The Impact of Information Systems Development Education *on* Entrepreneurial Personality Traits and Cognitions

By

Brendan Lyng

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School of Science
Department of Computing Maths and Physics
Waterford Institute of Technology

Head of Department:	Dr. Mícheál Ó hEigeartaigh
Research Supervisors:	Dr. Larry Stapleton
	Dr. Gabriel J. Byrne

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To my family

Declaration

The author herby declares that, except where duly acknowledged, this thesis is entirely his own work and has not been submitted for any degree in any other institute.

Preface

"The mind is not a vessel to be filled, but a fire to be ignited."

Plutarch

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Abstract

This study investigated the effectiveness of entrepreneurship modules at developing entrepreneurial personality traits and cognitions of Information Systems Development (ISD) students studying at Irish Institutes of Technology (IoT). Current Irish government policy dictated that entrepreneurship education should be embedded in all technical third-level courses. In theory, such an education should create an entrepreneurial mind-set amongst students and increase the probability of graduates engaging in entrepreneurial action post completion of their studies.

This study employed a classical research method. A set of hypotheses were designed and tested. Data was collected from first and final year students of IoT ISD courses; some of these courses featured a module in entrepreneurship. Data from these groups was compared. The results showed that: first-year ISD students possess entrepreneurial personality traits and cognitions similar to that of the general population. The results also showed that entrepreneurship modules rarely feature on IoT ISD courses. When offered they can impact the open-mindedness and entrepreneurial leadership qualities of students. However, one single entrepreneurship module was found to be insufficient to impact the other personality traits and cognitions associated with entrepreneurship.

This research contributed to the theory, practice and planning of entrepreneurship education. It presented implications for policy makers and economists endeavouring to promote entrepreneurship as a career choice among computing graduates. It also had implications for educationalists and designers of ISD curricula in Irish IoTs.

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Chapter 1 - Introduction

1.1 Background to Research

Since the 1960's successive Irish governments have promoted a policy of export-led economic growth. This growth strategy was reliant on attracting foreign, usually American, Multi-National Companies (MNCs) to invest in offshore subsidiaries in the Republic of Ireland (ROI). This practice was known as Foreign Direct Investment (FDI). Firms were attracted to these shores by Irish government grants, a low rate of corporation tax and a highly qualified workforce. In Porter's (1998) language, Ireland benefited from "a cost based national competitive advantage".

Cost-based national competitive advantages are rarely sustainable (Porter, 1998). Many countries have found it within their means to imitate the incentives offered by the Irish government. China and India both attract FDI by offering low cost business environments and an ample supply of skilled labour. These countries are now part of the growing global competition for markets and mobile investment (ESG, 2004). In addition to China and India, various countries in South-East Asia and Central Europe are now targeting the sources of FDI that have driven the ROI's growth rate since the early 1980s. These sources include investment by firms in electronics, software, financial and other services and pharmaceuticals (Forfás, 2006a).

According to Forfás (2006a), there have been many changes in the drivers of Irish growth in recent years. There is a reduced reliance on FDI and foreign exports. Economic growth has been largely driven by increases in domestic spending and activity in the construction industry. Traded services, including software

development, have grown in importance. The ROI is now the 14th largest exporter of services in the world. There also has been a corresponding increase in Research and Development (R&D) activity. Forfás considers the promotion of investment in R&D of high technology, such as Information and Communication Technologies (ICT), vital to sustaining recent positive economic performance. Another recent government report suggested that Irish economic endeavour should target those activities that contribute more value to the production cycle. Such activities, known as "value-added activities" reduce the reliance on manufacturing or developing products based upon other peoples' ideas (ESG, 2004). Examples of higher value-added activities in software development included the creative and innovative aspects of software work, such as the initiation, analysis and design components of software projects (Cusumano, 2005). The increased dependency on knowledge-based activities in the ROI coupled with the migration of lower value-added activities to lower cost economies required a greater reliance on indigenous companies to cultivate future wealth (Forfás, 2006b).

The Irish government devoted significant funding to this research led strategy. According to Forfás (2005) the Irish government spent €2.5bn between 2000 and 2006 on research. The government is committed to the ROI's development as an innovation and knowledge driven economy recognised for the excellence of its people and research.

In a broader EU context, entrepreneurship was considered to be another vital factor for future economic development. The encouragement of an enterprise spirit was considered key to job creation, improved competitiveness and overall economic growth throughout Europe (European Commission, 2002). A report to the European

commission made the argument that "a positive and robust correlation between entrepreneurship and economic performance has been found in terms of growth, firm survival, innovation, employment creation, technological change, productivity increases and exports" (European Commission, 2004, p.3). The Irish Government considered a pro-business environment and a strong support for entrepreneurship to be key factors in fostering an environment conducive to entrepreneurial activity in the ROI (Enterprise Ireland, 2006). The GEM Report (2006) showed the ROI was one of the most entrepreneurially active economies in Europe and was fast approaching the levels of early stage entrepreneurial activity prevalent in the United States.

Georgellis et al. (2000) postulated that government policy that supported entrepreneurial endeavour increases employment opportunities and creates a more prosperous economy in the long term. The Expert Group on Future Skills Needs (EGFSN) provided evidence of this happening in the Irish economy. They showed that the enterprise sector played a vital role in employment creation and improving exchequer revenues in Ireland. (EGFSN, 2004).

Stiglitz (2004) suggested that one of the best ways to underpin enterprise development in an economy was through education. Stiglitz argued that the positive economic indicators in the ROI were due in large part to ongoing investment in education. Matlay (2006) concurred: he suggested that more and better entrepreneurship education will result in a comparable growth in the quantity and quality of entrepreneurial activity in mature economies. The EGFSN echoed this point: they EGFSN singled out indigenous entrepreneurship as one of the most likely sources of future Irish economic growth. They advised that the educational system in the ROI should foster a culture that is conducive to innovation and entrepreneurship. The

EGFSN also advised that entrepreneurial skill can be greatly enhanced by teaching entrepreneurship at all levels of the Irish educational system (EGFSN, 2004). The European Commission also considered entrepreneurship education as being a key component in the future growth of the European economy. The Commission devised a code of best practice for teaching entrepreneurship which involved primary, secondary and tertiary education (European Commission, 2002 & 2006). The success of this best practice assumed that entrepreneurship education could directly impact the entrepreneurial tendency of students. Could it be that the education of entrepreneurs is an important part of developing entrepreneurs?

Forfás (2007) stated that integrating entrepreneurship education throughout Higher Education Institutions (HEIs) may help to develop an entrepreneurial mind-set among students and faculty and create an environment that is conducive to entrepreneurial activity among students. Despite these benefits, all is not well in the execution of entrepreneurship programmes. A 2004 European Commission report concluded that, although numerous entrepreneurship-related activities are currently being developed at all levels of education, many of them are neither integrated into the curriculum nor part of a coherent framework. The net result of this is that most European students have not had the opportunity to study entrepreneurship (European Commission, 2004). Could it be that students are not receiving enough entrepreneurship education? Could it be that monies invested in entrepreneurship research would be better invested in the teaching of entrepreneurship? Could it be that an understanding of the effects of the educational process on entrepreneurship would be a vital component in increasing entrepreneurial activity in an economy?

1.2 Research Objective

Degrees in high-technology areas such as Information Systems Development (ISD) are awarded in HEIs throughout the ROI. Very few of these courses have featured studies in entrepreneurship; little attempt has been made to measure the success of these courses in spawning entrepreneurs. The objective of this research was to ascertain the degree to which entrepreneurial personality traits and cognitions were developed by the third-level educational process. In essence, this was a study of the extent to which entrepreneurship could emanate from a classroom.

1.3 Research Questions

The above research objective gave rise to the following research goals:

1. How entrepreneurial are ISD students?

2. How effective are entrepreneurship modules on ISD courses at strengthening entrepreneurial personality traits amongst ISD students?

3. How effective are entrepreneurship modules on ISD courses at strengthening entrepreneurial cognitions amongst ISD students?

4. Are ISD courses designed to improve the entrepreneurial potential of students who partake in these courses?

1.4 Contribution of Research

The Irish government has responded to the international economic challenges by encouraging indigenous entrepreneurial endeavour. It was Irish government policy to encourage students in all levels of education to study entrepreneurship and to acquire an entrepreneurial mind-set. This was particularly true in high-technology disciplines such as ISD, pharmaceuticals, biotechnology and advanced engineering. Individuals who received such education would have benefited from gaining a creative approach to problem solving, adapting more readily to change, becoming more self-reliant, and developing their overall creativity through entrepreneurship. According to Forfás (2006c), creativity was a vital source of competitive advantage in Ireland, and should be cultivated in school learning curricula from an early age to third level education and beyond. In the prevailing economic climate, research that focused on the role of the classroom in developing entrepreneurial skill could have had far reaching benefits for society; careful study of these research findings should therefore be considered important. In the words of Henry et al. (2005a, p.101):

> *"It could be argued…that the need for entrepreneurship education and training have never been greater".*

The results of this study will be of interest to a variety of audiences. Third-level educators will be informed regarding the role and teaching of entrepreneurship on their courses. HEIs will benefit from possessing a more holistic understanding of entrepreneurial education. If these parties take on board the findings of this research, and make relevant changes to their courses, the wider region could benefit both economically and socially from an increase in graduate entrepreneurial activity. Irish government agencies such as Forfás, Enterprise

Ireland and Business Incubation Centres will gain from a deeper understanding of the entrepreneurial personality and the role of education in strengthening entrepreneurial personality traits and cognitions.

1.5 Thesis Summary

This thesis was developed as follows:

Chapter 1: Introduction. This chapter outlined the background to the study and its importance.

Chapter 2: Literature Review. This chapter contained an in-depth review of the literature on the factors required to develop an entrepreneurial mind-set amongst third-level students.

Chapter 3: Hypotheses. This chapter derived theory from concepts reviewed in the Literature Review relating to entrepreneurship education and its effect on entrepreneurial personality traits and entrepreneurial cognitions.

Chapter 4: Research Design. This chapter presented the research design to both test the hypotheses and to confirm the theoretical model of entrepreneurship education devised in chapter 3.

Chapter 5: Classification of Data. This chapter categorised respondents to the research instrument outlined in chapter 4.

Chapter 6: Testing of Hypotheses. This chapter contained results of the statistical tests of the hypotheses devised in chapter 3.

Chapter 7: Discussion of Findings. This chapter discussed the conclusions, implications, recommendations and limitations of the study.

Chapter 1	Introduction
1.1	Background of Research
1.2	Research Objective
1.3	Research Questions
1.4	Contribution of research
1.5	Thesis Summary
Chapter 2	Literature Review
Chapter 3	Research Hypothesis
Chapter 4	Research Design
Chapter 5	Classification Of Data
Chapter 6	Analysis Of Statistical Data
Chapter 7	Discussion of Findings

Table 1-1
Structure of Chapter 1 and the Research Process

Chapter 2 - Literature Review

2.1 Introduction

This chapter reviewed the relevant literature pertaining to the research objective and the research questions.

2.2 Entrepreneurship

2.2.1 Introduction

The word *entrepreneur* is derived from the French verb *entreprendre*, which means to undertake. During the early sixteenth century, Frenchmen who organised and managed military expeditions were referred to as entrepreneurs. In economics the word first appeared in the writings of the Irish economist, Cantillion (1755), who formally defined entrepreneurship as "self-employment of every sort".

The term *entrepreneur* was interpreted and re-interpreted many times since 1755, so much so in fact, that there was no one universally accepted meaning of the term in the literature. Cunningham and Lischeron (1991) declared that the academic literature contains many criteria for defining entrepreneurs, ranging from creativity and innovation, to personality traits. This section will review the literature pertaining to psychology of the entrepreneur. The literature can be separated into three modes of discourse: personality traits of the entrepreneur, cognitive aspects of entrepreneurial behaviour and entrepreneurial values.

2.2.2 Personality Traits of the Entrepreneur

The attempt to develop psychological constructs that differentiated the entrepreneur from the non-entrepreneur became known as the "psychological school" of entrepreneurship (Henry et al. 2003). The rationale for defining the psychological nature of the entrepreneur was that if key traits were identified, it would be possible to encourage individuals with these characteristics into entrepreneurship. Education and training could develop the traits that prospective entrepreneurs did not possess. This was considered desirable as entrepreneurship can contribute significantly to a country's economy (Koh, 1996). Similarly, information pertaining to the personality structure of entrepreneurs was considered useful for individualising education in successful entrepreneurial behaviour (Brandstatter, 1997). The personality traits frequently associated with the entrepreneurial personality were: *open-mindedness, need for achievement, risk taking propensity, locus of control, creativity,* and *autonomy* (Koh, 1996; Deakins, et al., 1997; Markman, et al., 2002).

2.2.2.1 Open-Mindedness

Bradley (1984) suggested that open-mindedness played a key role in the decision making of small business managers. It was his opinion that a propensity to firm growth and internationalisation reflected a manager's innovativeness and open-mindedness towards new markets. Those who lacked open-mindedness tended not to adapt well to ill-structured, constantly changing environments. Bradley measured open-mindedness using a dogmatic scale. Dogmatic managers were those displayed a closed cognitive style: they tended to be less able than open-minded people to learn new beliefs and to act in a creative fashion. He found that managers of new ventures were more open-minded than managers of more established companies. He also

found that open-minded managers tended to be more successful when internationalising their companies: those managers that were dogmatic about the international environment tended not to get involved in exporting and were less motivated than their open-minded counterparts. Bradley concluded that a dogmatic view of the unstructured and changing international business environment was a barrier to the internationalisation process for the potential exporting firm.

