi-level, on an individual level it is affected by domain-relevant skill, creativity related processes, intrinsic task motivation, and the social environment. Individual creativity is studied herein as the personal perception of creativity rather than the creative talent of the individual (Gundry, Ofstein and Kickul, 2014). Self-perceptions of creativity are adequate predictors of creative and academic performance (Chamorro-Premuzic, 2006; Pretz and McCollum, 2014).

A link between perceived creativity and entrepreneurship has previously been noted (Ward, 2004; De Tienne and Chandler, 2004). Studying Social Cognitive Career Theory, Pfeifer *et al.* (2016) found entrepreneurial identity predicted EI; thus if individual creativity is considered by the student to be pertinent to the entrepreneurial identity, then a relationship to EI may be observed. Shahab *et al.* (2018) found a direct positive relationship between entrepreneurial creativity and EI, and also found this creativity to mediate the relationship between ESE and EI. Biraglia and Kidile (2017) used the Social Cognitive Theory to study whether creativity and EP of American homebrewers predicted their intentions to move beyond a hobby to a venture. Their study found a link between creativity and EI, fully mediated by ESE. Extrapolating from this study, in EE a student who has positive perceptions of creative ability may consider themselves more skilled for the aspects involved in entrepreneurship. Hamidi *et al.* (2008) found a creativity test had a positive effect on the EI of entrepreneurship students, as mediated by ESE.

H4a: Pre-module entrepreneurial self-efficacy mediates the relationship between individual creativity and entrepreneurial intentions

H4b: Post-module entrepreneurial self-efficacy mediates the relationship between individual creativity and entrepreneurial intentions

#### **6.4.3 Person Input: Gender**

The study of gender in relation to ESE and EI has been recommended by Shahab *et al.* (2018) to also explore the student of EE in more depth. Camelo-Ordaz *et al.* (2016) found that in considering non-entrepreneurs, the relationship between gender and EI was mediated by ESE, the ability to recognise opportunities and fear of failure. Kickul, Marlino and Barbosa (2008) also found a gender effect in

their exploration of ESE and EI in students of entrepreneurship. Employing SCCT, Liguori (2012) found that entrepreneurial self-efficacy mediated the relationship between personal input factors (general self-efficacy, gender and minority status) and EI. Studying how classroom activities would motivate EE undergraduate students, Kassean *et al.* (2015) noted significant relationships between gender and ESE, EI and outcome expectations. While it is considered that these relationships have been previously established, it is necessary to consider them as part of the model study, particularly as 1) the Irish context remains untested and 2) the research design incorporating both time one and time two variables allow for a greater depth of examination which may create new findings for these relationships.

H5: Entrepreneurial self-efficacy mediates the relationship between gender and entrepreneurial intentions

#### **6.4.4 Person Input: Entrepreneurial Experience**

Prior student experience of entrepreneurship, either personal (having previously set up a new venture, or currently being involved in one), or familial (having a parent or family member who is/was an entrepreneur), are considered to be a realistic basis from which student attitudes, tendencies and skills relating to entrepreneurship may develop (Krueger, 1993; Ramayah, Ahmad and Fei, 2012; Tarling, Jones and Murphy, 2016). Considered a source of vicarious and mastery experiences, Liguori (2012) found previous work experience, previous entrepreneurial experience and prior family business exposure to predict ESE and outcome expectations. Kickul, Marlino and Barbosa (2008) found previous leadership experience, previous work experience and entrepreneurial role models to positively influenced EI in students. Pfeifer *et al.* (2016) found students who had their own entrepreneurial experience had significantly higher ESE, EI, and (non-sig.) higher entrepreneurial identity aspiration levels than those who had none. Consequentially, the link between entrepreneurial experience and EI in student populations has been noted previously by Carr and Sequeira (2007), Fayolle and Gailly (2015), Pfeifer *et al.* (2016) and Xu, Ni and Ye (2016), and is also predicted in this study.

H6a: The entrepreneurial experience of students increases entrepreneurial self-efficacy

H6b: The entrepreneurial experience of students increases entrepreneurial intentions

#### **6.4.5 Contextual Inputs: Training and Support**

Training and support provided by academic staff can be technical (training or assistance for prototyping or website development for example), relational (teamwork, conflict negotiation) and/or pertaining to competency development (creativity, presentation skills etc.). Studies have found that training improves cognitive ability, competency development and teamworking (Chen *et al.*, 2004; Ellis, Bell, Ployhart *et al.*, 2005; Deng and Liu, 2012; Harms, 2015). Entrepreneurship education is considered a positive factor to develop ESE (Bae *et al.*, 2014; Moberg, 2014; Nabi *et al.*, 2016; Shinnar *et al.*, 2014). Training provides opportunity for the development of ESE through enactive mastery (allowing a student to practice at a task/skill), role modelling (demonstrations), and social persuasion (constructive feedback from teachers, interaction with classmates) (Kassean *et al.*, 2015).

H7a: Entrepreneurial self-efficacy mediates the relationship between creativity training and entrepreneurial intentions

It is hypothesised that entrepreneurial self-efficacy will also mediate the relationship between creativity training and student engagement in EE (EEI). Zhao *et al.* (2005) also found ESE to be a predictor of EI (Time two) and a mediator of student perceptions of formal learning. In addition, Moberg (2014) noted the positive effect that action-based teaching involving creative thinking and proactive pedagogies had in increasing student engagement.

H7b: Entrepreneurial self-efficacy mediates the relationship between creativity training and student interest in entrepreneurship education

### **6.5 Methodology**

#### **6.5.1 Data Collection and Screening**

This study was carried out using a cohort of first year undergraduate students in the DICE entrepreneurship education module, as outlined in Chapter 5. The study consisted of a pre/post survey distribution which was firstly collected in November 2014, and at the end of the module (April - May

of 2015), before students received their grades<sup>9</sup>. These surveys are found in Appendix H and Appendix I. The datasets were merged by ID number in Microsoft Excel where a number of unmatched responses were found (students who had filled the survey at time one and not time two or vice versa). A proportion of ID numbers entered at time one were invalid as students were new to the university setting and entered their numbers incorrectly. The missing data was deemed to be missing at random (MCAR). The dataset was examined using the countblank formula in Microsoft Excel to calculate the percentage of row responses missing and was accordingly deleted (listwise deletion) as per Table 6.2. Two aberrant cases were identified and removed, as they had an exceptionally low standard deviation in their answers across all variables. Of the remaining dataset, the missing data was analysed and found less than 1% (Maximum missing 0.97) per item column and the decision was made to ignore as admissible.

**Table 6-1: Data Collection and Screening**

	<b>DICE Cohort 2014/15</b>
<i>Released time one survey</i>	November 2014
<i>Number of students in class</i>	356
<i>Number of time one survey attempts</i>	311 (87.4% of all DICE)
<i>Released time two survey</i>	April – May 2015
<i>Number of completed time two surveys</i>	257 DICE (72.2% of all DICE)
<i>Initial Dataset</i>	339 cases (matched/unmatched)
<i>Missing cases</i>	154 cases missing between 30-50% removed Six cases missing between 15-30% removed
<i>Outliers</i>	Two unengaged responses removed
<i>Final dataset</i>	177 matched pairs (49.7% of DICE)

### 6.5.2 Variables Used in Study

*Individual Creativity:* The measure chosen to examine individual level self-perceptions of creativity was based on the scale measure by Zhou and George (2001) adapted by Janssen and Xu (2008). The measure was shortened and adapted to be self-reporting, consisting of thirteen items with a five-point Likert scale. Preliminary analyses using IBM SPSS, revealed a KMO score of .870, and Bartlett’s test

<sup>9</sup> This survey and dataset was previously discussed in Chapter 4 analysing EP. While the dataset included other class groups in the earlier analysis, only the first year DICE students are studied in this analysis.



of Sphericity significance. PCA revealed two components with eigenvalues greater than one, accumulating to 52.421% of the total variance. An inspection of the scree plot supported a two-factor model. It appeared that items relating to plans, performance, and creative systems (e.g. *'I suggest new ways to achieve my goals, I help to create plans and schedules to get new ideas working'*) were answered differently to items relating to idea generation (e.g. *'I often have new and innovative ideas'*). It was decided to split them into two sub-dimensions (idea generation [IC 2, 3, 4, 8, 10 & 11] and idea implementation [IC 1, 5, 6, 7, 9, 12, and 13]). Testing for reliability, the measure attained acceptable Cronbach's alpha values as a composite measure (.880) and when separated (implementing – .795; generating – .841). For the purposes of the study, only the dimension of idea generation was used as it is considered more representative of the intended study.

**Table 6-2: Pattern Matrix of Individual Creativity**

	Items	Component	
		Idea Generation	Idea Implementation
IC1	I suggest new ways to achieve my goals	.323	.460
IC2	<i>I think of new and practical ideas to improve performance</i>	.470	.308
IC3	<i>I like to search out new technologies, processes, techniques, and/or product ideas.</i>	.664	
IC4	<i>I am a good source of creative and innovative ideas.</i>	.858	
IC5	I like to suggest new ways to increase quality.		.557
IC6	I am not afraid to take risks.		.773
IC7	I like to promote and champion my ideas to others.		.685
IC8	<i>I think I show creativity when given the opportunity to.</i>	.822	
IC9	I help to create plans and schedules to get new ideas working.		.661
IC10	<i>I often have new and innovative ideas.</i>	.750	
IC11	<i>I like to come up with creative solutions to problems.</i>	.615	.303
IC12	I think I often have a fresh approach to problems.		.531
IC13	I like to suggest new ways of performing work tasks.		.626
	Eigen Value		
	% Variance explained	42.376	10.045
Extraction Method: Principal Component Analysis.			
Rotation Method: Oblimin with Kaiser Normalization.			

*Entrepreneurial Experience:* Three dichotomous (yes/no) questions were used to identify student experience of entrepreneurship: 'I run my own company at present' 'I have run/set up a company in the past' and 'Members of my family (parents/siblings) run their own company'. The question responses were coded together to form a composite scale from 0-4.

*Gender:* This was coded as 1 = Male and 2 = Female in the analysis. There were 98 male students and 79 female students in the final dataset.

*Entrepreneurial Passion:* While EP was not hypothesised in the study, it was examined with ESE and EI to study the change in student levels from pre to post module. The Cardon *et al.* (2013) measure was used, which previously passed reliability, validity and factor structure tests in Chapter 5 using two of the three dimensions (inventor and founder).

*Training and Support:* The class group was provided with a lecture seminar designed to encourage creative teaching techniques they were encouraged to apply during their assignments. Students were asked to indicate the level creativity training they felt they were given during the module on a seven-point Likert scale ranging from 1 (none at all) to 7 (more than enough).

*Entrepreneurial Intentions:* EI was measured at the post-test (See Appendix I) in a survey that necessitated the inclusion of multiple feedback, entrepreneurial and teamwork related items. Due to the survey length and the inclusion of a number of similar construct scales, it was decided to revert to a simpler, more direct measure of EI. Hamidi *et al.* (2008) used this one-item measure of Krueger *et al.* (2000), in a previous EE study. It asks: 'How would you estimate the probability that you will run your own company in the future?' was administered with a seven-point Likert scale. It was acknowledged that the restriction of the variable to a single item would limit the statistical power within the analysis.

*Entrepreneurial Self-Efficacy:* The measure chosen was a uni-dimensional construct devised by Zhao *et al.* (2005), previously found to display discriminant validity with Chen *et al.* (1998)'s general self-efficacy construct, and positively related to EI, indicating convergent validity. The scale consists of four items relating to an individual's perception of self-efficacy regarding specific entrepreneurial

tasks. The items were measured on a Likert scale ranging from one (no confidence) to seven (complete confidence). The measure was used in the time one and two test and the reliability on both occasion was acceptable (Cronbach's Alpha time one - .886, time two - .826).

*Entrepreneurship Education Interest:* This was assessed through a number of feedback questions during the time two study. Students were asked four questions pertaining to their experience, interest and satisfaction with the entrepreneurial module, namely 'My experience of the DICE module made me more enterprising', 'My experience of the DICE module made me more entrepreneurial', 'I was satisfied with the DICE module in general', and 'I enjoyed working with my DICE team during the module'. The items were measured on a seven-point Likert scale, and the responses merged to form a composite indicator indicating perceived interest of the student in the EE module.

### 6.5.3 Preliminary Analysis

A high proportion of the study sample were aged 18 or 19 (85.5%, n = 153) and studying business studies as their core degree (79.1%). The dataset had a greater proportion of male students to female, and 84.2% were Irish. Table 6.3 summarises the main demographic information below.

**Table 6-3: Demographic Information**

<i>Demographic Information</i>	<i>Number</i>	<i>Percent</i>
<b>Gender (N=177)</b>		
Male	98	55.4%
Female	79	44.6%
<b>Age (N=177)</b>	Mean = 18.61	SD = 1.427
<b>Course (N=177)</b>		
Business Studies	140	79.1%
Enterprise Computing	37	20.9%
<b>Nationality (N=177)</b>		
Ireland	149	84.2%
Outside Ireland	28	15.8%
<b>Entrepreneurial Experience (N=177)</b>		
Own Company- Current	2	1.1%
None	175	98.9%
Past Company	13	7.3%
None	164	92.7%
Family Company	65	36.7%
None	112	63.3%

**Table 6-4: Paired Samples T-Test (time one to time two)**

	<i>Mean Time one</i>	<i>Std. Dev</i>	<i>Mean Time two</i>	<i>Std. Dev</i>	<i>Paired Differences</i>			<i>T</i>	<i>Sig. (2- tailed)</i>
					<i>Std. Error Mean</i>	<i>95% Confidence Interval of the Difference</i>			
						<i>Lower</i>	<i>Upper</i>		
<b>Entrepreneurial Self-Efficacy</b>	18.746	4.154	19.333	4.622	0.588	-.005	1.180	1.958*	.052
<b>Entrepreneurial Intentions</b>	4.39	1.512	4.09	1.723	0.102	-.500	-.099	-2.949**	0.004
<i>Entrepreneurial Passion (Inventing)</i>	<i>18.452</i>	<i>3.052</i>	<i>18.789</i>	<i>3.674</i>	<i>0.244</i>	<i>-.145</i>	<i>.820</i>	<i>1.381</i>	<i>0.169</i>
<i>Entrepreneurial Passion (Founding)</i>	<i>14.639</i>	<i>3.471</i>	<i>13.994</i>	<i>4.067</i>	<i>.237</i>	<i>-1.112</i>	<i>-.177</i>	<i>-2.721**</i>	<i>0.007</i>

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level (2-tailed); N=177

**Table 6-5: Paired Samples T-Test (split by gender)**

	<b>Paired Samples Test</b>											
	<b>Male Paired Differences</b>						<b>Female Paired Differences</b>					
	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>	<i>T</i>	<i>Df</i>	<i>Sig. (2- tailed)</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>	<i>T</i>	<i>df</i>	<i>Sig. (2- tailed)</i>
Entrepreneurial Self-Efficacy (T1 to T2)	.112	3.922	.396	.283	97	.778	1.177	4.025	.453	2.079**	78	.011
Entrepreneurial Intentions (T1 to T2)	-.367	1.410	.142	-2.580*	97	.011	-.215	1.278	.144	-1.497	78	.138
<i>Entrepreneurial Passion (Inventing) (T1 to T2)</i>	<i>-.021</i>	<i>3.390</i>	<i>.348</i>	<i>-.061</i>	<i>94</i>	<i>.952</i>	<i>.817</i>	<i>2.742</i>	<i>.326</i>	<i>2.510*</i>	<i>70</i>	<i>.014</i>
<i>Entrepreneurial Passion (Founding) (T1 to T2)</i>	<i>-1.00</i>	<i>3.135</i>	<i>.323</i>	<i>-3.093**</i>	<i>93</i>	<i>.003</i>	<i>-.200</i>	<i>2.973</i>	<i>.343</i>	<i>-.583</i>	<i>74</i>	<i>.562</i>

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level (2-tailed)

#### **6.5.4 Pre to Post-Test Analysis**

The need for information on the differential impact of EE on male and female students/graduates has been highlighted (Nabi *et al.*, 2017). Thus, a number of analyses studying the pre to post differences in the student sample were conducted. Firstly, the sample was examined comparing time one to time two changes (Table 6.5), then the dataset was split by gender and paired samples t-tests were conducted (Table 6.6).

*Entrepreneurial Self-Efficacy:* The mean scores recorded for ESE at time one was significantly increased at time two. By gender, males reported higher ESE levels than females before module start (males = 19.214, SD 4.33, females = 18.165, SD 3.874). However, when comparing the differences from pre to post module, an insignificant increase in ESE for the male students was observed, which was significant for female students.

*Entrepreneurial Intentionality:* Overall, the mean scores of the dataset were significantly lowered between time one and two. By gender, the initial EI levels for males (4.49, SD=1.594) was higher than for female students (4.27, SD=1.402). Both males and females decreased in intentions, significantly so for the male cohort only.

*Entrepreneurial Passion:* For the full dataset, the EP for founding a business significantly reduced from pre to post module, while EP (inventing) increased (non-significant). By gender, females significantly increased in EP (inventing), while males did so insignificantly. EP (founding) obtained a (non-significant) decrease in the female sample, and a significant decrease in males.

### **6.6 Model and Hypotheses Testing**

The hypotheses proposed are presented in Table 6.6 and are tested using consistent PLS algorithm and consistent PLS bootstrapping analyses in Smart-PLS3. In the model tested there were a mix of scale and single item measures. It is acknowledged that there are exogenous variables that reduce model parsimony. All latent variables within the model were considered reflective, suggesting that the items measure largely the same, and/or are manifestations of the construct itself

**Table 6-6: Hypotheses for the Study (Chapter 6)**

No		Hypotheses
H1	H1a	Pre-module entrepreneurial self-efficacy positively influences entrepreneurial intentions
	H1b	Post-module entrepreneurial self-efficacy positively influences entrepreneurial intentions
H2	H2a	Pre-module entrepreneurial self-efficacy positively influences student interest in entrepreneurship education
	H2b	Post-module entrepreneurial self-efficacy positively influences student interest in entrepreneurship education
H3	H3	Pre-module entrepreneurial self-efficacy positively influences post-module entrepreneurial self-efficacy
H4	H4a	Entrepreneurial self-efficacy mediates the relationship between individual creativity and entrepreneurial intentions
	H4b	Entrepreneurial self-efficacy mediates the relationship between individual creativity and student interest in entrepreneurship education
H5	H5a	Entrepreneurial self-efficacy mediates the relationship between gender and entrepreneurial intentions
	H5b	Entrepreneurial self-efficacy mediates the relationship between gender and student interest in entrepreneurship education
H6	H6a	The entrepreneurial experience of students positively influences entrepreneurial self-efficacy
	H6b	The entrepreneurial experience of students positively influences entrepreneurial intentions
H7	H7a	Entrepreneurial self-efficacy mediates the relationship between creativity training and entrepreneurial intentions
	H7b	Entrepreneurial self-efficacy mediates the relationship between creativity training and student interest in entrepreneurship education

### 6.6.1 Descriptive Analysis and Evaluation of Measurement Model

In studying the dataset, no issues in skewness or kurtosis were detected as evident in Table 6.7. The items were assessed for normality and it was found that the measure of composite entrepreneurial experience was highly kurthotic and marginly skewed. It was decided to calculate the Log<sup>10</sup> value of the item and use in its place. Gender was found to be kurthotic but was accepted with caution. The Inner VIF scores for the variables ranged from 1.012 to 1.058, which fell within acceptable ranges to consider multicollinearity was not an issue.

Table 6.8 shows the items included in the measurement model and their psychometric properties. Item reliabilities were evaluated by examining the standardized loadings ( $\lambda$ ) which were above the threshold of .50 (1000 bootstrapping runs). Item communalities ( $\lambda^2$ ) exceeded the

minimum requirement of .25. It was noted that IC2 had poor loadings, and its removal brought the measure of Individual Creativity from an AVE score of .490 to .524. Consequentially the IC2 item was removed and Table 6.8 reflects the results thereafter. The internal consistency was examined using Cronbach's alpha ( $\alpha$ ) and composite reliability (CR). As shown, all scales reached amenable results indicative of reliability (above 0.8). For all latent variables, AVE values were above the minimum benchmark of .50 (Fornell and Larcker, 1981). Discriminant validity was tested using both the Fornell-Larcker (Table 6.9) and Heterotrait Monotrait method (HTMT) (Table 6.10) where no issues were detected (See Chapter 4 and Appendix J for details and cut-off value information).

**Table 6-7: Skewness and Kurtosis of items**

	Mean	Min	Max	SD	Kurtosis	Skewness
Gender	1.446	1	2	0.497	-1.975	0.218
Entrepreneurial Experience	3.452	3	6	0.610	2.124	1.316
Entrepreneurial Experience (Log 10)	0.532	0.477	0.778	0.071	0.079	0.916
Entrepreneurial Intentions	4.090	1	7	1.718	-0.961	-0.141
Creativity Training	3.994	1	7	1.564	-0.626	0.045
EEI4	5.011	1	7	1.548	0.039	-0.803
EEI3	4.288	1	7	1.760	-0.957	-0.252
EEI1	4.543	1	7	1.881	-0.818	-0.509
EEI2	4.241	1	7	1.912	-1.080	-0.215
IC2	3.921	1	5	0.684	2.989	-1.178
IC3	3.429	1	5	0.943	-0.649	-0.304
IC4	3.672	1	5	0.911	-0.028	-0.612
IC8	3.791	1	5	0.841	0.703	-0.735
IC10	3.508	1	5	0.896	-0.081	-0.477
IC11	3.616	1	5	0.823	0.384	-0.591
ESE1 (time one)	4.497	2	7	1.170	-0.363	0.124
ESE2 (time one)	4.322	1	7	1.255	-0.181	-0.023
ESE3 (time one)	4.989	2	7	1.198	0.052	-0.475
ESE4 (time one)	4.938	0	7	1.245	0.810	-0.484
ESE1 (time two)	4.667	1	7	1.243	0.056	-0.235
ESE2 (time two)	4.610	1	7	1.353	-0.426	-0.408
ESE3 (time two)	5.056	1	7	1.309	0.026	-0.517
ESE4 (time two)	4.989	1	7	1.276	0.170	-0.522

IC = Individual Creativity; EEI = Interest in Entrepreneurship Education; ESE = Entrepreneurial Self-Efficacy; SD = Standard Deviation.

**Table 6-8: Reliability and Convergent Validity (Bootstrapped)**

	Item	$\lambda$	$t$	$\lambda^2$	$\alpha$	CR	AVE
<b><i>Individual Creativity</i></b>					0.838	0.842	0.524
I often have new and innovative ideas.	IC10	0.845	15.379	0.71			
I like to come up with creative solutions to problems.	IC11	0.73	12.158	0.53			
I like to search out new technologies, processes, techniques and/or product ideas.	IC3	0.536	5.734	0.29			
I am a good source of creative and innovative ideas.	IC4	0.831	18.616	0.69			
I think I show creativity when given the opportunity to	IC8	0.602	8.05	0.36			
<b><i>Entrepreneurial Self Efficacy (Time one)</i></b>					0.874	0.876	0.643
Successfully identifying new business opportunities	ESE1	0.82	18.396	0.67			
Creating new products	ESE2	0.91	25.27	0.83			
Thinking creatively in business	ESE3	0.805	18.883	0.65			
Commercialising an idea or new development	ESE4	0.64	8.358	0.41			
<b><i>Entrepreneurial Self Efficacy (Time two)</i></b>					0.918	0.919	0.741
Successfully identifying new business opportunities	RESE1	0.926	31.809	0.86			
Creating new products	RESE2	0.862	25.089	0.74			
Thinking creatively in business	RESE3	0.875	27.205	0.77			
Commercialising an idea or new development	RESE4	0.762	12.988	0.58			
<b><i>Interest in Entrepreneurship Education</i></b>					0.888	0.892	0.674
My experience of the DICE module made me more enterprising	EEI1	0.838	14.331	0.70			
My experience of the DICE module made me more entrepreneurial	EEI2	0.875	12.045	0.77			
I was satisfied with the DICE module in general	EEI3	0.833	11.406	0.69			
I enjoyed working with my DICE team during the module	EEI4	0.713	6.136	0.51			
$\lambda$ = Loading; $\lambda^2$ = Communality; $\alpha$ = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted. All factor loadings were significant at the *** $p < .001$ level (based on $t(177)$ , two-tailed test).							



**Table 6-9: Convergent and Discriminant Validity (Fornell-Larcker Matrix)**

	<i>Creativity Training</i>	<i>Ent. Exp.</i>	<i>EI</i>	<i>ESE (time one)</i>	<i>ESE (time two)</i>	<i>Gender</i>	<i>IC (Generation)</i>	<i>EEI</i>
Creativity Training	<b>1</b>							
Entrepreneurial Experience	-0.081	<b>1</b>						
Entrepreneurial Intentions	0.084	0.252	<b>1</b>					
Entrepreneurial Self-Efficacy (time one)	0.016	0.23	0.426	<b>0.802</b>				
Entrepreneurial Self-Efficacy (time two)	0.289	0.089	0.578	0.655	<b>0.861</b>			
Gender	-0.069	0.037	-0.021	-0.138	0	<b>1</b>		
Individual Creativity (Generation)	-0.025	0.178	0.329	0.723	0.609	-0.12	<b>0.724</b>	
Interest in Entrepreneurship Education	0.587	0.048	0.246	0.176	0.431	-0.011	0.146	<b>0.821</b>

**Table 6-10: Convergent and Discriminant Validity (Heterotrait Monotrait Matrix)**

	<i>Creativity Training</i>	<i>Ent. Exp.</i>	<i>EI</i>	<i>ESE (time one)</i>	<i>ESE (time two)</i>	<i>Gender</i>	<i>IC (Generation)</i>	<i>EEI</i>
Creativity Training								
Entrepreneurial Experience	0.081							
Entrepreneurial Intentions	0.084	0.252						
Entrepreneurial Self-Efficacy (time one)	0.063	0.232	0.423					
Entrepreneurial Self-Efficacy (time two)	0.288	0.087	0.575	0.656				
Gender	0.069	0.037	0.021	0.135	0.049			
Individual Creativity (Generation)	0.041	0.173	0.325	0.725	0.614	0.121		
Interest in Entrepreneurship Education	0.593	0.096	0.242	0.173	0.435	0.056	0.148	

### 6.6.2 Verification of the Structural Model

Smart PLS (version 3) was used to assess the structural model in the full sample (Table 6.11 above).

Studying this bootstrapped model (x1000), relationships with *t* values of above 1.96 indicate statistical significance (insignificant are noted in italics).

**Table 6-11: Original Bootstrapping (Chapter 6)**

<b>Path</b>	<b>Sample Mean</b>	<b>T</b>	<b>p (Sig.)</b>
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time one)	0.703	11.035***	0.000
Creativity Training -> Interest in Entrepreneurship Education	0.508	6.721***	0.000
Entrepreneurial Self-Efficacy (time two) -> Entrepreneurial Intentions	0.635	5.321***	0.000
Creativity Training -> Entrepreneurial Self-Efficacy (time two)	0.294	4.690***	0.000
Entrepreneurial Self-Efficacy (time one) -> Entrepreneurial Self-Efficacy (time two)	0.447	3.813***	0.000
Entrepreneurial Experience -> Entrepreneurial Intentions	0.199	3.365***	0.001
Entrepreneurial Self-Efficacy (time two) -> Interest in Entrepreneurship Education	0.32	2.736**	0.006
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time two)	0.32	2.724**	0.007
Gender -> Entrepreneurial Self-Efficacy (time two)	0.123	2.123*	0.034
Entrepreneurial Experience -> Entrepreneurial Self-Efficacy (time one)	0.112	1.834†	0.067
<i>Individual Creativity (Generation) -&gt; Entrepreneurial Intentions</i>	<i>-0.145</i>	<i>1.321</i>	<i>0.187</i>
<i>Creativity Training -&gt; Entrepreneurial Intentions</i>	<i>-0.095</i>	<i>1.24</i>	<i>0.215</i>
<i>Gender -&gt; Entrepreneurial Self-Efficacy (time one)</i>	<i>-0.056</i>	<i>0.928</i>	<i>0.354</i>
<i>Entrepreneurial Experience -&gt; Interest in Entrepreneurship Education</i>	<i>0.069</i>	<i>0.926</i>	<i>0.355</i>
<i>Entrepreneurial Experience -&gt; Entrepreneurial Self-Efficacy (time two)</i>	<i>-0.051</i>	<i>0.913</i>	<i>0.361</i>
<i>Gender -&gt; Entrepreneurial Intentions</i>	<i>-0.044</i>	<i>0.658</i>	<i>0.511</i>
<i>Entrepreneurial Self-Efficacy (time one) -&gt; Entrepreneurial Intentions</i>	<i>0.065</i>	<i>0.54</i>	<i>0.589</i>
<i>Creativity Training -&gt; Entrepreneurial Self-Efficacy (time one)</i>	<i>0.039</i>	<i>0.527</i>	<i>0.598</i>
<i>Entrepreneurial Self-Efficacy (time one) -&gt; Interest in Entrepreneurship Education</i>	<i>-0.053</i>	<i>0.355</i>	<i>0.723</i>
<i>Gender -&gt; Interest in Entrepreneurship Education</i>	<i>0.017</i>	<i>0.243</i>	<i>0.808</i>
<i>Individual Creativity (Generation) -&gt; Interest in Entrepreneurship Education</i>	<i>-0.004</i>	<i>0.106</i>	<i>0.916</i>

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level; \*\*\* Significant at the 0.001 level (All 2-tailed); † Significant at .10 level.

Variable relationships that showed insignificance and no indication of indirect effects were dropped from the model; the model was re-examined using the bootstrapping procedure (1000 resamples). As seen in Table 6.12, the final bootstrapping results have acceptable *t* values and significance.

**Table 6-12: Final Bootstrapped Results (Chapter 6)**

Path	Sample Mean	Original Sample	T	p (Sig.)
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time one)	0.636	0.725	12.337***	0.000
Entrepreneurial Self-Efficacy (time two) -> Entrepreneurial Intentions	0.538	0.560	9.818***	0.000
Creativity Training -> Interest in Entrepreneurship Education	0.491	0.513	8.224***	0.000
Entrepreneurial Self-Efficacy (time one) -> Entrepreneurial Self-Efficacy (time two)	0.408	0.298	5.625***	0.000
Creativity Training -> Entrepreneurial Self-Efficacy (time two)	0.287	0.279	4.904***	0.000
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time two)	0.305	0.438	4.267***	0.000
Entrepreneurial Self-Efficacy (time two) -> Interest in Entrepreneurship Education	0.256	0.202	3.871***	0.000
Entrepreneurial Experience -> Entrepreneurial Intentions	0.203	0.315	3.701***	0.000
Gender -> Entrepreneurial Self-Efficacy (time two)	0.105	0.119	1.985*	0.047
* Significant at the 0.05 level; ** Significant at the 0.01 level; *** Significant at the 0.001 level (All 2-tailed).				

Table 6.13 indicates the specific indirect effects and double mediation. While mediation is described in the methodology chapter (Section 4.6.2), applied to PLS-SEM Hair *et al.* (2017, p. 227) describes a mediator as: “A change in the exogenous construct which in turn changes the endogenous construct in the PLS path model”. To determine the predictive power of the final model, the *R*<sup>2</sup> statistic notes the total variance explained by each of the endogenous variables within the model. The model tested explained an adjusted 41.8% of the variance in EEI and 36.7% in EI (Table 6.14). Further highlighted are the high results of the mediating ESE variables that note an adjusted variance of 55.5% (ESE T2) and 52.3% (ESE T1). Lastly, Figure 6.4 presents the final model noting direct effects and explained variances, while Figure 6.5 shows the bootstrapped estimates.

**Table 6-13: Specific Indirect Effects for Study of EI/EEI**

Path	Sample Mean	T	p (Sig.)
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time one) -> Entrepreneurial Self-Efficacy (time two)	0.259	5.106***	0.000
Creativity Training -> Entrepreneurial Self-Efficacy (time two) -> Entrepreneurial Intentions	0.155	4.352***	0.000
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time one) -> Entrepreneurial Self-Efficacy (time two) -> Entrepreneurial Intentions	0.14	4.217***	0.000
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time two) -> Entrepreneurial Intentions	0.164	3.977***	0.000
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time one) -> Entrepreneurial Self-Efficacy (time two) -> Interest in Entrepreneurship Education	0.066	3.239***	0.001
Creativity Training -> Entrepreneurial Self-Efficacy (time two) -> Interest in Entrepreneurship Education	0.074	2.763**	0.006
Individual Creativity (Generation) -> Entrepreneurial Self-Efficacy (time two) -> Interest in Entrepreneurship Education	0.079	2.638**	0.008
Gender -> Entrepreneurial Self-Efficacy (time two) -> Entrepreneurial Intentions	0.057	1.901†	0.058
Gender -> Entrepreneurial Self-Efficacy (time two) -> Interest in Entrepreneurship Education	0.027	1.734†	0.083

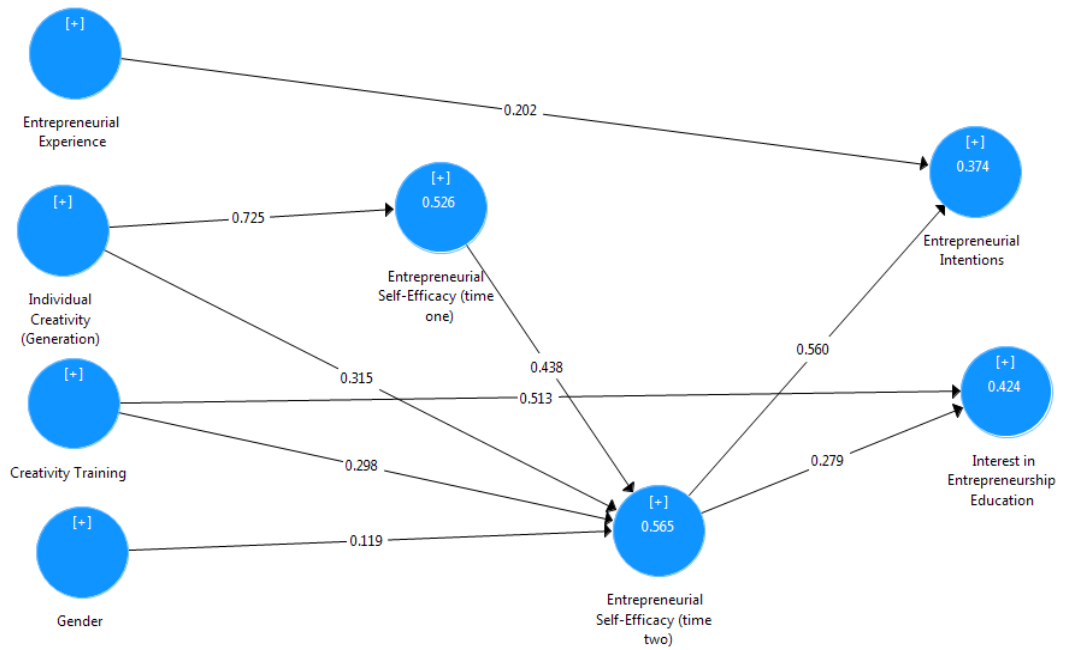
\* Significant at the 0.05 level; \*\* Significant at the 0.01 level; \*\*\* Significant at the 0.001 level (All 2-tailed); † Significant at .10 level.

**Table 6-14: Effect Sizes and Predictive Ability of the Model (Bootstrapped)**

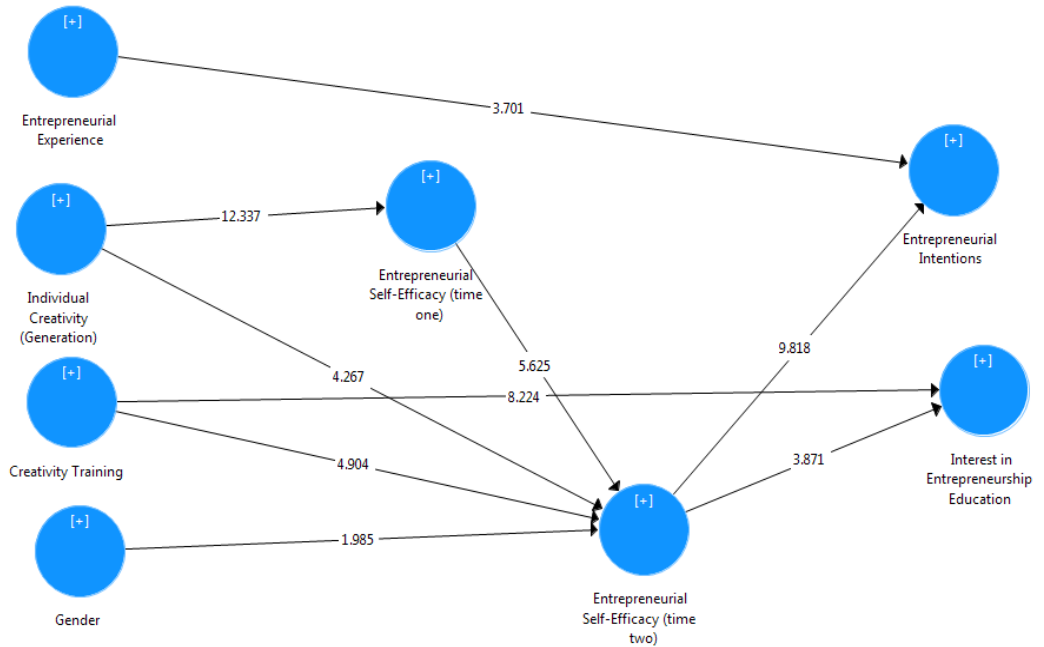
	R Square	R Square Adjusted	Q <sup>2</sup>
Entrepreneurial Intentions	0.374	0.367	0.337
Entrepreneurial Self-Efficacy (time one)	0.526	0.523	0.271
Entrepreneurial Self-Efficacy (time two)	0.565	0.555	0.362

Q<sup>2</sup> = Cross-Validated Redundancy

**Figure 6-4: Final Structural Model for EI/EEI**



**Figure 6-5: Final Bootstrapped Model for EI/EEI**



## 6.7 Findings and Discussion

Based on an adapted version of the Social Cognitive Career Theory (SCCT) by Bernstein and Carayannis (2012), the study explored factors affecting student EI and their interest in EE. A summary of the results and the findings is found in Table 6.15.

### *Changing levels of entrepreneurial tendency*

Before the model and hypotheses were examined, the change in entrepreneurial tendencies of the students between the start and the conclusion of the module were analysed, and compared by gender. ESE increased between time one and time two, but when split by gender, the effect was only significant for female students. Females also had lower initial ESE beliefs at the outset of the course (time one). This supports the findings of Wilson *et al.* (2007) which found that males initially reported higher levels of ESE, but after an entrepreneurship course females scored higher. The implication may be that the subject is more effective in raising ESE levels in the female population, or they are more attuned to its benefit. Kickul, Marlino and Barbosa (2008) found that the relationship between previous leadership and work experience on ESE was positive for EE students, it was significantly stronger for females. This result is different to that of Shinnar *et al.* (2014) who found male students' ESE increased significantly by the end of the entrepreneurship course, but female students' did not.

A significant reduction in EI was noted between time one and time two in the full student sample. Reduced or insignificant changes in EI have been found in similar studies by Von Graevenitz *et al.* (2010); Bae *et al.* (2014); Nabi *et al.* (2016), and it has been suggested that once a student gains a comprehensive understanding of the complexity of an entrepreneurial career, it may negate or limit the effect of EE (Moberg, 2014; Kassean *et al.*, 2015). Studies have also suggested the impact of EE on EI is gender-specific (Packham *et al.*, 2010; Joensuu *et al.*, 2013); and levels are higher in the male student population (Zhao *et al.*, 2005; Sieger, 2016; Santos *et al.*, 2016). While males were found to have a higher initial EI levels, the analysis found a reduction between time one and two for both genders (only significant for male students), partially supporting these claims.

Studying the changing levels of EP, females significantly increased in EP (inventing), while males did so insignificantly. It is suggested that EE may help students to enjoy thinking of new ideas and solutions to problems, which raises these identity passion levels. The founding role of EP revealed a non-significant decrease for the female group, and a significant decrease among the males. It is suggested that in this compulsory undergraduate EE course, students gain a more realistic and informed portrayal of the entrepreneurial career and may reduce their enthusiasm for the pursuit of the career (Oosterbeek *et al.*, 2010; Joensuu *et al.*, 2013; Bae *et al.*, 2014). A study examining the ‘anticipated emotions’ of entrepreneurship when students took EE was conducted by Zampetakis *et al.* (2015), finding students negative anticipated affective reactions to new business creation actually rose over time.

### ***Model investigation and findings***

In the model investigation, a number of factors were examined using a version of the SCCT framework where two iterations of ESE were the suggested mediators.

Firstly, the results indicated that entrepreneurial intentionality was positively influenced by entrepreneurial time two ESE (H1b supported), but was not influenced by time one ESE (H1a rejected). Research has related ESE to EI on many occasions (Boyd and Vozikis, 1994; Wilson *et al.*, 2007; Zhao *et al.* 2005; Sánchez, 2013; Bullough, Renko and Myatt, 2014), and this is partially supported in the findings. Due to the positive effect caused by efficacy-developing facets of EE (such as the observation of others, practical activities and receiving feedback), students were more likely to choose a career in entrepreneurship. ESE was also hypothesised to have a positive influence on student interest in the entrepreneurship education experience itself (EEI). A direct positive relationship was found for the ESE time two variable (H2b accepted), but not for the time one (H2a rejected). Entrepreneurship education has been recommended as an experience which raises ESE levels (Bae *et al.*, 2014; Moberg, 2014; Nabi *et al.*, 2016; Jerkku, Taajamaa and Kirjavainen, 2016), and this was supported in the study.

**Table 6-15: EI/EEI Model Findings**

	<b>Hypotheses</b>	<b>Supported</b>
H1a	Pre-module entrepreneurial self-efficacy positively influences entrepreneurial intentions	REJ
H1b	Post-module entrepreneurial self-efficacy positively influences entrepreneurial intentions	ACC
H2a	Pre-module entrepreneurial self-efficacy positively influences student interest in entrepreneurship education	REJ
H2b	Post-module entrepreneurial self-efficacy positively influences student interest in entrepreneurship education	ACC
H3	Pre-module entrepreneurial self-efficacy positively influences post-module entrepreneurial self-efficacy	ACC
H4a	Entrepreneurial self-efficacy mediates the relationship between individual creativity and entrepreneurial intentions	ACC (DM)
H4b	Entrepreneurial self-efficacy mediates the relationship between individual creativity and student interest in entrepreneurship education	ACC
H5a	Entrepreneurial self-efficacy mediates the relationship between gender and entrepreneurial intentions	ACC
H5b	Entrepreneurial self-efficacy mediates the relationship between gender and student interest in entrepreneurship education	ACC
H6a	The entrepreneurial experience of students positively influences entrepreneurial self-efficacy	REJ
H6b	The entrepreneurial experience of students positively influences entrepreneurial intentions	ACC
H7a	Entrepreneurial self-efficacy mediates the relationship between creativity training and entrepreneurial intentions	ACC
H7b	Entrepreneurial self-efficacy mediates the relationship between creativity training and student interest in entrepreneurship education	ACC
ACC = Accepted; REJ = Rejected; DM = Double mediation		

Pre-module ESE (time one) was found to positively influence post-module ESE (time two). It is considered that antecedent levels of ESE will help to develop it further, as individuals believing themselves competent may engage more and thus enhance their personal level more within EE. ESE has previously been highlighted as a robust mediator (Zhao *et al.*, 2005; Carr and Sequeira, 2007; Liguori, 2012; Yarima and Hashim, 2016), and this was supported in the study for both pre and post indicators of the construct. The results indicated that ESE positively mediated the relationship between individual creativity and EI (H4a accepted). Furthermore, a single and double mediated relationship was found relating to the positive effect that individual creativity had on EI when it was



mediated by ESE. These results offer support for the development of antecedent and within module levels of student creativity perceptions and entrepreneurial capacity.

The study found individual creativity was a strong predictor of ESE (time one and two). It is suggested that the archetype or picture of the entrepreneur which EE students have, may act as the benchmark by which they examine their own skills, and thus the student assumptions or perceptions of the entrepreneur could be a promising antecedent for future studies. The results herein would suggest that students might perceive creativity and idea generation to be strongly aligned to entrepreneurial competencies. Echoing Hamidi *et al.* (2008), Nasiru *et al.* (2014; 2015) and Shahab *et al.* (2018) this is also an indication of the importance of creativity within the academic study of EE. The study found that the relationship between individual creativity and EEI was approaching significance ( $p = 0.076$ ) (H5b rejected). Camelo-Ordaz *et al.* (2016) noted that their female students considered creativity to be the most important factor for creating a business, while males opted for risk-taking and other factors. An area of future exploration in this vein would be to study model differences according to gender.

ESE was also hypothesised to mediate the relationship between gender and EI, as was found by Liguori (2012). While significant results were attained, the relationship between gender and EI as mediated by ESE was significant at the 90% confidence interval (H5a accepted). Thus it would be considered that there is a gender effect and this should be studied further, as using gender as a factor in this manner (male to female) is limiting. The mediating effect of ESE on the relationship between gender and EI was also found to be significant at the 90% confidence interval, thus H5b was accepted.

A study by Zhao *et al.* (2005) noted a relationship between entrepreneurial experience and EI, which was mediated by ESE. Carr and Sequeira (2007) also found a mediating relationship between family related past experience and EI, through ESE. While entrepreneurial experience was a direct predictor

of EI in the study findings (H6b accepted), notably it was not related to or mediated by ESE (as distinct from Zhao *et al.* 2005; Carr and Sequeira, 2007). This may suggest that in the minds of the undergraduate students, there is a demarcation or divide in perception between their own experiences of entrepreneurship, and their perceived own entrepreneurial competencies. This supports the premise that entrepreneurial experiences are a realistic basis from which student attitudes of entrepreneurship may already have begun to develop (Ramayah *et al.*, 2012), however may not be fully connected to a student's perceptions of their own entrepreneurial competencies (H6a rejected). Kickul, Marlino and Barbosa (2008) also found that the positive impact of entrepreneurial parental role models on EI was not mediated through ESE in their study, which may have bearing in these results also.

Creativity training was found to positively effect EEI, as mediated by ESE (time one and two) or by ESE (time two) (H7b accepted). The study supports the findings of Nasiru *et al.* (2014; 2015) who found perceived creativity was related to the EI of Nigerian university students. Moberg (2014) noted the positive effect that action-based teaching involving creative thinking and proactive pedagogies had in increasing student engagement, which support the results herein. The findings show that the instructor can play a crucial role in developing student interest, by incorporating opportunities to develop ESE, and through the efficacy of the training and support provided. Burroughs *et al.* (2011) found that extrinsic rewards (prizes) were positively related to intrinsic motivation when creativity training was received. It is considered that training provided could enhance student entrepreneurial skills/competencies (ESE) which in turn may encourage them to consider entrepreneurship as a career choice more readily. In addition, ESE mediated the relationship between creativity training and EI (H7a accepted). The variable mediated the effect of creativity training on the outcomes, which supports a study Zhao *et al.* (2005) who also found ESE predictor of EI (Time two), and a mediator of formal learning (perceptions of) (H7 accepted).

## **6.8 Chapter Summary**

The purpose of this chapter study was to investigate the effect of antecedent student perceptions and entrepreneurial tendencies on the individual EE student interest in an entrepreneurship education module (EEL), and their entrepreneurial intentions. Social Cognitive Career Theory (SCCT) was the theoretical frame of the study, and hypotheses were drawn based on propositions of Bernstein and Carayannis (2012). Survey data was collected from 177 first year undergraduate students, and time-lagged iterations of ESE were studied as mediators. Results indicated that student perceptions of individual creativity, creativity training provided and gender were predictors of the outcomes, as mediated by ESE. Both the preliminary analyses and the model testing highlight the importance of the time one antecedent conditions in 1) methodologically adding depth to the empirical findings and, 2) highlighting the significance of raising entrepreneurial tendencies of students prior to university. The contributions of this study will be explored in greater depth during the synthesis and conclusion in Chapter 9.

In the next chapter (Chapter 7), the focus is on the student team in EE rather than the individual. Emanating from the conceptual framework proposed, variables hypothesised to affect the SET are proposed and examined through a quantitative analysis at the team-level. The study focuses on performing behaviours and social loafing as central themes.

**CHAPTER 7: Team Level Factors Affecting Team  
Performance in Entrepreneurship Education**

## 7.1 Abstract

**Aim:** To investigate factors affecting performance and social loafing in the student entrepreneurship team.

**Methodology:** The study was conducted using a sample group of undergraduate business students taking an entrepreneurship module. Individual survey data was collected and operationalised to the team-level, pertaining to 79 student teams. Data aggregation and preliminary analysis of validity was first carried out, before the model was examined using consistent PLS algorithm and PLS bootstrapping analyses in Smart-PLS3. A number of mediated and moderated relationships were examined, as well as a multi-group analysis conducted to compare model relationships for male and female-dominated teams.

**Results:** Findings indicated that team processes and a convergent team state: team conscientiousness had a positive influence on performance, and a negative influence on social loafing in teams. The entrepreneurial experience of the team positively influenced the interpersonal and action processes, but was a negative predictor of team conscientiousness. The separation of entrepreneurial self-efficacy levels within teams (ESE-SEP) was found to moderate the relationship between team processes and social loafing such that, at high levels of ESE-SEP, team processes are weaker in reducing social loafing. Teamwork training negatively influenced social loafing and positively influenced performance when mediated by both team conscientiousness and team processes. Entrepreneurial experience and team size were negative predictors in female-dominated teams while positive in male-dominated teams.

**Contribution:**

- The results of the study highlight the importance of studying multiple entrepreneurship education outcomes (not solely performance), and the promise that the exploration of team diversity variables in the analysis of the EE student or team may have.
- Entrepreneurial factors (experience and self-efficacy) had a significant impact on the team behaviours, states, and resultant outcomes within the model, which supports its rationale for study.
- The effect of entrepreneurial experience appears to affect male and female students and student teams differently, and this may have implications for how these teams should be instructed within EE.

**Keywords:** entrepreneurship education, student entrepreneurial teams, entrepreneurial self-efficacy, social loafing, entrepreneurial experience.

## 7.2 Introduction

In entrepreneurship team research, there are a growing number of studies exploring team dynamics and processes as well as contextual, demographic and team composition factors (Birley and Stockley, 2000; Ucbasaran *et al.*, 2001, Shepherd and Krueger, 2002; Chowdhury, 2005; Schjoedt and Kraus, 2009; Discua Cruz, Howorth and Hamilton, 2013; Klotz *et al.* 2014). Teamwork is an underexplored topic in EE, though it may offer substantial insight about entrepreneurial tendencies within the student population (Canziani *et al.*, 2015; Nabi *et al.*, 2016). The purpose of this chapter is to investigate

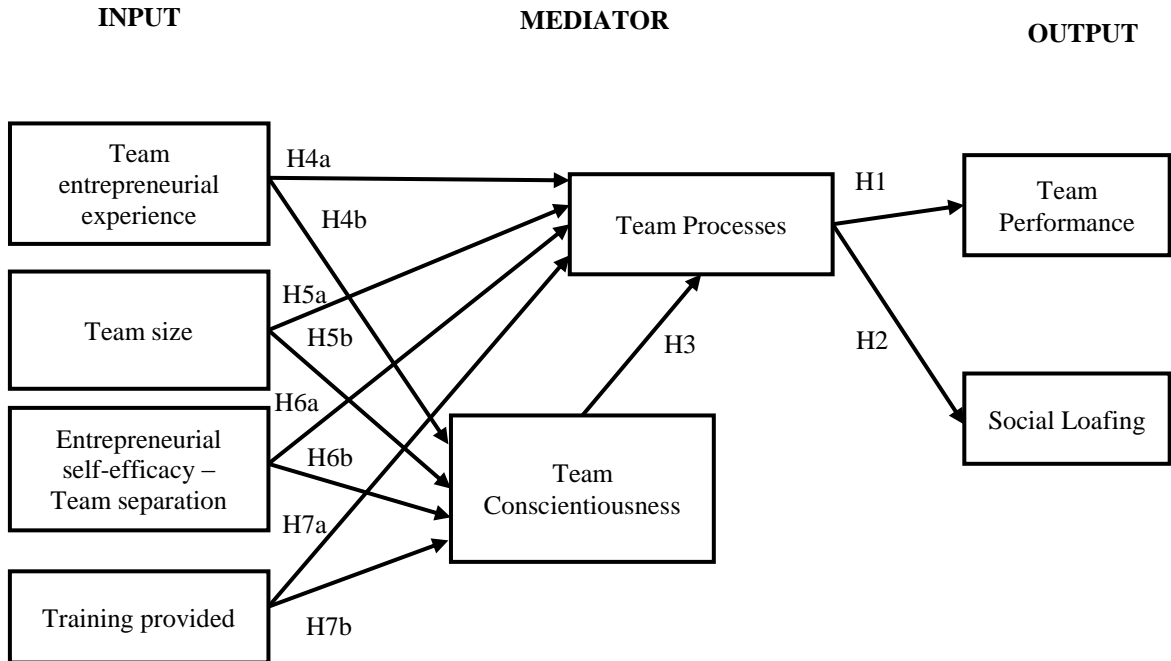
factors proposed to affect the student entrepreneurship team (SET), based on the framework presented in Chapter 3. While the initial framework refers broadly to team effectiveness outcomes and outputs as dependencies, this study takes a more granular approach and focuses on two sub-dimensions of team effectiveness: team performance and social loafing.

### **7.3 Model Selection and Development**

Performance can relate to the act of *performing* and the active and interpersonal behaviours that occur before, during and after completion of a team task (McEwan, Ruissen, Evs *et al.*, 2017). Antoni and Hertel (2009) consider team performance is achieved when a teams' output meets or exceeds the standards given to them. Some suggest output performance as a metric is limiting as it does not consider the impediments (externally) that can influence an end result, regardless of the efficiency (or performance) of the team (Beal *et al.* 2003). In addition, depending on stakeholder perception, performance can be subjectively judged (Savelsbergh, van der Heijden, and Poell 2010). For example, a teacher and a student may provide entirely different ratings of performance according to their perspective. Accordingly, student grades in isolation may not offer a wholly comprehensive view of student achievement or performing behaviours within the study, thus social loafing is also studied as a dependent factor. Social loafing or 'free-riding' has been found to negatively affect student team functioning, performance and perceptions of teamwork (Karau and Williams, 1993; Pfaff and Huddleston, 2003; Hart *et al.*, 2004)

Figure 7.1 shows the proposed IMO framework and relationships. As discussed in Chapter 4, a number of these inputs are collected at the individual level and operationalised to the team level (summed, aggregated or the separation between members noted). Focusing on performance, the mediating team processes chosen for the study refer to the action and interpersonal processes of Marks *et al.* (2001), while the emergent chosen is team conscientiousness.

**Figure 7-1: Hypothesised Model for Team Performance/Social Loafing**



As outlined in Chapter 3, team processes refer to active and behavioural mechanisms related to interactions that occur among group members and external others (Cohen and Bailey, 1997; Marks *et al.*, 2001). Marks *et al.* (2001) conceptualises team processes as transitional, interpersonal and active process dimensions, which while having discreet characteristics are usually congruent. For the purposes of this study, only action and interpersonal processes are examined. Mathieu *et al.* (2006) found performance correlated significantly with action and interpersonal processes, but not with transition processes. Marks *et al.* (2001) suggest team processes intervene between team composition and dependent outcomes. The mediators proposed may be inter-related such that the emergent state will have an impact on the team processes in context (De Church and Mesmer-Magnus, 2010).

The model does not explicitly predict a dependent relationship between social loafing and performance. It is considered that individuals known as a *'diligent isolate'* will do more than their fair share of the workload to compensate for less productive members (as outlined in Chapter Three) (Pieterse and Thompson, 2010). Thus, as they compensate, the presence of these individuals in a team may skew the impact of social loafing on performance (Schippers, 2014).

## 7.4 Hypotheses Development

### 7.4.1 Mediating Factor: Team Processes

The link between action processes such as coordination, communication and team performance has received empirical support (Stewart, 2006; Le Pine *et al.*, 2008). It is considered that the better a team are at systematically coordinating their activities (e.g. regularly monitoring their time-keeping and deadlines), the more likely they are to deliver their project effectively. Chen *et al.* (2009) found team action processes was a positive predictor of individual performance and goal striving behaviour. Bravo *et al.* (2016) found team action processes increased perceived goal attainment and attitude to teamwork (but not perceived improvement of skills). Ainsworth (2016) observed effective student teams exchanged ideas, provided task-related help, clarified content, exchanged needed resources, provided constructive feedback, and took on leadership roles. Chen and Agrawal (2018) found the active process of knowledge sharing had a positive impact on perceived student EE team performance. Acknowledging these findings, it is hypothesised that action processes will positively affect team performance, and will reduce social loafing.

H1a: Team action processes increase team performance

H1b: Team action processes decrease social loafing

Interpersonal processes are relational aspects such as conflict management, motivation building, and affect management; behaviours involved in maintaining team functioning (Marks *et al.*, 2001). Killumets *et al.* (2015) and Le Pine *et al.* (2008) found interpersonal processes had a positive effect on team effectiveness and organisational commitment. Chen and Agrawal (2018) found that knowledge sharing as a student EE team process had a positive significant effect on team performance. Interpersonal skills and behaviours are thought to promote cohesiveness between team-members (Baldwin *et al.*, 1997). Bravo *et al.* (2016) found positive results for the effect of interpersonal processes on perceived goal attainment, perceived improvement of skills, and positive attitude about the student team. Due to these interpersonal processes, a student's sense of engagement,



instrumentality, and value for the team may improve, reducing the tendency to engage in social loafing.

H2a: Team interpersonal processes increase team performance

H2b: Team interpersonal processes decrease team social loafing

#### **7.4.2 Mediating Factor: Team Conscientiousness**

It is hypothesised that the team conscientiousness emergent state may be related to team processes, as depicted in the conceptual framework in Figure 7.1. Team conscientiousness relates to the extent a team displays behaviours such as effort, perseverance, commitment, co-operation, and motivation for a task (Peeters, Van Tuijl, Rutte *et al.*, 2006). Conscientious teams have members who are deliberate, organised and task focused (English *et al.*, 2004).

The potential for inter-relationships between mediators has been noted in previous IMO models, as it is rationalised that emergent states will affect the active and interpersonal actions of a team, and vice versa (De Church and Mesmer-Magnus, 2010; Klotz *et al.*, 2014; De Mol *et al.*, 2015). A relationship from team conscientiousness to team processes is predicted, inferring that the shared sense of work ethic felt by the team will manifest as interpersonal or active team processes.

H3: Team conscientiousness increases team processes

#### **7.4.3 Input Factor: Entrepreneurial Experience**

Previous experience develops opportunity-seeking awareness, alertness and effectiveness in entrepreneurs (Politis, 2005; Ucbasaran, Westhead and Wright, 2009; Jiao, Cui, Zhu, and Chen (2014). It is considered that student teams, who have had more experience in entrepreneurial pursuits will be aware of the tasks necessary for an EE project/assignment, and will be more aware of the correct action and interpersonal processes to attain success. Chen and Agrawal (2018) found teams displaying high entrepreneurial leadership (potentially learned vicariously) had better team processes which may be a factor.

H4a: The entrepreneurship experience of the SET increases team processes

The mean entrepreneurial experience of the team, based on individual experience of the members is expected to reduce the team convergent state of conscientiousness within teams. Bae *et al.* (2014) has suggested that students with prior entrepreneurial experience may not benefit as fully from EE. As seen in Chapter 5, the entrepreneurial experience of the student was not significantly related to interest in the EE module. If a student has their own source of entrepreneurial guidance, they may perceive EE as less valuable, or have fewer expectations about it. This could erode the shared climate of a team, and increase instances of social loafing behaviour (Vroom, 1964; Karau and Williams, 1993; McMullen and Shepherd, 2006). Tarling, Jones, and Murphy documented this negativity towards the academic entrepreneurial experience (2016, p. 742), noting this response from one interviewee (from a family business background): “*You can’t learn about running a business from being at University*”.

H4b: The entrepreneurship experience of the SET decreases team conscientiousness

#### **7.4.4 Input Factor: Team Size**

In education, team size is a pertinent variable for exploration as the instructor can adapt it if the ideal size is known (Deeter-Schmelz *et al.*, 2002). Some suggest additional members enhance productivity, in consideration that ‘many hands make light work’ (Thomas and Fink, 1963; Wheelan, 2009). Amongst students, there is suggested a range from two to 10 members which will not affect team performance significantly (Deeter-Schmelz *et al.*, 2002). Others note that suggested increasing team size may introduce increased levels of ineffective work practices and reduced motivation (Steiner, 1972; Rentsch and Klimoski, 2001). In entrepreneurship education, Harms (2015) found that team size had a significant negative effect on individual performance, and found some support for its negative effect on group behaviours and performance. Studies have indicated that students are more cohesive and productive in smaller groups (Chidambaram and Tung, 2005; Wheelan, 2009). Much of this thinking is in an effort to reduce the likelihood of social loafing or ‘free-riding’ affecting performance, which it is said can be limited by team size (Deeter-Schmelz *et al.*, 2002). It is considered that smaller teams will have a stronger convergent state and sense of conscientiousness (increased instrumentality) and will have improved action and communicative processes. In the study

of the SET by Chen and Agrawal (2018), group size was negatively correlated to the team process variable (knowledge sharing) and the team convergent state (team cohesion).

H5a: Team size decreases team processes

H5b: Team size decreases team conscientiousness

#### **7.4.5 Input Factor: Entrepreneurial Self-Efficacy (Separation)**

*“Two (or more) cognitively diverse heads may be better than one head, but only sometimes”*

(Mello and Rentsch, 2014, p. 137)

Entrepreneurial Self-Efficacy Separation (ESE-SEP) relates to the deviation of team member cognitive beliefs on a lateral level of entrepreneurial self-efficacy. It is a deep-level variable reflecting a form of cognitive diversity which has not been studied in the EE context to date. Teamwork in entrepreneurship education is suggested to be a positive efficacy-building experience (Jerkku *et al.*, 2016). However, when team members have different levels of ESE, this misalignment may affect the outcomes, as teams of members who are cognitively dissimilar have been linked to reduced performance previously (DeChurch and Mesmer-Magnus, 2010). While it has been found (using the information diversity perspective) that cognitive diversity can bring new ideas and perspectives (Horwitz and Horwitz, 2007), this would be considered conceptually different to members recorded as strong and weak on the same construct.

Variation in member competency or attitude relevant to the task or assignment, such as inconsistent levels of functional and work experience has been found to cause conflict within teams (Pelled, Eisenhardt and Xin, 1999; Zellmer-Bruhn, Maloney, Bhappu *et al.*, 2008). This dissention in teams is noted for cognitive differences also, as Mello and Rentsch (2014) highlight a link between cognitive diversity and affective conflict. Jassawalla *et al.* (2009) found students attributed social disconnectedness to a ‘free-riders’ lack of participation and effort. During an EE assignment, the wide variation of ESE in a team may lead to affective conflict that would reduce the sense of team conscientiousness, and in turn reduce the efficacy of team processes.

H6a: Separation of entrepreneurial self-efficacy in a team decreases team processes

H6b: Separation of entrepreneurial self-efficacy in a team decreases team conscientiousness

#### **7.4.6 Input Factor: Teamwork Training**

Teamwork training is the provision of guidance and instruction to teams to aid their cohesive development as a unit; provided by classroom based instruction, workshops, or through practical or simulated role-play training (McEwan *et al.*, 2017). McEwan *et al.* (2017) meta-analytically found all types of teamwork training led to improved team performance, more significantly using active and simulated training than didactic lectures. In the student team context, it is suggested to improve team productivity and output (Stephens and Myers, 2000; 2001; Hernandez, 2002; Page and Donelan, 2003; Hansen, 2006; Hunsaker *et al.* 2011). Mathieu, Gilson and Ruddy (2006) found a positive relationship between perceived training supports and team processes in a study of 121 technician teams. Harms (2015) found that EE team learning behaviours positively affected group performance, and suggested team learning training would help to develop related behaviours and processes.

H7a: Teamwork training increases team processes

In turn, it is expected that team training will be positively related to the team conscientiousness. Team training has been linked to emergent states in the past such as team cohesion (Deeter-Schmelz *et al.* (2002) and collective efficacy (Eva, 2002). Swaim and Henley (2016) noted that rational persuasion by an instructor can increase student valence for a project, which may inspire them to be more committed and engaged.

H7b: Teamwork training increases team conscientiousness

### 7.4.7 Differentiating Factor: Gender

Noting the effect of differing numbers of males/females in teams, i.e. the team *gender diversity*, there are conflicting findings as shown in Table 7.1. A demographic or surface level variable, gender diversity when studied using similarity-attraction theory (Byrne, 1971) and social identity theory (Tajfel, 1979), suggests that individuals are more comfortable with their own perceived or evidential social category (i.e. when they have *homogeneity*). Mannix and Neale (2005) found demographic heterogeneity (gender, race, and age) made it difficult for teams to collaborate.

**Table 7-1: Gender Diversity in Teams and Student Teams**

Author	Type	Main Finding
Rogelberg and Rumery (1996)	General	The proportion of males in a team increased the decision quality of the team, leading to better performance.
Le Pine <i>et al.</i> (2002)	General	In performing masculine tasks, team decisions became more aggressive in an increasingly male group.
Joshi and Roh (2009)	General	Gender diversity had a significant negative effect on team performance in male-dominated occupational settings but a significant positive effect on team performance in gender-balanced occupational settings.
Woolley <i>et al.</i> (2010), Bear and Woolley (2011)	General	Females are said to be more perceptive in social situations; the presence of females in a team setting has a positive effect on the collaborative process.
Homberg and Bui (2013)	General	No significant evidence to support the effect of gender-diversity on performance
Zhou and Rosini, (2015)	Entrepreneurial teams	Limited and inconclusive relationships between gender diversity and team performance [meta-analysis]
Deeter-Schmelz <i>et al.</i> (2002)	Student teams	No significant difference caused by any instance of gender diversity on performance on a sample group of 85 undergraduate marketing students.
Lee and Farh (2004)	Student teams	Gender-diverse teams performed better than homogenous all-male or all-female undergraduate student teams.
Hansen <i>et al.</i> (2006)	Student teams (Business)	Male-dominated groups performed worse than female-dominated or balanced (fully heterogeneous) groups.
Watson <i>et al.</i> (2008)	Student teams	Gender heterogeneity of management student teams affected their performance according to team nationality.
Hoogendoorn <i>et al.</i> (2013)	EE student teams	Student teams with an equal gender mix perform better than male-dominated teams in terms of sales and profits

Others recommend diversity within teams to increase potential for diverse perspectives and critical thinking (Rentsch and Klimoski, 2001). While there appears to be no clear consensus, studying the differences between male-dominated and female-dominated teams has noted some significant results. Thus, it is proposed to run the analyses in discrete gender groupings (male-dominated/female-dominated) to ascertain if they react discretely.

H8: There is a difference between male-dominated and female-dominated teams

## 7.5 Methodology

**Table 7-2: Hypotheses for the Study (Chapter 7)**

	Hypotheses
H1a	Team action processes positively influence team performance
H1b	Team interpersonal processes positively influence team performance
H2a	Team action processes negatively influence social loafing
H2b	Team interpersonal processes negatively influence team social loafing
H3	Team conscientiousness positively influences team processes
H4a	The entrepreneurship experience of the SET positively influences team processes
H4b	The entrepreneurship experience of the SET negatively influences team conscientiousness
H5a	Team size negatively influences team processes
H5b	Team size negatively influences team conscientiousness
H6a	Separation of entrepreneurial self-efficacy in a team negatively influences team processes
H6b	Separation of entrepreneurial self-efficacy in a team negatively influences team conscientiousness
H7a	Teamwork training positively influences team processes
H7b	Teamwork training positively influences team conscientiousness
H8	There is a difference between male-dominated and female-dominated teams

### 7.5.1 Data Collection and Screening

Data was collected at the individual level using an online survey (available in Appendix G), which was distributed at the end of the DICE module (April/May of 2014) before students received their grades. From the online sample, 236 students completed the survey (response rate of 68.8% of the

class<sup>10</sup>). During the screening process, 10 cases in excess of 10% missing data and one unengaged (aberrant) case were deleted.

### 7.5.2 Survey Creation and Instruments Used

The survey consisted of demographic variables, measures relating to entrepreneurial tendencies, and module/team feedback questions. The individual level scale measures were tested prior to aggregation testing, using IBM SPSS (Version 23) to study scale reliabilities and factor structure (PCA with Direct Oblimin rotation). All scales received adequate reliability scores as seen in Table 7.3. Both the ESE and social loafing scale loaded strongly on one factor, and were accepted as such.

**Table 7-3: Reliability and Factor Structure of Scale Measures**

	Number of items	Cronbach's Alpha	KMO	Variance (Factor 1)
Entrepreneurial Self-Efficacy	4	.806	.766	63.245%
Team Processes (combined)	6	.900	.893	66.856%
(action)	3	.811		
(interpersonal)	3	.876		
Social Loafing	6	.921	.901	72.042%

*Entrepreneurial Self-Efficacy*<sup>11</sup>: A unidimensional four-item construct devised by Zhao *et al.* (2005) relating to an individual's perception of ability to conduct entrepreneurial tasks such as 'successfully identifying new business opportunities' and 'creating new products'. The scale was measured using a five-point Likert scale ranging from 1 (no confidence) to 5 (complete confidence).

*Entrepreneurial Experience*: This one-item dichotomous indicator asked students if they had ever started their own company. Within the dataset, 31 students (12.2%) indicated affirmatively.

*Team Social Loafing*: The scale for social loafing observed in teams was created based on literature outlining the consequences of social loafing in a team (Karau and Williams, 1993; Hart *et al.*, 2004; Jassawalla *et al.*, 2009). Students were asked to note the extent to which they perceived manifestations

<sup>10</sup> The response rate in the 2014/15 dataset was higher than 2013/14. Learning from this dissemination, further follow-up emails were sent in subsequent years.

<sup>11</sup> The measure chosen for this study was previously used in Chapters 4 and 5 of the thesis.

of social loafing within their team, on a five-point scale ranging from ‘never’ to ‘all the time’. Items related to aspects such as unfair workload distribution or ‘*team members not putting in as much effort as the rest*’. The majority (63.3%) considered their team experienced below average social loafing, while 22 students (10.1%) indicated none. The reliability and factor structure of the measure were accepted (Table 7.3).

*Team conscientiousness*: On a one-item seven-point scale, students were asked to rate their team unit in terms of how conscientious they perceived it to be, ranging from 1 (not at all) to 7 (more than enough). Of the dataset, 24 students considered their team below average (7.3%), 36 (16.5%) were neutral, and 72.5% (158) thought their team were above average.

*Team Processes*: Mathieu *et al.* (2006) developed the measure for action and interpersonal processes, each dimension consisting of three items measured on a five point Likert scale. Example items are ‘*my team took the time needed to share task-related information*’ (action), and ‘*my team created an environment of openness and trust*’ (interpersonal). The factor structure for the team processes items were tested both as a composite, and when split into its dimensions. Both forms suggested strong internal consistency but the factor analysis did not split the items into action/interpersonal dimensions. On this basis, it was decided to treat the team processes as composite (Table 7.4).

**Table 7-4: Factor Loadings for Team Processes**

<b>Item</b>	<b>Question</b>	<b>Factor Loading</b>
TPA1	My team took the time needed to share task-related information.	.760
TPA2	My team actively learnt from one another.	.778
TPA3	My team effectively communicated with each other.	.832
TPI1	My team created an environment of openness and trust.	.846
TPI2	My team thought in terms of what was best for the team.	.828
TPI3	My team really trusted each other.	.857
Extraction Method: Principal Component Analysis.		

*Teamwork training*: Students were asked to rate on a seven-point Likert scale from 1 (none at all) to 7 (more than enough) how much training and support they were given in relation to “teamwork



training” in the module. Of the 218 responses, 61 indicated they received below average training, 53 were neutral, and 104 indicated above average.

### 7.5.3 Team-level Operationalisation

The class consisted of 88 teams; however, as not all students completed the survey this led to inconsistency in terms of complete team response coverage. Nine teams were removed as they had single team-member responses, and would not be reflective of the full team. There were 43 teams with complete responses, 23 teams missing a single team member response, and 12 teams missing two member responses. Any individual level data (below 10% missing per respondent) was not imputed before team level operationalisation. A computational tool devised by Biemann *et al.* (2012), was used to determine interrater (within-team) agreement and complementary interrater reliability estimates based on analysis of variance calculations.

**Table 7-5: Interrater Agreement (IRA) & Interrater Reliability (IRR) Estimates**

Measure	$r_{wg}$	SD	F ratio	Sig.	ICC(1)	ICC(2)	Acc/Rej
<i>Entrepreneurial Self-Efficacy</i>	.82	.27	1.21	.168	.07	.17	R
Team Processes	.88	.22	1.80	.002	.22	.44	A
Team Conscientiousness	.71	.26	1.84	.001	.22	.46	A
Team Training	.62	.28	1.89	.001	.23	.47	A
Social Loafing	.63	.42	2.07	.000	.27	.52	A
$r_{wg}$ = Inter rater agreement; SD= Standard Deviation; ICC(1) and ICC(2)= Intraclass Correlation Coefficient; Acc/Rej = Accepted or Rejected for team-level aggregation							

As is shown in Table 7.5 below, most constructs tested displayed adequate mean  $r_{wg}$  values at a uniform distribution; however, the ESE scale was rejected for aggregation, (supporting its use as a separation variable). While ICC(2) values were low for the constructs tested, they were deemed acceptable, due to the reasonable ICC(1) and  $r_{wg}$  indices (Standifler *et al.*, 2015; Guchait *et al.*, 2016). Four of the five constructs were aggregated to the team level (team processes, team conscientiousness, team training, and social loafing). In addition, the mean score for team entrepreneurial experience was calculated, and the ESE separation diversity variable was based on the individual ESE scale values, calculated from the non-aggregated individual ESE items (as per the method used by Khan *et al.*, 2015). The team level variable was attained using the standard deviation between member score

totals<sup>12</sup>. To attain the team performance variable, instructor allocated assignment grades were used, based on a new venture creation project in which teams were asked to conceptualise a mobile application, and present their idea on a research poster. Team grades ranged from 38 to 93% (mean score = 61.96%, SD = 10.27).

## 7.6 Model and Hypotheses Testing

**Table 7-6: Descriptive Data Summary**

	Mean	Min	Max	SD	Kurtosis	Skewness
Team size	3.785	3	4	0.411	-0.004	-1.413
Performance	61.958	38	93	10.205	0.461	0.357
Gender Hetero	0.31	0	1	0.194	0.674	0.115
Ent. Experience	1.876	1.25	2	0.2	0.893	-1.405
Team Processes A1	4.133	2.5	5	0.535	0.565	-0.866
Team Processes A2	3.95	2.5	5	0.578	-0.368	-0.172
Team Processes A3	4.135	2.333	5	0.635	0.195	-0.761
Team Processes I1	4.092	3	5	0.561	-0.595	-0.364
Team Processes I2	4.157	3	5	0.513	-0.148	-0.591
Team Processes I3	3.976	2.5	5	0.636	-0.448	-0.525
Team Training	4.38	1.5	6.667	1.161	0.067	-0.416
Team Conscientiousness	5.107	3	6.667	0.915	-0.524	-0.431
Social Loafing 1	2.726	1	4.5	0.72	-0.199	0.206
Social Loafing 2	2.314	1	4.333	0.93	-0.760	0.335
Social Loafing 3	2.427	1	4.667	0.926	-0.898	0.272
Social Loafing 4	2.045	1	5	0.924	0.240	0.797
Social Loafing 5	2.348	1	5	0.966	-0.547	0.414
Social Loafing 6	2.175	1	5	1.036	-0.238	0.762
Entrepreneurial Self-Efficacy (separation)	14.082	9	18	1.805	0.029	-0.306

In the model tested there were a mix of scale item constructs and single item variables. Latent variables were considered reflective, suggesting the items measure largely the same, and/or are

<sup>12</sup> The other approach to attaining a separation variable is to use to the Euclidean distance however as discussed by Harrisson and Klein (2007), either is viable for this scenario.

manifestations of the construct. VIF scores for the study did not flag multicollinearity, ranging from 1.072 to 3.761. As seen in Table 7.6, all items were within acceptable ranges of skewness and kurtosis.