2.2.2.2 Need for Achievement.

McClelland (1961) explored the need for achievement (something he referred to as "nAch") demonstrated by entrepreneurs. He hypothesised that a

> *"society with a generally high level of need for achievement will produce more energetic entrepreneurs who, in turn, produce more rapid economic development"* (McClelland (1961, p.205)

He described nAch as a desire for: individual responsibility, moderate risk taking, knowledge of results of decisions and an anticipation of future possibilities.

According to Begley and Boyd (1987), nAch has been associated with entrepreneurial behaviour since McClelland's (1961) work. In their study they showed that entrepreneurs manifested a significantly higher nAch than non-entrepreneurs. This finding was repeated in research conducted on Singapore based entrepreneurs by Lee and Tsang (2001).

2.2.2.3 Risk Taking Propensity

A number of psychologists have attempted to classify types of risk undertaken by entrepreneurs. Liles (1974) for example suggested that risk covered a number of

areas - the critical ones being financial risk, career risk, family and social risk, and psychological risk. O'Gorman and Cunningham (1997) pointed out that probably the single biggest risk undertaken by an entrepreneur was the decision to leave their job and to set up business. Begley and Boyd (1987) reported a strong correlation between a person's propensity to take risk and the likelihood of them engaging in entrepreneurial activity. Koh (1996) reported a similar finding from his research.

2.2.2.4 Internal Locus of Control and Proactivity

Rotter (1966) first postulated the theory of "locus of control". An internal locus of control referred to control over one's life, where an entrepreneur (for example) has a strong sense that the results of behaviour were based upon one's own actions. An external locus of control referred to attitudes to outcomes being based upon the actions of other people, fate, chance or luck. According to Rotter (1966) an internal locus of control was associated with learning and action. Pandey and Tewary (1979) study of entrepreneurs in Northern India found a statistically significant link between internal locus of control and entrepreneurs.

Begley and Boyd's (1987) survey of 239 members of a small business association in New England reported similar findings to Pandey and Tewary (1979). They found that a high internal locus of control was a very common personality trait among entrepreneurs.

In a longitudinal study conducted over 11 years, Hansemark (2003) measured the connection between locus of control and entrepreneurial activity. His findings suggested that an internal locus of control was a statistically significant predictor of

future entrepreneurial activity. This was particularly true for male participants in the study.

Cromie and Johns (1984) found that Irish entrepreneurs had a significantly stronger locus of control than non-entrepreneurs. They interpreted this to mean that entrepreneurs were less likely to let external events dominate their lives and therefore tended to be proactive when dealing with their environments. Based upon the findings of their research, they argued that locus of control was one of the key traits of an entrepreneur.

Based upon a sample of 181 American students, Crant (1996) found a significant correlation between proactivity and entrepreneurial intentions. He suggested that proactive personalities identify opportunities and act on them, they showed initiative, took action and persevered until they brought about meaningful change. Proactive personalities typically showed initiative, perseverance and an orientation toward action.

2.2.2.5 Creativity

Creativity is another personality trait which has been frequently associated with entrepreneurship. Timmons and Spinnelli (2003) contended that the ability to think creatively helped entrepreneurs to recognise opportunities. Drucker (1985, p.102) took the argument a step further by suggesting that "the very foundation of entrepreneurship – as a practice and as a discipline – is the practice of systematic innovation". Drucker's theory of systematic innovation (where he postulated that the act of being creative can be divided into a set of steps) raised a debate on whether creativity and innovativeness were personality traits or, alternatively, processes that

can be "systemised". Many other authors explored the concept of managing creativity and systemising innovation such as Robinson and Stern (1997) Narayanan (2001) and Forbes and Wield (2002).

In a quantitative study of entrepreneurial personality traits, Koh (1996) showed that entrepreneurs possessed greater innovativeness (which he defined as the ability to perceive and act upon business activities in new and unique ways) than the general population.

From a statistical analysis of the common traits of successful entrepreneurs, Ames and Runco (2005) concluded that that "ideational tendencies" were an important talent for entrepreneurship. The authors argued that *ideation* - the generation of ideas - was important for entrepreneurs as it was the starting point for launching a business.

Ward (2004) continued this theme by claiming that novel and useful ideas are the lifeblood of entrepreneurship. For Ward (2004) entrepreneurial success was predicated upon creative ideas. In his view, entrepreneurial creativity involved more than just a search for novel products or services, but also developing ideas for bringing products to fruition, sourcing relevant funding, and generating ideas on how to convince others to buy the product or service. He argued that because of the entrepreneur's reliance on creative thinking throughout the entrepreneurial process, therefore it was no surprise that entrepreneurship and creativity were closely linked fields of study in the literature.

Ward (2004) also postulated that a paradoxical relationship existed between knowledge and creativity. In other words, the generation of new ideas, widely to be considered a vital skill of entrepreneurship (e.g. Gibb, 1997) and the necessary

cognitive processes required for creativity to take place, may, in fact, be inhibited by knowledge. Ward explained that the general propensity of people to store experiences in organised knowledge structures can prevent the shaping of newly formed ideas.

2.2.2.6 Need for Autonomy

Hackman and Oldham (1979) defined autonomy as the extent to which a job provides freedom, independence and discretion for planning work and determining how to undertake it. Kuratko, et al. (1997) found that a need for autonomy was a critical factor in motivating entrepreneurs to start and maintain their ventures. Kirby (2003) suggested that entrepreneurs valued individualism and freedom more than do other managers, and consequently, had a difficult time working in environments which stifled their creativity. Henry et al. (2003) found that the constraints imposed by conventional employment and bureaucratic structures were counter-productive to the development of innovative business ideas, which led to a need for freedom of thought and action.

2.2.3 Cognitive Aspects of Entrepreneurial Behaviour

Mitchell, et al. (2002, p.97) defined entrepreneurial cognitions as "the knowledge structure that people use to make assessments, judgements, or decisions involving opportunity evaluation, venture creation and growth". The field of cognitive theory was concerned with the mental models used by entrepreneurs to piece together previously unconnected information. This information helped entrepreneurs to identify new products and services, and to assemble the resources to turn their idea into a viable business (Mitchell, et al., 2002).

Two types of entrepreneurial cognition were uncovered in the review of the relevant literature. These were *Creative Response* and *Entrepreneurial Leadership*.

2.2.3.1 Creative Response

The role of creativity has frequently appeared in the entrepreneurship literature. Schumpeter (1911) suggested that the ability to innovate differentiated managers from entrepreneurs. For Schumpeter, entrepreneurs innovated by introducing new means of production, new products and new forms of organisation. Schumpeter (1947) differentiated between an *Adaptive Response* and *Creative Response*. An adaptive response occurred when individuals, an economic sector, or even an entire economy, reacted to change in an expected or predictable way. Any reactions which could have been predicted by classical economic theory would fit the profile of an adaptive response. In contrast, a reaction that was outside the range of existing practice was a defining characteristic of a creative response. For Schumpeter (1947) a creative response possessed three essential characteristics:

1. A creative response could only be understood ex ante: it could only be understood after the reaction occurred.

2. A creative response would change subsequent social and economic situations for good; it created situations that might have not have emerged in the absence of the creative response.

3. The frequency and intensity of the creative response depended upon the quality of the personnel in a society.

Schumpeter (1947) argued that the study of creative response in an industry is coterminous with the study of entrepreneurship. He declared that the defining characteristic of an entrepreneur is would be "the doing of new things or the doing of things that are already being done in a new way" (Schumpeter, 1947, p.151). An entrepreneur is more than an inventor – an entrepreneur "gets things done" (Schumpeter, 1947, p.152). Getting things done covered a wide variety of activities including setting up and organising a business, salesmanship, leadership or breaking down resistances in the environment.

2.2.3.2 Entrepreneurial Leadership

Morris, et al. (2005) defined humility as "a personal orientation founded on a willingness to see the self and put one-self accurately in perspective" (Morris, et al., 2005, p. 1331). They believed that authentic humility involved neither self-abasement nor overly positive self-regard. Their definition of humility involved three connected dimensions:

1. Self-awareness: An individual's ability to objectively appraise their own strengths and weaknesses.

2. Openness: To be humble is to be open to new ideas and new ways of knowing. Humility involves a willingness to learn from others.

3. Transcendence: An acceptance of something greater than the self. This led to an understanding of the small role that the individual plays in the universe, an appreciation of others, and a recognition that others have a positive worth.

Morris, et al. (2005) speculated that humility impacted upon the leadership process. They suggested that the presence of humility would generate *servant-leaders*. A servant leader was a leader who sought to fulfil the objectives of an organisation rather than maximise their own personal ambition.

Echoing the work of Morris, et al. (2005), Kallasvuo (2007) deemed humility to be a vital quality in any leader. Humility required a person to be externally oriented: it required that individuals listen to customers and seek ideas from the outside. Humility was of particular importance in complex and fast-changing industries: a rapidly changing external environment forced managers to humbly accept that their perspectives needed to be broadened by others. Humility allowed an individual to grow as a person, to possess an inward strength which led to an outward confidence. It gave leaders the ability to resist conformity and the courage to think differently.

Collins and Porras (1994) proposed that effective leaders directed people's attention to the goals and values of an organisation, in the process creating a strong corporate culture and sustained excellence. They argued that successful companies (i.e. companies that have been in existence for 100 years or more) selected leaders that fitted the company's core ideology; this selection method was one of the key factors of the companies success. Therefore leadership excellence depended upon a leader's ability to align himself with the corporate ideology as opposed to pursuing their own ambitions.

Collins (2005) argued that humility combined with a strong professional will were pre-requisite values for effective leadership. For Collins, a "Level 5 leader" was a great leader who possessed the apparently paradoxical mix of personal humility and professional will. He described personal humility as a compelling modesty, an ability

to shun public attention, and as a quiet calm determination. Collins suggested that Level 5 leaders were still ambitious but that their primary focus was the success of the organisation rather than their own personal success.

Bricklin (2001) considered humility to be a vital component in the entrepreneurial mind-set. He believed that arrogance, and a failure to pay attention to mistakes made by others in the past hampered the successful progress of an entrepreneur. For Bricklin, success required attention to history and to the work of others in one's field.

Following a review of over 150 published studies, Reave (2005) concluded that there was a clear consistency between spiritual values and effective leadership. Values, such as humility, had a direct effect on leadership success. The behavioural manifestation of these spiritual values included the following:

1. The demonstration of respect for others' values;
2. The fair treatment of others;
3. The expression of care and concern;
4. Responsive listening;
5. Appreciating the contribution of others; and
6. Engagement in reflective practice.

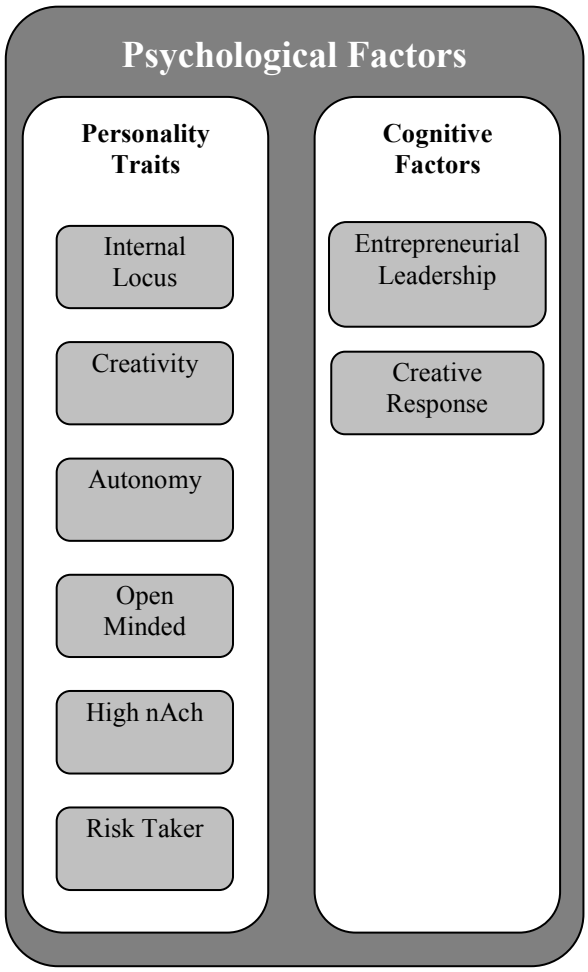

Figure 2-1
Entrepreneurial Personality Traits and Cognitive Factors
Assembled from Schumpeter (1934 & 1947), Rotter, (1966), Liles (1974), Bradley (1984), Begley and Boyd (1987), Kuratko, et al. (1997), Morris, et al, 2005; Kallasvuo (2007); Collins and Porras (1994); Collins (2005); Bricklin (2001); Reave (2005); and Barrett (1998)

Barrett (1998) argued that the biggest challenge facing organisations was how to build a culture that encouraged very high levels of creativity and productivity. He believed that the answer to this challenge lay in understanding human motivation. He showed that high levels of employee productivity and creativity were achieved by satisfying employee higher order human needs (such as the desire for personal growth, meaningful work and making a difference to society). These needs were achieved by leaders who demonstrated humility, in the form of nurture and support for others (as

opposed the control of others). Humility, in Barrett's opinion, resulted in a personal transformation leading to joy rather than just happiness. In short, maximum employee creativity and productivity were achieved through a leadership style which values humility.

Figure 2-1 summarised the psychological factors associated with entrepreneurial behaviour.

2.2.4 Entrepreneurial Values

Rockeach (1973) defined values as multifaceted standards that guide conduct in a variety of ways. Values led people to take particular actions on social issues and they predisposed people to favour one ideology over another. They were, according to the author, standards employed to evaluate others and ourselves.

Schwartz and Bilsky (1987) described values as possessing five formal features: values were concepts or beliefs; values pertained to desirable end states or behaviours; values transcended specific situations; values guided selection or evaluation of behaviour and events; and values were ordered by their relative importance. Values were cognitive representations of three universal human requirements: biologically based needs of the organism, social interactional requirements for interpersonal communication, and social institutional demands for group welfare and survival.

Schwartz's (1992) value theory suggested that there were 57 value items that represented 10 motivationally distinct value types that were in turn used to form value priorities. The 10 value types were defined in Table 2-1

Value Type Definition	Exemplary Values
Power: Social status and prestige, control or dominance over other people and resources.	Social power, authority, wealth
Achievement: Personal success through demonstrating competence according to social standards.	Successful, capable.
Hedonism: Pleasure and sensuous gratification for oneself.	Pleasure, enjoying life.
Stimulation: Excitement, novelty and challenge in life.	Daring, varied life, exciting life.
Self-direction: Independent thought and action, choosing, creating, exploring.	Creativity, curiosity, freedom.
Universalism: Understanding, appreciation, tolerance and protection for the welfare of all people and for nature.	Broad-minded, social justice, equality.
Benevolence: Preservation and enhancement of the welfare of people with whom one is in frequent personal contact.	Helpful, honest, forgiving.
Tradition: Respect, commitment, and the acceptance of customs and ideas that traditional culture or religion provide.	Accepting one's position in life.
Conformity: Restraint of actions, inclinations and impulses likely to upset or harm others and violate social expectations or norms.	Honouring parents and elders.
Security: Safety, harmony and stability of society, of relationships and of self.	National security, social order, cleanliness.

Table 2-1
Value Types
Adapted from Schwartz (1994, p.22)

According to Schwartz (1994), the pursuit of each value type may conflict or be compatible with the pursuit of other value types. He postulated that the pattern of relations of conflict and compatibility among value types could be represented by a quasi-circular structure, as portrayed in Figure 2-2.

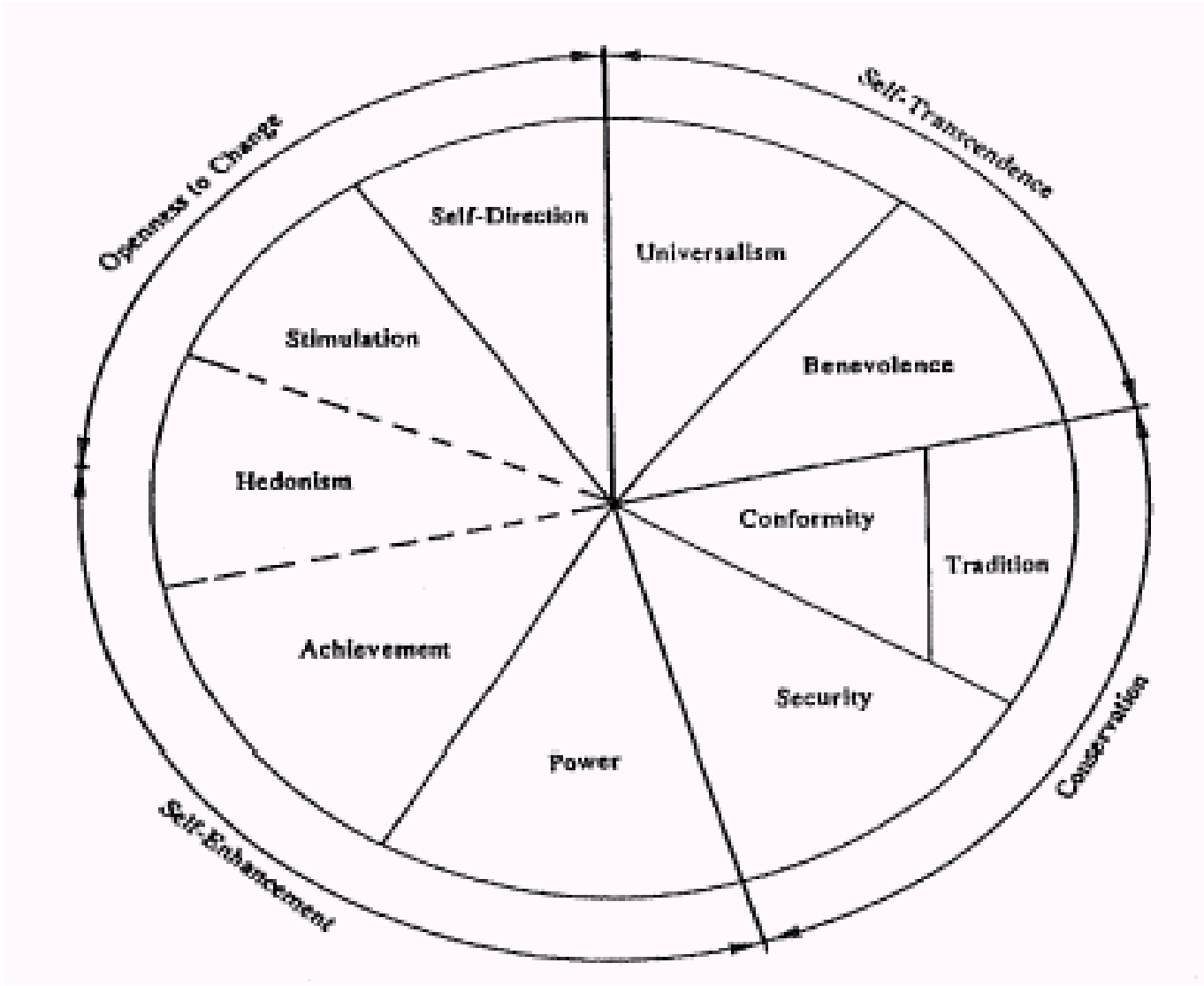

Figure 2-2
Model Of Relationships Between Value Types
(Schwartz, 1994, p.24)

Compatible value types were located adjacent to one another, e.g. Power and Security. Values and value types that expressed opposing motivations were clearly separated from one another, e.g. Power and Benevolence. These oppositions were summarised by viewing values as being placed in two bi-polar dimensions – Openness to Change vs. Conservatism and Self-enhancement vs. Self-transcendence. These two bi-polar dimensions were used to describe the cognitive style of the person in general

(Schwartz, 1994). In the same paper, Schwartz (1994) proposed and validated a measure of values and value types known as the Schwartz Value Survey (SVS).

Perry (1990) argued that both personal and interpersonal values distinguish entrepreneurs from the general population. For Perry, personal values involved the active perception of competitors and opportunities; interpersonal values related to social competence and supportiveness of others. Quoting Gasse (1982), Perry argued that values and cognitive styles were linked: values are "a set of beliefs about various aspects of the world. More specifically, in terms of entrepreneurship, it means the cognitive functioning of entrepreneurs…" (Gasse, 1982, p.61).

2.2.5 Entrepreneurship Summary

The psychological school of entrepreneurship postulated that the study of one or more of the psychological aspects of entrepreneurial personality would lead to an in-depth understanding of the entrepreneurial process. These psychological aspects comprised entrepreneurial personality traits (such as nAch, an internal locus of control, autonomy, creativity, propensity for risk-taking and open-mindedness) and cognitive processes (such as creative response and entrepreneurial leadership) and value types (such as openness to change, conservatism, self-enhancement and self-transcendence).

2.3 Entrepreneurial Learning

2.3.1 Introduction

This section reviewed the literature pertaining to entrepreneurial learning. It dealt with such issues as entrepreneurial learning styles, information pertinent to the

entrepreneurial process, the stage of career that an entrepreneur is most receptive to learning and the physical locations that learning is most likely to take place.

2.3.2 What Do Entrepreneurs Need To Learn?

Based upon a combination of case study and interview evidence, Boussouara and Deakins (1999) concluded that the most important issues faced by high-technology entrepreneurs were learning how to break into new markets, and dealing with cash flow problems. Third, fourth and fifth in their rank order of entrepreneurial issues were staff recruitment, dealing with competition and the complexities associated with exporting. Breaking into new markets was rated significantly above that of all other issues. Table 1 in Appendix A shows a full list of Boussouara and Deakins' (1999) high-technology entrepreneurship issues.

Gibb (1993) argued that the modern business environment was very complex, containing many variables that impact young companies. The multi-faceted problems that emerged from such complexity required a successful entrepreneur to demonstrate creativity, problem solving skills, persuasiveness, planning, negotiating and decision-making skills in a wide number of areas. Important issues often encountered by an entrepreneur included: budgeting, finding new ideas, organising workflow and jobs, recruitment and motivation of staff and dealing with competition. Although his list differed from Boussouara and Deakins' (1999) in that it had a greater emphasis on internal business processes, Gibb (1993) did stress the need for holistic skill set involving the total management of a business.

A US survey of 170 entrepreneurs conducted by Sexton, et al. (1997) found that the most frequently mentioned learning needs of entrepreneurs were finance-related. He

showed that the areas of greatest learning need included (in order) cash flow management, financing growth, increasing business value and remuneration. Table 2 in Appendix A shows a complete list of Sexton et al's entrepreneurial learning needs. Sexton et al's (1997) findings were very similar to those of Boussouara and Deakins' (1999). The findings placed less emphasis on the required skills of entrepreneurship, and greater emphasis on the technical issues in the day to day running of a business.

2.3.3 Learning Sources

According to Sexton, et al. (1997), entrepreneurs had definite ideas about information sources. Based upon closed list of options, 43% of entrepreneurs selected roundtable meetings with other entrepreneurs as their most preferred source of information; this option was almost twice as popular as half day seminars and almost ten times more popular then information from a private consultant. Deakins et al. (1997) and (2000) echoed the finding that entrepreneurs prefer to learn from their peers or more experienced entrepreneurs (as opposed to lecture-based courses). Table 3 in Appendix A showed a full list of preferred sources of information as identified by Sexton et al. (1997).

Based upon a study of entrepreneurial mentoring in England and Wales, Deakins, et al. (1997) concluded that business mentors, in the form of experienced entrepreneurs, can be beneficial to start-up firms - if mentors are suitably trained and experienced. The mentor could serve both as an educator to the entrepreneur and as a gatekeeper to their network of contacts, which could be as valuable as the education itself. The authors recommended that to fulfil the potential of the mentoring service, the mentor should be given a proactive role in the running of a client business.

Deakins et al. (2000) suggested that external, non-executive directors can deflect some of the responsibility and pressure placed on a lone entrepreneur as a decision-maker. The authors proposed that non-executive directors bring value-added benefits to small firms, such as giving advice on strategic issues, helping to devise strategic plans, and modifying entrepreneurial behaviour.

Research conducted by Sullivan (2000) concurred with that of Deakins et al. (2000). Sullivan (2000) believed that entrepreneurs do not have anyone in the work environment with whom that could share ideas or reflect upon experiences. This "void" was filled by business mentors who helped entrepreneurs make sense of their business experiences.

Dalley and Hamilton (2000) found that entrepreneurs preferred mentoring from advisors who shared a contextual compatibility with the entrepreneur. They showed that successful transfers of information only takes place when the entrepreneur and mentor share a similar business background; mentoring services are one-to-one and not course-based; and the mentor possesses satisfactory communication skills. Entrepreneurial businesses actively discriminate in favour of mentors that reflect most closely the beliefs of the entrepreneur.

Gibb (1997) argued that the supply of education should be sensitive to the contextual conditions under which SMEs learn. He contended that advice taken from consultants, mentors, education courses, and other sources, would be turned into learning only when it was adapted to the entrepreneur's business needs. The most fertile sources for active learning were those that required the entrepreneur to learn "under-pressure", discovering "how to" and "with who" do things for oneself. Such active learning took place when an entrepreneur received feedback from customers,

suppliers, competitors, professional advisors and peer groups through personal interaction rather than the written word or formal instruction.

Contrary to the work of Gibb (1997), many authors (including Garavan et al. (1995), DeClercq and Crijns (2001) and Ducheneaut (2001)) suggested that entrepreneurial learning was not just restricted to "real-world" activities. In fact, many of the skills and personality traits associated with entrepreneurship could be developed and improved in a classroom setting.

2.3.4 When Do Entrepreneurs Learn?

Many have argued that entrepreneurial learning was reactive and only occurred when it was demanded by a particular situation (Sexton, et al., 1997; Deakins and Freel, 1998; Deakins, et al., 2000). Greiner (1972) suggested that small business growth is not linear, but instead passed through a series of management crises. Sexton's (1997) survey found that entrepreneurs learned through experience, by reflecting on their reactions to critical events which occurred over their lifetime. Sexton (1997, p3) reported that entrepreneurs "are more reactive than proactive in their learning process" and "they want information that primarily solves their immediate needs". Deakins and Freel (1998) confirmed the findings of Sexton (1997). According to Deakins et al. (2000), these crises or critical events could be viewed as steps on the entrepreneurial developmental and learning paths. The ability to learn reactively from these experiences determined the successful transition to a further period of growth.

2.3.5 How Do Entrepreneurs Learn?

The issue of *how* entrepreneurial learning takes place is a highly contentious issue. The various theories on the issue could be classified under five headings:

Sensemaking/Discursive Theory, Learning Styles, Experiential Learning, Dynamic Theory, and Organisational Learning.