### 7.6.1 Evaluating the Measurement Model

Table 7.7 shows the items included in the measurement model and their psychometric properties.

**Table 7-7: Reliability and Convergent Validity Analysis (Bootstrapped)**

<i>Construct</i>	<i>Item</i>	$\lambda$	<i>T</i>	$\lambda^2$	$\alpha$	CR	AVE
<b><i>Team Processes</i></b>					0.926	0.926	0.678
<i>My team took the time needed to share task-related information.</i>	TPA1	0.733	9.813	0.54			
<i>My team actively learnt from one another.</i>	TPA2	0.784	12.022	0.61			
<i>My team effectively communicated with each other.</i>	TPA3	0.838	14.200	0.70			
<i>My team created an environment of openness and trust.</i>	TPI1	0.871	18.378	0.76			
<i>My team thought in terms of what was best for the team.</i>	TPI2	0.87	16.230	0.76			
<i>My team really trusted each other.</i>	TPI3	0.816	17.386	0.67			
<b><i>Social Loafing</i></b>					0.938	0.939	0.723
<i>Team members allowing others to take on extra responsibility rather than volunteering themselves</i>	SL1	0.733	10.143	0.54			
<i>Team members not doing their fair share of the workload</i>	SL2	0.776	11.138	0.60			
<i>Team members not putting in as much effort as the rest</i>	SL3	0.831	13.069	0.69			
<i>Team members being unreliable in terms of deadlines</i>	SL4	0.871	18.273	0.76			
<i>Team members taking it easy if there are others to do the work</i>	SL5	0.875	16.416	0.77			
<i>Team members missing meetings without explanation or forewarning</i>	SL6	0.819	16.708	0.67			
$\lambda$ = Loading; $\lambda^2$ = Communality; $\alpha$ = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted. All factor loadings were significant at the *** $p < .001$ level (t (79), two-tailed test).							

The dataset was examined using consistent PLS algorithm and bootstrapping analyses (see Chapter 4). A number of aspects were considered, namely the factor loadings and communalities, the reliability (Cronbach's alpha,  $\alpha$  and Composite Reliability, CR), and the Average Variance Extracted

(AVE). Firstly, all factor loadings ( $\lambda$ ) were above the threshold (.7) as calculated based on 1000 bootstrapping runs. This infers that over 50% of the variance in the observed variable is explained by the underlying construct. Item communalities ( $\lambda^2$ ) exceeded the minimum requirement of .25 and were accepted. The Cronbach's alpha for both measures was strong at .926 and .938, as was the composite reliability, with values of .92 and .94. Convergent validity was confirmed as the AVE was above .5. Discriminant validity was examined using the Fornell-Larcker criterion and the Hetero-trait Mono-trait method (Table 7.8 and 7.9), where no issues were found.

**Table 7-8: Convergent and Discriminant Validity (Fornell-Larcker Matrix)**

		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
1	ESE-SEP	<b>1</b>							
2	Entrepreneurial Experience	-0.094	<b>1</b>						
3	Performance	0.199	-0.147	<b>1</b>					
4	Social Loafing	0.154	0.02	-0.018	<b>0.85</b>				
5	Team Conscientiousness	0.174	-0.109	0.218	-0.447	<b>1</b>			
6	Team Processes	0.076	0.041	0.289	-0.612	0.757	<b>0.823</b>		
7	Team size	-0.071	-0.12	0.121	0.055	-0.057	-0.159	<b>1</b>	
8	Teamwork Training	0.205	0.279	0.072	-0.119	0.411	0.149	-0.253	<b>1</b>

Note: The numbers in bold show the square root of the AVE, while the numbers below these pertain to the construct correlations.

**Table 7-9: Convergent and Discriminant Validity (Heterotrait-Monotrait Matrix)**

		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
1	ESE-SEP							
2	Entrepreneurial Experience	0.094						
3	Performance	0.199	0.147					
4	Social Loafing	0.154	0.064	0.038				
5	Team Conscientiousness	0.174	0.109	0.218	0.449			
6	Team Processes_	0.082	0.067	0.29	0.608	0.758		
7	Team size	0.071	0.12	0.121	0.099	0.057	0.159	
8	Teamwork Training	0.205	0.279	0.072	0.114	0.411	0.149	0.253

### 7.6.2 Verification of the Structural Model

Using a bootstrapping procedure (1000 resamples), all hypothesised relationships were tested in the model, and path estimates noted (Table 7.10). Studying the bootstrapped model, relationships with *t* values of above 1.96 indicate statistical significance at the 95% confidence interval (non-significant in italics). Non-significant relationships showing no indication of indirect effects were dropped, and the model was re-examined (Table 7.11).

**Table 7-10: Original Bootstrapping (Chapter 7)**

<b>Path</b>	<b>Sample Mean</b>	<b><i>T</i>-statistic</b>	<b>p (Sig.)</b>
Team Conscientiousness -> Team Processes	0.904	13.466**	0.000
Team Processes -> Social Loafing	-0.737	4.342**	0.000
Teamwork Training -> Team Conscientiousness	0.47	4.114**	0.000
Entrepreneurial Experience -> Team Processes	0.208	2.633**	0.009
Team Processes -> Performance	0.539	2.455*	0.014
ESE-SEP -> Social Loafing	0.237	2.114*	0.035
Team size -> Team Processes	-0.158	1.962*	0.05
Entrepreneurial Experience -> Team Conscientiousness	-0.225	1.915†	0.056
Entrepreneurial Experience -> Performance	-0.229	1.863†	0.063
<i>Team size -&gt; Performance</i>	<i>0.205</i>	<i>1.592</i>	<i>0.112</i>
<i>ESE-SEP -&gt; Performance</i>	<i>0.176</i>	<i>1.545</i>	<i>0.123</i>
<i>Team Conscientiousness -&gt; Performance</i>	<i>-0.321</i>	<i>1.225</i>	<i>0.221</i>
<i>Entrepreneurial Experience -&gt; Social Loafing</i>	<i>0.129</i>	<i>1.194</i>	<i>0.233</i>
<i>Teamwork Training -&gt; Performance</i>	<i>0.198</i>	<i>1.151</i>	<i>0.250</i>
<i>Teamwork Training -&gt; Social Loafing</i>	<i>-0.179</i>	<i>1.135</i>	<i>0.257</i>
<i>Team Conscientiousness -&gt; Social Loafing</i>	<i>0.141</i>	<i>0.758</i>	<i>0.449</i>
<i>Team size -&gt; Social Loafing</i>	<i>-0.065</i>	<i>0.564</i>	<i>0.573</i>
<i>ESE-SEP -&gt; Team Conscientiousness</i>	<i>0.057</i>	<i>0.540</i>	<i>0.590</i>
<i>Team size -&gt; Team Conscientiousness</i>	<i>0.037</i>	<i>0.507</i>	<i>0.612</i>
<i>ESE-SEP -&gt; Team Processes_</i>	<i>-0.009</i>	<i>0.109</i>	<i>0.913</i>
<i>Teamwork Training -&gt; Team Processes_</i>	<i>-0.320</i>	<i>0.089</i>	<i>3.640</i>
* Significant at the 0.05 level; ** Significant at the 0.01 level; *** Significant at the 0.001 level (All 2-tailed); † Significant at .10 level.			

During the second analysis, it was found that the ESE-SEP variable dropped from significance. Rather than removal, its moderating effect on the relationships between team processes and the endogenous variables was tested. This decision was based on a study by Zhou (2016) on 144 entrepreneurial teams, which found a relationship between shared leadership and entrepreneurial team performance

was moderated by the personality diversity of the team. As seen in Table 7.11, this was found to have a significant effect on the model and dependent variables.

**Table 7-11: Final Bootstrapped Results (Chapter 7)**

Path	Sample Mean	Original Sample	T-statistic	p (Sig.)
Team Conscientiousness -> Team Processes	0.902	0.903	14.427***	0.000
Team Processes -> Social Loafing	-0.672	-0.664	8.736***	0.000
Teamwork Training -> Team Conscientiousness	0.470	0.479	4.573***	0.000
Teamwork Training -> Team Processes	-0.321	-0.325	3.649***	0.000
Team Processes -> Performance	0.295	0.289	2.740***	0.006
Entrepreneurial Experience -> Team Processes	0.208	0.210	2.730***	0.007
Moderating Effect 1 -> Social Loafing	-0.189	-0.202	2.232*	0.026
ESE-SEP -> Social Loafing	0.246	0.240	2.153*	0.032
Entrepreneurial Experience -> Team Conscientiousness	-0.248	-0.242	1.985*	0.048
Team size -> Team Processes	-0.161	-0.164	1.960†	0.051
* Significant at the 0.05 level; ** Significant at the 0.01 level; *** Significant at the 0.001 level (All 2-tailed); † Significant at .10 level.				

Table 7.12 indicates the specific indirect effects and highlights the presence of double mediation in the model. The model indicates that double-mediation is present in the model as some of the variables are mediated through both team conscientiousness and team processes. Methodologically, a similar study conducted by Yunis, Tarhini, and Kassar (2018) uses PLS-SEM (and multi-group analysis) in their study of IT adoption/use, corporate entrepreneurship, and organizational performance. They also noted a negative relationship between predictor and mediator, which was observed as positive when tested as a double mediated relationship.

Studying the total effects of the model in Table 7.13, the  $Q^2$  results established by the construct cross-validated redundancy were above zero, indicating the latent variables have predictive power and relevance. To check the predictive power of the final model, the  $R^2$  statistic notes the total variance explained by each of the endogenous variables. The adjusted model tested explains an adjusted 7.2% of the variance in SET performance, and 44.1% of the variance in social loafing. For the mediating

variables, team processes attained an (adjusted) variance of 65.1%, and team conscientiousness with 20.3%. Figures 7.2 and 7.3 present the final model noting the direct effects and explained variances.

**Table 7-12: Specific Indirect Effects (Chapter 7)**

Path	Sample Mean	Original Sample	T-statistic	p (Sig.)
Teamwork Training -> Team Conscientiousness -> Team Processes	0.426	0.432	3.983***	0.000
Teamwork Training -> Team Processes -> Social Loafing	0.215	0.216	3.478***	0.001
Teamwork Training -> Team Conscientiousness -> Team Processes -> Social Loafing	-0.288	-0.287	3.299***	0.001
Entrepreneurial Experience -> Team Processes -> Social Loafing	-0.140	-0.139	2.561**	0.011
Teamwork Training -> Team Processes -> Performance	-0.095	-0.094	2.163*	0.031
Teamwork Training -> Team Conscientiousness -> Team Processes -> Performance	0.128	0.125	2.055*	0.040
Entrepreneurial Experience -> Team Conscientiousness -> Team Processes	-0.225	-0.218	1.931†	0.054
Team size -> Team Processes -> Social Loafing	0.108	0.109	1.898†	0.058
Entrepreneurial Experience -> Team Conscientiousness -> Team Processes -> Social Loafing	0.150	0.145	1.895†	0.059
Entrepreneurial Experience -> Team Processes -> Performance	0.061	0.061	1.894†	0.059

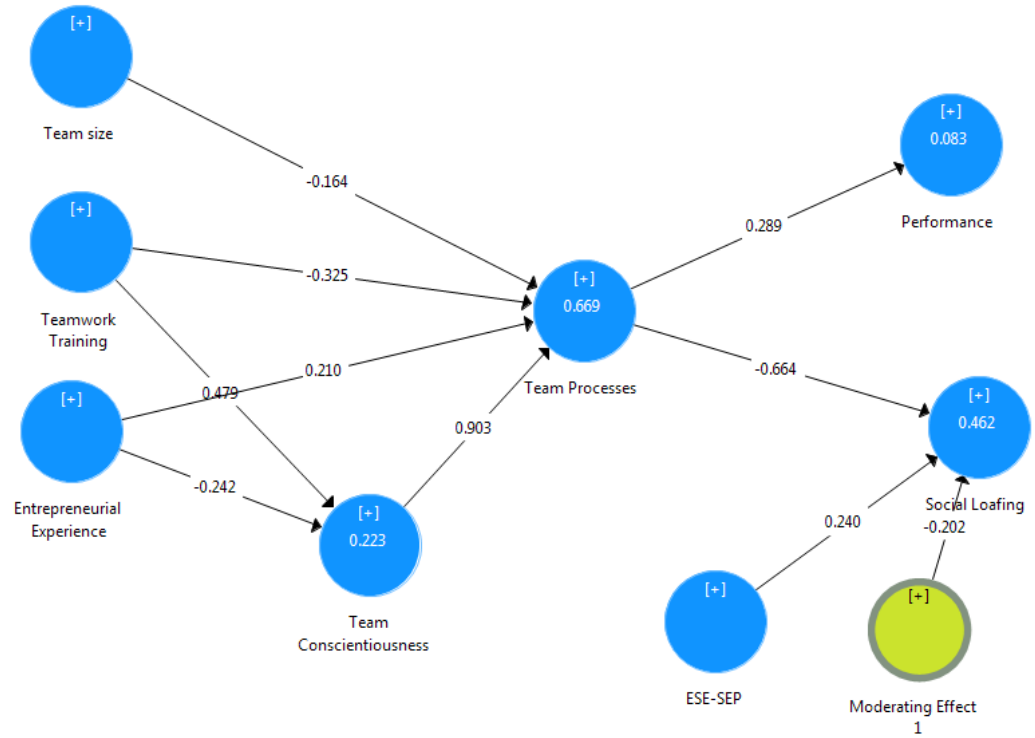
\* Significant at the 0.05 level; \*\* Significant at the 0.01 level; \*\*\* Significant at the 0.001 level (All 2-tailed); † Significant at .10 level.

**Table 7-13: Effect Sizes and Predictive Ability of the Model (Bootstrapped)**

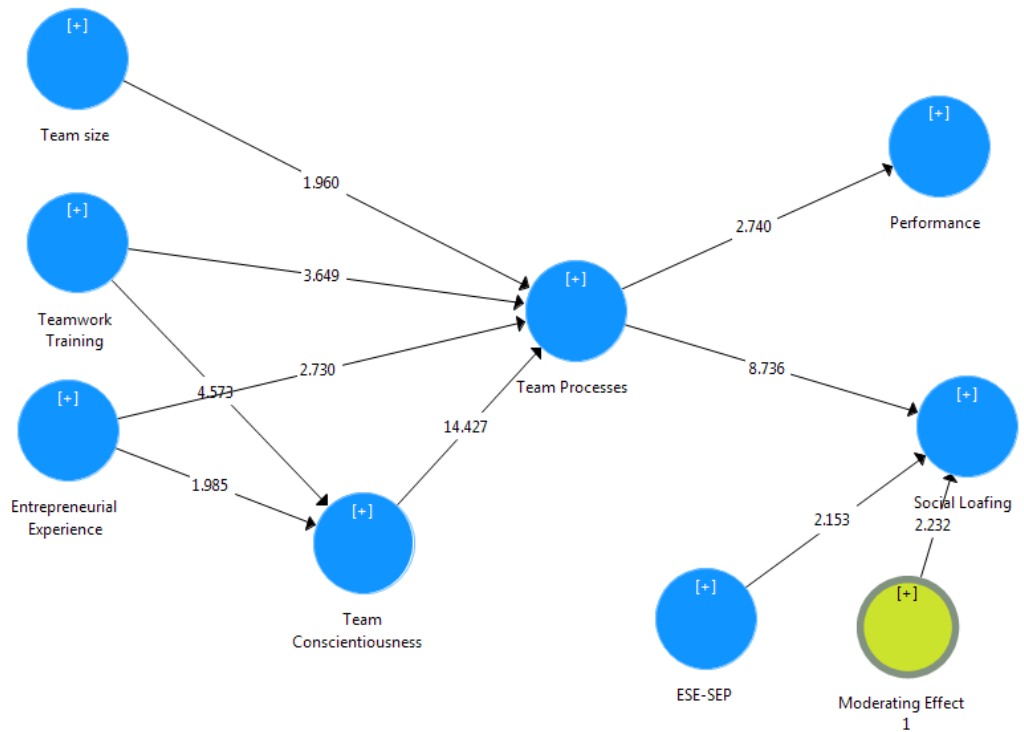
	$R^2$	Adjusted $R^2$	$Q^2$
Performance	0.083	0.072	0.066
Social Loafing	0.462	0.441	0.279
Team Conscientiousness	0.223	0.203	0.106
Team Processes	0.669	0.651	0.404

$Q^2$  = Cross-Validated Redundancy

**Figure 7-2: Final Structural Model for Team Performance/Social Loafing (Team level)**



**Figure 7-3: Final Bootstrapped Model Team Performance/Social Loafing (Team level)**





### 7.6.3 Multi-Group Analysis

In the stage, the dataset was split into male-dominated teams (teams that had more males than females, n=35), female-dominated teams (n=27) and balanced teams (n=17)<sup>13</sup>. Using Multi-Group Analysis (MGA) in Smart-PLS3, a number of path relationships were significantly different when compared.

**Table 7-14: Multi Group Analysis (MGA)**

Teams:	Male Dominated		Female Dominated		Difference	Sig.
	Mean	T	Mean	T		
Entrepreneurial Experience -> Team conscientiousness	-0.172	1.689	-0.793	4.888**	0.648**	0.003
Entrepreneurial Experience -> Team Processes	0.203	1.540	-0.232	0.895	0.386*	0.037
Team size -> Performance	0.308	2.111*	-0.215	1.137	0.555*	0.020

\* Significant at the 0.05 level; \*\* Significant at the 0.01 level; \*\*\* Significant at the 0.001 level (All 2-tailed).

As shown in Table 7.14, entrepreneurial experience was negatively (significant) related to team conscientiousness in female-dominated teams but insignificantly for male-dominated. The relationship between entrepreneurial experience and team processes was negative for female-dominated teams, while positive for male-dominated. The effect of team size on performance was positively significant for male-dominated teams, while negative and insignificant for female.

## 7.7 Findings and Discussion

An exploration of student team of entrepreneurship education was conducted, focusing on team output performance and social loafing, as per the framework proposed in Chapter 3. A summary of the results and additional findings (in italics) is found in Table 7.15. Team action and interpersonal processes were studied as a composite variable of team processes and significantly predicted performance, while were found to negatively predict social loafing (H1 and H2 are accepted). Team

<sup>13</sup> A sub-group of 17 teams was considered too small to attain comparable reliable data

conscientiousness was not directly related to either dependant variable, but was a strong positive predictor of team processes (H3 accepted). This finding highlights the importance of including inter-relationships between mediators in teamwork frameworks (Klotz *et al.*, 2014, De Mol *et al.*, 2015), and supports the suggestion that emergent states may affect the active and interpersonal actions of a team (De Church and Mesmer-Magnus, 2010). This supports Chen and Agrawal (2018) who noted that team cohesion had a positive impact on EE team knowledge sharing processes.

When studied indirectly, team conscientiousness had a significant positive influence on performance, and a negative influence on social loafing when mediated by team processes. In the past, conscientiousness has positively influenced group performance (Neuman and Wright, 1999; Peeters *et al.*, 2006; Bell, 2007; Schippers *et al.*, 2014). In addition, as previously outlined, emergent collective states such as group cohesion, agreeableness and team conscientiousness have been found to reduce social loafing in a team (Karau and Willliams, 1993; Schippers, 2014).

Entrepreneurial experience did not directly predict performance or social loafing, but positively influenced team processes, and negatively influenced team conscientiousness (H4 accepted). This suggests that while increased entrepreneurial experience in a team may encourage team processes, it also may negatively affect the team state of conscientiousness, possibly due to an imbalance (heterogeneity) in the team or an emergence of a 'lead' entrepreneur. The indirect relationship from entrepreneurial experience to performance via team processes as a mediator was significant at the 90% confidence interval.

In terms of social loafing, entrepreneurial experience had a negative significant influence when mediated by team processes. This implies that the more entrepreneurial experience in a team, the better the interpersonal and active processes, which can reduce free-riding behaviour. It should be noted however that the relationship when double mediation is examined (entrepreneurial experience

to social loafing, via TP and TC) becomes positive (significant at the 90% confidence interval,  $p = .059$ ). This is potentially due to the suppression effects of the negative relationship between entrepreneurial experience and team conscientiousness.

**Table 7-15: Team Performance/Social Loafing (Team level) Model Findings**

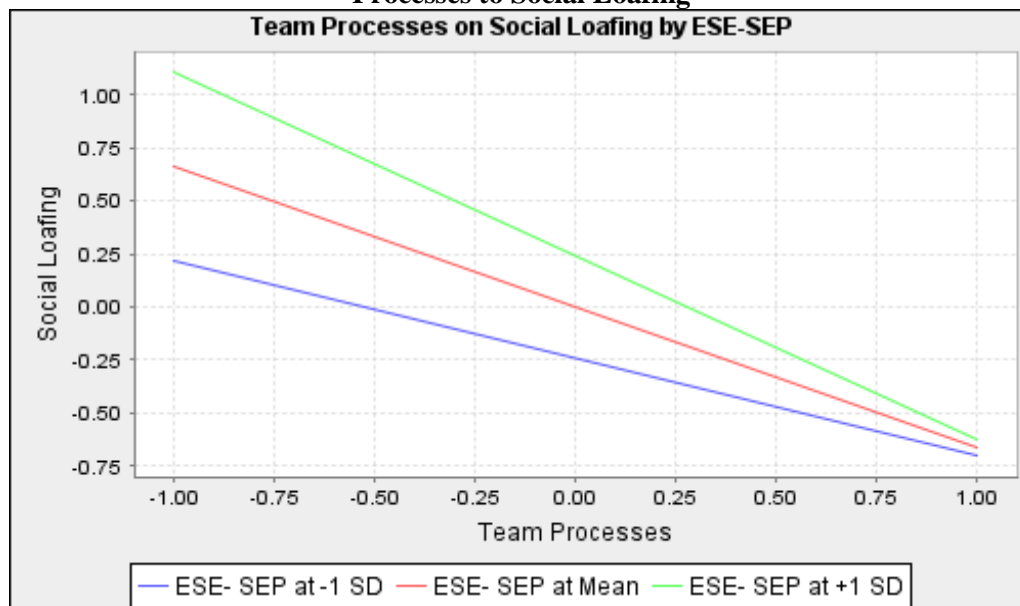
	<b>Hypotheses</b>	<b>Supported</b>
H1a	Team action processes positively influence team performance	n/a
H1b	Team interpersonal processes positively influence team performance	n/a
<i>H1c</i>	<i>Team processes (action and interpersonal) positively influence team performance</i>	ACC
H2a	Team action processes negatively influence social loafing	n/a
H2b	Team interpersonal processes negatively influence team social loafing	n/a
<i>H2c</i>	<i>Team processes (action and interpersonal) negatively influence social loafing</i>	ACC
H3	Team conscientiousness positively influences team processes	ACC
H4a	The entrepreneurship experience of the SET positively influences team processes	ACC
H4b	The entrepreneurship experience of the SET negatively influences team conscientiousness	ACC
H5a	Team size negatively influences team processes	ACC
H5b	Team size negatively influences team conscientiousness	REJ
H6a	Separation of entrepreneurial self-efficacy in a team negatively influences team processes	REJ
H6b	Separation of entrepreneurial self-efficacy in a team negatively influences team conscientiousness	REJ
<i>H6c</i>	<i>The separation of entrepreneurial self-efficacy levels moderates the relationship between team processes and social loafing.</i>	ACC
H7a	Teamwork training positively influences team processes	REJ
H7b	Teamwork training positively influences team conscientiousness	ACC
H8	There is a difference between male-dominated and female-dominated teams	ACC
ACC = Accepted; REJ = Rejected; NS = Not Significant		

Team size had a negative influence on team processes (H5a accepted) but had a non-significant effect on team conscientiousness (H5b rejected). It was also observed that team size had a positive significant effect on social loafing as mediated by team processes. This suggests that increased numbers of members reduced the effective action and interpersonal processes of the team, and this indirectly increased the potential for free-riding. This finding supports studies which indicate teams are more cohesive in smaller groups (Rentsch and Klimoski, 2001; Chidambaram and Tung, 2005;

Wheelan, 2009), and with smaller groups, member instrumentality is heightened which would reduce social loafing (Karau and Williams, 1993). Steenkamp (2003), North, Linley and Hargreaves (2000) and Pieterse and Thompson (2010) recommend limiting teams to five or under to reduce incidences of social loafing. The effect of team size on performance when mediated was not significant, and team size was not significantly related to team conscientiousness in the study.

The study proposed the separation between team member levels of entrepreneurial self-efficacy (ESE-SEP) would affect social loafing and performance. Initially, neither relationship was found to be directly significant in the model. However, following the method used in a study by Zhou (2016), ESE-SEP was found to be a moderator. As shown in Figure 7.4 and indicated in the study findings, team processes help to reduce social loafing.

**Figure 7-4: Simple Slopes Analysis of the Moderating Influence of ESE-SEP on Team Processes to Social Loafing**



However, when teams are highly dissimilar in their ESE, levels (i.e. have high ESE-SEP); the impact of team processes on social loafing is weakened. Thus, the greater the cognitive ESE divide in the team, the less the team processes reduce social loafing. This finding is new to the field of EE, and the study of the SET.

The mean level of teamwork training perceived by the team was a negative predictor of team processes (H7a rejected), and a positive predictor of team conscientiousness (H7b accepted). In addition, a positive relationship between training to team processes, once mediated by team conscientiousness. This suggest a positive effect when teamwork training succeeds in creating a shared emergent state, which then leads to improved action and interpersonal processes. However, if the team does not have a shared climate or do not perceive themselves conscientious, then training does little to teach them effective practices, it would appear.

This rationale was further supported as performance was indirectly negatively influenced by teamwork training via team processes alone, but once team conscientiousness was added to the relationship (double mediation), it became positive and significant. In turn, social loafing was positively influenced when only team processes mediated teamwork training, but this became negative once the relationship included team conscientiousness to team processes (double mediation). Thus, the level that a team considered itself to have contributed effort, perseverance, commitment in the form of team conscientiousness; the more positive the team processes which indirectly supported positive outcome factors.

In addition to the PLS model testing, a multi-group analysis was conducted comparing the male and female-dominated teams, as it was considered that there would be a significant difference (Lee and Farh, 2004, Hansen *et al.*, 2006; Hoogendoorn *et al.*, 2013). The negative effect of entrepreneurial experience on team conscientiousness was significant among female-dominated teams, but not among male-dominated. Additionally, entrepreneurial experience was a negative predictor of team processes in female-dominated teams, while positive for male-dominated teams. Team size was not related to performance in the full dataset, but in the multi-group analysis it was positively related to male dominated teams (sig.) while negatively (non-significant) for female-dominated teams.

The cumulative findings offer support for the SET framework proposed in the thesis and provide validation for the inclusion of variables noted herein. The contributions of this study will be explored in greater depth during the synthesis and conclusion in Chapter 9.

## **7.8 Chapter Summary**

This chapter presented and empirically tested a number of variables for their effect on student team performance and social loafing within EE. From the conceptual framework proposed in Chapter 3, variables hypothesised to affect performance and performing behaviours of SET were proposed and examined. The quantitative study was conducted on 79 student teams in EE and analysed at the team level using structural equation modelling. This study also answers recommendations for more exploration of cognitive diversity in teams (Van Knippenberg and Schippers (2007) as the impact of varying team member ESE was examined. Results indicated a low predictive power for the performance variable but highlighted a number of significant relationships pertaining to social loafing. Team processes positively predicted team performance, and negatively predicted social loafing, and were themselves positively influenced by team conscientiousness, entrepreneurial experience and reduced team size.

In the next chapter (Chapter 8), the focus is again on the student team in EE rather than the individual. Emanating from the conceptual framework proposed, variables hypothesised to affect the SET are proposed and examined through a quantitative analysis at the team-level. The study focuses on creative perceptions, innovative behaviours and innovative output as central themes.

**CHAPTER 8: Team Level Factors Affecting Student  
Team Innovation in Entrepreneurship Education**

## 8.1 Abstract

**Aim:** To investigate factors proposed to affect the innovative output of the student entrepreneurship team.

**Methodology:** The study was conducted using a sample of undergraduate business students taking an entrepreneurial module. Individual survey data was collected and operationalised to the team level, pertaining to 68 student teams. Data aggregation and preliminary analyses were firstly conducted, before the model and hypotheses were examined using consistent PLS algorithm, and PLS bootstrapping analyses in Smart-PLS3. A number of mediated and moderated relationships were also examined in the analysis.

**Results:** Team Climate for Innovation (TCI) was a direct positive predictor of the student teams' innovative output, as was team entrepreneurial experience. In addition, the positive relationship between entrepreneurial experience and innovative output was moderated by the separation of founding passion among team-members. The separation of member perceptions of university support for innovation negatively influenced team innovative output. Team size and the team norming process of creating a team signatory code positively influenced the Team Climate for Innovation. The positive relationship between TCI and innovative output was strengthened by the moderating effect of high team-member creativity perceptions.

**Contribution:**

A number of significant contributions emanate from this research study:

- The model and results note the importance of viewing the outcomes of EE more broadly, noting the significant relationships and variables which relate to innovative action and output as distinct from performance.
- Noting the separation along variables in teams has provided new depth to our understanding of the SET.
- Entrepreneurial factors (passion, experience, and entrepreneurial self-efficacy) were found to have a significant impact on team outcomes, which supports its research exploration in EE.

**Keywords:** entrepreneurship education, student entrepreneurial teams, entrepreneurial passion, innovation, entrepreneurial experience.

## 8.2 Introduction

While it is common to study the effect of entrepreneurship education on factors such as performance, there are more to consider:

*“The benefits of entrepreneurship education are not limited to start-ups, innovative ventures and new jobs ... [but, rather to] an individual's ability to turn ideas into action”*

(European Commission, 2008, p.7)



The degree to which entrepreneurial pursuits are innovative has significant benefits for venture performance, profit and economic growth (Utsch and Rauch, 2000; Lundin, 2015), thus the ability to behave innovatively is considered fundamental to the entrepreneur (Hisrich and Peters, 1986). These innovative behaviours relate to problem recognition, idea generation, resource seeking, networking, and prototype development (Scott and Bruce, 1994). When Klotz *et al.* (2014) discussed the future of entrepreneurship team level research, innovativeness was suggested a key area of interest.

It has been suggested that more focus needs to be placed on creativity and its development in EE students, though much is still unknown about how creativity, innovation and entrepreneurship education are linked (Berglund and Wennberg, 2006; Hamidi *et al.*, 2008; Book and Philips, 2013; Lewis and Elaver, 2014). This study investigates factors proposed to affect the innovative output of the student entrepreneurship team (SET), based on the framework discussed in Chapter 3.

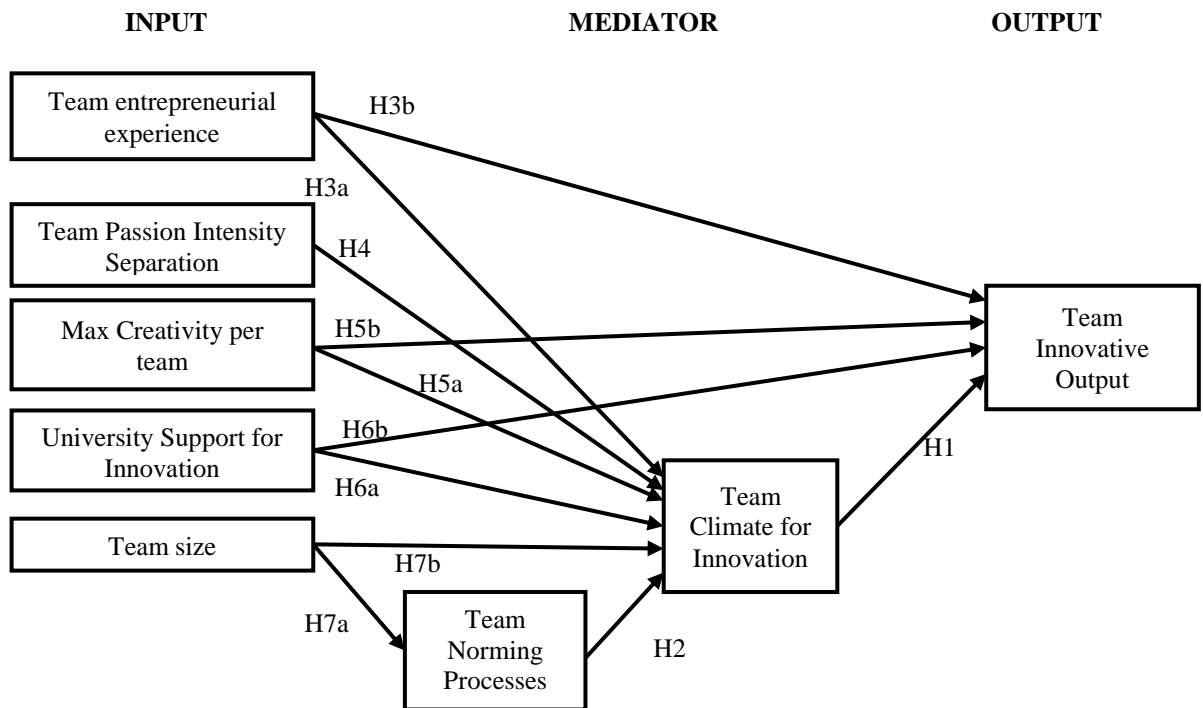
### **8.3 Model Selection and Development**

In the study, team innovative output refers to the innovative strength or power of the resultant product, process, idea, or output of the teamwork emanating from a teamwork experience, where innovation reflects radicalness, novelty, magnitude, and effectiveness (West and Hirst, 2005). Creativity and innovation have been studied in a number of contexts, using mainly the interactionist or componential theories of creativity as outlined in Chapter 3. The Four Factor theory of innovation of West (1990) has been used to study innovation and team innovation in numerous contexts and levels and is based on:

- 1) Vision: *“An idea of a valued outcome which represents a higher order goal and a motivating force at work”* (West, 1990, p. 310).
- 2) Participative Safety: *“involvement in decision-making is motivated and reinforced while occurring in an environment which is perceived as interpersonally non-threatening”* (West, 1990, p. 311). This relates to both attaining participation in decision-making, but also intra team safety (Somech and Drach-Zahevy, 2013).

- 3) Task orientation: *“a shared concern with excellence of quality of task performance in control systems and critical appraisals”* (West, 1990, p. 313). This would entail that the individual or team would be in pursuit of excellence using evaluations, control systems, and appraisals (Anderson and West, 1998; Somech and Drach-Zahevy, 2013).
- 4) Support for Innovation: *“the expectation, approval and practical support of attempts to introduce new and improved ways of doing things in the work environment”* (West, 1990, p.338).

**Figure 8-1: Hypothesised Model for Team Innovative Output**



Commonly used to study team innovation is the Team Climate for Innovation (TCI) (West, 1990). In addition, a number of factors considered to affect the efficacy of teams in producing innovative work are studied, including personal, team-related, and university-level variables. Figure 8.1 shows the proposed model and predicted relationships as taken from the SET framework described in Chapter 3.

## **8.4 Hypotheses Development**

The specific hypotheses for the model are discussed below and stated in Table 8.1. Only direct path relationships are hypothesised, while all mediating relationships are tested in the analysis and discussed thereafter.

### **8.4.1 Mediating Factor: Team Climate for Innovation**

Group innovativeness emanates from a team that has a shared vision, participative safety where members are encouraged to contribute without fear of reprimand, a high commitment to task and standards, support for innovative ideas (West 1990; West and Anderson 1998; Kivimaki and Elovainio, 1999; Ragazzoni, Baiardi, Zotti *et al.*, 2002; Antoni and Hertel, 2009). To determine and study this supportive team climate for innovation, West and Anderson (1998) devised a construct known as the Team Climate Inventory (or TCI) which measures the environment around the team for innovative assistance and encouragement along these four factors of innovation. Studies have repeatedly noted positive relationships between the team climate for innovation and team innovativeness (Bain *et al.* 2001; Pirola-Merlo and Mann, 2004). To date, studies with this conclusion are sparse in EE and warrant investigation

H1: The Team Climate for Innovation increases team innovative output

### **8.4.2 Input Factor: Team Transitional Processes (Norming)**

Somech and Drach-Zahevy (2013) recommend that to add depth to the inquiry of climate for innovation and innovative output, more focus should be placed on norming and the development of shared norms. As outlined in Chapter 3, within teamwork, transitional processes relate to planning, strategy creation, and goal-setting behaviours (Marks *et al.*, 2001; Mathieu *et al.*, 2008). Studies have found that considered planning during the early phases of team development, such as prior deliberation over plans, the anticipation of potential problems or the quantity of shared information and opportunities for participation offered to team members, correlate positively with team effectiveness (Le Pine *et al.*, 2008; Mathieu and Rapp, 2009).

As a pedagogical means of assisting the norming stage of team development, the creation of a team contract or signatory code is considered a transitional process. The team signatory code (a subset of the team charter) is a team generated document which stipulates rules used to determine whether individual team members can or cannot receive credit for assignments (Bailey *et al.*, 2005). Teams create their own code of practice dictating the conditions by which they must function, and stipulating the consequences for non-compliance of these conditions. It allows a team to define itself and its shared responsibilities, and 'recognises the delegation of authority from the professor to the students as a cooperative unit' (Valenti *et al.*, 2005). Essentially, it puts the onus on the team unit to develop their own norms and to solve internal problems.

It is considered that the effort a team invests in this norming activity, the better the team interaction and processes. Using a student sample, positive results have been found for the effect of transition processes on both perceived goal attainment and perceived improvement of skills (Pineda and Lerner, 2006; Bravo *et al.*, 2016). Transitional processes usually occur at the beginning of a team project (Kozlowski and Ilgen, 2006). They are said to be vital in affirming teams shared mission, and are related to processes of information gathering and strategy development (Ilgen *et al.*, 2005; Rico *et al.*, 2011). Accordingly, it is suggested that these norming activities are positively related to the Team Climate for Innovation.