2.3.5.1 Sensemaking

Rae and Carswell (2000) suggested that cognitive theories concerned with acquiring and structuring knowledge are flawed. They pointed out that cognitive theory allowed no room for individuals to be in a constant state of sensemaking. Sensemaking involved "turning circumstances into a situation that is comprehended explicitly as words and that serve as a springboard into action" (Weick et al., 1995, p.409). Rae and Carswell (2000) believed that there was a growing acceptance that were in a constant state of sensemaking. Individuals constantly evolved and reshaped their identity and their sense of meaning through what they did and how they talked about it. Sullivan (2000) suggested that a mentor aiding an otherwise isolated entrepreneur could be employed in a sensemaking support capacity by helping the entrepreneur to construct meaning from their experiences.

Rae and Carswell (2000) interviewed thirteen successful entrepreneurs to understand how the interviewees made sense of their experiences and developed their entrepreneurial capabilities. They found that sensemaking played a key role in learning which, when combined with other factors (such as capabilities and relationships with others), increased an individual's confidence and self-belief. The coupling of an increased self-efficacy with a motivation to achieve difficult goals increased the chances of an individual accomplishing their ambitious goals.

Rae (2005) proposed a triadic conceptual framework of entrepreneurial learning. He suggested that the triad comprised three major themes of entrepreneurial learning:

1. *Personal and Social Emergence.* This was the emergence of the entrepreneur's identity, including the formation of a sense of self and an aspiration of future actions. It was constructed through personal experience (such as education, career, and family interactions) and social relationships.

2. *Contextual Learning.* This was the development of entrepreneurial intuition and opportunity recognition skills through participation in group networks. It helped prospective entrepreneurs to acquire senses both who they can become and how they could work with others to achieve their aims.

3. *The Negotiated Enterprise.* Enterprises were constructed through negotiation with others such as customers, suppliers, investors, etc. These negotiations played a key role in entrepreneurial learning.

2.3.5.2 Kolb's Learning Styles

Ulrich and Cole (1987) suggested that an understanding of entrepreneurial learning could be gained from using Kolb's (1984) four stage learning model. The model was based on the premise that learning began when an individual experienced something (stage 1). This experience was then noticed and reflected upon (stage 2). These reflections were resolved into a generalised theory (stage 3). Finally implications were drawn from the generalised theory (stage 4). An *Accommodator* was an individual who was particularly strong at moving from stage 4 back to stage 1, (turning an in-depth understanding into a concrete experience). Accommodators were good at implementing plans, engaging in new experiences and at risk taking. The accommodator was action-orientated. Ulrich and Cole (1987) speculated that many entrepreneurs fell into this category.

2.3.5.3 Experiential Learning

Boussouara and Deakins (1999) advocated experience-based learning as the best method to acquire tacit knowledge associated with the setting up and running of a business, and as a useful way of improving an engineer's marketing skills. They concluded that the most effective way for a technical person to launch a successful high technology firm was for the technical expert to become involved at some level in a non-high technology start-up first. Such experiential learning provided "the naïve and novice entrepreneur a valuable window of development when potential mistakes can be overcome, when lessons can be learned and when contacts and networking can be developed" (Boussouara and Deakins, 1999, p. 220).

Erikson (2003) suggested that entrepreneurial learning was dependent on an individual's exposure to three types of experience: mastery experience, vicarious learning, and social experience. Mastery experience was acquired through practical experience and repeated accomplishments leading to an increased entrepreneurial ability and competence. Vicarious learning involved learning through observation of an entrepreneurial role model: this allowed the nascent or novice entrepreneur to gauge their ability against others. Social experience, or receiving positive encouragement, increased both effort and self-efficacy, thereby increasing competence. Erikson (2003) argued that the greater an individual's exposure to all three experiences, the better the entrepreneurial learning effect.

Deakins and Freel (1998) discussed the role of sophisticated networking activity in experiential learning. If an individual had access to a network of entrepreneurs, with whom they shared experiences and interacted, it would lead to modified behaviour and therefore learning on the part of the entrepreneur. Section 2.3.3 showed that such

networks were one of an entrepreneur's most trusted sources of information (Sexton et al. 1997).

Rae and Carswell (2001) suggested that although experience generated new meaning, experience based learning did not fully explain entrepreneurial learning. They argued that people do not *inevitably* learn or change their behaviour from experience.

2.3.5.4 Dynamic and Evolutionary Theory

Dynamic and evolutionary theories were essentially similar to experiential theory, but dynamic theory differed in one key respect: dynamic theories were explicitly evolutionary - they stressed that learning was both cumulative, and path dependent. It was easier for a learner to build new knowledge in spheres of existing expertise, and easier to recognise and understand knowledge in familiar areas (Costello, 1996). Deakins and Freel (1998) suggested that learning became highly specialised and suffered from a lack of robustness, unless the learner had several distinct knowledge bases from which to build.

2.3.5.5 Organisational Learning

Argyris and Schön's (1996) study of organisational learning suggested that all organisations had the ability to adapt to changes in the organisation's environment. The organisation could be portrayed as a single entity, and through a process of inquiry and efficient communication, *instrumental learning* (improved task performance) took place. Deakins and Freel (1998) felt that Organisational Learning theory was appropriate only to large organisations, and therefore may not be relevant to small firms or entrepreneurial learning.

Argyris's (1997) models of "theories in use" directly affected learning. Based upon his studies, Argyris reasoned that many people presented a *Model I* theory in use. This meant that the over-riding values and emotions of such individuals were: unilateral control, win-don't-lose, the suppression of feelings and rationality. The existence of Model 1 resulted in defensive reasoning and reduced learning. *Model II* individuals demonstrated informed choice based on validatable information and a personal responsibility to monitor their own actions. This resulted in increased questioning and testing of ideas, thereby facilitating learning.

2.3.6 Entrepreneurial Learning Summary

From reviewing the relevant literature it was evident that successful entrepreneurs required acumen in business functions such as finance and accounting and the possession of a set of skills that included creativity, problem solving skills and people management. Existing entrepreneurs - those who had previously engaged in entrepreneurial endeavour - preferred to acquire their information from business mentors and experienced entrepreneurs. Entrepreneurial learning tended to be both reactive and sensitive to a specific context - usually a problem that the entrepreneur is experiencing at that particular time. Theorists have postulated many ways in which entrepreneurs processed newly acquired knowledge. These theories included experiential learning, discursive theory, dynamic theory and organisational learning.

2.4 Entrepreneurship Education

2.4.1 Introduction

Garavan et al. (1995) defined enterprise education as the process designed to enable an individual to develop entrepreneurial knowledge, skills, values and understandings that were not simply related to a narrow field of activity, but which allowed a broad range of problems to be defined, analysed, and solved. This section concentrated on a number of aspects of entrepreneurial education, namely: student profile, qualification standards, timetabling issues and educational outputs.

2.4.2 Student Profile

DeClercq and Crijns (2001) suggested that for entrepreneurial education to be effective, a prospective student should possess four personality traits: an energy or capacity for work, a desire for accomplishment, a need for independence and a taste for enterprise. They postulated that such traits were formed early in life, and changed relatively little thereafter. Ducheneaut (2001) felt so strongly about the necessity of these pre-requisites, he recommended that prospective candidates be psychologically profiled before admission.

Entry to third-level ISD courses in the ROI for those under the age of 23 was based upon a points system, where points were awarded for a student's performance in the Leaving Certificate – the final examination in the Irish secondary school system. The CAO (Central Applications Office) was the organisation responsible for overseeing undergraduate applications to Irish HEIs. The principle role of the CAO was to offer places on HEI courses to students that have met a minimum points criteria. The CAO did not profile applicants for entrepreneurial proclivity, the only selection criteria they

used was academic performance in the leaving certificate. Prospective students over the age of 23 – known as *mature applicants* – were required to apply either directly to the HEI of their choice or to the CAO (the method of application depended upon the admission procedure for the HEI in question). Mature applicants did not have to meet any points-based criteria; evaluation of their application was based upon interviews and curriculum vitae assessment. These interviews were not used to profile the entrepreneurial personality traits or cognitions of the applicant (CAO, 2007).

2.4.3 Qualification Standards

Irish education quality standards were determined by the National Qualifications Authority of Ireland (NQAI). The NQAI established a national framework to standardise qualifications throughout the ROI known as the National Framework of Qualifications (NFQ). The NFQ provided a structure that allowed learners to compare and contrast the level and standard of Irish Higher Education (HE) and Further Education (FE) qualifications. The structure was based upon a system of levels that ranged from level one, elementary knowledge, to level ten, doctoral degree. Undergraduate University and IoT courses in the ROI were offered at three NQAI levels: 6, 7 and 8. NQAI Level 6 qualifications were labelled "Advanced Certificate and Higher Certificate", Level 7 was labelled "Ordinary Bachelors Degree" and Level 8 was labelled "Honours Bachelors Degrees" (NQAI, 2003).

2.4.4 Timetabling of Entrepreneurship Modules

The quantity of hours allocated to entrepreneurship modules and their subsequent course timetabling received some attention in the literature. Souitaris, et al. (2007) recommended that an entrepreneurship programme should include a portfolio of

complementary activities. They suggested that good practice programmes offered a combination of four types of activities:

1. A taught component with one or more modules;

2. A business planning component, involving competitions and advice on developing business ideas;

3. An interaction with practice component, including talks from practitioners and networking events; and

4. A university support component, including marketing research resources, space for meetings and seed-funding of student teams.

Gibb (1993) declared that little uniformity existed between entrepreneurship courses. He believed that this resulted from the debate surrounding the theoretical assumptions underpinning entrepreneurship education. He suggested that the ensuing confusion had negatively impacted entrepreneurship course design and structure, leading to a lack of agreement on entrepreneurship programme design.

In the context of Irish government policy, Forfás (2007a) declared that entrepreneurship education in Ireland should be part of the curriculum for business and non-business courses alike. They argued that it was particularly important that HEIs scientific and technical staff receive entrepreneurship education as it helped staff to develop and commercially exploit their new product and service ideas. Embedding entrepreneurship across scientific and technical courses would:

1. Develop entrepreneurial mind-sets among students;

2. Develop students' capacity to recognise entrepreneurial opportunities;

3. Create an environment that is conducive to entrepreneurial activity among students; and

4. Develop the necessary confidence and personal skills among the student body through the teaching and learning experience.

Forfás (2007a) argued that integrating entrepreneurship into scientific and technical degrees in Ireland would add value to these courses. They advised that all faculties and disciplines should develop opportunities for students at every level to experience entrepreneurship.

Forfás (2007b) reviewed an Irish cross-faculty approach to delivering enterprise education. They cited the example of Dundalk Institute of Technology (DKIT) where entrepreneurship education appears in more than twelve courses including informatics, nursing and engineering programmes. Every student in DKIT had the opportunity to pursue *one* entrepreneurship module at some point in their studies. Marsh (1987) and El Ansaria and Oskrochi (2004) both showed that a course's workload directly impacted student satisfaction and performance. Marsh (1987) found a positive correlation between workload and satisfaction, where courses with a very light workload were rated unfavourably by participating students.

2.4.5 Outputs

Hynes (1996) divided the outputs of the entrepreneurship education process into the tangible and the intangible. Tangible outputs included the development of physical artefacts associated with entrepreneurship, including the development of products, prototypes, drawings, etc. Intangible outputs included the effects on students behaviour (such as increased confidence and improved communication skills),

knowledge effects (management skills, propensity for risk taking and improved problem solving), and career effects (improved knowledge, broader career options, and a less structured career perspective).

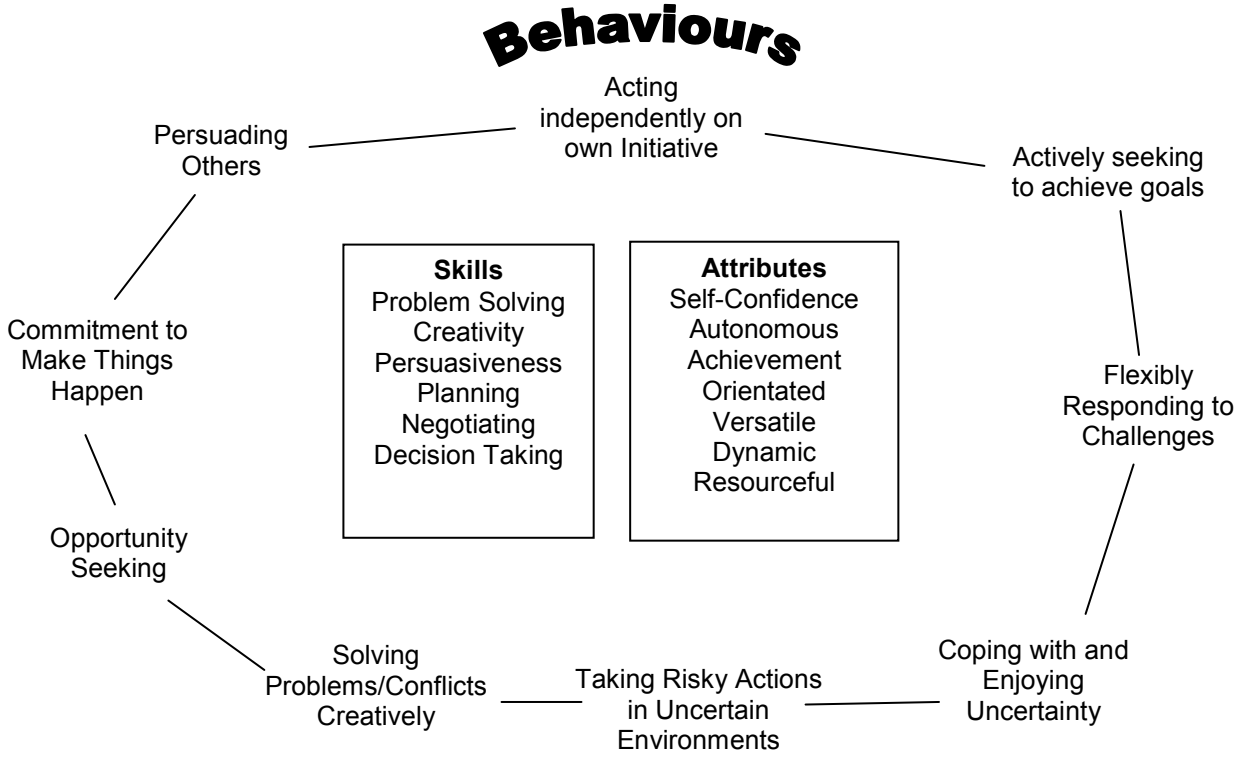

Figure 2-3
Enterprising Skills, Behaviours and Attitudes
(Gibb, 1993, p.14)

Gibb (1993) suggested that the outputs of an enterprise programme included enterprising behaviour, enterprising skills, and enterprising traits. Figure 2-3 illustrated Gibb's outputs; these outputs were very similar to Garavan et al.'s (1995) description of the aims of an entrepreneurship programme. Garavan et al. (1995) recommended that the outcome of any course should include developed knowledge, changed values, and improved understandings. Such outcomes would facilitate the definition, analysis and solving of a broad range of problems.

2.4.6 Entrepreneurship Education Summary

This section reviewed the literature pertaining to the education of entrepreneurship. The role of student profiling and course timetabling employed by educators have been found to directly impact the outputs of entrepreneurship education. According to the literature, the outputs of entrepreneurship included improved student knowledge, changed enterprising behaviour that resulted in long term effects on a student's future career. The section has shown that a student's entrepreneurial ability was not just determined by individual cognitions or personality traits; educational institutions and entrepreneurship courses also played a key role in developing entrepreneurial ability.

2.5 Tests for Entrepreneurship

2.5.1 Introduction

Section 2.2 described how the foundation of entrepreneurship hangs on the personality traits and cognitive styles of the individual. Section 2.5 reviewed the literature pertaining to the measurement of entrepreneurial personality traits and entrepreneurial cognitions.

2.5.2 Measuring Entrepreneurial Personality Traits

Entrepreneurial personality measurement suffers from a deficiency of validated measures. Popular, but invalidated measures include Gurol and Atsan (2006) and Anderson et al. (2005).

Caird (1988) identified five key personality traits associated with the entrepreneurial personality type, namely: locus of control, need for achievement, autonomy, creativity

and risk-taking, which formed the basis of the General Enterprising Tendency (GET) test.

Caird (1991) reported that the GET was valid, reliable and internally consistent. She found that entrepreneurs accrued a significantly higher GET score, and were therefore more enterprising, than other occupational groups. Cromie and O'Donoghue (1992) also validated the criteria upon which the GET test was based. They found that the GET subscales were positively correlated with one another and all subscales strongly correlated with the overall GET score. They concluded that the GET scale was a very useful measure for distinguishing between the entrepreneurial traits of entrepreneurs and other groups of individuals. Cromie and Callaghan (1997) concluded that the GET test was a valid and reliable instrument for assessing enterprising tendency.

Caird (2006) published an updated version of the GET test known as GET2. GET2 was not scrutinised in the literature to the same extent as its predecessor. The tests were similar in construction and style, but many of the questions posed in GET2 employed different wording from that used in the original GET. Table 1 in Appendix B was set out in order to provide a résumé of the differences in question wording between GET and GET2.

2.5.3 Measuring Open-Mindedness

Bradley (1984) measured open-mindedness by deploying a 10 item dogmatism scale, based upon the work of Rokeach (1954). Bradley reported that Rokeach's scale had been reviewed and tested a number of times and was found to be both valid and reliable. Rokeach's scale was further strengthened by Ray (1973) who included an element of balance to increase reliability still further.

2.5.4 Measuring Entrepreneurial Values

Section 2.2.4 described how cognitive style, in the form of values, can be measured using the Schwartz Value Survey (SVS) (Schwartz, 1994). The SVS included 57 items and 10 scales in relation to the measurement of values and value types. Scores of the 10 value types were measured across two dimensions: Conservation vs. Openness to Change and Self-transcendence vs. Self-enhancement.

Lindeman and Verkasalo (2002) suggested that a scale with 57 items was too time-consuming to fill in. They proposed and validated a shorter and less time-consuming version of the SVS known as the Short Schwartz Value Survey (SSVS). They reported that the SVS's 10 value types can be reliably and validly examined with only 10 items, by asking the respondents to rate the 10 value types directly. Lindeman and Verkasalo also reported that there was significant time-savings in employing the SVSS over the SVS: the 57 item SVS required 12 minutes to fill in while the 10 item SVS required 2 minutes on average. They concluded that the SSVS provided a practicable alternative to the SVS, providing good internal consistency and temporal stability and that the scores for the SVS and SSVS were highly correlated.

2.5.5 Tests for Entrepreneurship Summary

This section presented three scales that can be used to measure the entrepreneurial personality. Caird's (1988) General Enterprising Tendency Test can be used to measure locus of control, need for achievement, autonomy, creativity and risk-taking personality traits. Bradley's (1984) dogmatism scale can be used to measure open-mindedness. Schwartz's (1994) Value Survey can be employed to quantify the cognitive styles and values of people in general.

2.6 Research Design

2.6.1 Introduction

This section considered research designs and data analysis tools frequently used in social and entrepreneurial research.

2.6.2 Description of Research Designs

Common sociological paradigms were classified in Table 2-2. The table (adapted from Bailey (1994)) showed the unit of analysis, common data collection methods and data analysis techniques for common research paradigms.

2.6.2.1 Social Psychology and Small Group Research

Social psychology studied how social conditions affected human beings at a micro, or individual, level. It was the scientific study of how people's thoughts, feelings, and behaviours were influenced by the presence of others (Allport, 1985).

Paradigm	Unit of Analysis	Data-Collection Method Used	Data Analysis Technique
Social psychology and small group research	Micro	Usually laboratory experiment or observation	Statistical
Ethnography	From micro to macro	Observation and field notes	Verbal or qualitative analysis or field notes
Ethnomethodology	Micro	Observation and tape recording	Verbal analysis of field tapes and notes
Phenomenonology	Micro	Observation and field notes	Verbal or qualitative analysis or field notes
Grounded Theory	Micro	Interviews, observation, document analysis and surveys.	Qualitative or quantitative analysis
Case Study Approach	Micro	Observation, interview and document analysis	Qualitative analysis
Classical Approach	Usually micro but may be macro	Survey	Statistical

Table 2-2
Some Common Social Research Paradigms
Based upon Bailey (1994, p.38)

2.6.2.2 Ethnography

Ethnography provided a description and interpretation of a culture and social structure of a group. It involved immersion in a culture so that life in a community can be described in detail. The focus of ethnography maybe either macro (studying social groups and entire cultures), or micro (studying people at an individual level) (Robson, 2002).

2.6.2.3 Ethnomethodology

Ethnomethodology was the study of the way people made sense of the world. It involved the study of language and the way in which words are dependent on their context for meaning (Garfinkel, 1984).

2.6.2.4 Phenomenology

Phenomenonology stressed the importance of reflexivity i.e. an awareness of the ways in which the researcher has an impact upon the research process. The particular social identity and background of the researcher could introduce personal feelings and preconceptions into a research project (Robson, 2002).

2.6.2.5 Grounded Theory

Remenyi, et al (1998) described grounded theory as a theory-discovery methodology that allowed the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or evidence. For Myers (1997), grounded theory was a research method that sought to develop theory that was grounded in data that had been systematically gathered and analysed.

2.6.2.6 Case Study Approach

Yin (2003) described a case study as an inquiry which investigated a phenomenon within its real-life context. It allowed investigators to record real-life events in a holistic and meaningful way.

2.6.2.7 The Classical Approach

Blalock and Blalock (1968) distinguished between the conceptual and the empirical when constructing hypotheses. The empirical level referred to all phenomena that were directly measurable. According to the authors, all empirical phenomena have a conceptual counterpart. Bailey (1994) explained Blalock and Blalock's theory by way of example: he suggested that a crowd can be defined both as a mental concept and as an actual crowd that can be measured empirically.

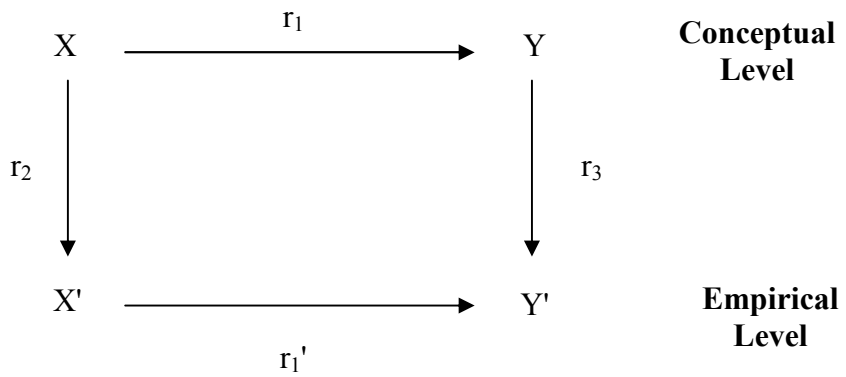

Figure 2-4
The Classical Approach to Hypothesis Construction and Verification
(Bailey, 1994, p.54)

Bailey (1994) suggested that the Classical Approach consisted of three stages. Stage 1, which existed on the conceptual level, consisted of defining concepts and proposing a link between them. Stage 2 involved devising ways to measure these concepts empirically. It included writing a testable hypothesis that linked the empirical measures of the two concepts. Stage 3 consisted of gathering and analysing the data in an attempt to verify the hypothesis. The relationship between the conceptual and the empirical is illustrated in Figure 2-4.

The empirical measures of concepts X and Y were and X' and Y' respectively. The value of r_1 could not be computed as it existed on the conceptual level, but the value of r'_1 could, as it existed on the empirical level. r_1 was the same value as r if X' and Y' were accurate measures of X and Y respectively. The relationship between X and X' was denoted by r_2 and the relationship between Y and Y' was denoted by r_3.

The advantages of the Classical Approach were that it was complete, included all stages of the research process and took advantage of both theorising and data analysis. A second benefit was that it utilised abstract concepts that had generalisability and made use of the power of deduction to generate concepts. Its primary disadvantage was an opportunity for measurement error to arise if the measurement did not represent the phenomena identified in the conceptual model (Bailey, 1994).

2.6.3 Data Analysis

Statistical Program for the Social Sciences (SPSS) version 15 was used to statistically analyse the research data. (SPSS, 2007).

2.6.4 Research Design Summary

This section reviewed research designs associated with social science research. Seven paradigms were described: Social psychology and small group research, Ethnography, Ethnomethodology, Phenomenonology, Grounded Theory, Case Study Approach and the Classical Approach. SPSS, a data analysis software tool, was also described.

2.7 Summary of Key Issues Emerging from Literature Review

1. Several personality traits and cognitions factors were associated with entrepreneurship. Entrepreneurial personality traits included: an internal locus of control, a propensity for creativity, a desire autonomy, open mindedness, a high need for achievement and a propensity for risk taking. The cognitive factors consisted of entrepreneurial leadership and a creative response.

2. School-leavers are admitted to Irish HEI courses by applying to and meeting the admission criteria set by the CAO. Mature students were admitted to HEI courses in one of two ways: through a CAO application or a direct application to a HEI. Applicants to Irish ISD courses were not screened for entrepreneurial personality traits and cognitions.

3. Effective entrepreneurship tuition should result in graduates possessing heightened entrepreneurial ability and a proclivity toward entrepreneurial action.

4. Several tests for entrepreneurial personality traits and cognitions existed, including GET, GET2, SVS, SSVS and Bradley's measure of Open-mindedness.

5. Many research methods were utilised in social science research including Social psychology and small group research, Ethnography, Ethnomethodology, Phenomenonology, Grounded Theory, Case Study Approach and the Classical Approach.

2.8 Conclusion

This literature review has considered the concepts related to the research objectives and the research questions. It has reviewed literature related to economics and management, entrepreneurship, entrepreneurial learning, entrepreneurship education, tests for entrepreneurship and research designs. Table 2-3 was set out in order to provide a résumé of the disciplines and authors covered in this review.