H2: Transitional (norming) processes increase the Team Climate for Innovation

#### **8.4.3 Input Factor: Team Entrepreneurial Experience**

The studies of Chapter 5 and 7 found previous experience of entrepreneurship was not linked to student interest in EE, nor to student team performance directly, but was a positive predictor of active and interpersonal team processes. Similarly, it is expected that the higher the level of experience of entrepreneurship in the team, the more vision and support for innovation developed, heightening TCI.

H3a: The entrepreneurial experience of the SET increase the Team Climate for Innovation

It is additionally suggested that in development of innovative product solutions, a team with more collective entrepreneurial experience may be beneficial. Politis (2005) suggests that prior experience

allows the entrepreneur to more effectively recognise opportunities (both from an informational and conceptual stance), make improved associations and enhance their creative action. Jiao *et al.* (2014) found knowledge gained from an entrepreneur's social network, and past management experiences improved entrepreneurial alertness and innovativeness. It is expected that a SET with entrepreneurial experience will be more able to recognise opportunities, think of innovative ideas, and produce more innovative assignments.

H3b: The entrepreneurial experience of the SET increase the team innovative output

#### **8.4.4 Input Factor: Entrepreneurial Passion**

Past studies have suggested a link between emotion (or *affect*) and creative or innovative action (Amabile *et al.* 2005; McEwan and Beauchamp, 2014). Isen (1999) recommended that a positive affective state encourage divergent cognitive thought and processes, which can lead to ideas that are more novel. Amabile *et al.* (2005) found an inter-relationship between affect and creativity, finding quantitatively that affect was an antecedent of creativity, and qualitatively that creativity had a positive influence on employee emotion.

Considering the emotion-based construct of EP, once it is activated, an individual will adopt appropriate coping strategies and behaviours synonymous to their aligned role-identity (Cardon *et al.*, 2009; Murnieks *et al.*, 2014). Whilst the majority of studies of EP are individual-level, interest is building for team-level (collective, divergent) passion (Drnovšek *et al.*, 2009; Klotz *et al.*, 2014; Chen, Liu and He, 2015; Cardon *et al.*, 2017). Cardon *et al.* (2017) propose two types of team-level EP diversity constructs:

**Passion focus variety** – the difference in EP levels of team members for specific roles or objects (inventor, founder, developer).

**Team Passion Intensity Separation (TPIS)** – Described as the dispersion in the level of activation of emotion experienced by team members (Cardon *et al.*, 2017), the variable is based on the deviance between EP levels reported by members of the same team (i.e. highest

to lowest). For example, within a team if members report EP scores of 2, 5, 5, and 10, the TPIS would be the difference between the maximum (10) and minimum (2) reported score and thus would be 8.

Cardon *et al.* (2017) speculated that a team displaying both high focus variety and high intensity separation would lead to extreme levels of conflict and reduced collective state formation. This supports Drnovsek *et al.* (2009) who suggest high cohesion within homogenously affective teams, due to a shared sense of passion and goal commitment.

While there is no empirical study of TPIS in entrepreneurship education to date, using student teams, Dlugoborskyte and Petraite (2016) studied the effect of team personality diversity on team innovative output using the IMO/IPO model. Their model studied the effect that diversity in teams (diversity of personality, diversity of team roles) had on innovativeness and idea generation, as mediated by team processes and communication. This study highlights the potential for studying student teams in terms of innovativeness, and found that teams had increased innovative output according to high diversity in personality type. To date, few have studied innovation at the student level in entrepreneurship education. It is similarly hypothesised that TPIS and innovative output would be negatively related, such that smaller the divide between member perceptions of EP, the better the team consensus and processes, and more innovative the resulting output. If students differed widely in their EP levels it may lead to subgroups or faultlines forming in team which could hinder the team climate and innovative behaviour of the team (Kratzer, Leenders and Engelen, 2004).

H4: The Team Passion Intensity Separation (TPIS) of the SET decreases the Team Climate for Innovation

#### **8.4.5 Input Factor: Individual Creativity**

Creative thinking has been linked to innovative behaviour and outcomes (Cummings and Oldham, 1997; Hülshager *et al.*, 2009; Anderson *et al.*, 2014). In addition, self-perceptions of creativity have been found to be adequate predictors of creative and academic performance (Chamorro-Premuzic, 2006; Pretz and McCollum, 2014). De Tienne and Chandler (2004) found a module which delivered creative thinking and opportunity recognition activities, increased the innovative projects of the entrepreneurship students. Accordingly, it is suggested that the perceived creativity of individuals within a SET have an impact on the subsequent innovativeness of the final project. Operationally, an aggregated measure of individual creativity would not be reflective of the team, and the separation between individuals would not be reflective of the creative level of the team.

Açıköz and Günsel (2016) found individual creativity improved the quality of team decision processes, which were positively associated with team climate. Pirola-Merlo and Mann (2004) studied a number of forms of creativity (average, team-level, maximum per team, minimum per team) in their study and found that while team climate affected team member creativity, a majority of variance in team member creativity was not attributed to group membership (i.e. not determined because of the group itself). Thus, it was decided that instead of studying the collective (summed) or separation along the creativity variable, the maximum member score per team would be studied for its indirect or moderating effect. Černe, Kaše and Škerlavaj (2016) found that the maximum score per team along a construct of 'idea championing', wherein a member advocates for an idea or plan, was most significantly related to idea implementation in their analysis. In addition, Gong *et al.* (2013) found that the maximum creativity score per team was a positive predictor of team-level outcomes.

H5a: Maximum member individual creativity per team increases the Team Climate for Innovation

H5b: Maximum member individual creativity per team increase team innovative output

#### **8.4.6 Input Factor: University Support for Innovation**

Relating to the descriptions of the *school innovative climate* by Moolenaar, Karsten, Slegers and Zijlstra, (2009), *organisational support for innovation* (Woodman *et al.*, 1993; Martins and Terblanche, 2003), and perceptions of innovative support in industry (Montes *et al.*, 2004), University Support for Innovation (USI) is defined herein as:

*“the student perception of the encouragement, resources and rewards available for the practices, procedures and behaviours that promote the generation of new knowledge and practices within a university setting”*

In an organisational setting, employee perceptions of how innovation is recognised, supported and resourced has been found to improve creative performance, informed risk taking and the use of novel solutions at work (George and Zhou, 2002; 2007; Gumusluoglu and Ilsev, 2009). Dul and Ceylan (2014) found firms with creativity-supporting work environments introduce more new products to the market (NP productivity), and have greater sales success. This employee perception of the organisational support for innovation is affected by how they view their managers/company dealing with worker ideas and risk and (Amabile and Gryskiewicz, 1989; Scott and Bruce, 1994). A meta-analysis by Evanschitzky, Eisend, Calantone *et al.* (2012) found organisational support factors (dedicated company resources, strategic considerations, and organisational climate) positively influenced new product success. Studying other industries, teachers have also been noted to be more responsive to creativity, innovation, and the implementation of technology-enhanced innovation when they perceive their school/institution to be supportive of innovation (Zhu, 2015).

In EE, Saeed *et al.* (2015) found that student perceptions of university support for entrepreneurship (in the form of perceived educational support, concept development support, business development support and institutional support) related to personal entrepreneurial outcomes of efficacy and intentionality. Noting these findings, it is hypothesised that students who perceive their institution is supportive of innovation will feel secure and encouraged to take risks in creating innovations. It is acknowledged that the teacher may have a significant role in shaping these



perceptions, and this is considered to be included within the current definition of USI (and in a future avenue of research, could be studied in greater depth).

H6a: University Support for Innovation increases the Team Climate for Innovation

H6b: University Support for Innovation increase team innovative output

#### **8.4.7 Input Factor: Team size**

In the previous study (Chapter 7), team size<sup>14</sup> was found to negatively affect team processes and performance, and positively affect social loafing. Following this premise, the first proposition is a similar effect between team size and team norming processes as manifest by engagement in creating the team contract.

H7a: Team size decreases the team transitional (norming) processes

Weiss and Hoegl (2016) propose a dichotomy such that, while small team sizes may increase individual motivation, and raise the creativity and quality of the output, it too may increase stress and lower team efficiency (due to reduced task-to-person fit). Bacon, Stewart and Stewart-Belle (1998) suggested additional team-members would produce diminishing gains in creativity, however, Gielnik *et al.*, (2012) considered that divergent thinking has an effect on venture growth by encouraging the generation of original ideas. It is suggested that team size may be positively related to team innovative output insofar that as teams increase, so too does the potential for divergent thinking and innovative ideas. It may also increase member perceptions of participative safety, which would relate to the TCI (West, 1990). West and Anderson (1996) found the number of innovators per team positively related to innovation radicalness in management teams.

H7b: Team size increases the Team Climate for Innovation

<sup>14</sup> Limited to teams ranging from 2 to 4 person teams.

## 8.5 Methodology

**Table 8-1: Hypotheses for the Study (Chapter 8)**

No	Hypotheses
H1	Team Climate for Innovation positively influences team innovative output
H2	Transitional (norming) processes positively influence the Team Climate for Innovation
H3	H3a: The entrepreneurial experience of the SET positively influence the Team Climate for Innovation H3b: The entrepreneurial experience of the SET positively influence the team innovative output
H4	H4a: The Team Passion Intensity Separation (TPIS) of the SET negatively influences the Team Climate for Innovation
H5	H5a: Maximum member individual creativity per team positively influences the Team Climate for Innovation H5b: Maximum member individual creativity per team positively influences team innovative output
H6	H6a: University Support for Innovation positively influences the Team Climate for Innovation H6b: University Support for Innovation positively influences team innovative output
H7	H7a: Team size negatively influences the team transitional (norming) processes H7b: Team size positively influences the Team Climate for Innovation

### 8.5.1 Data Collection and Screening

Two iterations of the online survey (available in Appendices H and I) were distributed to the undergraduate DICE students (November 2014 and May 2015) as per the procedure discussed in the research methodology<sup>15</sup>. The surveys consisted of demographic questions, entrepreneurial tendency indicators (time one and two), and module and teamwork feedback (time two). Post-screening, the dataset consisted of 317 row responses relating to 68 teams. It was acknowledged that of this dataset, a number of the row responses had missing data (T1 completed but not T2 or vice versa). Any individual level data (below 10% missing per respondent) was not imputed before team level operationalisation.

<sup>15</sup> The dataset was utilised previously in Chapter 6 at the individual level, thus was screened at this stage.

## 8.5.2 Survey Creation and Instruments Used

A number of the measures underwent preliminary quantitative analyses in Chapter 6, as summarised in Table 8.2 below. The other variables are discussed thereafter.

**Table 8-2: Measures Used**

Variable	Example item	Source	Detail	Cronbach's Alpha
Entrepreneurship Experience	<i>I run my own company at present</i>	Own – created for study	Three dummy variables (own/past/family company) recoded to 0-4	n/a
Entrepreneurial Passion	<i>It is exciting to figure out new ways to solve market needs</i>	Cardon <i>et al.</i> (2013)	2/3 role identities: inventor [5 items]; founder [4 items]	0.881 [inventing .803, founding .898]
Individual Creativity	<i>I like to search out new technologies, processes, techniques, and/or product ideas.</i>	George and Zhou (2001) adapted by Janssen and Xu (2008)	[idea generation 6 items, 5 point Likert scale]	0.781

*Perceived University Support for Innovation*: A scale measure from Woodman *et al.* (1993) used to examine the organisational characteristics that affect creativity was amended to refer to ‘the university’ in place of ‘the organisation’ for the study. Students were asked to indicate agreement on a five-point Likert scale (strongly disagree to strongly agree) to the following:

- 1) *This university recognises and welcomes innovation in its students (USI1)*
- 2) *There is a culture of innovation and enterprise in this university (USI2)*
- 3) *There are many resources available in the university to aid innovation (USI3)*
- 4) *Creativity and innovation are rewarded in this university (USI4)*
- 5) *There is much support for students who are pursuing innovative tasks (USI5)*

The measure was found highly reliable (Cronbach’s alpha 0.918). The factor structure was analysed using principal components analysis (PCA). The Kaiser-Meyer-Okin value in this case was .886 and Bartlett’s test of Sphericity reached significance ( $p=.000$ ). PCA revealed one component, accumulating to 78.495% of the total variance. An inspection of the scree plot supports that the items were related to a one-factor model.

*Team Transitional Processes (Norming)*: As a pedagogical means of assisting the norming stage of team development, the creation of a team contract or signatory code is considered a transitional

process activity. Student teams were supplied with training and templates for the creation of a team signatory code, and were tasked with creating this over the first week of team norming. The collective effort invested in conducting this assignment was asked in the survey (*How much effort did your DICE team put into constructing the team signatory code for the module?*) in a one-item measure using a seven-point Likert scale

*Team Climate Inventory*: This measure constructed by Anderson and West (1998) contains items such as ‘we are able to be critical with each other in order to improve our product/idea’ and ‘we co-operate with each other to help develop and apply new ideas’. The TCI has previously demonstrated reliability and validity (Anderson and West, 1998; Kivimäki and Elovainio, 1999; Ragazzoni *et al.*, 2002). A shortened version developed by Kivimäki and Elovainio (1999) was used, consisting of fourteen of the original items on a seven-point Likert scale.

**Table 8-3: Pattern Matrix for Team Climate Inventory**

Item Measure	Component	
	1	2
<i>We were in agreement about the team objectives.</i>		.574
<i>The team objectives were clearly understood by all members of the team.</i>		.835
<i>We believed the team objectives were actually achievable.</i>		.809
<i>We believed these team objectives were worthwhile.</i>		.835
Our team had a ‘we are in it together’ attitude.	.805	
People kept each other informed about work-related issues in the team.	.864	
People felt understood and accepted by each other.	.765	
There were real attempts to share information throughout the team	.821	
As a team we were constantly asking each other questions	.809	
We were able to be critical with each other in order to improve our product/idea	.747	
As a team we built on each other’s ideas to improve our product/idea	.607	
People in the team were always searching for fresh, new ways of looking at problems.	.712	
In the team we took the time needed to develop new ideas.	.650	
We co-operated with each other to help develop and apply new ideas.	.727	
<i>Principal Component Analysis/ Oblimin with Kaiser Normalization</i>		

This shortened version was conceived as a four factor model representing vision, participative safety, task orientation and support for innovation and has been used successfully to study innovation in teams (Somech and Drach-Zahevy, 2013) and student teams (Loo and Loewen, 2002).

Mathisen *et al.* (2006) noted that there was minimal difference between a one-factor, second order TCI model and a four-factor first order model in their analyses, and suggest that a composite measure may be applicable in certain scenarios. Somech and Drach-Zahevy (2013) preferred to use a composite one-factor measure when using the shortened scale, finding it to have improved model fit. The factor structure attained a Kaiser-Meyer-Olkin value of .925 and the Bartlett's test of Sphericity reached significance. As shown in Table 8.3 above, the PCA analysis revealed two components with an eigenvalues greater than one, accumulating to 62.144% of the total variance (52.925% and 9.219%). In studying the component matrix, the first four items pertaining to the vision dimension of the TCI loaded on a second factor. These two components were tested in the analyses.

### **8.5.3 Team-level Aggregation**

Teams ranged in size with 7 x four member teams, 52 x five member, and 9 x six member teams. The analysis revealed 45 teams had full member survey completion (no member responses missing), 21 teams had one missing member response, and two teams were missing two member responses. The individual level responses were tested for aggregation using a computational tool by Biemann and Cole (2014) to study the interrater (within-team) agreement and interrater reliability estimates. The ICC (1) and ICC (2) results (shown in Table 8.4) supported aggregation for the TCI (ten item) and the team norming variables. Attaining team-level TCI by aggregating individual-level responses has been supported as a common and valid method (Pirola-Merlo and Mann, 2004; Mathisen *et al.*, 2006). Despite this, Mathisen *et al.* (2006) did find that a high proportion of the total variance in the TCI tested at the team level was accounted for by individual factors (e.g. personality) in their assessment.

**Table 8-4: ICC and R<sub>wg</sub> values**

Measure	Mean <i>r<sub>wg(J)</sub></i>	SD	F ratio	Sig.	ICC(1)	ICC(2)	Acc/ Rej
<i>University Support for Innovation</i>	0.93	0.05	0.92	0.649	-0.02	-0.09	Rej
<i>Team Climate Inventory (Vision – Factor 1)</i>	0.89	0.13	1.26	0.130	0.07	0.20	Rej
Team Climate Inventory (Composite – Factor 2)	0.95	0.08	1.78	0.002	0.18	0.44	Acc
<i>Individual Creativity</i>	0.95	0.13	0.77	0.882	-0.07	-0.30	Rej
<i>University Support for Innovation</i>	0.93	0.10	1.14	0.263	0.04	0.12	Rej
Team Norming	0.62	0.30	1.47	0.029	0.12	0.32	Acc
r <sub>wg</sub> = Inter rater agreement; SD= standard deviation; ICC(1) and ICC(2)= Intraclass Correlation Coefficient; Acc/Rej = Accepted or Rejected for team-level aggregation.							

The four-item TCI factor pertaining to vision/objectives was not accepted for aggregation, and was discontinued in the analysis. To attain separation variables, the standard deviation between member score totals was calculated. As the University Support for Innovation was not accepted for aggregation and was examined as a separation variable. Table 8.5 present the final operationalisation of the variables for the analysis.

**Table 8-5 Operationalised Variables**

Name	Type	Abbreviation	Mean	Range
University Support for Innovation	Separation	USI-SEP	2.46 (SD = 1.374)	0 - 6.160
Entrepreneurial Passion (founding)	Separation	TPIS (founding)	3.369 (SD = 1.598)	0.577 - 9.238
Entrepreneurial Passion (inventing)	Separation	TPIS (inventing)	3.128 (SD = 1.723)	0 - 10.017
Team Climate Inventory	Aggregated	TCI	Mean total score (40.560, SD = 4.404)	26 - 47.333
Team Norming	Aggregated	Engagement (TSC)	4.969 (SD = 1.064)	2 – 7
Maximum Individual Creativity per team	Maximum	MaxIC	24.897 (SD=2.865)	14 – 25
Team size		Team size	5.029 (SD = 0.484)	4 – 6

It has been suggested a challenge to measure the innovative performance of teams in social science research (Kratzer *et al.*, 2004). A six-point scale by Fiet (2002) and revised by De Tienne and

Chandler (2004) was used<sup>16</sup>, operationalised as a percentage scale for the study (See Table 8.6). To determine innovativeness, a panel of research staff in the university who were familiar with the project rated the team assignments. An interrater reliability analysis performed to determine consistency among raters and was found to be valid (ICC = 0.682.  $p < 0.001$ ). The projects were allocated innovativeness scores ranging from 37.75 to 77, with a mean score of 57.05 (SD = 8.975).

**Table 8-6: Innovative Output of Student Project**

1.	No apparent innovation or not enough information to make a determination (0-40%)
2.	A product or service identical to an existing product/service offered to an underserved market (40-50%)
3.	A new application for an existing product/service, with little/no modification or a minor change to an existing product (50-60%)
4.	A significant improvement to an existing product/service (60-70%)
5.	A combination of two or more existing products/services into one unique or new product/service (70-80%)
6.	A new-to-the world product/service, a pure invention or creation (80-100%)

## 8.6 Model and Hypotheses Testing

In the model, there was a limitation apparent in that there were a reduced number of scale measures due to the team level operationalisation. The latent variables were considered reflective, suggesting that the items measure largely the same, and/or are manifestations of the construct itself. Table 8.7 notes the variables in the analysis and their descriptive information. During the assessment of skewness and kurtosis, the TCI8 and TPIS (inventing) items were removed as they displayed high kurtosis scores of 4.405 and 2.600 respectively. TCI10 and TCI13 were noted to be quite kurtotic but were retained as they were below acceptable cut-offs (See Chapter 4, Section 4.5.3). VIF scores did not flag multicollinearity as all scores were less than three (range = 1.038 – 1.939).

<sup>16</sup> A scale for product innovativeness has been previously used by Henneke and Luthje (2007) was deemed overly industry-focused

**Table 8-7: Descriptive Summary**

	Mean	Min	Max	SD	Kurtosis	Skewness
Innovative Output	57.048	37.75	77	8.975	-0.587	-0.179
Entrepreneurial Experience	0.519	0	1.20	0.281	-0.537	0.161
Team Size	5.029	4	6	0.484	1.431	0.078
Team Norming	4.969	2	7	1.064	0.724	-0.804
TCI5	4.023	2	5	0.665	0.944	-0.881
TCI6	4.229	3	5	0.521	-0.041	-0.618
TCI7	4.224	2.5	5	0.496	1.514	-1.021
TCI8	4.202	2	5	0.507	4.405	-1.524
TCI9	3.877	2.3	5	0.591	-0.591	-0.265
TCI10	3.832	2	5	0.494	2.105	-1.062
TCI11	4.163	3	5	0.486	0.146	-0.544
TCI12	3.832	2	5	0.592	1.258	-0.746
TCI13	3.962	2	5	0.517	1.952	-1.024
TCI14	4.168	2.8	5	0.502	0.062	-0.426
USI-SEP	2.511	0	6.16	1.343	0.444	0.281
TPIS (inventing)	3.128	0	10.02	1.723	2.600	0.921
TPIS (founding)	3.369	0.58	9.24	1.598	1.437	0.514
Max Individual Creativity	21.529	15	25	2.348	-0.241	-0.306

**Table 8-8: Reliability and Convergent Validity (Bootstrapped)**

	Item	$\lambda$	$T$	$\lambda^2$	$\alpha$	CR	AVE
<b>Team Climate Inventory</b>					0.942	0.940	0.640
Our team had a 'we are in it together' attitude.	TCI5	0.868	9.045	0.753			
People kept each other informed about work-related issues in the team.	TCI6	0.775	7.705	0.601			
People felt understood and accepted by each other.	TCI7	0.641	3.913	0.411			
As a team we were constantly asking each other questions	TCI9	0.828	10.107	0.686			
We were able to be critical with each other in order to improve our product/idea	TCI10	0.681	4.462	0.464			
As a team we built on each other's ideas to improve our product/idea	TCI11	0.722	5.301	0.521			
People in the team were always searching for fresh, new ways of looking at problems.	TCI12	0.822	8.793	0.676			
In the team, we took the time needed to develop new ideas.	TCI13	0.928	10.885	0.861			
We co-operated with each other to help develop and apply new ideas.	TCI14	0.886	12.664	0.785			
$\lambda$ = Loading; $\lambda^2$ = Communality; $\alpha$ = Cronbach's alpha; CR= Composite Reliability; AVE= Average Variance Extracted. Factor loadings were significant at the *** $p < .001$ level; $t(68)$ , two-tailed test).							



### **8.6.1 Evaluating the Measurement Model**

The dataset was examined using the Smart-PLS3 software programme, wherein a number of Consistent PLS algorithm and bootstrapping analyses were conducted (as discussed in Chapter 4). Table 8.8 shows the measurement model items and their psychometric properties. Factor loadings and communalities, the  $t$  score and its significance, the reliability (Cronbach's alpha and CR) and the AVE were studied. TCI7, 10 and 11 were below the factor loadings ( $\lambda$ ) threshold (.7) as calculated on 1000 bootstrapping runs this range (.672, .661, .662) but were deemed acceptable as they were above 0.4 and their removal did not increase the composite reliability (Hair *et al.*, 2017). Item communalities ( $\lambda^2$ ) exceeded the minimum requirement of .25 and were accepted. The Cronbach's alpha ( $\alpha$ ) for the TCI measure was strong at .942, as was the composite reliability (CR) at .940. Convergent validity was assessed via the average variance extracted (AVE) and this was accepted as all construct items were higher than .50. The Fornell-Larcker criterion and the Hetero-trait Mono-trait method as seen in Table 8.9 and 8.10 found no issues with discriminant validity.

### **8.6.2 Verification of the Structural Model**

PLS-SEM was used to assess the structural model in the full sample (Table 8.11). Firstly, all hypothesised relationships were tested in the model with path estimates noted. A bootstrapping procedure (1000 resamples) determined the statistical significance of each chosen path in the model. Non-significant variable relationships with no indication of indirect effects were dropped from the model in a stepwise fashion and the model was re-examined using the bootstrapping procedure (1000 resamples). After the hypothesised relationships, the mediating and moderating relationships were examined. Table 8.12 presents the total and indirect effects of the model below. Two variables were investigated as moderators in the analysis. The maximum level of individual creativity (idea generation) was a significant moderator of the relationship between TCI and innovative output (See Table 8.12).

**Table 8-9: Convergent and Discriminant Validity (Fornell-Larcker Matrix)**

		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
1	Entrepreneurial (Founding) Passion - Team Separated (TPIS)	<i>1</i>							
2	Entrepreneurial Experience	0.095	<i>1</i>						
3	Individual Creativity (Max)	-0.434	0.074	<i>1</i>					
4	Innovative Output	0.053	0.305	0.014	<i>1</i>				
5	Team Climate for Innovation	0.099	0.060	0.075	0.251	<i>0.8</i>			
6	Team size	0.082	-0.146	0.008	-0.050	0.225	<i>1</i>		
7	Transitional (Norming) Processes	0.064	0.113	0.162	0.098	0.663	0.065	<i>1</i>	
8	University Support for Innovation - Team Separated (USI-SEP)	-0.187	-0.056	0.136	-0.439	-0.17	0.026	-0.107	<i>1</i>

Note: The numbers in bold show the square root of the AVE, numbers below pertain to the construct correlations.

**Table 8-10: Convergent and Discriminant Validity (Heterotrait-Monotrait Matrix)**

		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
1	Entrepreneurial (Founding) Passion - Team Separated (TPIS)								
2	Entrepreneurial Experience	0.095							
3	Individual Creativity (Max)	0.434	0.074						
4	Innovative Output	0.053	0.305	0.014					
5	Team Climate for Innovation	0.107	0.093	0.099	0.253				
6	Team size	0.082	0.146	0.008	0.050	0.219			
7	Transitional (Norming) Processes	0.064	0.113	0.162	0.098	0.655	0.065		
8	University Support for Innovation - Team Separated (USI-SEP)	0.187	0.056	0.136	0.439	0.173	0.026	0.107	

**Table 8-11: Original Bootstrapping (Chapter 8)**

	<i>Original Sample</i>	<i>Sample Mean</i>	<i>T Statistics</i>	<i>P Values</i>
Transitional (Norming) Processes -> Team Climate for Innovation	0.64	0.649	8.200***	0.000
University Support for Innovation - Team Separated (USI-SEP) -> Innovative Output	-0.404	-0.391	3.852***	0.000
Entrepreneurial Experience -> Innovative Output	0.279	0.284	2.530**	0.012
Team size -> Team Climate for Innovation	0.186	0.189	2.041*	0.042
<i>Team Climate for Innovation -&gt; Innovative Output</i>	<i>0.29</i>	<i>0.304</i>	<i>1.531</i>	<i>0.126</i>
<i>Individual Creativity (Max) -&gt; Transitional (Norming) Processes</i>	<i>0.226</i>	<i>0.221</i>	<i>1.500</i>	<i>0.134</i>
<i>Transitional (Norming) Processes -&gt; Innovative Output</i>	<i>-0.168</i>	<i>-0.179</i>	<i>1.056</i>	<i>0.291</i>
<i>University Support for Innovation - Team Separated (USI-SEP) -&gt; Transitional (Norming) Processes</i>	<i>-0.111</i>	<i>-0.108</i>	<i>0.957</i>	<i>0.339</i>
<i>Entrepreneurial (Founding) Passion - Team Separated (TPIS) -&gt; Transitional (Norming) Processes</i>	<i>0.127</i>	<i>0.127</i>	<i>0.941</i>	<i>0.347</i>
<i>University Support for Innovation - Team Separated (USI-SEP) -&gt; Team Climate for Innovation</i>	<i>-0.101</i>	<i>-0.087</i>	<i>0.871</i>	<i>0.384</i>
<i>Entrepreneurial Experience -&gt; Transitional (Norming) Processes</i>	<i>0.088</i>	<i>0.087</i>	<i>0.758</i>	<i>0.449</i>
<i>Team size -&gt; Transitional (Norming) Processes</i>	<i>0.069</i>	<i>0.060</i>	<i>0.444</i>	<i>0.657</i>
<i>Team size -&gt; Innovative Output</i>	<i>-0.049</i>	<i>-0.055</i>	<i>0.417</i>	<i>0.677</i>
<i>Entrepreneurial (Founding) Passion - Team Separated (TPIS) -&gt; Innovative Output</i>	<i>-0.048</i>	<i>-0.042</i>	<i>0.369</i>	<i>0.712</i>
<i>Individual Creativity (Max) -&gt; Innovative Output</i>	<i>0.033</i>	<i>0.023</i>	<i>0.197</i>	<i>0.844</i>
<i>Entrepreneurial (Founding) Passion - Team Separated (TPIS) -&gt; Team Climate for Innovation</i>	<i>0.019</i>	<i>0.011</i>	<i>0.167</i>	<i>0.868</i>
<i>Entrepreneurial Experience -&gt; Team Climate for Innovation</i>	<i>0.009</i>	<i>-0.003</i>	<i>0.085</i>	<i>0.933</i>
<i>Individual Creativity (Max) -&gt; Team Climate for Innovation</i>	<i>-0.009</i>	<i>-0.023</i>	<i>0.060</i>	<i>0.952</i>
* Significant at the 0.05 level; ** Significant at the 0.01 level; *** Significant at the 0.001 level (All 2-tailed); † Significant at .10 level.				

The intensity separation of team member entrepreneurial passion (founding) was studied for its moderating effect on the relationship between entrepreneurial experience and innovative output. The variable was significant at the 90% confidence interval.

**Table 8-12: Final Bootstrapped Model with Moderating Variables (Chapter 8)**

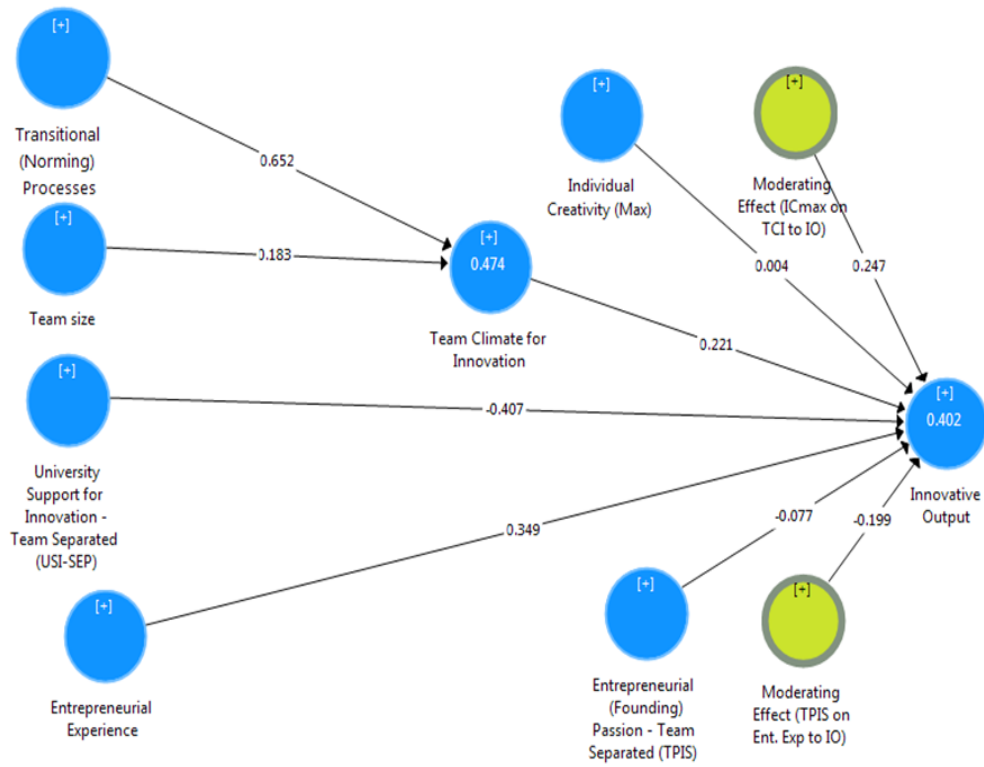
	<b>Original Sample</b>	<b>Sample Mean</b>	<b>T Statistics</b>	<b>P Values</b>
Transitional (Norming) Processes -> Team Climate for Innovation	0.652	0.656	7.823***	0.000
University Support for Innovation - Team Separated (USI-SEP) -> Innovative Output	-0.407	-0.400	4.236***	0.000
Entrepreneurial Experience -> Innovative Output	0.349	0.346	3.374**	0.001
Team size -> Team Climate for Innovation	0.183	0.190	2.23*	0.026
Team Climate for Innovation -> Innovative Output	0.221	0.210	2.079*	0.038
Moderating Effect (ICmax on TCI to IO) -> Innovative Output	0.247	0.234	2.005*	0.045
Moderating Effect (TPIS on Ent. Exp to IO) -> Innovative Output	-0.199	-0.183	1.923†	0.055
<i>Entrepreneurial (Founding) Passion - Team Separated (TPIS) -&gt; Innovative Output</i>	<i>-0.077</i>	<i>-0.067</i>	<i>0.692</i>	<i>0.489</i>
<i>Individual Creativity (Max) -&gt; Innovative Output</i>	<i>0.004</i>	<i>-0.008</i>	<i>0.03</i>	<i>0.976</i>
<b>INDIRECT EFFECTS</b>				
<i>Team size -&gt; Team Climate for Innovation -&gt; Innovative Output</i>	<i>0.040</i>	<i>0.04</i>	<i>1.403</i>	<i>0.161</i>
Transitional (Norming) Processes -> Team Climate for Innovation -> Innovative Output	0.144	0.138	1.966*	0.050
* Significant at the 0.05 level; ** Significant at the 0.01 level; *** Significant at the 0.001 level (All 2-tailed); † Significant at .10 level.				

**Table 8-13: Effect Sizes and Predictive Ability of the Model (Bootstrapped)**

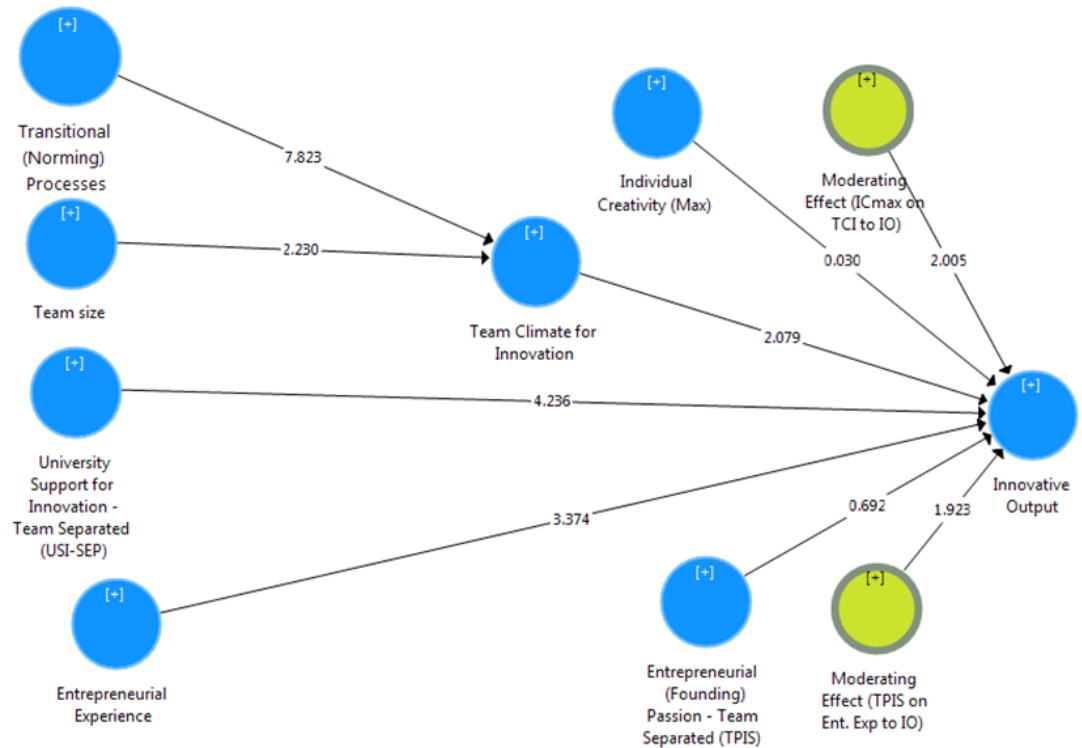
	<i>Adjusted R<sup>2</sup></i>	<i>R<sup>2</sup></i>	<i>Q<sup>2</sup></i>
Innovative Output	0.402	0.332	0.287
Team Climate Inventory	0.474	0.458	0.261
Q <sup>2</sup> = Cross-Validated Redundancy			

Studying the total effects of the model, the Q<sup>2</sup> results established by the construct cross-validated redundancy was above 0, which establishes that the latent variables have predictive power and relevance (Table 8.13). The model explained an adjusted 45.8% of the variance in the TCI, and 33.2% (adjusted) of the variance in innovative output. Figures 8.3 and 8.4 present the final model noting the direct effects and explained variances.

**Figure 8-2: Final Structural Model for Team Innovative Output (Team-level)**



**Figure 8-3: Final Bootstrapped Model for Team Innovative Output (Team-level)**



## 8.7 Findings and Discussion

*“Innovation and entrepreneurship are complementary because innovation is the source of the entrepreneurship and entrepreneurship allows innovation to flourish and helps to realise its economic value”*

(Zhao 2005, p. 34)

An exploration of student team effectiveness in entrepreneurship education was conducted in this study, focusing on of team innovative output as per the framework proposed in Chapter 3. The results and the additional findings (in italics) are summarised in Table 8.14. TCI has been suggested to develop team innovative behaviours and output by enabling creative vision, participative safety, commitment to task, and support for innovative ideas (Kivimaki and Elovainio, 1999; Ragazzoni *et al.*, 2002; Antoni and Hertel, 2009). Just as Bain *et al.* (2001) and Pirola-Merlo and Mann (2004) found TCI positively affected creative output, the results noted that TCI was a significant direct and positive predictor of innovative output (H1 accepted).

The early creation of the team signatory code to facilitate team norming is recommended to facilitate close and respectful relationships in teams (Cox and Bobrowski, 2000; Cox Schmitt, Bobrowski and Graham, 2005; Hunsaker *et al.*, 2011; Schippers, 2014). In the study, it was a positive predictor of TCI (H2 accepted), indicating that this may be a positive activity to create a shared climate to support innovation in the team. In addition, support was given for the mediating effect of TCI on the relationship between team norming and innovative output, as it was significant.

In entrepreneurship literature, support is given to previous experiences in developing skills of opportunity awareness, alertness, creativity, effectiveness and innovativeness (Politis, 2005; Ucbasaran *et al.*, 2009; Jiao, Cui, Zhu, *et al.*, 2014). In the model, team entrepreneurial experience positively influenced innovative output (H3b accepted). The team entrepreneurial experience did not

predict TCI, which echoes the Chapter 7 findings that found experience did not influence the shared team constructs in its model.

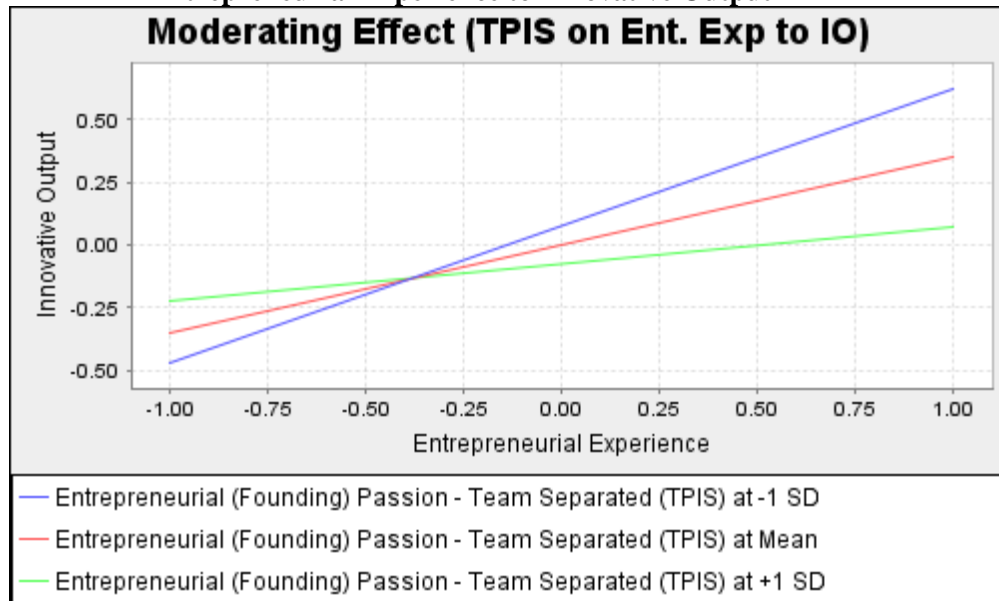
**Table 8-14: Team Innovative Output (Team-level) Model Findings**

No	Hypotheses	Supported
H1	Team Climate for Innovation positively influences team innovative output	ACC
H2	H2a: Transitional (norming) processes positively influence the Team Climate for Innovation <i>H2b: The relationship between transitional (norming processes) and team innovative output is mediated by Team Climate for Innovation</i>	ACC ACC
H3	H3a: The entrepreneurial experience of the SET positively influence the Team Climate for Innovation H3b: The entrepreneurial experience of the SET positively influence the team innovative output	REJ ACC
H4	H4a: The Team Passion Intensity Separation (TPIS) of the SET negatively influences the Team Climate for Innovation <i>H4b: Team Passion Intensity Separation (founding) moderates the relationship between entrepreneurial experience and team innovative output</i>	REJ ACC
H5	H5a: Maximum member individual creativity per team positively influences the Team Climate for Innovation H5b: Maximum member individual creativity per team positively influences team innovative output <i>H5c: Maximum individual creativity moderates the relationship between Team Climate Inventory and innovative output</i>	REJ REJ ACC
H6	H6a: University Support for Innovation positively influences the Team Climate for Innovation H6b: University Support for Innovation positively influences team innovative output <i>H6c: Team Separated University Support for Innovation (USI-SEP) negatively influences team innovative output</i>	n/a n/a ACC
H7	H7a: Team size negatively influences the team transitional (norming) processes H7b: Team size positively influences the Team Climate for Innovation	REJ ACC
ACC = Accepted; REJ = Rejected.		

The passion intensity separation for entrepreneurial founding (TPIS) did not influence innovative output in the model, which mirrors the study by De Mol *et al.* (2015) on 77 entrepreneurial teams (H4a rejected). However, TPIS (founding) moderated the relationship between entrepreneurial experience and innovative output. At high levels of TPIS (founding) (see Figure 8.4), the positive effect of entrepreneurial experience on innovative output is weaker. Essentially, the more a team are misaligned in their founding passions, the weaker the positive relationship between entrepreneurial

experience and innovative output. This result has implications for team selection, indicating that teams formed according to entrepreneurial experience and passion may be more innovative. In a similar vein, Chen and Agrawal (2018) found that task conflict within student teams moderated the relationship between entrepreneurial leadership and team cohesion.

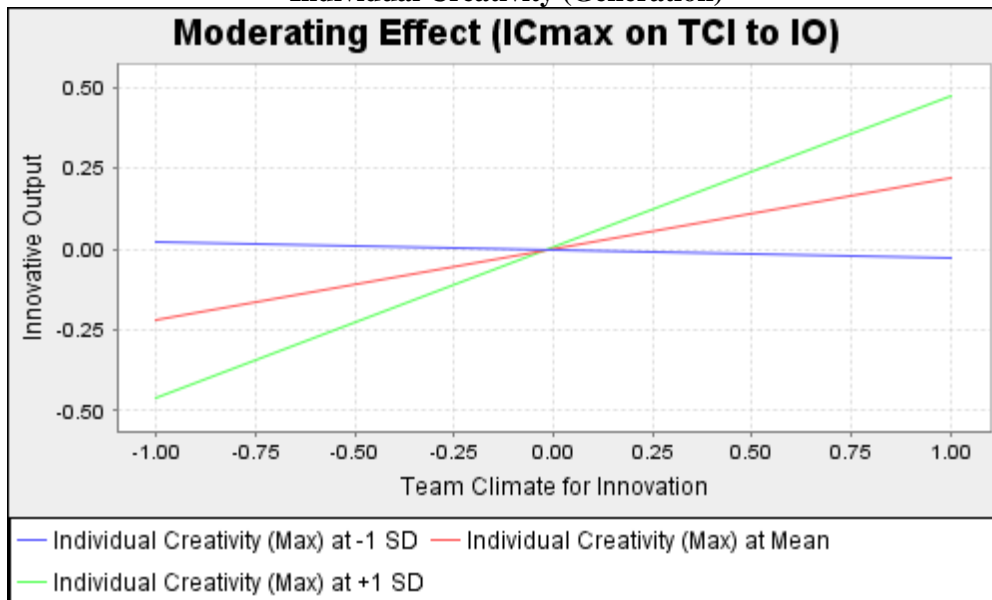
**Figure 8-4: Simple Slopes Analysis of the Moderating Influence of TPIS (founding) on Entrepreneurial Experience to Innovative Output**



While the maximum individual creativity variable did not garner direct effects in the model (H5a and H5b rejected), it positively moderated the relationship between TCI and innovative output. In teams where members (or a member) consider themselves highly creative, the positive effect of the team climate on the innovative output is considered stronger (see Figure 8.5). Bain *et al.* (2001) suggested that the TCI might have an impact on innovation within a team in a number of ways; making the team more innovative as a unit, or by making its individual members more innovative. These results indicate that while a team climate for innovation is positively related to innovative output, students who perceive themselves highly capable at idea generation further it. In essence, the team is made more innovative by ‘its strongest link’ in terms of individual creativity. The impact of the leader of the SET, who is proactive, innovative and risk-taking, has already been established by Chen and Agrawal (2018), and is thought to be linked in this finding.



**Figure 8-5: Simple Slopes Analysis of the Moderating Influence of Maximum Member Individual Creativity (Generation)**



The results give further support for the role that creativity (and creativity perceptions) of the individual student have on entrepreneurship education and its outcomes. It supports the suggestion by Somech and Drach-Zahavy (2013) that individual creativity and climate for innovation would work together to affect innovation implementation, however the prediction of these authors was that the climate for innovation would be the moderator. It also has implications for the works of Černe *et al.*, (2016) as it could be the ‘idea champion’ per team triggering innovative action.

University Support for Innovation (USI) was not accepted for aggregation to the team level (thus, H6a and H6b could not be examined). Instead, USI was operationalised as a separation variable (USI-SEP), and was found to negatively influence team innovative output. This suggests the more aligned the team in their perception of university support, the more innovative the resultant team output. While comparable findings are limited in EE the context, employees have been found to perform more creatively when they perceived a supportive workplace climate for innovation (George and Zhou, 2002, 2007; Gumusluoglu and Ilsev, 2009; Evanschitzky *et al.*, 2012; Dul and Ceylan, 2014). This finding of support for the innovative nature of the university is of significance at a university-

wide and national level. In considering the manner by which universities can make themselves more entrepreneurial, the HEInnovate self-assessment tool (which was developed by the European Commission and the Organisation for Economic Co-operation and Development) was developed to measure the entrepreneurial and innovative nature of universities, and assist them in building this. The framework focuses on themes of (i) Leadership and Governance; (ii) Organisational Capacity: Funding, People and Incentives; (iii) Entrepreneurial Teaching and Learning; (iv) Preparing and Supporting Entrepreneurs; (v) Knowledge Exchange and Collaboration; (vi) The Internationalised Institution and (vii) Measuring Impact. Given the findings of this empirical study, future work could be done in evaluating which of the above themes increase the student perception of the university to a greater degree.

Lastly, team size had a direct positive effect on TCI but did not influence team norming processes. This implies that team size was not related to the effort in creating the team signatory code document, but may increase the potential for creative vision, participative safety, commitment to task, support for innovative ideas, however the study was limited to between four and six members.

The cumulative findings offer support for the SET framework proposed in the thesis and provide validation for the inclusion of variables noted herein. The contributions of this study will be explored in greater depth during the synthesis and conclusion in Chapter 9.

## **8.8 Chapter Summary**

This chapter discussed and empirically examined a model of student team innovative output within the context of entrepreneurship education. The study answer calls for the study of innovation within the SET, by examining a number of input and mediating factors of relevance. Kramer (2013) has highlighted the complexity inherent in the study of innovation in the student EE context, however by using independent adjudicators and focusing on the innovative output of the student projects, this was accomplished in this study. The study was conducted with 68 teams, analysed at the team level using structural equation modelling. Certain variables were operationalised as indications of team

agreement (aggregated variables) or separation (noting deviation in member responses). The model attained strong predictive power for the dependent variable (team innovative output) and the mediator Team Climate Inventory (TCI). Results indicated that TCI had a significant effect on innovative output. These findings will be further discussed in the next chapter (Chapter 9) in line with the final presentation of the proposed SET framework (IMO-SET).

## CHAPTER 9: Discussion and Conclusions

## 9.1 Introduction

The aim of entrepreneurship education is to build an ecosystem of innovators, idea creators, risk-takers, and entrepreneurs; individuals who can give expedient and informed advice to start up founders, or choose to themselves initiate a new venture (Nilsson, 2012). While the subject is constructed to impart knowledge and develop skills, it is also intended to foster an ecosystem conducive to effective entrepreneurial growth. This thesis considered the impact of personal, team, and pedagogical factors affecting student and team outcomes of entrepreneurship education. It follows an awareness that curriculum and course assessment measurement in the domain is challenged by issues of structure, impact and convergence (Souitaris, Zerbinati, and Allaham, 2007; Duval-Couetil, Reed-Rhoads, and Haghghi, 2010; Blenker, Elmholdt, Frederiksen, Korsgaard and Wagner, 2014).

This chapter revisits the four studies conducted in the thesis and highlights the main findings and conclusions. The final proposed conceptual framework depicting the student entrepreneurship team (SET) is presented as a synthesis of the study findings and extant knowledge. This is followed by the inclusion of a comprehensive table and discussion of the main contributions of the thesis in terms of theory, context, empirical evidence, method and practice. The limitations and future avenues of research are considered, followed by final researcher comments.

## 9.2 Summary and Conclusions of Studies

This study was informed by two research questions, pertaining to the impact of student perceptions and experiences prior to EE instruction, on subsequent personal and team outcomes:

*RQ1: What factors influence the entrepreneurial tendencies of individual students participating in entrepreneurship education?*

*RQ2: What factors influence the performance and innovation of student entrepreneurship teams participating in entrepreneurship education?*

To ground the thesis, an extensive literature review was conducted, spread over two chapters. To theoretically consider multiple factors, the literature review spanned themes of: (1) individual

entrepreneurial theory; (2) entrepreneurship education; (3) teamwork and related models/frameworks; (4) innovation; and (5) performance and social loafing. The theoretical discussion and review of extant literature led to the examination of the EE student using Social Cognitive Career Theory, and the team using the IMO framework. During the literature review, a definition of the SET was presented as:

*“A group of students working together towards a common goal in an entrepreneurship education related activity or project, which necessitates the combination of individual member entrepreneurial actions and interactions”*

A framework was proposed, termed the IMO-SET (an adapted input-mediator-output framework for the student team of EE). To examine the student and team, and to validate the framework in context, a series of quantitative studies were undertaken, which are summarised and concluded in the next sections (Section 9.2.1 – 9.2.4).

### **9.2.1 Study 1: Investigating Entrepreneurial Measures in the Student Context**

With an evolution that crosses into economic, sociological and management perspectives, the concept of entrepreneurship has benefitted from a broad range of perspectives, methodological approaches and specialised researchers, each adding a new and interesting dimension to the field (Audretsch, 2012). Although the academic field of entrepreneurship education grows, and topics relating to it diversify (Henry and Lewis, 2018), measurement and methodological rigor remain key limitations (Lorz *et al.*, 2013; Nabi *et al.*, 2017). The academic study of entrepreneurship education relates to general entrepreneurship inquiry, and consequentially many perspectives relating to the entrepreneur are used to investigate the EE student. The student however, differs from the entrepreneur as he/she may work in a more simulated or supported context, rather than a real start-up experience. In addition, the student may be influenced by institutional or instructor-led constraints of curriculum, time, and continuity. Studies have found differences when comparing students and entrepreneurs along

entrepreneurial measures and instruments (Caird, 1991; Hemmasi and Hoelscher, 2005), thus it is suggested that assessment approaches created for one group might not be representative of the other.

Accordingly, the main objective of the first empirical study was to investigate a selection of entrepreneurial psychosocial constructs for their legitimacy of use on the EE student. ESE, EI, ET and EP were selected due to their value in general entrepreneurship studies, and their recommendation for use in the EE context. The measures of Zhao *et al.* (2005), Liñán and Chen (2009), Caird (1988, 1991), Cardon *et al.* (2013) and Murnieks *et al.* (2014) were chosen to represent the constructs selected. The instruments were tested for their comparable reliability, validity, internal consistency, and factor structure student in the EE context, using undergraduate and postgraduate students. The findings indicated support for the use of the instruments measuring ESE, EI, and EP. The GET test results did not provide adequate empirical support, and a revised adaptation of the instrument was presented.

There is a need for researchers to consider that knowledge gleaned in entrepreneurship discourse needs to be conscientiously applied to EE. Measures and theories should not arbitrarily move from one domain to the other, and researchers are recommended to conduct the proper preliminary analyses to ascertain fit before commencing research in the context. This is one of the first studies within the EE context which studies the EP construct. The analysis and recommendations are of benefit to researchers intending to study entrepreneurial tendencies on students of entrepreneurship education.

**Table 9-1: Synopsis of Study One**

**Objective:** To investigate a selection of constructs used within the general study of entrepreneurship for their applicability on the EE student.

**Method:** Measurement instruments were selected for each theory [Zhao *et al.* (2005); Liñán and Chen (2009); Caird (1988, 1991); Cardon *et al.* (2013) and Murnieks *et al.* (2014)]. The instruments were tested for their comparable reliability, validity, internal consistency, and factor structure using a sample of undergraduate and postgraduate students.

**Findings:**

1. Theoretically, the constructs studied (ESE, EI, ET, EP) would appear appropriate for use at the student level, and most have been used in previous studies successfully. However, a number of studies using the GET trait test failed to note basic measure reporting (reliability etc.), and some authors recommend more testing (Stormer *et al.*, 1999; Cromie, 2000).
2. Empirically, ESE, EI, and EP (both measures) performed as expected for internal consistency, test-retest reliability, construct validity, content/face validity, criterion validity, convergent validity, and factor analysis, suggesting they are applicable in the EE context.
3. Limited support for empirical research inquiry of the trait GET test was found. The measure displayed adequate criterion and convergent validity but did not meet accepted standards of reliability or factor structure.

**Actions taken:**

A proposed revision of the GET test for the EE student sample was proposed and presented.

**Implications:** [PRACTICE/POLICY/RESEARCH]

- [PRACTICE/RESEARCH] The results allow EE researchers to be more informed about their theoretical and methodological choices.
- [ALL]The analysis indicates that while the measures and constructs predominately showed support for use, researchers should be aware that the student sample should be treated as a separate research cohort, rather than a proxy for entrepreneurs.
- [RESEARCH]The revised trait measure requires further testing, but could be of significant use to EE researchers.

*EE = Entrepreneurship Education; ESE = Entrepreneurial Self-Efficacy; EI = Entrepreneurial Intentions; ET = Entrepreneurial trait theory; EP = Entrepreneurial Passion; GET = General Enterprise Tendency test (trait).*



### **9.2.2 Study 2: Examining Student Entrepreneurial Efficacy, Intentions, and Interest.**

The purpose of the second study was to investigate the effect of antecedent student perceptions and entrepreneurial tendencies on the individual EE student. The relationships between antecedent individual factors, student interest in the entrepreneurship education module (EEI), and entrepreneurial intentions (EI) were explored. Social Cognitive Career Theory (SCCT) was the theoretical frame of the study, and hypotheses were drawn based on propositions of Bernstein and Carayannis (2012). Survey data was collected from 177 first year undergraduate students, and two time-lagged iterations of ESE were studied as mediators. The entrepreneurial tendencies were compared pre to post module, and analysed to determine if changing levels were gender-specific.

Male students had higher average ESE and EI levels initially, however the level of ESE increased significantly from time one to time two only for the female group. Entrepreneurial intentions decreased over the period for both groups, supporting the findings of Osterbeek *et al.* (2010) and Joensuu *et al.* (2013), with only males recording a significant decrease. EP for founding a business decreased for both male and female students between time periods. It is recommended that when evaluating entrepreneurship education on a larger level, institutions should take a more strategic and holistic (a 'balanced scorecard') approach by studying a number of factors, and not relying on intentionality as a predominant measure. Past studies have found EE reduces the number of students intending to pursue a career in entrepreneurship (Von Graevenitz *et al.*, 2010; Bae *et al.*, 2014; Nabi *et al.*, 2016), and this was supported in this thesis. This may not be a negative outcome of EE, but a valid claim that students have the capacity based on their EE experience, to make more informed predictions about their careers.

When EP was compared pre to post module, polarising results were found for the identity roles of inventing and founding passion. For the individual student, the EP (founding) decreased, while EP (inventing) increased. These results suggest that entrepreneurship education may focus on

raising self-identity perceptions of idea generation and innovation, more than enthusing them about the actual act of new venture generation.

This thesis supports ESE as a prominent and instrumental construct in the study of EE. ESE increased over the module period, particularly for female students. Student interest in the entrepreneurship subject and career were predicted by ESE beliefs, developed both prior to university, and during EE itself. The finding that pre-module ESE levels were significant predictors provides an indication that it should be concentrated on at second and third level education. It also provides an indication that methodologically, the exclusion of entrepreneurial tendencies prior to EE may be a reason for the superfluous and sometimes ambiguous nature of EE research. To foster the development of ESE, prominence must be given to developing student mastery experiences, social persuasion and vicarious experiences relating to new venture creation (Stumpf *et al.*, 1991; Goddard *et al.*, 2004). Guest speakers can give students a real sense of success, failure and the implications of creative and risk-taking behaviour. These individuals from industry or entrepreneurship act as mentors who can assist students in idea generation, team working, and in attaining feedback (Wilson *et al.*, 2007; Maritz and Brown, 2013).

Entrepreneurial experience had a direct positive influence on EI, but did not relate to ESE (time one or two) or EEI in the model. Previous research suggests that past experience of entrepreneurship has had a positive effect on ESE (Krueger, 1993; Carr and Sequeira, 2007). This was not found in the study, which may infer there is a disconnect between entrepreneurial experience and entrepreneurial competency perceptions. To allow students feel they have developed useful skills through their personal or familial experiences of entrepreneurship, these need to be highlighted and integrated more coherently into the EE curriculum, allowing student to reflect on the value of these experiences. For example, if an assignment necessitated that a student had to reflect on these experiences, it may raise subsequent ESE levels, and connect student experience to a sense of capability (self-efficacy).

**Table 9-2: Synopsis of Study Two**

**Objective:** To investigate the relationships between antecedent individual factors, student interest in entrepreneurship education and entrepreneurial intentions.

**Findings:**

1. ESE increased from time one to time two: males (non.sig.) increase; females (sig.) increase,
2. EI decreased from time one to time two: males (sig.) increase; females (non.sig.) increase.
3. EP (founding) decreased from time one to time two: male (sig.) decrease; female (non.sig.) decrease. EP (inventing) increased from time one to time two; males (non.sig.) increase; females (sig.) increase.
4. Individual Creativity positively predicts both EI and EEI, mediated by ESE (time one and time two/time two).
5. Creativity training positively predicts both EI and EEI, mediated by ESE (time one and time two/time two).
6. Gender positively predicts both EI and EEI, mediated by ESE (time one and time two/time two).
7. Entrepreneurial experience had a positive influence on EI, but it did not relate to ESE (time one or two) or EEI in the model.

**Limitations:**

- Only one dimension of individual creativity measure was used in the analysis.
- Only one large group of students (DICE) were studied, which reduces the comparability of the results to other EE contexts.
- Considerable missing data (MCAR) during survey analysis due to student response rates.
- EI was measured using a single item, which reduces its statistical power of the model analysis.
- There were a number of exogenous variables in the model that reduced model parsimony.
- Outcome expectations were not used in the model investigation thus the full model adaptation of Bernstein and Carayannis (2012) was not examined.

**Implications [PRACTICE/POLICY/RESEARCH]:**

- [ALL] The study indicates the benefit of creativity in EE. It also highlights the distinctive effects that EE has by gender.
- [RESEARCH] The study offered further support for the use of SCCT in the study of EE. Outcome expectations should be considered in future studies incorporating the Bernstein and Carayannis (2012) model.

*DICE = Digital, Innovation, Creativity and Enterprise (sample group); ESE = Entrepreneurial Self-Efficacy; EI = Entrepreneurial Intentions; EP = Entrepreneurial Passion; EEI = Interest in Entrepreneurship Education; EE = Entrepreneurship Education; MCAR = Missing Completely at Random; SCCT = Social Cognitive Career Theory.*

The findings support the inclusion of the creativity-related constructs in EE studies, as both individual creativity and creativity training had a positive impact on both dependants, when mediated by ESE. It also further strengthens the use of social cognitive theory/social cognitive career theory in context. The separate relationships for the two dependent variables (EI, EEI) support the proposed double-ringed SCCT adaptation by Bernstein and Carayannis (2012), where interest in the entrepreneurial career and interest in entrepreneurship education are separated. Lastly, it was observed that the effect of gender on both EI and EEI was mediated by ESE (significant at the 90% confidence interval) which suggests that there is a gender impact on self-efficacy beliefs which indirectly effects the student outcomes tested.

### **9.2.3 Study 3: Factors Affecting Student Team Performance**

While performance is a crucial outcome factor in education, it may not be wholly reflective of the full picture of student success in EE. In an educational setting, performance based on output (for instance a report or presentation) may be affected by other compounding factors such as good academic writing skills, or conformity to the assignment structure. In turn, there may be team-related aspects or issues that have bearing on the output. As a key issue, social loafing is prevalent at third level (Karau and Williams, 1993), though remains a relatively unexplored concept in EE.

The third study investigated factors affecting team performance and social loafing in the student team of entrepreneurship education (SET), as conducted on 236 students (79 teams), and analysed at the team level using structural equation modelling. Results indicated a low predictive power for the performance variable but highlighted a number of significant relationships (summarised in Table 9.3). In the model, team processes positively predicted team performance, and negatively predicted social loafing in student EE teams. These action and interpersonal team processes were positively influenced by team conscientiousness, entrepreneurial experience and reduced team size. These findings suggests that the emergent state of team conscientiousness enhances effective team processes (e.g. communication, co-ordination), which then improves performance and reduces social loafing in the SET. This highlights the importance of nurturing a shared team sense of effort,

perseverance, commitment, co-operation, and motivation for the module task, which relates to subsequent team behaviours.

Nabi *et al.* (2017) have welcomed studies focusing on the effect of student background (entrepreneurial exposure) on EE outcomes. Entrepreneurial experience was a positive predictor of team processes and a negative predictor of team conscientiousness, suggesting that while experience of entrepreneurship may benefit teamwork processes, it could negatively affect or imbalance the shared climate or work ethic of a team. Entrepreneurial experience had a limiting influence on team social loafing, when mediated by team processes. This implies that the more entrepreneurial experience in a team, the better the interpersonal and active team processes, which mitigates free-riding behaviour. The effect of entrepreneurial experience was differentiated according to the gender grouping of the team, with female dominated teams noting a more strongly negative effect on team conscientiousness, and team processes.

Owing to these findings, educators could question their team selection practices in EE: Should we allocate groups according to student entrepreneurial experience or gender? If not, are we depriving the more entrepreneurial students the chance at heightened success together, in an effort to create a semblance of balance or fairness in the classroom? By ignoring student experience prior to grouping, are educators inadvertently predetermining student success in the team experience? There is an implication that educators may need to consider how to remain relevant to both tiers (entrepreneurial experience/none) within an EE classroom. Holienka *et al.* (2013) notes that EE may serve as a way of encouraging students with no family ties to entrepreneurship that they can succeed as entrepreneurs. Using role models as a proxy for personal learned experiences may serve to assist this within the classroom setting (Bosma *et al.*, 2012).

**Table 9-3: Synopsis of Study Three**

**Objective:** To examine the factors affecting student team processes, performance and social loafing in entrepreneurship education.

**Findings:**

1. Team processes directly predicted performance (+) and social loafing (-).
2. Team conscientiousness positively influenced team processes; and indirectly predicts performance (+), and social loafing (-) (mediated by team processes).
3. Team entrepreneurial experience positively influences team processes but negatively influences team conscientiousness. It also has an indirect negative influence on social loafing and positive effect on performance (as mediated by team processes).
4. ESE-SEP moderated the relationship between team processes and social loafing [*at high levels of team ESE SEP, the negative effect of team processes on social loafing is reduced*].
5. Teamwork training had a negative influence on team processes, and positive influence on team conscientiousness. However, the relationship between team training and processes was positive when mediated by team conscientiousness, indicating a shared team state is required for teamwork training to be effective on team processes.
6. Team size had a negative influence on student team processes, and a positive effect on social loafing (as mediated by team processes).
7. The negative effect of entrepreneurial experience on team conscientiousness was significant for female-dominated teams only. Entrepreneurial experience was a negative predictor of team processes in female-dominated teams, while positive for male-dominated teams. Team size was positively related to performance for male dominated teams (sig.) while negative and insignificant for female-dominated teams

**Limitations:**

- Only a selection of factors the proposed SET framework were used.
- The sample group was the DICE cohort only with no control group.
- Some of the measures were limited in the number of items used, and the operationalisation of the measures to the team level reduced the variance, which would affect the analysis.
- There were significantly more three and four member teams, than two members.
- The total variance explained for performance was low.

**Implications:** [PRACTICE/POLICY/RESEARCH]

- [RESEARCH] The results highlight the importance of studying multiple entrepreneurship education outcomes (not solely performance), and the promise of cognitive diversity.
- [ALL] Entrepreneurial factors (experience and ESE) had a significant influence on team processes, states, and resultant outcomes within the model, which supports its study in EE.
- [PRACTICE] The effect of entrepreneurial experience appears to affect male and female students and student teams differently, which may have implications for how team selection.
- [ALL] The team conscientiousness to team processes relationship highlights the importance of nurturing a shared team sense of effort, perseverance, commitment, co-operation, and motivation. It also supports the study of inter-relationships between mediators in teamwork.

*DICE = Digital, Innovation, Creativity and Enterprise (sample group); ESE = Entrepreneurial Self-Efficacy; EE = Entrepreneurship Education; ESE- SEP= Team member separation of Entrepreneurial Self-Efficacy; SET = Student Entrepreneurship Team.*

As previously outlined, entrepreneurial self-efficacy was found to be an influential construct in the thesis. In this study, the separation of ESE levels among members moderated the relationship between team processes and social loafing, such that at high ESE separation, team processes have less strength in mitigating social loafing. This finding is new to the field of EE, and to the study of the SET.

#### **9.2.4 Study 4: Factors Affecting Student Team Innovation**

Teamwork as a pedagogical technique is suggested to aid skill development and creativity, though little is known how this occurs in the EE context (Hynes, 1996; Collins and Robertson, 2003; Hamidi *et al.*, 2008; Wing Yan Man and Wai Mui Yu, 2007; Harms, 2015). The final empirical study related to factors affecting student team innovative output. The study was conducted with 317 student surveys pertaining to 68 teams, analysed at the team level using structural equation modelling. Certain variables were operationalised as indications of team agreement (aggregated variables) or separation (noting deviation in member responses) (Harrisson and Klein, 2007; Solanas *et al.*, 2012).

The model attained strong predictive power for the dependent variable (team innovative output) and the mediator Team Climate Inventory (TCI). Results indicated that TCI had a significant effect on innovative output. The study bore a number of noteworthy findings using more novel operationalisations of team level variables (separation, aggregation, maximum), and through the examination of mediating and moderating relationships. The entrepreneurial experience of the team positively predicted innovative output, and this was moderated by the separation of founding passion in the team, such that more aligned teams strengthened the relationship. The separation of member perceptions of university support for innovation negatively influenced team innovative output. Team size and the team norming process of creating a team signatory code positively influenced the TCI. In addition, the relationship between transitional (norming processes) and team innovative output was mediated by TCI, indicating the importance of activities like the team signatory code in creating a team atmosphere amenable for innovative behaviours. The early creation of this document in the

early phases of teamwork is recommended to facilitate close and respectful relationships in teams (Cox *et al.*, 2005; Cox and Bobrowski, 2000; Schippers, 2014), and this is supported in the thesis. Cardon *et al.* (2017) propose that when members feel that they are affectively (or passionately) dissimilar to the group or each other, they would be more likely to exit the new venture team. This statement would suggest that when there is a disparity in the EP levels or goals between members in the team (i.e. high team passion diversity), the likelihood of members engaging in free-riding behaviours may increase. The Team Passion Intensity Separation (TPIS) variable as proposed by Cardon *et al.* (2017) was tested in the team-level study, where it was found to negatively moderate the relationship between entrepreneurial experience and team innovative output. Based on the findings noted herein, the further study of the team passion separation (entrepreneurial career and the entrepreneurial project task) is recommended for EE. Entrepreneurial passion thus, offers a new insight into the student and student team in the entrepreneurship education context.

Student perceptions of university support (for innovation) had an impact on the student team, such that, the more a team was separated in these perceptions, the more limited the team innovative output. Thus, a university can positively influence their students by creating a culture supportive of idea generation and original thought, and as a result may witness a marked improvement in student output. Employee assessment of organizational support for innovation is affected by how they view their company dealing with worker ideas, risk, and staff (Amabile and Grysiewicz, 1989; Scott and Bruce, 1994). Studies have noted a number of physical and psychological aspects to develop a workplace environment that supports creativity (See Table 9.8: Dul and Ceylan, 2014; p. 1267). These could be studied within the EE context to note which shape this perception among students.



**Table 9-4: Synopsis of Study Four**

<p><b>Objective:</b> To investigate the factors which have an effect on student team innovative output in entrepreneurship education.</p>
<p><b>Findings:</b></p> <ol style="list-style-type: none"><li>1. Entrepreneurial experience was a significant positive predictor of innovative output.</li><li>2. TPIS (founding) moderated the relationship between entrepreneurial experience and innovative output (<i>such that, at high levels of TPIS (founding), the positive effect of entrepreneurial experience on innovative output is lower</i>).</li><li>3. The maximum individual creativity per team positively moderated the relationship between TCI and innovative output [<i>such that, at high levels of maximum IC, the relationship between TCI and innovative output is stronger</i>]</li><li>4. Team Separated perception of University Support for Innovation (UNI-SEP) negatively influenced team innovative output.</li><li>5. TCI was a significant positive predictor of innovative output.</li><li>6. The relationship between transitional (norming processes) and team innovative output is mediated by Team Climate for Innovation</li><li>7. Engagement with the team signatory code directly and positively predicted TCI, and was positively related to team innovative output.</li><li>8. Team size had a direct positive effect on TCI but did not relate to team innovative output</li></ol>
<p><b>Limitations:</b></p> <ul style="list-style-type: none"><li>- Only a selection of factors of the proposed SET framework was used.</li><li>- The sample group was the DICE cohort and no control group were analysed.</li><li>- Some of the measures were limited in the number of items used, and the operationalization to the team level reduced their statistical variance.</li><li>- Team size ranged from 4-6 members thus findings cannot be extrapolated beyond this.</li><li>- There were one-item measures in the model, which limits the statistical legitimacy. Common method bias was a more measured issue due to item selection and data collection.</li></ul>
<p><b>Implications:</b> [PRACTICE/POLICY/RESEARCH]</p> <ul style="list-style-type: none"><li>- [PRACTICE] The moderating effect of TPIS has implications for team selection, indicating that teams formed according to entrepreneurial experience and founding entrepreneurial passion may be more innovative.</li><li>- [ALL] The necessity to enhance team alignment in terms of cognition and passion for entrepreneurship is noted. In turn, by controlling team size and enforcing a team signatory code, the instructor may be able to encourage the development of TCI.</li><li>- [ALL] The team entrepreneurial experience influences innovative output thus more experience building activities should be embedded into second level education.</li><li>- [ALL] The results give further support for the role that creativity (and creativity perceptions) and university support for innovation has in the encouragement of EE</li></ul>
<p><i>DICE = Digital, Innovation, Creativity and Enterprise (sample group); EE = Entrepreneurship Education; IC = Individual Creativity; TPIS = Team Passion Intensity Separation; TCI = Team Climate for Innovation; UNI-SEP = Team member separation in perceptions of University support of innovation; SET = Student entrepreneurship team;</i></p>

### **9.3 Proposed Conceptual Framework for the SET**

Following the literature review, a conceptual framework for the student team of entrepreneurship education was proposed in the Input-Mediator-Output (IMO) format in Chapter 3. As outlined in the previous section, four studies exploring the impact of entrepreneurship education on students and student teams were conducted. These considered a number of mediating, moderating, and antecedent variables, their findings adding depth to current knowledge of related theories, and the SET. Based on the knowledge gained from extant literature and the empirical analyses, the full framework is presented in Figure 9.1 as a synthesis of these learnings.

This conceptual framework (referred to as the IMO-SET) is intended to be comprehensive, and include both variables studied in the thesis, and additional factors that have been examined or referred to by scholars in the area. It is understood that while comprehensive, the framework does not claim to be an exhaustive list, but represents the “state of the art” of entrepreneurship education theory at present. Table 9.5 provides an overview of each of the elements of the framework, and outlines examples of variables in each category. Many of these variables attained significant results when examined in the thesis, and this is highlighted in the table as justification of inclusion.

A description of the framework structure is discussed in Chapter 3 (Section 3.8). Input factors (demographic, cognitive, affective etc.) of the individual student will shape actions and interactions within a team, thus are acknowledged in the framework. The manner in which these are operationalised as a team construct has significant ramifications for the model relationships. Next, team input factors such as tenure and team size will have a bearing, and are of importance to educators as these can be prescribed. Contextual input factors such as training and support have been highlighted in the thesis study findings, and are integrated. It is acknowledged that at times, inputs can be move between categories (person-team, team, context) according to their conception. For example, social class or socio-economic status has been studied relating individual’s economic standing, school system availability, societal control, and social valuation. Usually conceptualised as a ‘person input’,

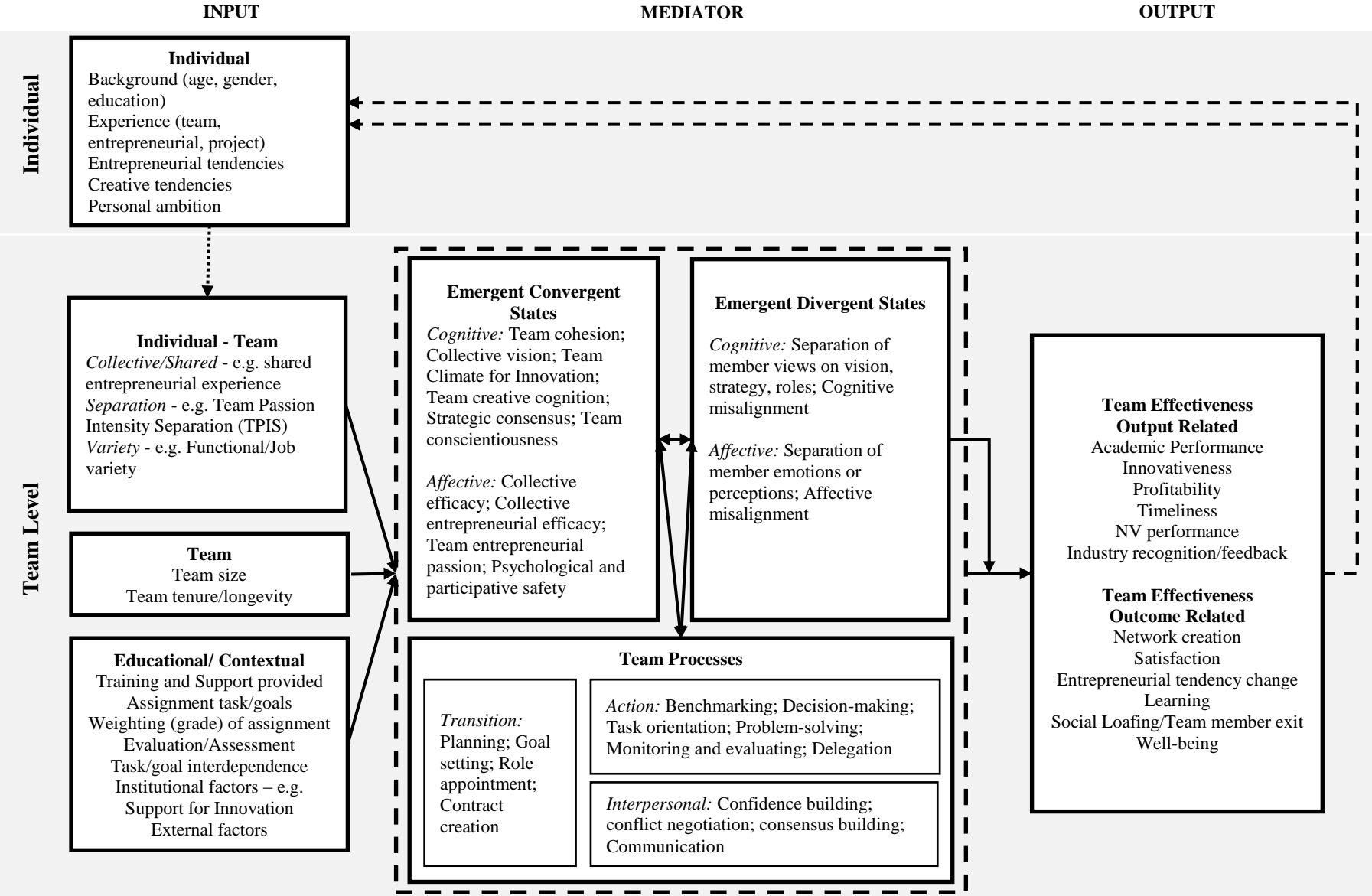
these could also be framed as macrosystemic or contextual factors (influencing the nature of classroom pedagogies, resource allocation etc.) (Flores *et al.*, 2017).