Economics and Management	**Entrepreneurship**	**Entrepreneurship Education**	**Entrepreneurial Learning**	**Research Design and Personality Measurement**
Forfas (2007a)	Kallasvuo (2007)	CAO (2008)	Rae (2005)	SPSS (2007)
Forfas (2007b)	Ames and Runco (2005)	Souitaris, et al. (2007)	Henry et al. (2005)	Gurol and Atsan (2006)
Matlay (2006)	Reave (2005)	WIT (2007)	Erikson (2003)	Caird (2006)
GEM Report (2006)	Morris et al. (2005)	OED (2007)	Markman et al. (2002)	Anderson et al. (2005)
Forfás (2006a)	Collins (2005)	CAO (2007)	Rae and Carswell (2001)	Yin (2003)
Forfás (2006b)	Ward (2004)	El Ansaria and Oskrochi (2004)	DeClercq and Crijns (2001)	Lindeman and Verkasalo (2002)
Forfás (2006c)	Hansemark (2003)	Hytti and O'Gorman (2004)	Ducheneaut (2001)	Robson (2002)
European Commission (2006)	Kirby (2003)	NQAI (2003)	Rae and Carswell (2000)	Remenyi et al. (1998)
Enterprise Ireland (2006)	Timmons and Spinnelli (2003)	Timmons and Spinelli (2003)	Sullivan (2000)	Myers (1997)

Economics and Management	Entrepreneurship	Entrepreneurship Education	Entrepreneurial Learning	Research Design and Personality Measurement
Forfás (2005)	Henry et al. (2003)	Henry et al. (2003)	Deakins et al. (2000)	Cromie and Callaghan (1997)
Cusumano (2005)	Mitchell et al. (2002)	Ducheneaut (2001)	Sullivan (2000)	Schwartz (1994)
Enterprise Strategy Group (2004)		Hynes (1996)	Boussouara and Deakins (1999)	Bailey (1994)
European Commission (2004)	Forbes and Wield (2002)	Garavan et al. (1995)	Dalley and Hamilton (2000)	Schwartz (1992)
EGFSN (2004)	Bricklin (2001)	Gibb (1993)	Deakins and Freel (1998)	Cromie and O'Donoghue (1992)
Stiglitz (2004)	Narayanan (2001)	Marsh (1987)	Argyris (1997)	Caird (1991)
European-Commission (2002)	Lee and Tsang (2001)		Brandstatter (1997)	Caird (1988)
Georgellis et al. (2000)	Barrett (1998)		Sexton et al. (1997)	Allport (1985)
Porter (1998)	Robinson and Stern (1997)		Deakins et al. (1997)	Garfinkel (1984)
Koh (1996)	O'Gorman and Cunningham (1997)		Gibb (1997)	Bradley (1984)
	Gibb (1993)		Koh (1996)	Ray (1973)
	Kuratko et al. (1997)		Costello (1996)	Blalock and Blalock (1968)
	Crant (1996)		Argyris and Schön (1996)	Rokeach (1954)

Economics and Management	Entrepreneurship	Entrepreneurship Education	Entrepreneurial Learning	Research Design and Personality Measurement
	Koh (1996)		Weick et al. (1995)	
	Collins and Porras (1994)		Garavan et al. (1995)	
	Cunningham and Lischeron (1991)		Gibb (1993)	
	Perry (1990)		Ulrich and Cole (1987)	
	Begley and Boyd (1987)		Kolb (1984)	
	Schwartz and Bilsky (1987)		Greiner (1972)	
	Drucker (1985)			
	Bradley (1984)			
	Cromie and Johns (1984)			
	Gasse (1982)			
	Pandey and Tewary (1979)			
	Hackman and Oldham (1979)			
	Liles (1974)			

Economics and Management	Entrepreneurship	Entrepreneurship Education	Entrepreneurial Learning	Research Design and Personality Measurement
	Rockeach (1973)			
	Rotter (1966)			
	McClelland (1961)			
	Schumpeter (1947)			
	Schumpeter (1911)			
	Cantillion (1755)			

Table 2-3
Literature Referenced in this Thesis

Table 2-4 listed the topics addressed in this chapter and indicated the position of Chapter 2 in the context of the overall research document.

Chapter 1	Introduction
Chapter 2	Literature Review
2.1	Introduction
2.2	Entrepreneurship
2.2.1	Introduction
2.2.2	Personality Traits of the Entrepreneur
2.2.3	Cognitive Aspects of Entrepreneurial Behaviour
2.2.4	Entrepreneurial Values
2.2.5	Entrepreneurship Summary
2.3	Entrepreneurial Learning
2.3.1	Introduction
2.3.2	What Do Entrepreneurs Need To Learn?
2.3.3	Learning Sources
2.3.4	When Do Entrepreneurs Learn?
2.3.5	How Do Entrepreneurs Learn?
2.3.6	Entrepreneurial Learning Summary
2.4	Entrepreneurship Education
2.4.1	Introduction
2.4.2	Student Profile
2.4.3	Qualification Standards
2.4.4	Timetabling of Entrepreneurship Modules
2.4.5	Outputs
2.4.6	Entrepreneurship Education Summary
2.5	Tests for Entrepreneurship
2.5.1	Introduction
2.5.2	Measuring Entrepreneurial Personality Traits
2.5.3	Measuring Open-Mindedness
2.5.4	Measuring Entrepreneurial Values
2.5.5	Tests for Entrepreneurship Summary
2.6	Research Design
2.6.1	Introduction
2.6.2	Description of Research Designs
2.6.3	Data Analysis
2.6.4	Research Design Summary
2.7	Summary of Key Issues Emerging from Literature Review
2.8	Conclusion
Chapter 3	Research Hypothesis
Chapter 4	Research Design
Chapter 5	Classification Of Data
Chapter 6	Analysis Of Statistical Data
Chapter 7	Discussion of Findings

Table 2-4
Structure of Chapter 2 and the Research Process

Chapter 3 - Hypotheses

3.1 Introduction

This chapter derived theory from concepts reviewed in the literature review relating to entrepreneurship education and its effect on entrepreneurial personality traits and entrepreneurial cognitions.

3.2 Inputs to Classroom Learning

Sections 2.2.2 and 2.2.3 suggested that there are several personality traits and cognitions that were associated with entrepreneurial behaviour. Figure 2-1 summarised these personality traits and cognitions. Entrepreneurial personality traits were identified as: an internal locus of control, creativity, autonomy, open mindedness, a high need for achievement and a propensity for risk taking. The cognitive factors associated with entrepreneurship were entrepreneurial leadership and creative response. It was suggested in sections 2.2.2 and 2.2.3 that if any individual possessed these personality traits and cognitions they were more inclined to entrepreneurial acts than those who did not. Section 2.4 showed that student entrepreneurial ability was not just determined by individual cognitions or personality traits, educational institutions and entrepreneurship courses also played a key role in developing entrepreneurial ability. *Inbound Students* - students entering the third-level educational process for the first time - presented themselves to the educational system with a set of personality traits and cognitions (as summarised in Figure 2-1). The common practice for the admission of students to ISD courses in the ROI did not involve filtering students based upon a pre-test for these entrepreneurial traits and

cognitions. Instead, entry to third-level courses in the ROI was managed by the CAO (see section 2.4.2). School-leavers – students exiting the secondary school system after sitting the Leaving Certificate state examination – were admitted to the third-level system based upon their performance in the Leaving Certificate and the resulting number of CAO points they accrued. A separate admission procedure was employed for mature applicants. Mature applicants (i.e. prospective students over 23 years old) either applied directly to the HEI of their choice or applied to the CAO (depending on the admissions policy of the HEI). Curriculum vitae and interviews were used as the basis for admission of mature students, pre-tests for entrepreneurial personality traits and cognitions were not employed as filtering mechanisms. Therefore there was no requirement that inbound students to ISD courses must have displayed some propensity towards entrepreneurship. Thus, the absence of pre-testing for entrepreneurial proclivity on ISD courses would most likely result in inbound ISD students possessing the same entrepreneurial personality profile as the general population. Therefore it was speculated that a random distribution of entrepreneurial personality traits and cognitions existed for non-filtered inbound ISD students. Hypotheses 1(a) and 1(b) can therefore be stated as follows:-

Hypothesis 1(a): The entrepreneurial personality traits of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.

Hypothesis 1(b): The entrepreneurial cognitions of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.

The relationship between entrepreneurial traits and cognitions for inbound students, both for the pre-test case of filtering inbound ISD students to third-level education

and the non pre-test case where students are admitted from a CAO register (or generic college interview) was illustrated in Figure 3-1.

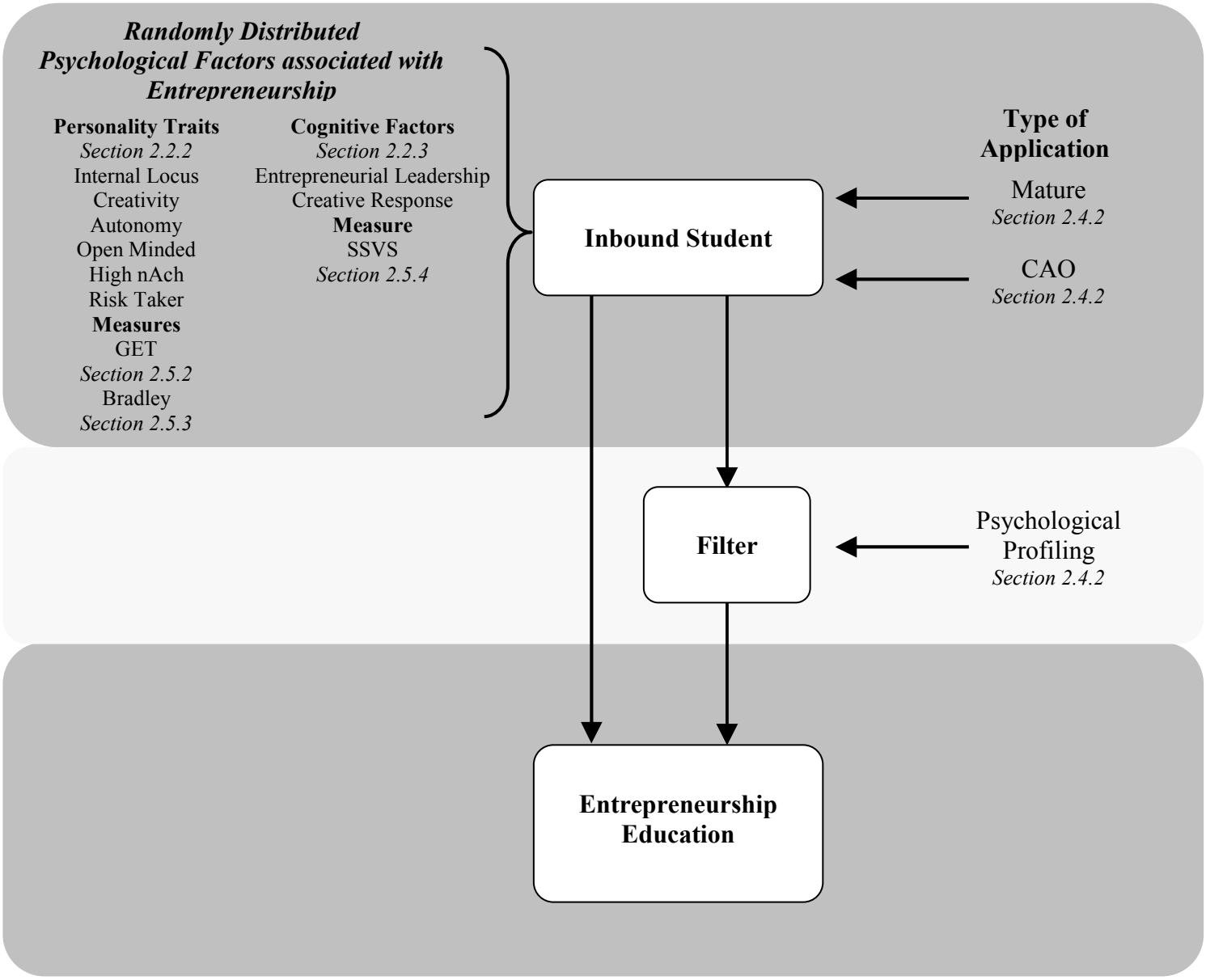

Figure 3-1
The Relationship between Pre-Tests For Entrepreneurial Personality Traits Student Personality Profile and Inbound Students

3.3 Entrepreneurship Education

Section 2.4.4 examined the timetabling of entrepreneurship modules on ISD degrees in the ROI. It was found that approximately 20% of IoT ISD programmes included one module in entrepreneurship. Previous research has shown that effective entrepreneurship education has depended upon the careful design and scheduling of entrepreneurship modules. Graduates of well designed and deployed entrepreneurship modules were expected to benefit from heightened entrepreneurial ability in the form of: a greater tendency towards the development of products, prototypes and drawings; behavioural changes; improved confidence; and altered personality traits. In short, entrepreneurship education could heighten an individual's proclivity to behave in an entrepreneurial fashion. The relationship between entrepreneurship education and course timetabling was illustrated in Figure 3-2.

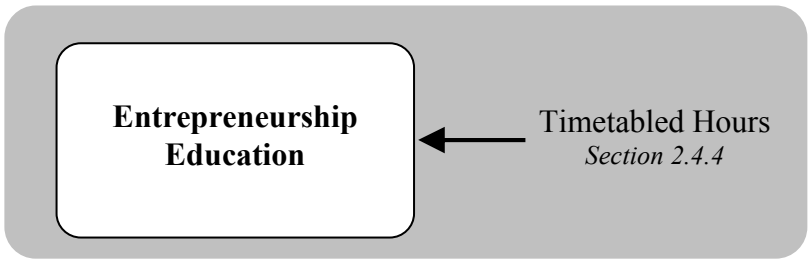

Figure 3-2
Entrepreneurship Education andIts Constituent Variables

Therefore it can be argued that an *Outbound Student* (a student who has completed or is completing the final year of their degree) that has studied entrepreneurship should possess heightened entrepreneurial ability when compared to an inbound student that has not received any formal tuition in entrepreneurship. If the entrepreneurship education received by outbound students was effective, outbound students would be

expected to exhibit stronger entrepreneurial personality traits and cognitions than those demonstrated by inbound students. Therefore outbound students should possess stronger entrepreneurial personality traits in the form of a greater internal locus of control, greater creativity, greater desire for autonomy, be more open minded, possess a higher need for achievement and a greater propensity for risk taking than inbound students. Likewise, outbound students that have completed entrepreneurship modules should possess increased cognitive abilities associated with entrepreneurship, namely, entrepreneurial leadership and creative response.

The impact of effective education on outbound students was illustrated in Figure 3-3.