The mediator stage of the framework notes three key categories: emergent convergent states, emergent divergent states, and team processes. As stated in Chapter 3, the separation of emergent team states in this manner is newly proposed in this thesis, and arises from a need to highlight the variance in team constructs due to the inherent complexity of team dynamics and composition. It is proposed (and supported empirically) that specific team outcomes and relationships are noted based on the manner by which constructs are operationalised, and by classifying team constructs as convergent and divergent, a clearer picture is formed.

Two adaptations to the earlier proposed framework of Chapter 3 were made due to study findings at the mediator stage. Firstly, due to the inter-relationships found between mediating variables in studies three and four, the model was adapted to reflect this aspect at the mediating stage, particularly moving from the emergent states to processes. In addition, the format of the team processes was altered to indicate that team transitional processes should be considered temporally distinct to the interpersonal and action team processes.

An aim of the thesis was to explore a number of outcomes of entrepreneurship education, to widen the discussion about determinants of success in context. Several outcomes are included in the framework, and these are divided into outcome and output to reflect both tangible and intangible determinants. Due to the moderating effect that TPIS and ESE-SEP (both separation-based variables) had in the team-level studies, the potential for emergent divergent states to moderate relationships was included in the framework. Lastly, a feedback loop to the individual is noted in the IMO-SET, acknowledging that the student perception of the teamwork processes and outcomes/outputs will shape their personal attitudes, beliefs and experience levels.

Figure 9-1: IMO Framework for the Student Entrepreneurship Team (IMO-SET)



**Table 9-5: Factors of the Proposed SET Conceptual Framework**

	Level	Variable Type ( <i>and example</i> )	Selected Research Support for Inclusion
<b>INPUT</b>	<b>Individual</b>	Background ( <i>age, gender, education, nationality</i> )	Social loafing is more prevalent in western cultures and third level institutes (Karau and Williams, 1993); Included in IMO (entrepreneurial teams) by De Mol <i>et al.</i> (2015). [Gender - Supported in Study 2]
		Experience ( <i>team, entrepreneurial, project</i> )	Individuals with no entrepreneurial experience have less entrepreneurial potential (Santos <i>et al.</i> , 2017); Included in IMO (entrepreneurial teams) by De Mol <i>et al.</i> (2015); [Entrepreneurial Experience supported in Study 2, 3 and 4]
		Entrepreneurial tendencies ( <i>EI</i> )	Multiple – See Chapter 5; [ESE, EI, EP – Supported in Studies 1, 2, 3, and 4]
		Creative Tendencies ( <i>Individual Creativity</i> )	Maynard, Kennedy and Sommer (2015) recommend studying affect and creativity with IMO in entrepreneurship; May affect team decision making and team climate (Açıköz, and Günsel, 2016); [Supported in Study 4]
	<b>Individual to Team Level</b>	Collective/Shared ( <i>entrepreneurial experience</i> )	Shared entrepreneurial experience included in IMO (entrepreneurial teams) by De Mol <i>et al.</i> (2015); [Supported in Studies 3 and 4]
		Separation ( <i>Team Passion Intensity Separation</i> )	Cardon <i>et al.</i> (2017); [Supported in Study 4]
		Variety ( <i>Functional/Job variety</i> )	Student diversity noted in framework of De Mol <i>et al.</i> (2015) and Maritz (2017); Unaligned groups (e.g. skillsets) can lead to frustration and greater social loafing (Pieterse and Thompson, 2010); Job related diversity noted to influence team-level innovation in the workplace (Hülshager <i>et al.</i> , 2009)
	<b>Team</b>	Team size	Can affect team processes, cohesion (Wheelan, 2009); performance (Chidambaram and Tung, 2005); social loafing (North <i>et al.</i> , 2000; Pieterse and Thompson, 2010); team-level innovation/innovative output (Hülshager <i>et al.</i> , 2009; Weiss and Hoegl, 2016); [Supported in Study 3 and 4]
		Team tenure/longevity	Linked to student team experiences and processes (Bacon <i>et al.</i> , 1999)
	<b>Educational/ Contextual</b>	Training / Support provided ( <i>resource allocation</i> )	[Supported in Study 3 and 4]
		Evaluation/Assessment ( <i>individual contributions, peer-evaluation, % of final grade</i> )	Clarity of desired outcomes and evaluation positively affects student team experience (Bacon <i>et al.</i> , 1999); Evaluation potential affects student team performance (Gagne and Zuckerman, 1999; Hunsaker <i>et al.</i> , 2011). Individual grading may limit team emergent state (Bailey <i>et al.</i> , 2005)
		Task/goal interdependence	Students sharing judgement making task with others increased in social loafing (Weldon and Mustari, 1988); Task and goal interdependence noted to influence team-level innovation in the workplace (Hülshager <i>et al.</i> , 2009)
		Institutional factors ( <i>Support for Innovation/ Effect of teacher</i> )	Noted to influence team-level innovation (Hülshager <i>et al.</i> , 2009) [Supported in Study 4]; Teacher effects (Ruskovaara and Pihkala, 2015)
		External factors ( <i>institutional</i> )	EE is more effective in entrepreneurship hostile institutional contexts (Walter and Block, 2016)

Table 9.5: Factors of the Proposed SET Conceptual Framework (continued)

Type	Type	Type	Type
<b>MEDIATOR</b>	<b>Team Processes</b>	Transition: <i>Planning; Goal Setting; Role appointment; Contract creation</i>	Planning and goal setting included in entrepreneurial team IMO by Klotz <i>et al.</i> (2014) and De Mol <i>et al.</i> (2015); [Supported in Study 3]
		Action: <i>Benchmarking; Task orientation; Problem-solving; Monitoring and evaluating; Delegation</i>	Task orientation noted as predictor of team-level innovation in the workplace (Hülshager <i>et al.</i> , 2009); Knowledge sharing processes found in study of the SET by Chen and Agrawal (2018); [Supported in Study 3]
		Interpersonal: <i>Confidence and motivation building; conflict negotiation; consensus building; Communication</i>	Confidence building included in IMO (entrepreneurial teams) by De Mol <i>et al.</i> (2015); Communication noted to influence team-level innovation in the workplace (Hülshager <i>et al.</i> , 2009); [Supported in Study 3]
	<b>Emergent Convergent States</b>	Cognitive: <i>Team cohesion; Collective vision; Team Climate Inventory; Team creative cognition; Strategic consensus; Team conscientiousness</i>	Cohesion included in entrepreneurial team IMO by Klotz <i>et al.</i> (2014); Team cohesion found in the SET (Chen and Agrawal, 2018). Student team cohesion reduces social loafing (Karau and Williams, 1993). Team climate related to team innovativeness (Mathisen, Martinsen and Einarsen, 2008); Team conscientiousness reduced social loafing and positively enhanced performance in the student team (Schippers, 2014); Strategic consensus and creative cognition included in IMO (entrepreneurial teams) by De Mol <i>et al.</i> (2015); Vision noted to influence team-level innovation in the workplace (Hülshager <i>et al.</i> , 2009); [TCI supported in Study 4]
		Affective: <i>Collective efficacy; Collective entrepreneurial efficacy; Team entrepreneurial passion; Psychological safety</i>	Psychological safety noted for entrepreneurial teams by Klotz <i>et al.</i> (2014); Teams considered social disconnectedness in a team to relate to social loafing (Jassawalla <i>et al.</i> , 2009); Participative safety noted to influence team-level innovation in the workplace (Hülshager <i>et al.</i> , 2009)
	<b>Emergent Divergent States</b>	Cognitive: <i>Team vision misalignment; Cognitive misalignment (Task and team conflict)</i>	Team conflict included in entrepreneurial team IMO by Klotz <i>et al.</i> (2014); Task conflict found in SET by Chen and Agrawal (2018).
		Affective: <i>Separation of member emotions or perceptions; Affective misalignment</i>	Długoborskyte and Petraite (2016) noted student teams with diversity in personalities had a greater innovative output; [Supported in Studies 3 and 4]

Table 9.5: Factors of the Proposed SET Conceptual Framework (continued)			
Type	Level	Variable Type ( <i>and example</i> )	Selected Research Support for Inclusion
OUTPUT	Output Related	Academic Performance	Multiple studies [Supported in Study 3]
		Innovativeness/innovative output	Included in entrepreneurial team IMO by Klotz <i>et al.</i> (2014); De Tienne and Chandler (2004) [Supported in Study 4]
		NV performance/ profitability	Noted in frameworks of Klotz <i>et al.</i> (2014); De Mol <i>et al.</i> (2015); Lackéus (2015) and Maritz (2017)
	Outcome Related	Network creation	SET's interact with multiple stakeholders (Wing Yan Man, 2015); Noted in frameworks of De Mol <i>et al.</i> (2015);
		Satisfaction	SET experience led to lower achievement orientation (Canziani <i>et al.</i> , 2015)
		Entrepreneurial tendency change (increase/decrease)	Noted in frameworks of Lackéus (2015) and Maritz (2017); [Supported in Studies 2 and 3]
		Skill development	Noted in frameworks of Lackéus Lackéus (2015) and Maritz (2017); Hynes (1996) suggests EE teamwork aids skill development
		Learning	Noted in framework of De Mol <i>et al.</i> (2015) and Maritz (2017);
		Social Loafing/Team-member exit	Social loafing noted as a common issue in SET's (Lyons <i>et al.</i> , 2017); Noted in frameworks of De Mol <i>et al.</i> (2015); [Supported in Study 3]
		Well-being	Included in entrepreneurial team IMO by Klotz <i>et al.</i> (2014);
		Creativity	Teamwork in EE may develop student creativity (Hamidi <i>et al.</i> , 2008)

The IMO-SET is intended as a first-step in examining the potential of the study of the student team in entrepreneurship education. It should serve as a foundation on which further testing can be conducted, and further related variables can be proposed.

## **9.4 Contributions of the thesis**

Colquitt and Zapata-Phelan (2007) discuss the ways that empirical research studies contribute to an academic field. Firstly, they help to test theory, supporting theoretical suggestions and giving strength to proposed frameworks. Studies also build theory, generating theoretical propositions and suggestions inductively by deciphering a range of study findings and results. Entrepreneurship education is of practical concern as well as being a research topic: firstly, as the taught subject of entrepreneurship where the educator delivers content relating to new venture creation in an academic setting. Secondly, it is also conceptualised as an academic research field where theory building and empirical data is analysed to understand the impact of entrepreneurship education on a macro level. This thesis contributes to both modes, as described below.

This section highlights the major contributions of the thesis along dimensions of theory, context, empirical evidence, method and practice. These contributions are considered in terms of whether they (i) support existing knowledge in the field, (ii) develop or build upon current knowledge, or (iii) add new aspects or dimensions. In the preceding five sections, major themes will be highlighted as critical themes emanating from the thesis, and then will be tabulated as part of a comprehensive summary of the key cumulative findings/contributions in Table 9.7.

### **9.4.1 Contribution to Theory**

The thesis applied Social Cognitive Career Theory when studying the individual student, and the IMO framework in studying the team. Additionally, the literature review critically discussed and examined a number of other theories and frameworks of relevance. This is of importance due to the observation that commonly EE studies tend to lack theoretical underpinning (Nabi *et al.*, 2017; Henry and Lewis, 2018).



A number of research frameworks have been used in the evaluation of entrepreneurship education and its outcome goals, yet some have been considered to be under-developed and conceptual; they lack a holistic approach in their assessment, and are in need of increased depth (Fretschner and Weber, 2013; Nabi *et al.*, 2017). Despite recommendations for the use of Social Cognitive Career Theory in EE research, there have been few studies that employ it (Kassean *et al.*, 2015). The SCCT framework adaptation used in the study successfully split into two outcome factors, pertaining to the entrepreneurial career, and to student interest in entrepreneurship education (as per the proposals of Bernstein and Carayannis, 2012). In entrepreneurship literature, the distinction between project and career are not delineated; the focus is the new venture creation or company, which is not finite in its intended duration, and is intrinsically connected to the career of the entrepreneur. In entrepreneurship education, projects may be prescribed by the instructor, or may not be a tangible start-up option for the student, thus there may be a disconnect between module task/educational experience and perceptions about the career. Thus, as indicated by the results from Study two and in support of the propositions of Bernstein and Carayannis (2012), a student may develop skills and enjoy the EE experience, but may not incline towards an entrepreneurship career.

Team entrepreneurship is a popular area of research, and the ability to work in teams has been listed as a key competency for entrepreneurial growth (Draycott and Rae, 2011; Klotz *et al.*, 2014). Educational institutes use teamwork to develop collaborative and communicative skills, necessary for graduates joining the workforce (Gardner and Korth 1998; McCorkle *et al.*, 1999; Deeter-Schmelz, Kennedy and Ramsey, 2002; Hansen, 2006). The majority of student entrepreneurs prefer to create ventures within a team unit (Sieger *et al.*, 2016). However, why this is so, or how they view the team unit is not yet well known (Canziani *et al.*, 2015). Moreover, students are continuously placed in teams within EE with limited knowledge of the consequences.

This thesis made a strong case for the recognition of the student EE team as a worthy research topic. While some empirical work has been conducted on the SET (e.g. Hoogendoorn, Oosterbeek and Praag 2013; Chen and Agrawal, 2018), little is known about antecedent or within-module effects. As discussed in Chapter 3 (summarised in Table 9.6), there are a number of reasons why the SET should be considered as an important research topic, distinct to other team typologies.

**Table 9-6: Justification for SET Research Inquiry (Summary)**

<b>Justification for SET Research Inquiry (Summary)</b>	
a)	A SET will interact with a wide range of stakeholders with increased opportunity to develop networking and interpersonal skills worthy of research investigation.
b)	EE teamwork is expected to develop creativity in students, yet this is under-explored, as is the link between EE and innovation or team level innovation.
c)	Experiential and novel pedagogical techniques are commonly employed within EE, which may affect students/student teams in novel ways.
d)	EE attempts to provide more authentic experiences of new venture creation, which may affect team factors, and experiences.
e)	Corresponding to increasing studies of team entrepreneurship, the study of the SET should be investigated.
f)	Constructs relating to entrepreneurial tendencies (e.g. EI, ESE, and EP) may provide a greater understanding of the EE student via study of the SET.

In considering the development of a conceptual framework for the student entrepreneurship team, a number of team effectiveness versions were examined, from both general teamwork and extant entrepreneurship literature. This thesis creates and tests a number of hypotheses relating to the SET, and develops both a definition and a research framework accordingly. A definition for the SET was presented, and a conceptual framework using the IMO format was proposed based on extant literature and the resultant study findings (Marks *et al.*, 2001; Ilgen *et al.* 2005, Mathieu *et al.*, 2008) which are notable additions to our current understanding and recognition of the area.

#### **9.4.2 Contribution to Context**

A number of contextual contributions are summarised in Table 9.7. Three of particular note are listed below:

- One of the first to study social loafing in EE
- The first to empirically apply the Bernstein and Carayannis (2012) proposed SCCT framework adaptation
- The first to empirically examine separation of member entrepreneurial self-efficacy and passion in the student team in EE.

A major focus of the thesis was the study of entrepreneurial tendency indicators in the EE context specifically. While ESE is said to be increased by education and training (Zhao *et al.*, 2005; Wilson, Kickul and Marlino, 2007; Bae *et al.*, 2014), this finding is lacking academic support in context (Nabi *et al.*, 2017). This research thesis also contributes to emerging knowledge of EP, and is one of the first to apply it to entrepreneurship education (Nabi *et al.*, 2017).

Irish institutions have embraced the development of enterprise and innovation skills through curricula advances (HEInnovate Ireland, 2017; Clinton and Lyons, 2016); strategic goal modification (ACE, 2009); innovative programmes (Priyadarshini, 2015), and the growth of awards and competitions for innovation in institutions (Table 1.1, Chapter 1). These practices are validated to an extent in the thesis, as it was found that student perceptions of university support for innovation has an effect on student team output. To this end, these findings suggest these practices be continued at third level, and advocate for their continued growth.

The findings herein also support the current developments in the Irish educational context. In 2018, the Irish government set out a number of objectives to encourage entrepreneurial tendency development and growth in students (particularly at primary and post-primary level). These include the publication of an entrepreneurship policy statement and entrepreneurship education guidelines for schools, the possible inclusion of a subject pertaining to EE on the curriculum, as well as the introduction of a national entrepreneurship award at primary/post primary school level (Action Plan

for Education, 2018). The findings of the thesis relating to the effect of prior experience, ESE and creativity offer definite support and justification for these national plans.

While also a methodological contribution it should be noted that this is one of the first Irish studies incorporating Social Cognitive Career Theory. In addition, it supports the PLS-SEM in quantitative research for EE studies (Do Paco *et al.*, 2011; Ferreira *et al.*, 2012; Dinis *et al.*, 2013; Nasiru *et al.*, 2014; 2015; Yarima and Hashim, 2016; Lanero *et al.*, 2016; Santos *et al.*, 2016).

#### **9.4.3 Contribution to Empirical Evidence**

The empirical contributions are summarised in Table 9.7. Among these, the studies found a reduction along a number of entrepreneurial tendencies measures over the time of the year-long EE module (EI, EP for founding). This supports the findings of previous works and strengthens consensus to an extent (Von Graevenitz *et al.*, 2010; Moberg, 2014; Nabi *et al.*, 2016). The use of multiple outcome indicators and the empirical results, which were found, are also considered contributions of the thesis.

Theoretically and empirically, this thesis supports entrepreneurial self-efficacy as a prominent and instrumental construct in the study of entrepreneurship education. In the studies, it was successful in examining student perceptions of entrepreneurial competencies, observing personal development during entrepreneurship education, and in detecting misalignment within student teams. The construct was linked to EI, interest and (the reduction of) social loafing. In addition, it was present in students prior to EE, was increased thereafter, and mediated the influence of a number of factors, confirming its robustness and importance as a construct in EE. These findings relating to the influence of the antecedent level of ESE, would highlight the need to develop ESE at an earlier level (primary or second level) but to potentially try to do this in a more systematic (or national) level in order to reduce student misalignment.

This thesis finds that teamwork processes and states have a significant effect on student team outcomes, and on a more macro level, the EE programmes themselves. Through the team level studies, the separation of team member perception and entrepreneurial tendency was a key factor, successfully used to examine ESE, passion, and university support. It strongly advocates for the further inquiry of factors that highlight divergence in team thinking and team state, rather than solely examining shared or aggregated team values. The investigation of these factors at the team level allowed for the examination of complex relationships, for example, noting the moderating effects that individual member creative tendencies have on the team. The effect of moderated relationships on the SET was also highlighted by Chen and Agrawal (2018).

#### **9.4.4 Contribution to Methodology**

As a diversifying field, measurement and methodological rigor are considered integral (Lorz *et al.*, 2013; Nabi *et al.*, 2017). With multiple approaches to teaching the subject there is little consensus on the efficacy of entrepreneurial education, partly due to measurement discrepancies and disparity (Cooney and Murray, 2008). As a result, Lorz *et al.* (2013, p. 141) recommends that researchers focus on the research design as imperative, particularly the theoretical foundation, measurement detail, sampling and reliability testing. These recommendations are acknowledged in this thesis, and adhered to where possible. There have been repeated calls to systematise the assessment of entrepreneurship education, to consolidate and strengthen existing knowledge and research rather than continuously produce new solutions (Shook *et al.*, 2003; Blenker *et al.*, 2014). A comparative analysis of selected entrepreneurial measures conducted, and recommendations for their use in EE provided. Thus, the examination added substantial rigor, and was a significant methodological contribution as a comparative study does not exist in the EE context to date. This thesis provides scholars empirically backed insight of measures to adopt for future research and assessment of the EE student. In addition, a revised instrument for the GET test in the student context is presented for further study. By validating the identified instruments, and presenting revised versions for context, the thesis will assist in legitimising future EE studies.

There is a lack of research studying antecedent factors in entrepreneurship education (Lorz *et al.*, 2013; Bae *et al.*, 2014), and it is thought that studies may be skewed by a failure to acknowledge prior perceptions or experiences of entrepreneurship (Nabi *et al.*, 2017). The study of ESE at two time points in the second study helped to show the importance of this construct from the outset, and during the module, as both iterations was found to mediate relationships. These findings also provide support for the inclusion of antecedent student perceptions in the research framework.

The team-level studies also used a number of novel operationalisations to study constructs that contributed to academic arguments and discussions. The effect of cognitive diversity on team processes and performance has been found difficult to form consensus on, and is an under-researched area (Basadur and Head, 2001; Mello and Rentsch, 2014). The exploration of the separation of entrepreneurial self-efficacy (ESE-SEP) marks a significant step in the EE context as it used cognitive rather than demographic differentiators (Mohammad and Angell, 2004; Takleab and Quigley, 2014; Zhou and Rosini, 2014). The operationalisation of the EP construct in terms of its separation diversity, have not been studied empirically in this context to date. The findings from the collective two studies relating to the separation of constructs within teams<sup>17</sup> are novel in their approach, and their findings help to explain the complexity of the individual effect on the team in more depth.

#### **9.4.5 Contribution to Practice**

Entrepreneurship education is taught in a number of different manners globally, and can include aspects of marketing, management, ideation, product development, interpersonal skills, and business planning (Rasmussen and Sørheim, 2006; Costin *et al.*, 2007; Mwasalwiba, 2010). It can link many business subjects in an applied and experientially focused way, where idea generation and innovation are hallmarks of EE course delivery (Bird, 2002; Hytti and O’Gorman, 2004; Birdthistle *et al.*, 2007; Jones and Iredale, 2010).

<sup>17</sup> ESE-SEP, UNI-SEP, TPIS

A distinct goal of the thesis was to add value and insight for the instructor of EE, supplementing their pedagogical knowledge for its effective delivery. It was found that training provided by the instructor had a positive effect on student outcomes. Teamwork training was an indirect predictor of team processes and a direct predictor of team conscientiousness. These findings echo support for teamwork training within the research domains of teamwork and education (Kozlowski and Ilgen, 2006; Mathieu *et al.*, 2006; Salas *et al.*, 2008). However, the negative link to team processes highlights the need for this type of training to first focus on developing a shared state in a team, rather than teaching process-oriented aspects. Creativity training was also found to have a positive impact on student self-efficacy and innovation (supporting Clapham, 2003) and should be incorporated into EE delivery.

The study results indicate that effective teamwork can negate the effect of social loafing in the SET, which supports the research of Jassawalla *et al.* (2009), but has not been confirmed until now in the EE context. It is important that educators be aware of the limiting effect that social loafing has on a student team, and take measures to reduce its effects. In particular, efforts should be taken to improve team shared emergent states and team processes, and to limit the effect of any team divergent states or separation factors. Tactics such as the development of a team signatory code and the inclusion of teamwork training were seen to aid these beneficial teamwork variables, are recommended for use in such a course.

In this thesis, a number of outcomes and outputs were studied: entrepreneurial intentions, interest in entrepreneurship education, performance, social loafing and, finally, innovative output.

**Table 9-7: Contributions of the Thesis**

<i>Table 9.7 Contributions of the thesis</i>			
	<b>Supports</b>	<b>Develops</b>	<b>Adds</b>
Theory	<ul style="list-style-type: none"> <li>- Supports the use of the SCCT to study the entrepreneurship student as per Segal, Borgia and Schoenfeld (2002); Liguori (2012); Bernstein and Carayannis (2012); Kassean <i>et al.</i> (2015).</li> <li>- Supports the study of the inter-relationships between emergent states and team processes in IMO studies (De Church and Mesmer-Magnus, 2010; Klotz <i>et al.</i>, 2014; De Mol <i>et al.</i>, 2015).</li> <li>- Supports the study of Entrepreneurial Passion as a construct to add depth to knowledge of entrepreneurial cognition (Cardon <i>et al.</i>, 2017).</li> </ul>	<ul style="list-style-type: none"> <li>- Furthers the propositions of Bernstein and Carayannis (2012) and offers partial support for their framework adaptation for the EE context.</li> <li>- Develops understanding of the IMO in context by examining extant studies across relevant research streams of entrepreneurship, EE, innovation, and performance as applied to the SET.</li> <li>- Develops knowledge about the presence and effect of social loafing in the student team of EE</li> <li>- Adds new knowledge of TPIS and its effect on innovative output (Cardon <i>et al.</i>, 2017)</li> </ul>	<ul style="list-style-type: none"> <li>- Proposes a definition for the student team in entrepreneurship education (SET) and a justification for their research inquiry.</li> <li>- Proposes a new conceptual framework for the SET (IMO-SET) and recommendations for further study.</li> <li>- Recommends a separation of emergent states to ‘emergent divergent’ and ‘emergent convergent’ in line with IMO framework.</li> <li>- Proposes a new definition for University Support for Innovation (USI) and Project Entrepreneurial Passion (PEP).</li> </ul>
Empirical Evidence	<ul style="list-style-type: none"> <li>- Supports SCCT in context, finding relationships between person/contextual inputs, and outputs are mediated by ESE (Liguori, 2012).</li> <li>- Supports calls to examine antecedent levels of entrepreneurial tendencies in EE (Bae <i>et al.</i>, 2014; Nabi <i>et al.</i>, 2017).</li> <li>- Supports: (i) the impact of gender on ESE and EI (Kassean <i>et al.</i>, 2015); (ii) entrepreneurial experience on EI (Zhao, 2005; Carr and Sequeira, 2007; Fayolle and Gailly, 2015)</li> </ul>	<ul style="list-style-type: none"> <li>- Supports findings about the reduction in certain entrepreneurial tendencies measures over the time of an EE (EI, EP for founding) (Von Graevenitz <i>et al.</i>, 2010; Moberg, 2014; Nabi <i>et al.</i>, 2016).</li> <li>- Builds on findings using time-lagged data and gender groupings.</li> <li>- Noted the differential impact of gender and entrepreneurial experience on EP in context).</li> <li>- Team size indirectly increased social loafing (Karau and Williams, 1993), while team conscientiousness reduced it (Schippers, 2014)</li> </ul>	<ul style="list-style-type: none"> <li>- Answers calls to add more holistic assessment measures in EE (Fayolle <i>et al.</i>, 2006) and provides findings pertaining to performance, social loafing, intentionality, module interest and project innovation.</li> <li>- Support not found for relationship between ESE and entrepreneurial experience (as found by Carr and Sequeira, 2007) which warrants further inquiry.</li> <li>- Finds new relationship between entrepreneurial experience of the SET and team innovative output.</li> </ul>



**Table 9.7 Contributions of the thesis (continued)**

	<b>Supports</b>	<b>Develops</b>	<b>Adds</b>
Method	<ul style="list-style-type: none"> <li>- Applies rigor in empirical EE studies (Rideout and Gray, 2013; Lorz <i>et al.</i>, 2013; Nabi <i>et al.</i>, 2017).</li> <li>- Supports the use of operationalization techniques (separation, aggregation, max/min etc.) to study individual data at a team level.</li> <li>- Adds to a growing number of EE studies using PLS-SEM in quantitative research (Do Paco <i>et al.</i>, 2011; Ferreira <i>et al.</i>, 2012; Dinis <i>et al.</i>, 2013; Nasiru <i>et al.</i>, 2014; 2015; Yarima and Hashim, 2016; Lanero <i>et al.</i>, 2016; Santos <i>et al.</i>, 2016)</li> </ul>	<ul style="list-style-type: none"> <li>- Adapts a number of measures for the study: (i) USI was adapted from Woodman <i>et al.</i> (1993) for the university context (ii) ESE-SEP, USI-SEP and TPIS were constructed using the standard deviation between member score totals; (iii) the innovative output was based on a scale by Fiet (2002) adapted to a grading scheme; (iv) the measure for individual creativity was made self-reporting (Zhou and George, 2001; Janssen and Xu, 2008).</li> <li>- The use of multiple-group analysis to study gender-domination in teams rather than gender diversity is recommended based on analysis.</li> </ul>	<ul style="list-style-type: none"> <li>- Provides a specific comparison of popular EE construct measures to aid the future EE scholar in their quantitative analysis.</li> <li>- Provides a revision of the General Enterprise Tendency test for EE context.</li> <li>- Studies EE using two time based iterations of the ESE measure, and tested both as mediating factors in the analyses.</li> <li>- Provides a new social loafing scale that shows adequate strength and reliability.</li> </ul>
Context	<ul style="list-style-type: none"> <li>- Answers calls for examination of entrepreneurial tendencies in EE.</li> <li>- Findings support the exploration of creativity and innovation in EE (Hamidi <i>et al.</i>, 2008; Book and Philips, 2013; Lewis and Elaver, 2014; Shahab <i>et al.</i>, 2018)</li> </ul>	<ul style="list-style-type: none"> <li>- Contributes to empirical studies investigating innovation and creativity as outputs of EE, particularly those focused on the SET.</li> <li>- Is considered the first Irish study to use the SCCT to study entrepreneurship students.</li> </ul>	<ul style="list-style-type: none"> <li>- Develops new knowledge relating to the use of constructs in the EE context such as (i) TCI, (ii) TPIS, (iii) USI. (iv) ESE-SEP.</li> <li>- Highlights a new avenue for further research, investigating social loafing in the EE context.</li> </ul>
Practice	<ul style="list-style-type: none"> <li>- The empirical use of selected measures of entrepreneurial tendency by EE scholars. Particularly supports the use of ESE as a robust construct and assessment measure in studies.</li> <li>- Recommends the team signatory code contract, team emergent state development and team process development (Cox <i>et al.</i>, 2005; Cox and Bobrowski, 2000; Schippers, 2014)</li> </ul>	<ul style="list-style-type: none"> <li>- Informs practitioners of the merits of incorporating creativity and teamwork training. Provides empirical support for inclusion of creativity and innovation in EE</li> <li>- Provides greater understanding of implications of male-dominated /female-dominated teams in EE.</li> <li>- Adds to findings supporting the development of ESE levels prior to third level, and enhances their development within EE.</li> </ul>	<ul style="list-style-type: none"> <li>- Adds empirical support for the positive effect that student perceptions of the University Support for Innovation has on EE outcomes.</li> <li>- Provides new evidence for the impact of certain team factors on innovative output including entrepreneurial experience (+), individual creativity (+), alignment of team university support for innovation (+) and TCI.</li> </ul>

It is hoped that this will encourage others to use greater ingenuity in their conceptualisation and measurement of EE success. In doing so, this thesis supports the call of numerous authors to attain a greater reliance on the studies of educational science, in an effort to better understand the complexity of entrepreneurship education (Fayolle and Gailly, 2006; Pittaway and Cope, 2007a; Fayolle, 2013; Nabi *et al.*, 2017).

## **9.5 Limitations and Future Research**

### **9.5.1 Limitations of the Thesis**

Despite the contributions this thesis makes to research and practice, there are a number of limitations that must be acknowledged, which provide avenues for future research investigation.

Firstly, the main context for the study was the DICE undergraduate module within Dublin City University. This thesis acknowledges that institutional factors have a bearing on the delivery and effect of EE (HEInnovate Report - Ireland, 2017). Admittedly, considering this group as representative of a wider population, or indicative of entrepreneurship education on a national or international basis would be misleading as the data is from a single institution.

Second, the DICE module was the main focus of the thesis, studied over a number of years, each year with a different cohort of incoming students. While efforts were made to ensure that the class groups were given similar educational experiences, it is acknowledged that they were different annual iterations. While it has been considered that the teacher has an effect on the EE delivery (Ruskovaara and Pihkala, 2015), this remained largely unchanged for the duration. Focusing on this DICE group solely removed a number of extraneous factors, which could have skewed results; however, the lack of a control group in many of the studies is a decided limitation. If the study was broadened to include

multiple courses and contexts, other influences could be tested, such as the effect of nationality on entrepreneurial attitudes and tendencies for example (Packham *et al.*, 2010).

From a data collection standpoint, issues of sample size, as there was a large drop-off response rate of students who did not complete the survey. This indicates that the surveys themselves were too long or caused students to disengage, and secondly creates concerns that the study sample were less representative of the entire group. While at the team level, the sample sizes (79; 68) were adequate for the software employed (Smart-PLS3), an increase would have increased validity in the study results. However, increasing the sample size by adding more EE sample groups from different cohorts would have added more extraneous factors to the quantitative studies.

While real attempts were made to deploy and conduct the studies with care, some methodological limitations were noted. In the first study, it was accepted that the measures chosen for the empirical examination are not fully reflective of respective theories, and alternative measurement instruments could have been selected. In addition, one-item variables were used in studies, particularly in dealing with team-level operationalised data, which is a distinctly limiting, and these were discussed within the study chapters.

Lastly, many other team-related theories and themes could have been drawn from in the studies. In the future, depth could be added to the investigation of the SET drawing from aspects such as the concept of faultlines (divisions which split teams into sub-groups) (Lau and Murnighan, 1998); team process improvement (cyclical team strategic changes due to reflection and adaptation) Wiedow and Konradt (2011) or team learning behaviour (Edmondson, 1999; Savelsberg *et al.*, 2009).

### 9.5.2 Future Avenues of Research

A number of specific areas are recommended for future consideration. Firstly, a key theme of this thesis was the impact of entrepreneurial experience on the student and student team behaviours. However, more levels could be considered. For example, do students with prior entrepreneurial experience learn differently in EE? Berglund and Wennberg (2006) found entrepreneurially minded students to be poor at following rules, while Young and Sexton (2003) note that entrepreneurs tend towards self-directed learning. Cope (2003) suggested that entrepreneurs may engage in higher order and intensive learning during significant and discontinuous (sometimes crisis) trigger events. This may suggest that a curriculum, which incorporates moments of key spontaneous learning activities, may be a valuable addition to an EE course or module. Alternate structures and pedagogical choices may be required to ensure students with and without prior experience of entrepreneurship are catered for. Understanding the ways that entrepreneurial experience can impact student behaviour within a module could add considerable depth to the field. This was studied as a composite in the EE teams herein, however Ucbasaran *et al.* (2003) found heterogeneity of entrepreneurial experience positively predicted team member exit in entrepreneurial teams, thus this should be examined for the SET (social loafing).

Entrepreneurial passion was found to have an effect on the EE student and this was noted in multiple studies. However, general passion literature highlights that passion relates to the object of focus (be it work, a hobby or a new venture idea), and the activities related to it (Perttula, 2004). Cardon and Glauser (2010) interviewed 80 entrepreneurs on their 'source of passion' and highlighted a significant attachment to the task (product/service). In conjunction with the joy an individual feels for activities relating to the identity of the entrepreneur (EP), they too may feel intense emotion for the specific entrepreneurial task or project at hand (Warnick *et al.*, 2018). It is proposed in the EE context that this could be a new area of interest, which we define as Project Entrepreneurial Passion (PEP). Based on the definitions of entrepreneurial passion by Cardon *et al.* (2009) and Passion for Work by Perttula (2004), PEP is defined herein as:

*“The intense positive emotion or joy felt by an individual student when undertaking a finite project or task assignment that is considered entrepreneurial in nature”*

In entrepreneurship education, projects may be prescribed by the instructor, or may not be a tangible start-up option for the student, thus there could be a disconnect between task and career. In addition, as students in particular perceive themselves far from career decisions, they may not identify with the EP construct fully. While EP is said to endure beyond the experience (Cardon et al., 2009), PEP would endure as long as the project timeline itself, thus being more transient. PEP would be proposed to have a positive effect on student performance and engagement in a module of entrepreneurship education. While PEP has not been explicitly tested, the affective state of enjoyment has been found to be positively related to student motivation and performance (Pekrun, Elliot and Maier, 2009; Valiente, Swanson and Eisenberg, 2012; Hall, Sampasivam, Muis and Ranellucci, 2016). In a multivariate study by Taasobshirazi, Heddy, Bailey, and Farley (2016) on University physics students, it was found that enjoyment of the course project was linked to students' motivation, deep cognitive engagement, course grade, and conceptual change. It is recommended that this construct should be studied in the EE context.

Creativity permeates much of the findings of this thesis, and results found perceptions of creativity and creativity training positively predicted entrepreneurial self-efficacy and interest in EE, as well as improving a team's innovative output. It has been suggested that EE should focus on developing of creative students (Berglund and Wennberg, 2006; Hamidi, Wennberg and Berglund, 2008; Book and Philips, 2013; Lewis and Elaver, 2014; Shahab *at al.*, 2018), and this is also concluded in the thesis. While some support has been found linking creativity and innovation to sought-after outcomes of EE, more depth and investigation is needed (De Tienne and Chandler, 2004; Hamidi *et al.* 2008; Nasiru *et al.* 2014; 2015).

The finding that student perceptions of the university support for innovation had an effect on their team behaviour, could be explored in greater depth. Studies have noted a number of physical and psychological aspects to develop a workplace environment that supports creativity (See Table 9.8: Dul and Ceylan, 2014; p. 1267). These could be studied within the EE context to note which shape this perception among students. In addition, the role of the teacher of EE in shaping these university perceptions is a worthy research avenue, one which found significant, could potentially be developed by training and advanced university induction or awareness of innovation supports.

**Table 9-8: Creativity-supporting Work Environment**

<b>Psychological A</b>	<b>Psychological B</b>	<b>Physical A</b>	<b>Physical B</b>
Challenging job	Creative goals	Furniture	Quantity of light
Teamwork	Recognition of	Indoor plants/flowers	Daylight
Task rotation	creative ideas	Calming colours	Indoor (physical) climate
Job autonomy	Incentives for	Inspiring colours	Sound (positive sound)
Coaching supervisor	creative results	Privacy	Smell (positive smell)
Time for thinking		Window view to nature	Any window view

Another potential avenue for this research is the link between creativity/innovation and emotion. Amabile and Mueller (2008) found that an affective state can significantly impact individual creativity, and there is a growing body of work linking the componential model of creativity to affect and emotion (Cardon *et al.*, 2009; Anderson *et al.*, 2014). Cardon *et al.* (2013) found a positive relationship between the inventor role identity of EP and creative behaviours. While EP and innovation were linked in the thesis, there is no clear consensus on whether EP has an effect on perceptions of individual creativity (or vice versa) despite suggestions of a relationship between the two (Baron, 2008). There may be implications due to the sample group of predominantly business students as when studying innovation, Berglund and Wennberg (2006) noted that business students studying entrepreneurship tend to focus on radically new ideas while engineering students look to incremental innovations in their product ideas.

Pertaining to the SET, the conceptual framework allows for a wealth of exploration and further study. Bae *et al.* (2014) found a number of cultural factors (gender egalitarianism, in-group collectivism and uncertainty avoidance) moderated the relationship between EE and EI in their meta-analysis. Considering the team-level, these contextual or cultural factors could have significant bearing on the student team formation and communicative or active processes, and may be fruitful.

Considering specific EE activities, authors such as Der Foo, Wong, and Ong (2005), and Jones and Jones (2011) have noted the effect of business plan competitions on teambuilding and teamworking competencies. Following this, a possible avenue for team research exploration could be business plan competition activities, or hackathons; to investigate the team in these short-term, high-intensity pursuits. It was found that the individual team-member and their creativity have an influence on the team and team output. Thus, investigating the impact of the ‘idea champion’ in the team, as proposed by Černe *et al.* (2016); or the entrepreneurial leader in the student EE team discussed by Chen and Agrawal (2018) may have merit.

While efforts were taken in the thesis to retain methodological rigor, there are numerous additional methods which could strengthen or add depth to the study findings herein. In relation to the effect of EE and teamwork on entrepreneurial tendencies, delayed post tests (e.g. at the end of the fourth year, after graduation) could add significant understanding to the temporal nature of these conditions. To examine the effect of the teamwork experience or creativity training in greater depth, the use of randomised control treatments would provide a clearer picture of the explicit effects of these interventions on the student or student team.

## 9.6 Final Thoughts

To strengthen the academic field of entrepreneurship education, it is necessary to continuously test assumptions (Zahra and Wright, 2011; Fayolle, 2013).

*“Without occasions where a field can question even its most deeply held beliefs, we are at risk of becoming ideologically rather than analytically constituted”*

(Rehn *et al.*, 2013, p. 543)

Rather than accept the status-quo thinking that teamwork is an arbitrarily beneficial pedagogical technique, the decision to use teamwork should be based on the desire to provide an effective and innovative learning experience for students. There is much to learn within this research topic, however by understanding the complexity of the student, and team in detail; it may be possible to offer a more nuanced and holistically beneficial offering.

*“It is rarely the insight that makes for an interesting theory. That usually comes from the weaving together of many insights, many creative leaps, most small and perhaps a few big”*

(Mintzberg, 2017, p. 194)

Reflecting Mintzberg’s perspective on the cumulative nature of the theory development process, this thesis weaves together the key findings from four empirical studies to develop a research framework for the student team in entrepreneurship education. This framework incorporates key concepts considered to affect the field of entrepreneurial education including ESE, performance, teamwork, social loafing, and innovative output.

The rich findings of this thesis attest to the usefulness of the framework and the potential for future studies, for example:

- Entrepreneurial self-efficacy was found to be a critical concept in determining EE outcomes, important in predicting EI, interest, and mitigating social loafing.
- Prior experience of entrepreneurship had a positive impact on student EI and founding passion, while teams with entrepreneurial experience had superior collective processes and innovative output.



- Individual student creativity perceptions, creativity training, and supportive climates for innovation (team and institutional) positively influence the innovative nature of student team output in entrepreneurship education.

Methodologically, it is one of the first studies to examine cognitive team separation variables (entrepreneurial passion and self-efficacy, university support for innovation) in the context of EE. It also advances understanding of entrepreneurial tendency in the EE student population. Finally, the research contributes to practice, as the findings support the use of teamwork and creativity training, as well as pedagogical tools such as the team signatory code to develop shared states in teams, and more effective processes.

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## APPENDICES

## APPENDIX A: Research Recommendations for Entrepreneurship

### Education

**Table 11-1: Research Recommendations for Entrepreneurship Education**

<i>No</i>	<i>Recommendation</i>
1	Researchers conducting impact measurement for entrepreneurship programs need to pay more attention to the research design, especially in terms of (1) the theoretical foundations, (2) the time of measurement, (3) validity and reliability procedures, (4) structured sampling procedures and (5) adequate sample size.
2	Researchers conducting impact measurement for entrepreneurship programs need to utilize ex ante/ex post measurements in order to take into account self-selection bias, and to measure the impact of entrepreneurship education from the beginning to the end of an education program.
3	Authors of impact studies should describe the entrepreneurship intervention under scrutiny. More specifically, the learning objectives, duration, and pedagogical methods need to be provided so that others can assess the results.
4	The use of advanced statistical procedures allowing for the simultaneous measurement of complex interdependencies between measured variables.
5	Analysing the impact of entrepreneurship education programs at secondary and vocational level provides an untapped research opportunity, especially considering the existence of large international entrepreneurship education programs.
6	In future impact studies entrepreneurship education researchers should analyse the stability of the dependant variable and continue the measurement after the end of the program.
7	The impact of entrepreneurship education programs on subsequent entrepreneurial actions is currently under-researched.
8	In future research on the impact of entrepreneurship education researchers could test the effectiveness of different types of pedagogies.
9	The identification of events which trigger entrepreneurial intention and/or activity could be a promising field of research.

*Recommendations of Lorz, Mueller & Volery (2013, pp. 141–145) for future EE research studies.*

## APPENDIX B: The DICE and NGM Modules

The main sample group used in this dissertation is an undergraduate module which has run in Dublin City University (DCU) for six years. DCU itself is a young university established in 1989, with approximately 16,000 students to date. One of its core missions is ‘to transform lives and societies through education, research and innovation by developing creative, analytical, enterprising and socially-responsible citizens’ (DCU Strategic Plan 2012 – 2017, p.14). The university attempts to encourage enterprise and entrepreneurship through many means (see earlier Table 1.2). Entrepreneurship education is also highlighted as of importance in the university strategy five year goals:

*“To foster the development of entrepreneurial skills in our students through a range of new initiatives including curricular and extra-curricular modules and entrepreneurial experiential learning”*

(DCU Strategic Plan 2012 – 2017, p.23)

The DCU Business School delivers a wide range of undergraduate and postgraduate programmes and was awarded accreditation by the Association to Advance Collegiate Schools of Business (AACSB) in 2016, establishing it in the top 5% of Business Schools internationally.

### DIGITAL INNOVATION CREATIVITY AND ENTERPRISE (DICE)

The DICE module is a compulsory yearlong (two semester) 5 ECTS subject taken in the first year by a number of the DCU Business School undergraduate business degree programmes (Business Studies; Global Business; Accounting and Finance; Enterprise Computing). The module exposes participants to multiple modes of learning including online e-learning, mini-conferences, mobile app building, blogging and research posters. Students are taught through team work, online learning, live webinars, project work and mini-conferences with speakers and attendees from the wider business community. The rationale is that all students should be exposed to industry and different modes of learning as early as possible. In doing so, students will gain insight into the reality of the business world while still developing their skills in key areas. The major elements of the DICE module are displayed in Table 11.2 and discussed below.

**Table 11.2: Elements of the DICE Module**

<i>Semester 1</i>	<i>Semester 2</i>
Lectures (A)	
Project Management Training (Prince2) (B)	
Conferences (C)	
Online Reflective Blog (C)	
Mobile App Development (D)	Mobile App Conceptual Poster (E)

- A) Lectures:** The module which is based on 100% continuous assessment does not have weekly lectures but instead rotates between independent or online study, traditional lectures, teamwork, applied workshops and conference events. Students keep track of their timetable through a live calendar that is synchronised to their email and virtual learning environment

(VLE) known as Loop. Where it was deemed that theoretical grounding or content was needed for certain topics (e.g. cloud computing) this was delivered through traditional lectures or online webinars.

- B) Project Management:** DICE teams are assigned one to two mentors for the year; postgraduate students tasked with meeting their DICE team a number of times during the year, and facilitating their progress. This forms part of a management module they undertake called Next Generation Management (NGM). For the years measured within this research thesis (2012-2016) both the DICE and NGM students undertook a form of project management training and completed an online exam to demonstrate learning. Project management knowledge was delivered via an asynchronous platform for the main of the study period, however for 2015-2016 it was delivered through traditional lectures (which were video-taped and could be watched remotely).
- C) Conferences and Blog writing:** Each DICE student attends up to four mini-conferences per year to gain insight from industry experts. These range in theme from: Get Started (Starting a business); Get Mobile (Mobile technology and trends); Get Social (Social media marketing and building a community); Get Digital (Cloud computing and digital transformation) and Get Creative (Creative thinking and innovation). The events last four hours and are hosted in a large conference venue (The Helix, Dublin). The events are open free to the public and attract 200+ additional guests per event. The conference has welcomed many speakers from international universities and companies such as Facebook, Microsoft, Twitter, Google+, Storyful, Edelman, Nokia, Microsoft, PayPal, Social Entrepreneurs Ireland, IntelLabs and Marketo. During the Get Started conference there is an emphasis on inviting guest speakers at varying stages of success (and at times failure) within the start-up sphere. DICE students hear from these role models about current and key issues in their future career. They then reflect upon these, and synthesise and publish their learnings (along with additional reading) through a digital medium (blog). The blog posts are graded as reflective assignments within the DICE module.
- D) Applied Project (Mobile App Development):** Students participate in a cross-faculty team to work on an applied project relevant to the core themes of digital technology, innovation, creativity and enterprise/entrepreneurship. From 2010 - 2016 this entailed that students develop and publish a functioning mobile app, facilitated by workshops with DICE staff and Microsoft Ireland. During this period, the module witnessed the publication of over 300 mobile apps to the Microsoft Store Marketplace. In 2016-7, the applied project was adapted to allow students engage with gamification. Teams were asked to conceptualize an online gamified experience for a chosen business topic. For the purposes of this thesis all students sampled were involved in the mobile application project.
- E) Research Poster:** To demonstrate innovation, idea generation and communication skills in the second semester student teams were asked to conceptualise an innovative cloud-based app which solves a declared issue (e.g. 'improving student life' or 'going green' etc.). Applying their knowledge from semester one relating to the design of mobile apps, functionality and target market analysis; student teams conceptualise innovative cloud

solutions and present via a research poster. These posters were showcased at an event where student teams were judged by industry experts.

**Table 11.3: Comparison of DICE to Nabi *et al.* (2016) EE module**

Element	DICE parallel
A taught component which focuses on entrepreneurial opportunities,	Content lectures which deliver topics relating to entrepreneurship theory, social media marketing, digital technology and project management.
A practical component which focuses on the tools and skills needed for the entrepreneurial journey,	Workshop, conference and class activities. Group reflective and note keeping documents.
A group-based component which allows students select their best idea, turn it into a business plan and pitch to tutors,	Group project – Mobile app development in teams
A reflective component incorporating an individual portfolio of activities and development,	Online blog assignment where students discuss their personal experience of the conference themes and academically reflect on the core topics.
A broader business management component which includes topics, e.g. finance, international business, etc.	Conference events where students learn from industry experts and entrepreneurs – both personal journeys and relevant information for prospective businesses

Student feedback subsequent to the DICE module has been very positive and indicates that it is a valuable addition to business school and computing programmes. The DICE module is generally well received by students, who find it to be current, applied and innovative:

*“Overall I think the DICE module was a great thing to get involved in. It challenged our creative thinking and it definitely gave us the chance to improve our team-working skills. We had to think for ourselves and we all had to pull our weight. I feel honoured that we had the opportunity to listen to the guest’s stories and how they have gotten to where they are today even though they faced many difficulties along the way. So I really enjoyed this module as it varied and it wasn’t like any of our other subjects”*

(Male student, 19)

The DICE conferences are now attended by students from all disciplines and the general public in mass numbers reflect the calibre of the speakers. These speakers in turn are becoming more readily willing to present at the conferences due to the popularity of the event.

*Milestones of the module include:*

- The industry collaboration with Microsoft received coverage in the Herald, the Irish Times and the Irish Examiner as well as TechCentral and IrishTechNews.
- In 2013, one of the DICE students (17) who submitted his app concept into an accelerator competition was awarded €10’000 in funding to continue in its development



- The course has been shortlisted for two teaching and learning awards and two innovation in teaching awards to date.

*Inception of the module*

Initially, the concept of the module originated from a few key stakeholders who approached the teaching and learning and centre. Brennan, Wall, & McGowan (2005) found that in order to encourage enterprise education in a university, ‘trialectic’ thinking should be adopted which allows multiple stakeholder relationships to be recognised. Programme heads were joined to the conversation and the broad objectives were set in place. The planning process took a top-down approach in this sense and once the strategies were put in place, the logistical and operational planning came into effect. The stakeholders involved and their roles can be seen in Fig 11.1 below.

*Delivery of the module*

For the thesis duration, the DICE module was run by a team of three: two lecturers/course coordinators and one teaching assistant. Where content lectures or ‘housekeeping’ talks are needed (re: assignments etc.) then the group are assembled into one large lecture hall. A clear system is in place with regard to reporting student issues, administration and assignment grading. The teaching assistant handles all emails which are directed to a central ‘DICE’ email account, records them in a spreadsheet and notes priority/urgency to the lecturing team who collectively meet on a weekly basis. In addition, reporting logs are available on Loop for students to flag team or personal issues to the team in a systematic manner, and they are repeatedly encouraged to use this method. Grading is arranged based on a well-defined and specific excel-based and automated rubric system, which creates a personalised student feedback for assignments based on a script of over 100 phrases and feedback comments. These measures assist in the effective running of such a large module.

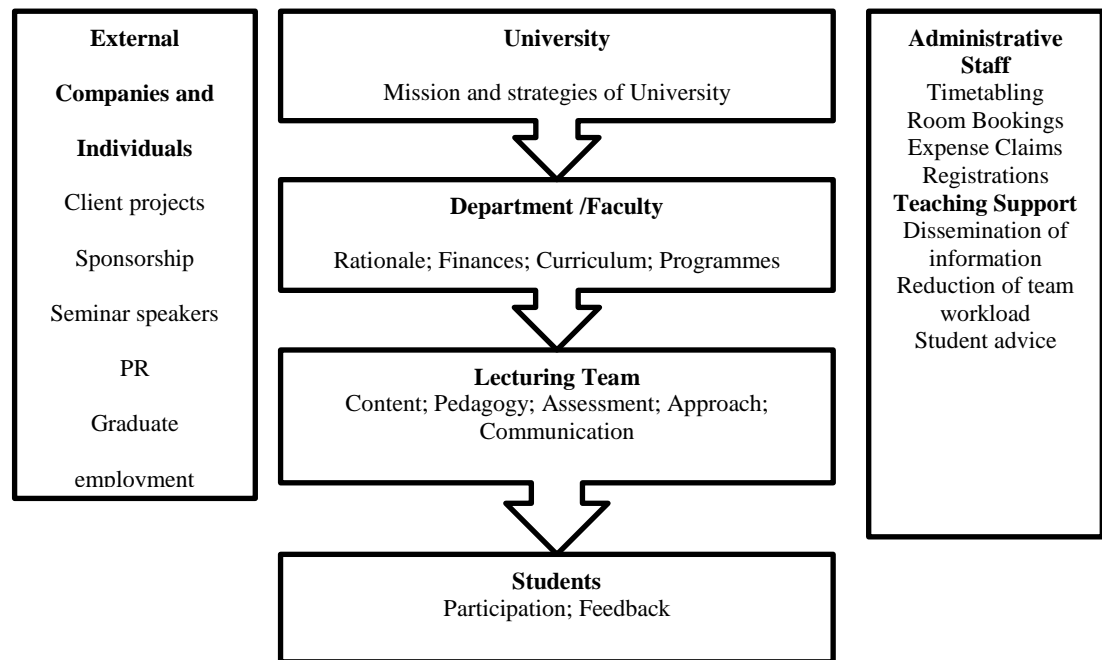


Fig. 11.1: Stakeholders involved in module and their respective roles

## **NEXT GENERATION MANAGEMENT**

While not the primary study sample, students of the paralleled postgraduate NGM module are referred to and warrant summarisation. The Next Generation Management (NGM) module is incorporated as a yearlong capstone module for a number of the DCU Business School postgraduate courses. Its aim is to develop key competencies required for management and leaderships roles and to increase the employability of graduates. Particular emphasis is placed on reflection, critical thinking, collaboration, creating and sharing knowledge, and dealing with complexity (DCU, 2017). The module focuses on four key themes: 1) Management and Career Development; 2) Business and Society; 3) Research; and 4) Digital Technology Media and Communication. During the module students will collate evidence of learning into a portfolio reflecting selected and self-proposed 'personal opportunities for development' which students undertake relating to the core themes. The module employs a rotational model of team teaching where each lecturer delivered their content independently of each other and had separate small assignments. Periodic team meetings during the year and careful curriculum designing are integral to the working relations of the lecturers involved.

One of the elements of the NGM module relates to project management and mentoring. This aspect necessitates that students undertake project management training (usually Prince2 certification), and are assigned a DICE team as mentor. The NGM mentor is required to facilitate the undergraduate team towards the completion of their projects over the year, and will submit project management documentation over the course of the year to reflect their own efforts. This element is a beneficial learning experience for undergraduate and postgraduate students and allows the DICE team to become fore-warned to instances of team conflict or social loafing (*free-riding*).

## APPENDIX C: Research Ethics Documentation

Dublin City University  
Ollscoil Chathair Bhaile Átha Cliath



Dr. Theo Lynn  
DCU Business School

7<sup>th</sup> October 2011

**REC Reference:** DCUREC/2011/098

**Proposal Title:** **An investigation of the role a university plays in creating or developing enterprising tendencies within student populations: a longitudinal study**

**Applicants:** Dr. Theo Lynn, Ms. Roisin Lyons

Dear Theo,

Further to expedited review, the DCU Research Ethics Committee approves this research proposal. Materials used to recruit participants should note that ethical approval for this project has been obtained from the Dublin City University Research Ethics Committee. Should substantial modifications to the research protocol be required at a later stage, a further submission should be made to the REC.

Yours sincerely,

A handwritten signature in black ink that reads 'Donal O'Mathuna'.

Dr. Donal O'Mathuna  
Chairperson  
DCU Research Ethics Committee



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for Research

Dublin City University,  
Dublin 9, Ireland

T +353 1 700 8000  
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[www.dcu.ie](http://www.dcu.ie)

Ollscoil Chathair Bhaile Átha Cliath  
Dublin City University



Ms. Roisin Lyons  
DCU Business School

1<sup>st</sup> December 2014

**REC Reference:** DCUREC/2014/223

**Proposal Title:** Investigating team dynamics and their impact on student outcomes in entrepreneurship education

**Applicants:** Ms. Roisín Lyons, Dr. Theo Lynn and Dr. Ciarán Mac an Bhaird

Dear Roisin,

This research proposal qualifies under our Notification Procedure, as a low risk social research project. Therefore, the DCU Research Ethics Committee approves this research proposal. Materials used to recruit participants should state that ethical approval for this project has been obtained from the Dublin City University Research Ethics Committee. Should substantial modifications to the research protocol be required at a later stage, a further submission should be made to the REC.

Yours sincerely,

A handwritten signature in black ink that reads 'Donal O'Mathuna'.

Dr. Donal O'Mathuna  
Chairperson  
DCU Research Ethics Committee



**Taighde & Nuálaíocht Tacaíocht**  
Ollscoil Chathair Bhaile Átha Cliath,  
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[www.dcu.ie](http://www.dcu.ie)

## APPENDIX D: SURVEY 1 (NOV 2012)

Welcome to the DICE Survey 2012/2013

Thank you for undertaking this survey. This survey is being undertaken by researchers attached to the Dublin City University Business School. It is funded by the DCU Business School. The objective of this survey is to assess the general enterprising tendencies of students. Completing the survey should take approximately 20 minutes. Your identity will be kept secure at all times. Your co-operation in this survey is much appreciated. If you have any queries, or require further information, please do not hesitate to contact roisin.lyons@dcu.ie

The research study will investigate the role a Business School has in creating or developing enterprising tendencies in students. We have invited you to participate as you are about to undertake an enterprise related module in a business school. You do not have to participate if you do not wish to do so. This will not affect student grading in any way. The confidentiality of any information provided is subject to legal limitations and will be destroyed upon completion of the research analysis.

I consent to participate in the study [Required]

Yes

No

### Background Information

\*2. Student Number:

\*3. Area of study

\*4. What year of study are you in?

1st year

2nd year

3rd year

4th year

Post-graduate

\*5. Are you a mature student?

Yes

No

\*6. How old are you?

\*7. Are you?

Male

Female

\*8. What nationality are you?

\*9. What is your parents' education?

\*10. Occupation of parent

\*11. Which of the following best describes you?

- I love new technologies and am among the first to experiment with and use them.
- I like new technologies and use them before most people I know.
- I usually use new technologies when most people I know do.
- I am usually one of the last people I know to use new technologies.
- I am sceptical of new technologies and use them only when I have to.

\*12. Please rate your agreement with the following statements (Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree)

I will be able to achieve most of the goals that I have set for myself.  
When facing difficult tasks, I am certain that I will accomplish them.  
In general, I think that I can obtain outcomes that are important to me.  
I believe I can succeed at most any endeavour to which I set my mind.  
I will be able to successfully overcome many challenges.  
I am confident that I can perform effectively on many different tasks.  
Compared to other people, I can do most tasks very well.  
Even when things are tough, I can perform quite well.

\*13. For a project when do you find you are most productive:

- When I am working on my own
- When I am working with one other person
- When I am working in a team

### **Self-Efficacy Tests**

\*14. Please rate your confidence in completing the following tasks from 1= no confidence to 5=complete confidence

Successfully identifying new business opportunities  
Creating new products  
Thinking creatively in business  
Commercialising an idea or new development

\*15. Please rate your confidence in completing the following tasks from 1= no confidence to 5=complete confidence

Applying different tools or techniques to generate ideas for a project  
Identifying problems and finding solutions for them  
Meeting a project goal even when there are challenges  
Thinking of creative approaches to doing projects  
Spending time anticipating the outcomes of decisions before making them  
Taking measured risks on projects based on judgement  
Applying what you have learnt to a project  
Working productively in a team  
Working productively on own  
Ability to get my ideas across when working on a team  
Able to persuade others about my ideas when working in a team  
Making an interesting project a success

### **General Enterprise Tendency Test**

\*16. For each of the questions below, please select the answer that you feel most closely reflects yourself.

1. I would not mind routine unchallenging work if the pay and pension prospects were good.
2. I like to test boundaries and get into areas where few have worked before
3. I tend not to like to stand out or be unconventional.
4. Capable people who fail to become successful have not usually taken chances when they have occurred.
5. I rarely day dream.
6. I find it difficult to switch off from work completely.
7. You are either naturally good at something or you are not, effort makes no difference.
8. Sometimes people find my ideas unusual
9. I would rather buy a lottery ticket than enter a competition.
10. I like challenges that stretch my abilities and get bored with things I can do quite easily.
11. I would prefer to have a moderate income in a secure job rather than a high income in a job that depended on my performance
12. At work, I often take over projects and steer them my way without worrying about what other people think.
13. Many of the bad times that people experience are due to bad luck.
14. Sometimes I think about information almost obsessively until I come up with new ideas and solutions.
15. If I am having problems with a task I leave it, forget it and move on to something else.
16. When I make plans I nearly always achieve them.
17. I do not like unexpected changes to my weekly routines.
18. If I wanted to achieve something and the chances of success were 50/50 I would take the risk.
19. I think more of the present and past than of the future.
20. If I had a good idea for making some money, I would be willing to invest my time and borrow money to enable me to do it.
21. I like a lot of guidance to be really clear about what to do in work.
22. People generally get what they deserve.
23. I am wary of new ideas, gadgets and technologies.
24. It is more important to do a job well than to try to please people
25. I try to accept that things happen to me in life for a reason.
26. Other people think that I'm always making changes and trying out new ideas.
27. If there is a chance of failure I would rather not do it.
28. I get annoyed if people are not on time for meetings.
29. Before I make a decision I like to have all the facts no matter how long it takes.
30. I rarely need or want any assistance and like to put my own stamp on work that I do.
31. You are not likely to be successful unless you are in the right place at the right time.
32. I prefer to be quite good at several things rather than very good at one thing.
33. I would rather work with a person I liked who was not good at the job, rather than work with someone I did not like even if they were good at the job.
34. Being successful is a result of working hard, luck has little to do with it.
35. I prefer doing things in the usual way rather than trying out new methods.
36. Before making an important decision I prefer to weigh up the pro's and con's fairly quickly rather than spending long time thinking about it.

37. I would rather work on a task as part of a team rather than take responsibility for it myself.
38. I would rather take an opportunity that might lead to even better things than have an experience that I am sure to enjoy.
39. I usually do what is expected of me and follow instructions carefully.
40. For me, getting what I want is a just reward for my efforts.
41. I like to have my life organised so that it runs smoothly and to plan.
42. When I am faced with a challenge I think more about the results of succeeding than the effects of failing.
43. I believe that destiny determines what happens to me in life
44. I like to spend time with people who have different ways of thinking.
45. I find it difficult to ask for favours from other people.
46. I get up early, stay late or skip meals if I have a deadline for some work that needs to be done.
47. What we are used to is usually better than what is unfamiliar.
48. I get annoyed if superiors or colleagues take credit for my work.
49. People's failures are rarely the result of their poor judgement.
50. Sometimes I have so many ideas that I feel pressurised.
51. I find it easy to relax on holiday and forget about work
52. I get what I want from life because I work hard to make it happen.
53. It is harder for me to adapt to change than keep to a routine.
54. I like to start interesting projects even if there is no guaranteed payback for the money or time I have to put in.

### **Future Goals and Present Feeling**

Top of Form

\*17. What do you expect your overall grade to be at the conclusion of this module? (DICE or NGM)

- 90%+
- 80%-90%
- 70%-80%
- 60%-70%
- 50%-60%
- 40%-50%
- Below 40%

\*18. Do you think you will start your own company in the future?

- Yes
- No

\*19. Indicate your level of agreement with the following statements from 1 (total disagreement) to 7 (total agreement)

- I'm ready to make anything to be an entrepreneur
- My professional goal is becoming an entrepreneur



- I will make every effort to start and run my own firm

- I'm determined to create a firm in the future

- I have very seriously thought in starting a firm

- I've got the firm intention to start a firm some day

\*20. Have you ever started your own company in the past?

Yes

No

If yes, please give detail

\*21. Have you worked full time in any position in the past?

Yes

No

If yes, please give detail

## APPENDIX E: SURVEY 2 (MAY 2013)

Welcome to the DICE Survey 2012/2013

Top of Form

Thank you for undertaking this survey. This survey is being undertaken by researchers attached to the Dublin City University Business School. It is funded by the DCU Business School. The objective of this survey is to assess the general enterprising tendencies of students and to receive feedback about the DICE module. Completing the survey should take approximately 20 minutes. Your identity will be kept secure at all times. Your co-operation in this survey is much appreciated. If you have any queries, or require further information, please do not hesitate to contact roisin.lyons@dcu.ie

Consent is Required

Top of Form

\*1.

I consent to participate in the study [Required]

Yes

No

2. StudentNumber:

\*3. Area of study

\*4. Are you a mature student

Yes

No

\*5. How old are you?

\*6. Are you

Male

Female

\*7. What nationality are you?

8. The DICE module incorporated both online and offline forms of learning. In DICE I found that.  
[Almost Never, Seldom, Sometimes, Often, Almost Always]

1. my learning focused on issues that interest me.

2 what I learnt is important for my professional practice.

3 I learnt how to improve my professional practice.

4 what I learnt connects well with my professional practice.

5 I thought critically about how I learn.

6 I thought critically about my own ideas.

7 I thought critically about other students' ideas.

8 I thought critically about ideas from speakers and managers.

9 I explained my ideas to other students.

10 I asked other students to explain their ideas.

11 other students ask me to explain my ideas.

12 other students responded to my ideas.

13 the tutor stimulated my thinking.

14 the tutor encouraged me to participate.

15 the tutor models good discourse.

16 the tutor models critical self-reflection.

17 other students encouraged my participation.

18 other students praised my contribution.

19 other students valued my contribution.

20 other students empathised with my struggle to learn.

21 I made good sense of other students' messages.

22 other students made good sense of my messages.

23 I made good sense of the tutor's messages.

24 the tutor made good sense of my messages.

\*9. How satisfied were you with the DICE module in general

Very satisfied

Somewhat satisfied

Unsure

Somewhat dissatisfied

Very dissatisfied

10. Do you think you have developed as a person in the following areas as a result of the DICE module? [Strongly disagree, Disagree, Uncertain, Agree, Strongly Agree]

The tendency to be creative: When thinking of ideas, I am now more innovative and original.

Locus of Control: I more firmly believe that I control my own destiny; that my successes/failures will be determined by my own actions.

Autonomy: I want to be able to do and say what I want, to give my opinion regardless of the consequences

Need for Achievement: I am more determined to reach a standard of excellence that is recognised

Calculated Risk-taking: Even if I have incomplete information, I am now more likely to make a decision that requires some risk but which could result in a very positive outcome.

Critical Thinking: I now think more clearly and rationally. I am more able to engage in reflective and independent thinking.

Qs 11-15 – Specific course element feedback Qs omitted.

16. Please rate your agreement with the following statements in relation to the Team Signatory Code and Teamwork elements [Strongly disagree, Disagree, Uncertain, Agree, Strongly Agree]

Creating the signatory code helped me to understand the importance of a governance system

My team kept minutes of every meeting

My team's signatory code was a fair way to determine who deserved credit for projects

My team's signatory code was useful in ensuring that team members did their fair share of the work

Everyone on my team did their fair share of the work

My team had problems with attendance at meetings

My team had problems with the quality of work submitted by team members

The signatory code is a valuable component in the module

On reflection, I would have used the signatory code more effectively to address team issues

\*17. What tools did you find helpful in co-ordinating your teamwork? [Very helpful, Helpful, Uncertain, Not helpful, Did not use]

Email

Google docs

Moodle

Course Outline

Emails from DICE staff

Project Manager

Facebook groups

Texting

Other (please specify)

18. At what stage, if any, did your team experience difficulty?

At the beginning when getting used to each other

At the end of semester one

At the start of semester two

Before assignment deadlines in semester two

Throughout the year consistently

We did not experience problems

\*19. How severe do you believe these problems were?

Minor issues that were dealt with easily

More serious issues that involved student warnings

More serious issues that caused us to weight team members contributions unequally

Major issues that forced the team to involve DICE staff

Major issues that forced the team to remove a member

\*20. Please rate your agreement with the following statements

[Strongly Agree, Agree, Uncertain, Disagree, Strongly disagree]

I will be able to achieve most of the goals that I have set for myself.

When facing difficult tasks, I am certain that I will accomplish them.

In general, I think that I can obtain outcomes that are important to me.

I believe I can succeed at most any endeavour to which I set my mind.

I will be able to successfully overcome many challenges.

I am confident that I can perform effectively on many different tasks.

Compared to other people, I can do most tasks very well.

Even when things are tough, I can perform quite well.

\*21. For a project when do you find you are most productive.

When I am working on my own

When I am working with one other person

When I am working in a team

\*22. Please rate your confidence in completing the following tasks from 1= no confidence to 5=complete confidence

Successfully identifying new business opportunities

Creating new products

Thinking creatively in business

Commercialising an idea or new development

\*23. Please rate your confidence in completing the following: 1= no confidence to 5=complete confidence

Applying different tools or techniques to generate ideas for a project

Identifying problems and finding solutions for them

Meeting a project goal even when there are challenges

Thinking of creative approaches to doing projects

Spending time anticipating the outcomes of decisions before making them

Taking measured risks on projects based on judgement

Applying what you have learnt to a project

Working productively in a team

Working productively on own

Ability to get my ideas across when working on a team

Able to persuade others about my ideas when working in a team

Making an interesting project a success

\*24. For each of the questions below, please select the answer that you feel most closely reflects yourself. [Strongly Agree, Agree, More agree than disagree, More disagree than agree, Disagree, Strongly disagree]

1. I would not mind routine unchallenging work if the pay and pension prospects were good.

2. I like to test boundaries and get into areas where few have worked before

3. I tend not to like to stand out or be unconventional.

4. Capable people who fail to become successful have not usually taken chances when they have occurred.

5. I rarely day dream.

6. I find it difficult to switch off from work completely.

7. You are either naturally good at something or you are not, effort makes no difference.

8. Sometimes people find my ideas unusual

9. I would rather buy a lottery ticket than enter a competition.

10. I like challenges that stretch my abilities and get bored with things I can do quite easily.

11. I would prefer to have a moderate income in a secure job rather than a high income in a job that depended on my performance

12. At work, I often take over projects and steer them my way without worrying about what other people think.

13. Many of the bad times that people experience are due to bad luck.

14. Sometimes I think about information almost obsessively until I come up with new ideas and solutions.

15. If I am having problems with a task I leave it, forget it and move on to something else.

16. When I make plans I nearly always achieve them.

17. I do not like unexpected changes to my weekly routines.

18. If I wanted to achieve something and the chances of success were 50/50 I would take the risk.

19. I think more of the present and past than of the future.

20. If I had a good idea for making some money, I would be willing to invest my time and borrow money to enable me to do it.

21. I like a lot of guidance to be really clear about what to do in work.

22. People generally get what they deserve.

23. I am wary of new ideas, gadgets and technologies.

24. It is more important to do a job well than to try to please people

25. I try to accept that things happen to me in life for a reason.

26. Other people think that I'm always making changes and trying out new ideas.

27. If there is a chance of failure I would rather not do it.

28. I get annoyed if people are not on time for meetings.

29. Before I make a decision I like to have all the facts no matter how long it takes.
30. I rarely need or want any assistance and like to put my own stamp on work that I do.
31. You are not likely to be successful unless you are in the right place at the right time.
32. I prefer to be quite good at several things rather than very good at one thing.
33. I would rather work with a person I liked who was not good at the job, rather than work with someone I did not like even if they were good at the job.
34. Being successful is a result of working hard, luck has little to do with it.
35. I prefer doing things in the usual way rather than trying out new methods.
36. Before making an important decision I prefer to weigh up the pro's and con's fairly quickly rather than spending long time thinking about it.
37. I would rather work on a task as part of a team rather than take responsibility for it myself.
38. I would rather take an opportunity that might lead to even better things than have an experience that I am sure to enjoy.
39. I usually do what is expected of me and follow instructions carefully.
40. For me, getting what I want is a just reward for my efforts.
41. I like to have my life organised so that it runs smoothly and to plan.
42. When I am faced with a challenge I think more about the results of succeeding than the effects of failing.
43. I believe that destiny determines what happens to me in life
44. I like to spend time with people who have different ways of thinking.
45. I find it difficult to ask for favours from other people.
46. I get up early, stay late or skip meals if I have a deadline for some work that needs to be done.
47. What we are used to is usually better than what is unfamiliar.
48. I get annoyed if superiors or colleagues take credit for my work.
49. People's failures are rarely the result of their poor judgement.
50. Sometimes I have so many ideas that I feel pressurised.
51. I find it easy to relax on holiday and forget about work
52. I get what I want from life because I work hard to make it happen.
53. It is harder for me to adapt to change than keep to a routine.
54. I like to start interesting projects even if there is no guaranteed payback for the money or time I have to put in.

\*25. What do you expect your overall grade to be at the conclusion of this module? (DICE or NGM)

- 90%+
- 80%-90%
- 70%-80%
- 60%-70%
- 50%-60%
- 40%-50%
- Below 40%

\*26. Indicate your level of agreement with the following statements from 1 (total disagreement) to 7 (total agreement)

- I'm ready to make anything to be an entrepreneur
- My professional goal is becoming an entrepreneur
- I will make every effort to start and run my own firm
- I'm determined to create a firm in the future

- I have very seriously thought in starting a firm

- I've got the firm intention to start a firm some day

\*27. Have you ever started your own company in the past?

Yes

No

\*28. Have you worked full time in any position in the past?

Yes

No

## APPENDIX F: SURVEY 3 (NOV 2013)

The research study will investigate the role a Business School has in creating or developing enterprising tendencies in students and investigate the impact that teamwork has in an entrepreneurship module. We have invited you to participate as you are studying in a business school. You do not have to participate if you do not wish to do so. This will not affect student grading in any way. The confidentiality of any information provided is subject to legal limitations and will be destroyed upon completion of the research analysis.