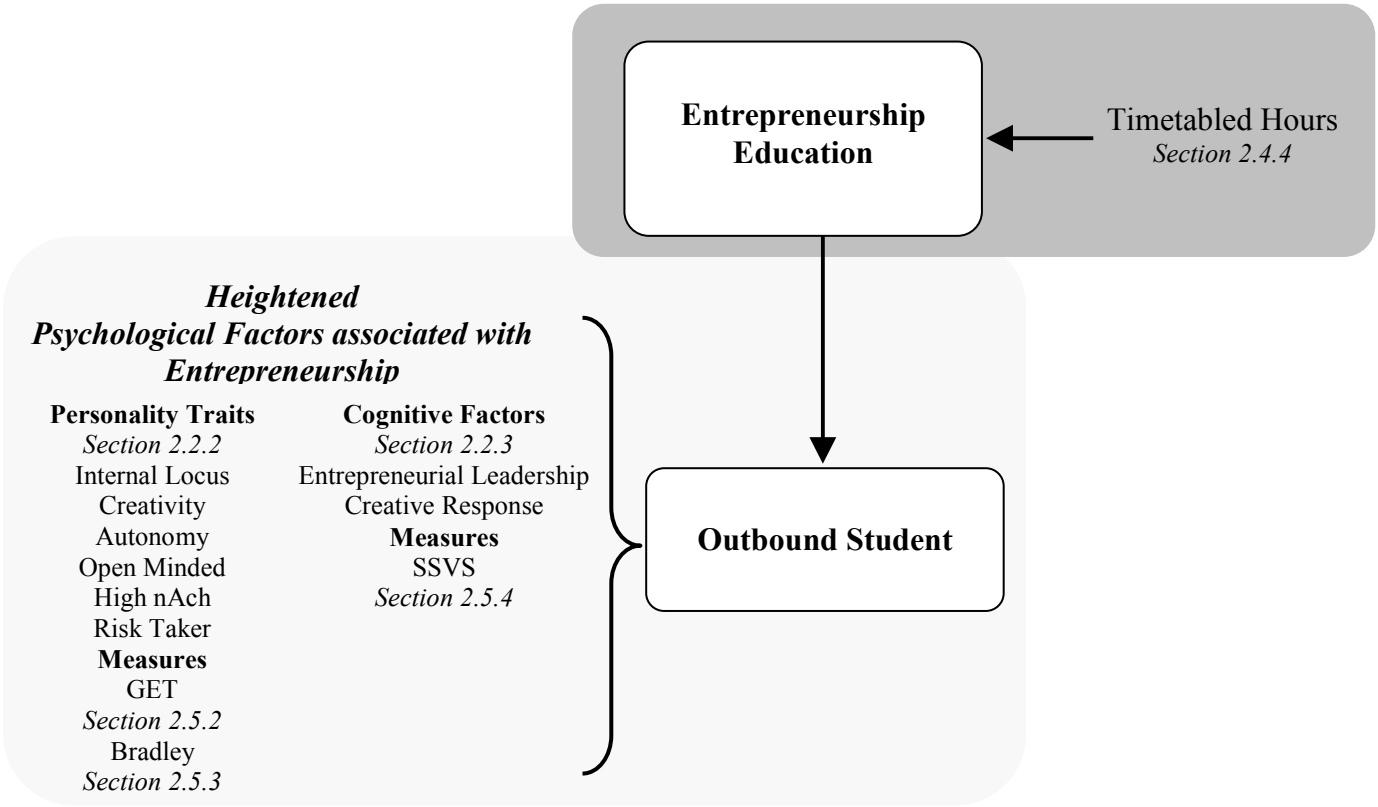

Figure 3-3
The Impact of Effective Entrepreneurship Education on Outbound Students

Hypotheses 2(a) and 2(b) can therefore be stated as follows:-

Hypothesis 2(a): Entrepreneurship education would develop definable entrepreneurial personality traits in outbound ISD students.

Hypothesis 2(b): Entrepreneurship education would develop definable entrepreneurial cognitions in outbound ISD students.

Section 2.4.4 showed that approximately 20% of ISD degrees in the IoT sector offered one single module in entrepreneurship. Not one programme ranging from Higher Certificate to Honours Degree offered more than one module in entrepreneurship. Potentially, too few entrepreneurship modules on an ISD degree would have a negligible impact upon the entrepreneurial personality traits and cognitions of students. In short, entrepreneurship education might be too diluted with respect to total course content to have any appreciable effect on entrepreneurial ability. It is speculated that outbound students of ISD courses that offer only one module of entrepreneurship education may not possess significantly stronger entrepreneurial personality traits and cognitions than outbound students of courses that do not feature any entrepreneurship modules. Hypotheses 3(a) and 3(b) can therefore be stated as follows:-

Hypothesis 3(a): Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial personality traits than outbound students that have not studied entrepreneurship.

Hypothesis 3(b): Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial cognitions than outbound students that have not studied entrepreneurship.

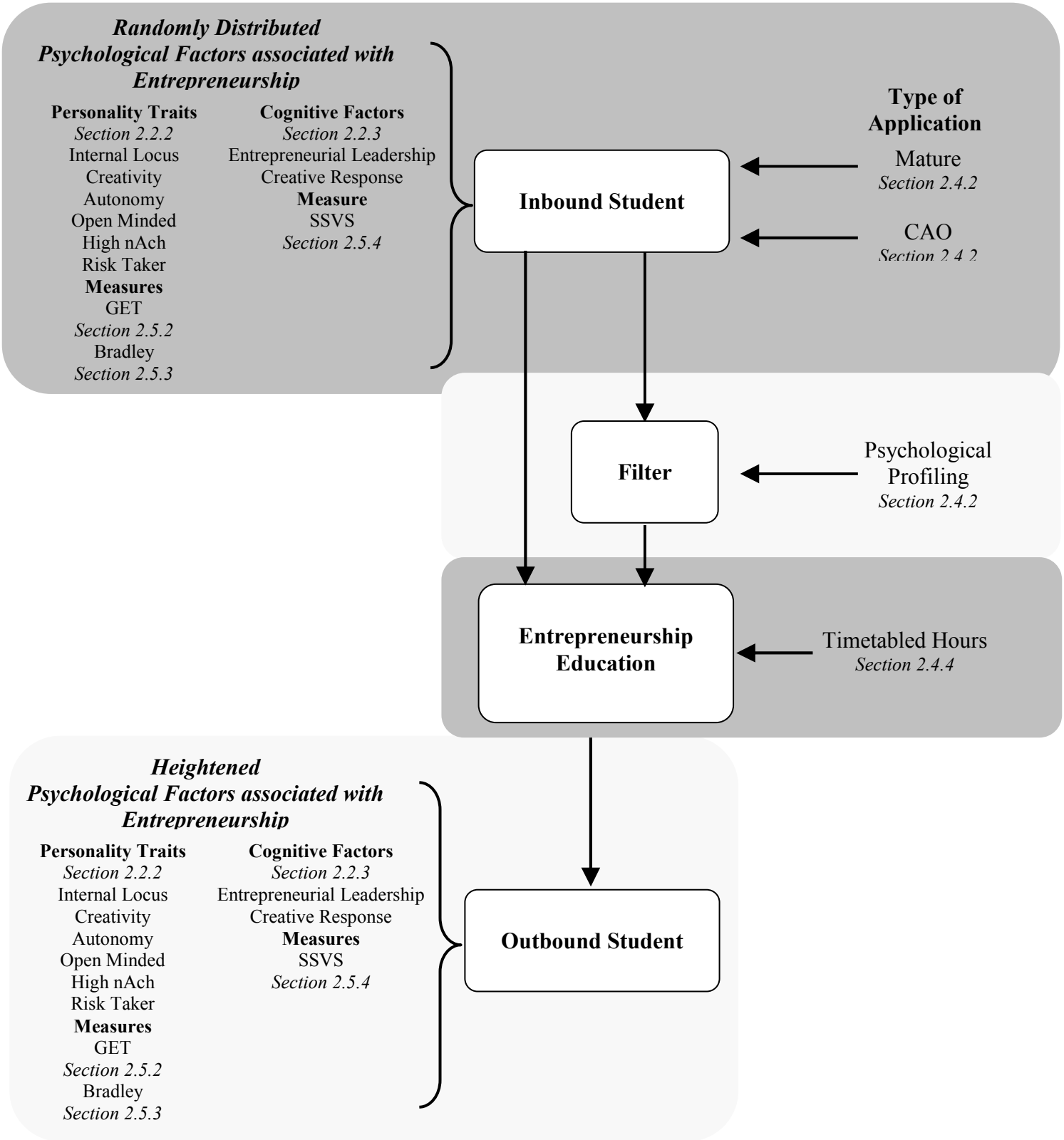

Figure 3-4
A Classroom Model of Entrepreneurship Education

Figure 3.4 – a combination of Figures 3.1, 3.2 and 3.3 - represents a class room model of entrepreneurship education.

3.4 Summary of Research Hypotheses

The research hypotheses for this study are summarised in Table 3-1.

Number	Hypothesis
1(a)	The entrepreneurial personality traits of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.
1(b)	The entrepreneurial cognitions of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.
2(a)	Entrepreneurship education would develop definable entrepreneurial personality traits in outbound ISD students.
2(b)	Entrepreneurship education would develop definable entrepreneurial cognitions in outbound ISD students.
3(a)	Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial personality traits than outbound students that have not studied entrepreneurship.
3(b)	Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial cognitions than outbound students that have not studied entrepreneurship.

Table 3-1
Summary of the research Hypotheses Developed in this Research

3.5 Conclusion

This chapter produced a model of entrepreneurship education based upon the concepts defined and the literature reviewed in Chapter 2. The Classroom Model of Entrepreneurship Education illustrated the impact of entrepreneurship education on the personality traits and cognitions of third-level students. Testable hypotheses were stated that can be used to empirically investigate the validity of this model. Table 3-2

listed the topics addressed in this chapter and indicated the position of Chapter 3 in the context of the overall research document.

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Research Hypothesis
3.1	Introduction
3.2	Inputs To Classroom Learning
3.3	Entrepreneurship Education
3.4	Summary of Research Hypotheses
3.5	Conclusion
Chapter 4	Research Design
Chapter 5	Classification Of Data
Chapter 6	Analysis Of Statistical Data
Chapter 7	Discussion of Findings

Table 3-2
Structure of Chapter 3 and the Research Process

Chapter 4 - Research Design

4.1 Introduction

This chapter presented the research design to both test the hypotheses stated in sections 3.2 and 3.3 and to confirm the theoretical model of entrepreneurship education shown in Figure 3-4.

4.2 Research Design

This research set out to answer questions on the effectiveness of ISD courses at promoting entrepreneurship amongst ISD students. The questions posed by this research could have been addressed by employing quantitative or qualitative research methods (a summary of which can be found in Table 2-2). Given the position of the author as a full time member of the lecturing staff of an IoT, with access to all undergraduate and postgraduate ISD students his department, it was decided that the Classical Approach (described in section 2.6.2.7 and compared to other methodologies in Table 2-2 could be adopted as the basis of this study's research design. Figure 4-1 illustrated the application of this methodology to the present research.

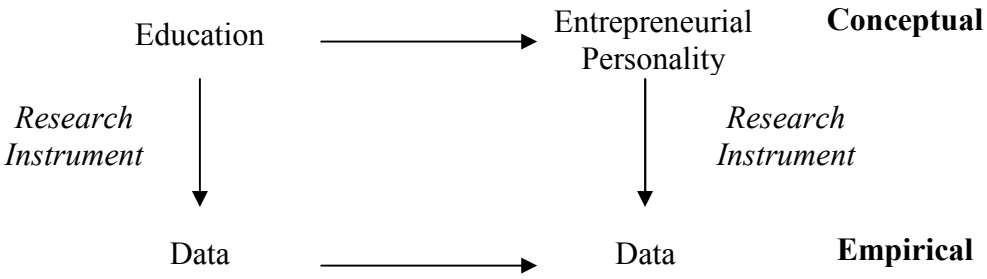

Figure 4-1
Classical Approach to Research Design
Adapted from Bailey (1994, p.54)

The Classical Approach was deemed the most suitable research methodology as it readily facilitated both theorising and data analysis. Concepts were uncovered in Sections 2.2, 2.3, 2.4 and 2.5 that gave rise to an induced model of entrepreneurship education (as illustrated in Figure 3-4). The relationships between the model's components (inbound students, entrepreneurship education and outbound students; see Sections 3.2 and 3.3 and Table 3-1) were tested in an empirical way by making certain measurements, as required by the Classical Approach. The two stages of the Classical Approach were applied as follows:

4.2.1 The Conceptual Level

Stage 1 involved theorising. Sections 3.2 and 3.3 hypothesised that the education an ISD student received may affect change upon the student's personality traits and cognitions. Therefore it was conceived that education can directly impact upon a student's personality. This conceptual relationship between education and personality was illustrated in Figure 4-1.

4.2.2 The Empirical Level

Stage 2 involved identifying empirical measures of the relationship between education and personality. It also involved gathering and analysing data to test the research

hypotheses. The conceptual relationship outlined in 4.2.1 was measured in an empirical way by gathering data pertaining to entrepreneurial cognitions and personality traits. Gathering data of this type facilitated the empirical measurement of the relationship between entrepreneurship education on one side and the entrepreneurial personality on the other.

4.3 Research Instrument

A survey instrument was designed to test the hypotheses detailed in sections 3.2 and 3.3. The instrument was used to collect data pertaining to the educational profile and the entrepreneurial personality traits and cognitions of ISD students. The research instrument was a 13 page self-administered questionnaire. A copy of the instrument can be found in Appendix D, "Research Instrument".