\*1. *I consent to participate in this survey.*

Yes

No

\*2. ID number.

\*3. Team Number.

\*4. How many members are there currently in your DICE team (including project managers)?

\*5. Area of Study.

\*6. What year of study are you in?

\*7. Age

\*8. Are you: Male/Female?

9. Nationality.

\*10. Which of the following best describes you?

I love new technologies and am among the first to experiment with and use them.

I like new technologies and use them before most people I know.

I usually use new technologies when most people I know do.

I am usually one of the last people I know to use new technologies.

I am sceptical of new technologies and use them only when I have to.

\*11. Please rate your agreement with the following statements [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]

I will be able to achieve most of the goals that I have set for myself.

When facing difficult tasks, I am certain that I will accomplish them.

In general, I think that I can obtain outcomes that are important to me.

I believe I can succeed at most any endeavor to which I set my mind.

I will be able to successfully overcome many challenges.

I am confident that I can perform effectively on many different tasks.

Compared to other people, I can do most tasks very well.

Even when things are tough, I can perform quite well.

12. Please rate your confidence in completing the following tasks [1= no confidence to 5=complete confidence]

Applying different tools or techniques to generate ideas for a project

Identifying problems and finding solutions for them

Meeting a project goal even when there are challenges.

Thinking of creative approaches to doing projects .

Spending time anticipating the outcomes of decisions before making them



Taking measured risks on projects based on judgement

Applying my knowledge to a project

Working productively in a team

Working productively on my own

My ability to communicate ideas when working in a team

My ability to persuade others about my ideas when working in a team

Making an interesting project a success

\*13. For a project when do you find you are most productive.

When I am working on my own.

When I am working with one other person.

When I am working in a team.

\*14. On a scale from 1-7 [ where 1 = none at all, 7 = more than enough] how enjoyable do you find working in a team?

\*15. Please indicate the extent to which you agree or disagree with each statement in relation to your DICE team and teamwork. [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]

I am in agreement with the team objectives.

The team objectives are clearly understood by all members of the team.

I believe the team objectives are actually achievable.

I believe these team objectives are worthwhile.

Our team have a 'we are in it together' attitude.

People keep each other informed about work-related issues in the team.

People feel understood and accepted by each other.

There are real attempts to share information throughout the team.

Is the team prepared to question the basis of what the team is doing?

Does the team critically appraise potential weaknesses in what it is doing in order to achieve the best possible outcome?

Does the team build on its ideas in order to achieve the best possible outcome?

People in the team are always searching for fresh, new ways of looking at problems.

In the team we take the time needed to develop new ideas.

People in the team co-operate in order to help develop and apply new ideas.

\*16. Please rate your agreement with the following statements about your DICE team

[*Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree*]

My team discuss our performance vision.

My team discuss what we can do to make our vision a success.

My team discuss our objectives.

My team takes the time needed to share task-related information.

My team actively learns from one another.

My team learn from mistakes and errors.

My team effectively communicates with each other.

My team creates an environment of openness and trust.

My team thinks in terms of whats best for the team.

My team really trust each other.

My team criticise each others work in order to improve performance.

My team freely challenge the assumptions underlying each others ideas and perspectives.

My team engage in evaluating any weak points in attaining effectiveness.

My team utilise different opinions for the sake of obtaining optimal outcomes.

*\*17. On a scale from 1-7 (where 1 = none at all, 7 = more than enough) how much training have you been given for the teamwork element of this module?*

*\*18. On a scale from 1-7 (where 1 = not at all, 7 = more than enough) how conscientious do you believe your team is?*

*\*19. On a scale from 1-7 (where 1 = none at all, 7 = more than enough) how much effort did your team put into constructing the team signatory code for the module?*

*\*20. On a scale from 0-7 (where 0 = No Confidence, 7 = Complete confidence) How confident are you that your DICE team could...*

Reach an agreement about what needs to get done at each meeting.

Find ways to bridge individual differences (e.g. in age, personality or programme) between team members.

Assist members who are having difficulties with certain tasks.

Communicate well with one another despite differences in cultural background.

Adapt to changes in group tasks or goals.

Work well together even in challenging situations.

Deal with feedback or criticism from the course instructor.

Find ways to capitalise on the strengths of each member.

*\*21. Please rate your confidence in completing the following tasks [1= no confidence to 5=complete confidence].*

Applying different tools or techniques to generate ideas for a project.

Identifying problems and finding solutions for them.

Meeting a project goal even when there are challenges.

Thinking of creative approaches to doing projects.

Spending time anticipating the outcomes of decisions before making them.

Taking measured risks on projects based on judgement.

Applying what you have learnt to a project.

Working productively in a team.

Working productively on own.

Ability to get my ideas across when working on a team.

Able to persuade others about my ideas when working in a team.

Making an interesting project a success.

*\*22. Please rate your agreement with the following statements [Strongly Disagree, Disagree Uncertain, Agree, Strongly Agree]*

The new things that I discover with entrepreneurship allow me to appreciate it even more.

Entrepreneurship reflects the qualities I like about myself.

Entrepreneurship is in harmony with the other activities in my life.

For me, being an entrepreneur is a passion.

I am completely taken with being an entrepreneur.

My intention is to become an entrepreneur.

My experience of the DICE module makes me want to become an entrepreneur more.

\*23. Please rate your confidence in completing the following tasks [1= no confidence to 5=complete confidence]

Successfully identifying new business opportunities

Creating new products

Thinking creatively in business

Commercialising an idea or new development

\*24. What do you expect your overall percentage grade to be at the conclusion of this module? (DICE or NGM)

\*25. Have you ever started your own company in the past?

Yes

No

If yes, please specify

\*26. Have you worked full time in any position in the past?

Yes

No

## APPENDIX G: SURVEY 4 (MAY 2014)

The research study will investigate the role a Business School has in creating or developing enterprising tendencies in students and investigate the impact that teamwork has in an entrepreneurship module. We have invited you to participate as you are studying in a business school. You do not have to participate if you do not wish to do so. This will not affect student grading in any way. The confidentiality of any information provided is subject to legal limitations and will be destroyed upon completion of the research analysis.

\*1. I consent to participate in this survey

Yes

No

\*2. ID number

\*3. Team Number

\*4. How many members are there currently in your DICE team (including project managers)?

\*5. Area of Study

\*6. What year of study are you in?

\*7. Age

\*8. Are you [Male/Female]

9. Nationality

\*10. Please rate your agreement with the following statements

[Strongly Disagree, Disagree, Uncertain, Agree, Strongly]

I will be able to achieve most of the goals that I have set for myself.

When facing difficult tasks, I am certain that I will accomplish them.

In general, I think that I can obtain outcomes that are important to me.

I believe I can succeed at most endeavors I set my mind to.

I will be able to successfully overcome many challenges.

I am confident that I can perform effectively on many different tasks.

Compared to other people, I can do most tasks very well.

Even when things are tough, I can perform quite well.

\*11. Please rate your confidence in completing the following [1= no confidence to 5=complete confidence]

Successfully identifying new business opportunities

Creating new products

Thinking creatively in business

Commercialising an idea or new development

\*12. For a project when do you find you are most productive

When I am working on my own.

When I am working with one other person.

When I am working in a team.

\*13. Based on your experience, how confident are you that your DICE team could....

[0 = No Confidence, 7 = Complete confidence]

Reach an agreement about what needs to get done at each meeting.

Find ways to bridge individual differences (e.g. in age, personality or programme) between team members.

Assist members who are having difficulties with certain tasks.

Communicate well with one another despite differences in cultural background.

Adapt to changes in group tasks or goals.

Work well together even in challenging situations.

Deal with feedback or criticism from the course instructor.

Find ways to capitalise on the strengths of each member.

\*14. Please indicate the extent to which you agree or disagree with each statement in relation to your DICE team and teamwork. [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]

I was in agreement with the team objectives.

The team objectives were clearly understood by all members of the team.

I believed the team objectives were actually achievable.

I believed these team objectives were worthwhile.

Our team had a 'we are in it together' attitude.

People kept each other informed about work-related issues in the team.

People felt understood and accepted by each other.

There were real attempts to share information throughout the team.

The team were prepared to question the basis of what the team was doing at all times

The team critically appraised potential weaknesses in order to achieve the best possible outcome

The team built on its ideas in order to achieve the best possible outcome

People in the team were always searching for fresh, new ways of looking at problems.

In the team we took the time needed to develop new ideas.

People in the team co-operated in order to help develop and apply new ideas.

\*15. Please rate your agreement with the following statements about your DICE team [Strongly disagree, Disagree, Uncertain, Agree, Strongly Agree]

My team discussed our performance vision.

My team discussed what we can do to make our vision a success.

My team discussed our objectives.

My team took the time needed to share task-related information.

My team actively learnt from one another.

My team learnt from mistakes and errors.

My team effectively communicated with each other.

My team created an environment of openness and trust.

My team thought in terms of what was best for the team.

My team really trusted each other.

My team criticised each other's work in order to improve performance.

My team freely challenged the assumptions underlying each other's ideas and perspectives.

My team engaged in evaluating any weak points in attaining effectiveness.

My team utilised different opinions for the sake of obtaining optimal outcomes.

\*16. On a scale from 1-7 (where 1 = none at all, 7 = more than enough) how much training or support in the following areas did you feel you were given for the module?

Teamwork training

Creativity training

Technical training (e.g. mobile app development/blog writing training)

Technical support

\*17. Please answer the following on a scale from 1-7 (where 1 = not at all, 7 = more than enough).

In general, how enjoyable do you find working in a team?

How conscientious do you believe your DICE team was?

How much effort did your DICE team put into constructing the team signatory code for the module?

\*18. Please rate your agreement with the following statements in relation to the Team Signatory Code [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]

Creating the signatory code helped me to understand the importance of a governance system

My team's signatory code was a fair way to determine who deserved credit for projects

My team referred to the signatory code at points during the year to resolve issues

My team's signatory code was useful in ensuring that team members did their fair share of the work

On reflection, I would have used the signatory code more effectively to address team issues

\*19. What tools did you find helpful in co-ordinating your teamwork?

[Very Helpful, Helpful, Uncertain, Unhelpful, Very Unhelpful, Did not use]

Email

Google docs

Moodle

Course Outline

Emails from DICE staff

Project Manager

Facebook groups

Calls/Texts

Whatsapp groups

The Marketing Lab

20. At what stage, if any, did your team experience difficulty?

At the beginning when getting used to each other

At the end of semester one

At the start of semester two

Before assignment deadlines in semester two

Throughout the year consistently

We did not experience problems

\*21. In terms of your teamwork experience, please rate the following scenarios from 1-5 by the amount they were encountered by the team. [1= never, 5= all the time].

Team members allowing others to take on extra responsibility rather than volunteering themselves

Team members not doing their fair share of the workload

Team members not putting in as much effort as the rest

Team members being unreliable in terms of deadlines

Team members taking it easy if there are others to do the work

Team members missing meetings without explanation or forewarning

22. How satisfied were you with the DICE module in general

Very satisfied

Somewhat satisfied

Unsure

Somewhat dissatisfied

Very dissatisfied

Reason for selection (optional)

[Qs 23 and 24 feedback about specific assignment, omitted from appendix]

*\*25. Please rate your agreement with the following statements in relation to entrepreneurship [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]*

The new things that I discover with entrepreneurship allow me to appreciate it even more.

Entrepreneurship reflects the qualities I like about myself.

Entrepreneurship is in harmony with the other activities in my life.

For me, being an entrepreneur is a passion.

I am completely taken with being an entrepreneur.

I'm ready to make anything to be an entrepreneur

My professional goal is becoming an entrepreneur

I will make every effort to start and run my own firm

I'm determined to create a firm in the future

I have very seriously thought about starting a business

I've got the firm intention to start a business some day

My experience of the DICE module made me want to become an entrepreneur more.

My experience of the DICE module made me more enterprising

I would prefer to be innovative within a company than start a new venture

*\*26. What do you expect your overall percentage grade to be at the conclusion of this module? (DICE or NGM)*

*\*27. Have you ever started your own company in the past?*

Yes

No

If yes, please specify

*\*28. Have you worked full time in any position in the past (Yes/No)*

## APPENDIX H: SURVEY 5 (NOV 2014)

This research study is being conducted by Roisin Lyons and Theo Lynn in the DCU Business School. Its purpose is to investigate the role a Business School has in creating or developing enterprising tendencies in students and secondly, to investigate the impact that teamwork has in an entrepreneurship module. We have invited you to participate as you are undertaking a university module and are engaged in teamwork within this module. The information you provide has no bearing on your module or your grades in any way. You do not have to participate if you do not wish to do so. The confidentiality of any information provided is subject to legal limitations and will be destroyed upon completion of the research analysis. If you do participate in the survey we may contact you at the conclusion of your module to attain some feedback. If you would like to know more about the project, or have any questions please email roisin.lyons@dcu.ie

I consent to participate in this survey.

Yes

No

\*2. ID (Student number)

\*3. What year of study are you in?

4. Area of Study.

\*5. What module are you participating in this survey for?

\*6. Age

\*7. Are you [Male/Female]

8. Nationality

\*9. In relation to your prior experience of entrepreneurship, please answer yes or no the following.

I run my own company at present

I have run a company in the past

Members of my family (parents/siblings) run their own company

\*10. Which of the following best describes you?

I love new technologies and am among the first to experiment with and use them.

I like new technologies and use them before most people I know.

I usually use new technologies when most people I know do.

I am usually one of the last people I know to use new technologies.

I am sceptical of new technologies and use them only when I have to.

\*11. For a project when do you find you are most productive

When I am working on my own.

When I am working with one other person.

When I am working in a team.

12. Team Number

\*13. How many members are there currently in your team (including project managers)?

\*14. On a scale from 1-7 (where 1 = none at all, 7 = more than enough) how much training have you been given about working in teams during this module?

\*15. On a scale from 1-7 (where 1 = we do not have a team signatory code, 7 = more than enough) how much effort did your team put into constructing the team signatory code for the module?

\*16. Please rate yourself in terms of the following. [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]

I suggest new ways to achieve my goals

I think of new and practical ideas to improve performance



I like to search out new technologies, processes, techniques and/or product ideas.  
I am a good source of creative and innovative ideas.  
I like to suggest new ways to increase quality.  
I am not afraid to take risks.  
I like to promote and champion my ideas to others.  
I think I show creativity when given the opportunity to.  
I help to create plans and schedules to get new ideas working.  
I often have new and innovative ideas.  
I like to come up with creative solutions to problems.  
I think I often have a fresh approach to problems.  
I like to suggest new ways of performing work tasks.

\*17. As part of your module you are involved in an entrepreneurial task (e.g. the development of a mobile app).

Please rate your feeling about this task below

[1 = Uninteresting and 7 = Interesting]

\*18. [1 = Boring and 7 = Exciting]

\*19. [1 = Annoying 7 = Challenging]

\*20. [1 = Shallow 7 = Engrossing]

\*21. [1 = Unfulfilling 7 = Fulfilling]

\*22. What do you expect your overall percentage grade to be at the conclusion of this module?

\*23. Please rate your agreement with the following statement in relation to your university

[Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]

This university recognises and welcomes innovation in its students

There is a culture of innovation and enterprise in this university

There are many resources available in the university to aid innovation

Creativity and innovation are rewarded in this university

There is much support for students who are pursuing innovative tasks

\*24. Please rate your agreement with the following statements

[Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]

I will be able to achieve most of the goals that I have set for myself.

When facing difficult tasks, I am certain that I will accomplish them.

In general, I think that I can obtain outcomes that are important to me.

I believe I can succeed at most any endeavor to which I set my mind.

I will be able to successfully overcome many challenges.

I am confident that I can perform effectively on many different tasks.

Compared to other people, I can do most tasks very well.

Even when things are tough, I can perform quite well.

\*25. Please rate your confidence in completing the following [1= no confidence to 7=complete confidence]

Successfully identifying new business opportunities

Creating new products

Thinking creatively in business

Commercialising an idea or new development

26. Please rate your agreement with the following statements from 1= no agreement whatsoever to 7 = total agreement

The more I find out about starting a new business the more I want to do it myself

Thinking of new opportunities for business really excites me

I am passionate about entrepreneurship

I am completely obsessed with the idea of having my own company

*\*27. Please indicate the extent to which you agree or disagree with each statement [Strongly Disagree, Disagree, Nether Agree nor Disagree, Agree, Strongly Agree]*

It is exciting to figure out new ways to solve market needs

Searching for new ideas for products/services to offer is enjoyable to me

I am motivated to figure out how to make an existing project

Looking for new opportunities really excites me

Inventing new solutions to problems is an important part of who I am

The idea of establishing a new company excites me

The idea of owning my own company energizes me

The idea of nurturing a new business through its emerging success would be enjoyable

Being the founder of a business will be an important part of who I am

*\*28. How would you estimate the probability that you will run your own company in the future? 1 - very low probability, 7 - very high probability*

## APPENDIX I: SURVEY 5 (MAY 2015)

This research study is being conducted by Roisin Lyons and Theo Lynn in the DCU Business School. Its purpose is to investigate the role a Business School has in creating or developing enterprising tendencies in students and secondly, to investigate the impact that teamwork has in an entrepreneurship module. We have invited you to participate as you are undertaking a university module and are engaged in teamwork within this module. The information you provide has no bearing on your module or your grades in any way. You do not have to participate if you do not wish to do so. The confidentiality of any information provided is subject to legal limitations and will be destroyed upon completion of the research analysis. If you do participate in the survey we may contact you at the conclusion of your module to attain some feedback. If you would like to know more about the project, or have any questions please email roisin.lyons@dcu.ie

\*1. I consent to participate in this survey.

Yes

No

\*2. ID (Student number)

\*3. What year of study are you in?

4. Area of Study

\*5. What module are you participating in this survey for?

\*6. Age

\*7. Are you: [Male/Female]

\*8. In relation to your prior experience of entrepreneurship, please answer yes or no to the following.

I run my own company at present

I have run a company in the past

Members of my family (parents/siblings) run their own company

\*9. Which of the following best describes you?

I love new technologies and am among the first to experiment with and use them.

I like new technologies and use them before most people I know.

I usually use new technologies when most people I know do.

I am usually one of the last people I know to use new technologies.

I am sceptical of new technologies and use them only when I have to.

\*10. For a project when do you find you are most productive.

When I am working on my own.

When I am working with one other person.

When I am working in a team.

11. Team Number

\*12. How many members are there currently in your team (NOT including project managers)?

\*13. How many of each category were in your team?

Males

Females

\*14. On a scale from 1-7 (where 1 = none at all, 7 = more than enough) how much training or support in the following areas did you feel you were given for the module?

Teamwork training

Creativity training

Technical training (e.g. mobile app development/blog writing training)

Technical support

\*15. Please indicate the extent to which you agree or disagree with each statement in relation to your team and teamwork. [Strongly Disagree, Disagree, Uncertain, Agree, Strongly]

We were in agreement about the team objectives.

The team objectives were clearly understood by all members of the team.

We believed the team objectives were actually achievable.

We believed these team objectives were worthwhile.

Our team had a 'we are in it together' attitude.

People kept each other informed about work-related issues in the team.

People felt understood and accepted by each other.

There were real attempts to share information throughout the team

As a team we were constantly asking each other questions

We were able to be critical with each other in order to improve our product/idea

As a team we built on each other's ideas to improve our product/idea

People in the team were always searching for fresh, new ways of looking at problems.

In the team we took the time needed to develop new ideas.

We co-operated with each other to help develop and apply new ideas.

\*16. Innovation is a process involving both the generation and implementation of ideas. As such, it requires a wide variety of specific behaviours on the part of the team. Please rate your team on the extent to which they: [Not at all, A little, Uncertain, A lot, To an exceptional degree]

Sought out new technologies, processes, techniques and or ideas

Generated creative ideas

Promoted and championed new ideas

Investigated and attained resources and information necessary to implement new ideas

Developed adequate plans and schedules for the implementation of new ideas

Were innovative

\*17. Please rate the degree to which each of the adjectives below describes 'the character and typical behaviour of your team'. [Not at all, A little, Uncertain, A lot, To an exceptional degree]

Efficient

Systematic

Organised

Reliable

Conscientious

Hardworking

\*18. Please answer the following questions on a scale from 1-7 [ 1 = not at all, 7 = more than enough].

In general, how enjoyable did you find working in your DICE team?

How much effort did your DICE team put into constructing the team signatory code for the module?

How satisfied were you with the DICE module in general?

My experience of the DICE module made me more enterprising

My experience of the DICE module made me want to become an entrepreneur more.

\*19. In terms of your teamwork experience, please rate the following scenarios from 1-5 by the amount they were encountered by the team. [1= never, 5= all the time]

Team members allowing others to take on extra responsibility rather than volunteering themselves

Team members not doing their fair share of the workload

Team members not putting in as much effort as the rest

Team members being unreliable in terms of deadlines

Team members taking it easy if there are others to do the work

Team members missing meetings without explanation or forewarning

\*20. What tools did you find helpful in co-ordinating your teamwork  
[Very Helpful, Helpful, Uncertain, Unhelpful, Very Unhelpful]

Email

Google docs

Moodle

Course Outline

Emails from DICE staff

Project Manager

Facebook groups

Calls/Texts

Whatsapp groups

\*21. At what stage, if any, did your team experience difficulty?

At the beginning when getting used to each other

At the end of semester one

At the start of semester two

Before assignment deadlines in semester two

Throughout the year consistently

We did not experience problems

\*22. In terms of your project this semester (extended app concept), please indicate which sentence is more closely related to the finished product in terms of its innovative output.

No apparent innovation

A product/service identical to an existing product offered to another market

A new use for an existing product/service with little/no modification

A significant improvement to an existing product/service

A combination of two or more existing products/services into one unique or new product/service

A new-to-the-world product/service, a pure invention or creation

We did not complete an assignment like this in our module

[Qs 23and 24 feedback about project manager, omitted from appendix]

\*25. *As part of your module you were involved in an entrepreneurial task (e.g. the development of a mobile app and its application to cloud computing via a poster presentation). Please rate you're feeling about this task below. [1 = Uninteresting and 7 = Interesting]*

\*26. . [1 = Boring and 7 = Exciting]

\*27. . [1 = Annoying and 7 = Challenging]

\*28. . [1 = Shallow and 7 = Engrossing]

\*29. . [1 = Unfulfilling and 7 = Fulfilling]

\*30. *Please rate each aspect of the DICE module in terms of your perceived development [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]*

I was satisfied with the project management element of the course

I was satisfied with the conference element of the course

The conferences allowed me to witness business concepts in action

The conferences gave me a greater sense of motivation to work in business

I was satisfied with the Blog element of the course

Developing a blog helped me to develop my digital business skills

I was satisfied with the Mobile App Development element of the course

Developing the mobile app allowed me to experience new trends in business

Developing the mobile app helped me to gain a better understanding of how new products are conceptualised

I was satisfied with the Cloud Computing poster element of the course

The cloud computing poster allowed me to experience new trends in business

*\*31. What do you expect your overall percentage grade to be at the conclusion of this module?*

*\*32. Please rate yourself in terms of the following.[Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]*

I suggest new ways to achieve my goals

I think of new and practical ideas to improve performance

I like to search out new technologies, processes, techniques and/or product ideas.

I am a good source of creative and innovative ideas.

I like to suggest new ways to increase quality.

I am not afraid to take risks.

I like to promote and champion my ideas to others.

I think I show creativity when given the opportunity to.

I help to create plans and schedules to get new ideas working.

I often have new and innovative ideas.

I like to come up with creative solutions to problems.

I think I often have a fresh approach to problems.

I like to suggest new ways of performing work tasks.

*\*33. Please indicate the extent to which you agree or disagree with each statement in relation to your university [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]*

This university recognises and welcomes innovation in its students

There is a culture of innovation and enterprise in this university

There are many resources available in the university to aid innovation

Creativity and innovation are rewarded in this university

There is much support for students who are pursuing innovative tasks

*\*34. Please rate your agreement with the following statements [Strongly Disagree, Disagree, Uncertain, Agree, Strongly Agree]*

I will be able to achieve most of the goals that I have set for myself.

When facing difficult tasks, I am certain that I will accomplish them.

In general, I think that I can obtain outcomes that are important to me.

I believe I can succeed at most any endeavor to which I set my mind.

I will be able to successfully overcome many challenges.

I am confident that I can perform effectively on many different tasks.

Compared to other people, I can do most tasks very well.

Even when things are tough, I can perform quite well.

*\*35. Please rate your confidence in completing the following [1= no confidence to 7=complete confidence]*

Successfully identifying new business opportunities

Creating new products

Thinking creatively in business

Commercialising an idea or new development

*36. Please rate your agreement with the following from 1= no agreement whatsoever to 7 = total agreement*

The more I find out about starting a new business the more I want to do it myself

Thinking of new opportunities for business really excites me

I am passionate about entrepreneurship

I am completely obsessed with the idea of having my own company

*\*37. Please indicate the extent to which you agree or disagree with each statement  
[Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree]*

It is exciting to figure out new ways to solve market needs

Searching for new ideas for products/services to offer is enjoyable to me

I am motivated to figure out how to make an existing project

Looking for new opportunities really excites me

Inventing new solutions to problems is an important part of who I am

The idea of establishing a new company excites me

The idea of owning my own company energizes me

The idea of nurturing a new business through its emerging success would be enjoyable

Being the founder of a business will be an important part of who I am

*38. How would you estimate the probability that you will run your own company in the future? 1 - very low probability, 7 - very high probability*

## APPENDIX J: Statistical Analyses Used in the Thesis

**Table 11. 3 Statistical Analyses Used in the Thesis**

		Study 1 (Chapter 5)	Study 2 (Chapter 6)	Study 3 (Chapter 7)	Study 4 (Chapter 8)
1	Pearson Correlation	Y	Y	Y	Y
2	Internal consistency (Cronbach's alpha- $\alpha$ )	Y	Y	Y	Y
3	Intra-class Correlation Coefficient (ICC)	Y		Y	Y
4	T-tests	Y	Y		
5	Factor Analysis (PCA)	Y	Y		
6	Inter-rater Agreement ( $r_{wg}$ )			Y	Y
7	Composite Reliability (CR)		Y	Y	Y
8	Average Variance Extracted (AVE)		Y	Y	Y
9	Hetero-trait Mono-trait matrix (HTMT)		Y	Y	Y
10	Fornell-Larcker matrix		Y	Y	Y
11	Coefficients of determination ( $R^2$ )		Y	Y	Y
12	Predictive relevance ( $Q^2$ )		Y	Y	Y
13	Multi-Group Analysis (MGA)			Y	

1. *Pearson's correlation (r)*: is used to demonstrate the potential relationships in a study sample of two or more variables, usually continuous. A significant result relates to the probability that the observed correlation between the variables tested is in fact a true statement. The correlation coefficient,  $r$  ranges from +1 to -1 and allows the researcher to gauge the strength and direction of the relationship (Saunders *et al.*, 2009).
2. Internal consistency indicates whether the specific items of a measure relate to the construct under investigation. The most common indicator of internal consistency is the *Cronbach's alpha coefficient ( $\alpha$ )* which provides a value of between 0 and 1 (Cronbach, 1951). Broadly speaking it is said that this value should be higher than 0.7 (Gliem and Gliem, 2003). However, the formula for calculating the required alpha value is:

$$rk / [1 + (k - 1) r]$$

$k$  is the number of items and  $r$  is the mean of the inter-item correlations.



Thus, the size of alpha is determined by both the number of items in the scale, and the mean inter-item correlations. Recommended item-total correlations range between 0.2 - 0.4 (Briggs and Cheek, 1986) to 0.50 - 0.80 (Netemeyer, Bearde and Sharma, 2003).

3. *Intraclass Correlation Coefficient (ICC:)* Offers an indication of both the degree of correlation, and the agreement between measurements. It is calculated by mean squares obtained through analysis of variance (Koo and Li, 2016). There are a number of different forms of ICC, used in various analyses. It is commonly used to evaluate interrater, test-retest, and intrarater reliability. To study test-retest reliability, each measure is collected and assessed twice, resulting in pairs of observations matched by an identifier. The null hypothesis assumes that the true mean difference between the paired samples is zero, and the significance is noted by a p value of less than 0.05 (one-tailed) or 0.01 (two-tailed).
4. *T-tests:* Used when comparing two groups or two time points. It is known as an independent samples t-test when the mean score for a continuous variable is examined for two different groups, and paired samples t-test when the mean score is examined on the same group on two occasion (linked by an identifying variable).
5. *Factor Analysis:* Operationally, the main decisions to consider in conducting factor analyses are: 1) the model, 2) the rotational method, 3) the cut off point for the factor loadings, and 4) the criteria for the number of factors to be extracted (for exploratory factor analyses). Considering the model, *Principal Component Analysis (PCA)* removes the risk of negative estimates in the analysis. Second, the rotational method assists in the interpretation of factor analysis. This can be orthogonal (e.g. Varimax) or oblique (e.g. Direct Oblimin). The oblique rotations allow factors to correlate and is selected. Third, the cut off point for the factor loadings was set at +/- 0.30, in accordance with established recommendations (Hair *et al.*, 2010). Finally, the Kaiser rule was applied which gives significance to factors displaying eigenvalues greater than one (Hair *et al.*, 2010). In terms of sample size, it is recommended that there are a minimum of 5 cases per variable tested (Hair *et al.*, 2010).
6. *Inter-rater Agreement ( $r_{wg}$ ):* Outlined in Chapter 4.
7. *Composite Reliability (CR):* Assesses the 'true' reliability of a test or scale as represented by the ratio of its true score variance divided by its observed score variance (which can be attained by structural equation analysis) (Peterson and Kim, 2013).
8. *Average Variance Extracted (AVE):* Used to assess convergent validity, which quantifies the amount of variance that a construct captures from its indicators relative to the amount of variance due to measurement error (Chin, 1998). For all latent variables, AVE values are required to reach a minimum benchmark of .50 implying the construct shares more than half of its variance with its respective indicators (Fornell and Larcker, 1981).
9. *Hetero-trait Mono-trait matrix (HTMT):* Used to detect discriminant validity - none of the items presented in the HTMT matrix should be higher than one (Hair *et al.*, 2017).
10. *Fornell-Larcker matrix:* Discriminant validity is observed if the square root of each constructs AVE is greater than its highest correlation with any other construct (Hair *et al.*,

2017). In other words, if the square roots of the AVE values are larger than the standardized correlations among constructs, this suggests satisfactory discriminant validity (Fornell and Larcker, 1981).

11. *Coefficients of determination ( $R^2$ ):* The models quality is examined by studying the  $R^2$  statistic, which provides information on the total variance of the endogenous or dependant variable explained by the model. In addition, the relationships are assessed for significance using the t test results and a bootstrapping technique (Hair *et al.*, 2017). Hair et al. (2017) consider that an adjusted value of 0.25 is weak, 0.50 is moderate and 0.75 is substantial, but this depends on the context and discipline of the analysis.
12. *Predictive relevance ( $Q^2$ ):* Established by the construct cross-validated redundancy in Smart-PLS. If values are noted above 0 it establishes that the latent variables have predictive power and relevance (Hair *et al.*, 2017).
13. *Multi-Group Analysis (MGA):* Tests if specific groupings (determined by the researcher) have significant differences in their group-specific parameter estimates (e.g., outer weights, outer loadings and path coefficients) (Hair *et al.*, 2017).

## APPENDIX K: Types of Mediation

**Table 11. 4: Mediation Types**

Presence	Type	Detail
Non-mediation	<i>Direct-only non-mediation</i>	The direct effect is significant but not the indirect effect
	<i>No-effect non-mediation</i>	Neither the direct nor the indirect effect are significant
Mediation	<i>Complementary mediation</i>	The indirect effect and the direct effect both are significant and point in the same direction
	<i>Competitive mediation</i>	The indirect effect and the direct effect both are significant and point in opposite directions
	<i>Indirect-only mediation</i>	The indirect effect is significant but not the direct effect

*Adapted from Hair et al. (2017, p. 232/233)*

Mediators are studied to determine whether the effect is complementary, competitive or indirect. *Suppression* is a concept found in many studies of social science, education and psychology and can explain another indirect relationship found between variables (MacKinnon *et al.*, 2000). It is defined by Conger (1974, p. 36/37) as:

*“a variable which increases the predictive validity of another variable (or set of variables) by its inclusion in a regression equation”.*

MacKinnon *et al.* (2000) suggest suppression may be visible if it is clear the relationship between an independent (X) and dependent (Y) variable gets stronger in the presence of a third suppressor variable. Suppression exists if the addition of a predictor *increases* the predictive power of another variable (Watson *et al.* 2013). Competitive mediation (inconsistent mediation) notes the extent of a relationship is being suppressed, when the direct and mediated effects of an independent variable on a dependent variable have opposite signs, i.e. when  $c$  and  $c'$  are different signs in Figure 4.3 (MacKinnon *et al.*, 2000). If direct and indirect effects are of similar magnitudes and opposite signs, they may cancel out, resulting in a non-significant total effect (Flueckiger *et al.*, 2014).

When the suppressor is uncorrelated (or only weakly correlated) with the dependent (Y) variable, it is termed classical suppression. Reciprocal or cooperative suppression involves cases in which 1) two predictors either correlate oppositely with the dependent (Y) but are positively related to one another, or 2) both are correlated positively with the criterion but negatively with one another (Wooley *et al.*, 1997). Net or cross-over suppression describes cases where all three variables are correlated positively with one another; including both predictors in the regression equation increases the weight for the stronger predictor and changes the sign of the weaker predictor (i.e., a positive zero-order correlation becomes a negative beta weight) (Wooley *et al.*, 1997).

## APPENDIX L: Factor Analysis of GET Test

**Table 11. 5: Factor Analysis of GET Test (All)**  
**Total Variance Explained (shortened)**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.815	10.769	10.769	5.815	10.769	10.769
2	5.018	9.293	20.062	5.018	9.293	20.062
3	3.009	5.573	25.635	3.009	5.573	25.635
4	2.096	3.882	29.517	2.096	3.882	29.517
5	1.702	3.152	32.669	1.702	3.152	32.669
6	1.620	2.999	35.668	1.620	2.999	35.668
7	1.584	2.933	38.601	1.584	2.933	38.601
8	1.430	2.648	41.250	1.430	2.648	41.250
9	1.368	2.534	43.784	1.368	2.534	43.784
10	1.337	2.476	46.259	1.337	2.476	46.259
11	1.236	2.288	48.548	1.236	2.288	48.548
12	1.231	2.280	50.827	1.231	2.280	50.827
13	1.193	2.209	53.037	1.193	2.209	53.037
14	1.127	2.088	55.125	1.127	2.088	55.125
15	1.046	1.938	57.062	1.046	1.938	57.062
16	1.017	1.884	58.946	1.017	1.884	58.946
17	.999	1.849	60.796			
18	.973	1.801	62.597			
Extraction Method: Principal Component Analysis.						

**Table 11. 6: Component Matric for GET test (All)**

	<i>Component Matrix<sup>a</sup></i>															
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>15</i>	<i>16</i>
GET2	.481															
GET4													.308			
GET6	.305			.560												
GET8			.438			.372										
GET10	.582															
GET12		-.343	.383													
GET14	.436									.331						
GET16	.417										.301					
GET18	.533															
GET20	.481															
GET22																
GET24	.388			-.301		.321					-.347					
GET26	.512		.321													
GET28	.313															
GET30					.429											
GET32	.340															.310
GET34	.368		-.421				.428									
GET36							.380									
GET38	.515								-.370							
GET40	.336															.324
GET42	.526															
GET44	.561									-.318						
GET46	.411							.354		-.466						
GET50		-.355	.430													
GET52	.625															
GET54	.511															
RGET1	.310	.386														
RGET3	.348	.495														
RGET5				-.359		.382	-.336					.356				
RGET7		.440	-.305													
RGET9											.378					
RGET11	.336	.420						.310								
RGET13		.345	-.361				.305									
RGET15		.405						-.343								
RGET17		.458	.350													
RGET19		.366														



**Table 11. 7: Need for Achievement**

<b>Pattern Matrix<sup>a</sup></b>				
	Component			
	1	2	3	4
GET6		.813		
GET10	.418		.375	
GET28				.538
GET46		.602		
GET24			.534	.324
GET42			.789	
RGET1	.691			
RGET19	.562			
RGET37	.520			
RGET15	.591			.340
RGET33				.833
RGET51		.697	-.463	

Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. a. Rotation converged in 15 iterations.

**Table 11. 8: Need for Autonomy**

<b>Pattern Matrix<sup>a</sup></b>			
	Component		
	1	2	3
GET12	.796		
GET30	.729		
GET48			.663
RGET3			.761
RGET21		.740	
RGET39		.735	

Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. a. Rotation converged in 7 iterations.

**Table 11. 9: Creative Tendency**

<b>Component Matrix<sup>a</sup></b>				
	Component			
	1	2	3	4
GET14	.572			
GET32	.351		.521	.315
GET50	.587	-.320	-.362	
GET8	.564			.358
GET26	.706			
GET44	.524		.391	
RGET23		.346		-.583
RGET5		.345	.411	.536
RGET41		.525	-.575	.320
RGET17		.716		
RGET35	.459	.547		
RGET53	.305	.530		

Extraction Method: Principal Component Analysis. a. 4 components extracted.

**Table 11. 10: Calculated Risk Taking**

<b>Pattern Matrix<sup>a</sup></b>	
	Component

	1	2	3	4
GET2	.425			
GET20	.650			
GET38	.726			
GET18	.632			
GET36	.471	-.439	.468	
GET54	.347			.607
RGET11		.535		-.413
RGET29			.820	
RGET47		.679		
RGET9		.479		
RGET27		.609		
RGET45				-.744

Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. a. Rotation converged in 12 iterations.

**Table 11. 11: Locus of Control**

<b>Pattern Matrix<sup>a</sup></b>				
	Component			
	1	2	3	4
GET4	.533			
GET22	.526		-.330	
GET40	.653			
GET16	.473			
GET34	.521	.479		
GET52	.645			
RGET13		.763		
RGET31		.642		
RGET49				.869
RGET7		.544		
RGET25			.823	
RGET43			.734	.375

Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. a. Rotation converged in 12 iterations.

*It's not the start up that's important, it's the end up. It's where you end up from where you start up"*

Leah Carri (family member)