4.3.1 Instrument Layout

The questionnaire consisted of four sections:

Section 1: Introduction. This section contained instructions to the reader, explaining how to record responses to the questions posed. It also collected data about the respondent's educational background and exposure to entrepreneurial education. It was used to gather data pertaining to the hypotheses generated in chapter 3 and shown in Table 3-1.

Section 2: Personality Traits. The Personality Traits contained 72 questions and was based upon Caird's (1988) GET test. Section 2 was used to gather data pertaining to five of the hypothesised personality traits shown in Table 3-1. These personality traits were internal locus of control, creativity, autonomy, a high need for achievement and

a propensity for risk taking. Five variables were created to calculate values for each of these personality traits, these variables and their calculations were summarised in Table 4-1.

Variable	Calculation
Need for Achievement	Σ(Q1+Q7+Q13+Q18+Q22+Q28+Q34+Q42+Q49+Q55+Q60+Q67)
Risk Taking	Σ(Q2+Q12+Q14+Q21+Q23+Q33+Q35+Q47+Q50+Q59+Q62+Q71)
Creativity	Σ(Q6+Q9+Q17+Q20+Q27+Q31+Q40+Q46+Q54+Q57+Q66+Q70)
Autonomy	Σ(Q3+Q15+Q25+Q37+Q51+Q63)
Locus of Control	Σ(Q4+Q8+Q16+Q19+Q26+Q30+Q39+Q44+Q52+Q56+Q+65Q+69)
GET Value	Σ(Need for Achievement + Risk Taking + Creativity + Autonomy + Locus of Control)

Note: (Qn denotes section 2 question number).

Table 4-1
Calculated Variables from Section 2 of the Research Instrument

In line with Caird's GET test, a sixth variable was created. This was a composite score of the five aforementioned personality traits, and was labelled "GET Value".

Section 3: Value Survey. Section 2.2.4 described entrepreneurial cognitions that have been closely linked to entrepreneurial values. A value survey was constructed based upon Lindeman and Verkasalo's (2002) Short Schwartz Value Survey (described in section 2.5.4). This value survey was deployed to collect data pertaining to entrepreneurial cognitions. People in general may be described using two key bi-polar value dimensions, namely, Openness to Change vs. Conservation and Self-

transcendence vs. Self-enhancement. Section 2.2.4 showed that successful entrepreneurs had a high creative response i.e. their openness to change value dimension is stronger than their conservation value dimension. Likewise, entrepreneurs are characterised by high levels of entrepreneurial leadership - they possess stronger self-transcendence value dimension when compared to their self-enhancement value dimension.

Section 3 of the research instrument contained 10 questions. It was used to gather data pertaining to the hypotheses 1(b), 2(b) and 3(b) generated in chapter 3 and shown in Table 3-1. The comparison of openness to change to conservation dimensions and self-transcendence to self-enhancement dimensions required the creation of six calculated variables: Openness to Change, Conservation, Creative Response, Self-Transcendence, Self-Enhancement and Entrepreneurial Leadership. The calculation of these variables was summarised in Table 4-2.

Variable	Calculation
Openness to Change	Σ(Q3+Q4+Q5)/3
Conservation	Σ(Q8+Q9+Q10)/3
Creative Response	Openness to Change - Conservation
Self-Transcendence	Σ(Q6+Q7)/2
Self-Enhancement	Σ(Q1+Q2+Q3)/3
Entrepreneurial Leadership	Self-transcendence – Self-enhancement

Note: (Qn denotes section 3 question number).

Table 4-2
Calculated Variables from Section 3 of the Research Instrument

Section 4: Open-Mindedness Scale. It was hypothesised in sections 3.2 and 3.3 that open-mindedness was a key trait in the entrepreneurial personality. Section 2.5.3 described how Bradley's scale measured open-mindedness among business owners. Section 2.2.3.1 presented Schumpeter's argument that entrepreneurs were people who "get things done". Business owners readily fit Schumpeter's description – therefore Bradley's open-mindedness scale can be deployed to measure this personality trait among entrepreneurs. Section three of the research instrument, which contained 12 questions was used to gather data pertaining to the hypotheses 1(a), 2(a) and 3(a) generated in chapter 3 and shown in Table 3-1.

A variable was created to calculate a value for open-mindedness. The calculation of this variable was described in Table 4-3. Analysis of Bradley's scale required inversion of the data supplied in response to questions 3, 6 and 9.

Variable	Calculation
Open-mindedness	Σ(Q1+ Q2+ (6-Q3)+ Q4+ Q5+ (6-Q6)+ Q7+ Q8+ (6-Q9)+ Q10+ Q11+Q12)/12
Note: (Qn denotes section 4 question number).	

Table 4-3
Calculated Variables from Section 4 of the Research Instrument

Table 4-4 described all of the above constructs in terms of both their relevance to the study's hypotheses and the constructs' statistical characteristics. Need for achievement, risk taking, creativity, autonomy, locus of control, GET value and open-mindedness were all used as measures of entrepreneurial personality traits. Openness to change, conservation, creative response, self-transcendence, self-enhancement and entrepreneurial leadership were used as measures of entrepreneurial cognition.

Constructs	Hypothesis	Characteristic
Need for Achievement Risk Taking Creativity Autonomy Locus of Control GET Value Open-mindedness	1(a), 2(a) and 3(a)	Distribution
Openness to change Conservation Self-transcendence Self-enhancement	1(b), 2(b) and 3(b)	Distribution

Table 4-4
Relevance of Constructs to Research Hypotheses

There were 93 questions on the research instrument. Table 4-5 related the relevance of each question in the instrument to the hypotheses stated in Sections 3.2 and 3.3.

Question No.	Survey Section	Hypothesis
1-9	1	1(a), 1(b), 2(a), 2(b), 3(a) and 3(b)
1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 30, 31, 33, 34, 35, 37, 39, 40, 42, 44, 46, 47, 49, 50, 51, 52, 54, 55, 56, 57, 59, 60, 62, 63, 65, 66, 67, 69, 70 and 71.	2	1(a), 2(a) and 3(a)
1-10	3	1(b), 2(b) and 3(b)
1-12	4	1(a), 2(a) and 3(a)

Table 4-5
Relevance of Research Instrument Questions to Research Hypotheses

4.3.2 General Enterprising Tendency Test

Section 2 of the research instrument was assembled from two separate versions of the same test – the General Enterprising Tendency (GET) and the General Enterprising Tendency test 2 (GET2) (both tests are described in section 2.5.2). Of the 72 questions found in section 2, 54 questions were from the GET test and 18 were from the GET 2 test. Table 4-6 categorises the questions in section 2 of the research instrument according to their origin.

Origin	Question number on research instrument
GET	1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 30, 31, 33, 34, 35, 37, 39, 40, 42, 44, 46, 47, 49, 50, 51, 52, 54, 55, 56, 57, 59, 60, 62, 63, 65, 66, 67, 69, 70 and 71.
GET2	5, 10, 11, 24, 29, 32, 36, 38, 41, 43, 45, 48, 53, 58, 61, 64, 68 and 72

Table 4-6
Categorisation of Question Number based upon Question Origin

Section 2.5.2 described the relationship between GET and GET2. 36 of the 54 questions on GET2 were identical or very similar to 36 of the questions on GET. Although designed to measure the same personality traits as their equivalent on the GET test, the remaining 18 questions were markedly different in their wording. Both GET and GET2 versions of all eighteen questions were included in the research instrument in order to test the validity of GET2. The GET2 questions were randomly interspersed among the GET questions. A nineteenth GET2 question was dropped from the survey as a result of the research instrument pre-test. Pre-test respondents reported that the GET and GET2 versions of one particular question were not significantly different, rendering redundant any comparisons of the GET and GET2 responses to that particular question in the final survey.

The responses to GET versions of the eighteen questions were compared to the responses of their GET2 counterparts. It was found that only two questions had agreement rates in excess of 75%, i.e. 75% or more of respondents supplied an identical answer to both the GET and GET2 versions of a question. One question had less than 50% agreement. The mean agreement score for the eighteen questions was 62.8%, with a standard deviation of 10.3%.

4.3.3 Instrument Presentation

The questionnaire was 13 pages long and consisted of four sections. In an effort to avoid confusion, and to aid document navigability, the four sections were presented on four different paper colours. Section 1 was printed on yellow paper, section 2 on pink, section 3 on blue and section 4 on beige.

4.3.4 Pre-test of the Research Instrument

The research instrument was pre-tested by administering the survey among seven faculty members of Waterford Institute of Technology. Based upon their feedback, the following modifications were made:

1. The wording of section 1 was modified to make the section instructions more understandable.

2. A question was removed from section 2 of the research instrument. Section 4.3.2 compared and contrasted GET and GET2. Section 4.3.1 described how the research instrument was constructed to measure the differences between GET and GET2. Results from the pilot study showed that the GET and GET2 versions of a question relating to risk taking were not significantly different. The GET2 version of the question was removed from the research instrument.

3. The instructions for the second questionnaire required the respondent to select a –1 (minus one) for not more than one of the listed values. Unfortunately, due to a typographical error, -1 was not among the options presented on the response sheet. This omission was corrected in the final version of the questionnaire

4. To prevent any misunderstanding of the questions in section 3 of the research instrument, a dictionary definition of each value type was appended to each question.

4.4 The Survey Sample

A desktop analysis of IoT ISD courses was conducted in October 2007. The objective of this study was to gather information on the prevalence of entrepreneurship on IoT ISD courses and to identify a case study site. To achieve this objective, data was gathered pertaining to ISD courses, the name and location of the IoT offering the course and whether or not the course featured modules in entrepreneurship. If a course offered entrepreneurship modules, the number of modules available and the nature of the offering (i.e. if they were studied on mandatory or elective basis) were also recorded. All information from this desktop analysis was gathered from the CAO. The results of this desktop analysis were recorded in Table 4-7. Fifty eight IoT ISD programmes were offered by the CAO in 2008 ranging from Higher Certificates (NQAI Level 6) to Honours Degrees (NQAI Level 8). Fourteen of these programmes featured one single module in entrepreneurship; not one programme offered more than one entrepreneurship module. The remaining forty four did not offer any modules in entrepreneurship (CAO, 2008).

It emerged from the desktop analysis that ISD degrees offered at WIT were typical of ISD degrees offered throughout the IoT sector. The majority of ISD programmes offered at WIT did not feature any modules in entrepreneurship; those that did offered a maximum of one entrepreneurship module. The results of the desktop analysis showed that a very similar pattern emerged from the wider IoT sector: the majority of IoT ISD programmes did not offer any entrepreneurship modules, those that did offered a maximum of one. Therefore WIT ISD courses were selected as a representative case study of ISD courses throughout the IoT sector. The 224 students

of ISD courses at WIT, the largest IoT in Ireland outside of the Dublin area, were selected as the sample for this study.

Institute	Course Number	Course Name	NQAI Level	Number of Entre'ship Modules
Athlone IoT (AIT)	AL011	Higher Certificate in Engineering in Electronics and Computer Engineering	6	0
	AL022	Bachelor of Business Computing	7	0
	AL047	BSc in Computer Network Administration	7	0
IoT Blanchards-town (ITB)	BN002	Higher Certificate in Science in Computing	6	0
	BN012	Bachelor of Engineering in Computer Engineering	7	0
	BN013	BSc in Computing in Information Technology	7	0
	BN015	Bachelor of Engineering	7	0
	BN104	BSc (Hons) in Computing	8	0
	BN106	Bachelor of Engineering(Hons) in Computer Engineering	8	1 (Elective)
Cork IoT (CIT)	CR 310	BSc. (Hons) in IT Management	8	1 (Mandatory)
	CR 106	BSc. (Hons) in Software Development	8	0
	CR 116	BSc. (Hons) in Software Development and Computer Networking	8	0
	CR 016	BSc in Computing	7	0
	CR 888	Higher Certificate in Science in Information Technology Support	6	0
IoT Carlow (IT Carlow)	CW206	Higher Certificate in Science in Computing	6	0
	CW208	BSc (Hons) in Computer Games Development	8	0
		BSc in Computer Systems Management	7	0

Institute	Course Number	Course Name	NQAI Level	Number of Entre'ship Modules
Dundalk IoT (DKIT)	DK721	Bachelor Of Science in Computing	7	0
	DK762	Bachelor of Arts in Communications in Creative Multimedia	7	0
	DK820	BSc (Hons) in Computing in Games Development	8	1 (Mandatory)
	DK821	BSc (Hons) in Computing in Internet Technologies	8	0
IADT Dun Laoghaire (IADT)	DL131	BSc in Computing in Multimedia Programming	7	1 (Mandatory)
Dublin IoT (DIT)	DT081	BSc (Hons) in Computer & Communications Engineering	8	0
	DT089	Higher Certificate In Electronic & Computer Systems	6	0
	DT211	BSc (Hons) In Computing	8	0
	DT228	BSc (Hons) In Computer Science	8	0
	DT354	BSc (Hons) In Business Computing	8	1 (Mandatory)
Galway Mayo IoT (GMIT)	GA570	BSc in Computer and Electronic Engineering	7	0
	GA571	BSc in Computer and Electronic Systems	7	0
	GA776	BSc in Business Computing and Digital Media	7	1 (Mandatory)
	GA869	Higher Certificate in Business in Computer Applications	6	0
Letterkenny IoT (LYIT)	LY627	Bachelor of Engineering in Computer Engineering	7	1 (Mandatory)
	LY707	BSc in Computing with Computer Games Development	7	0
	LY708	BSc (Hons) in Applied Computing	8	1 (Elective)
	LY717	BSc in Computing with Business Applications	7	0

Institute	Course Number	Course Name	NQAI Level	Number of Entre'ship Modules
	LY727	BSc in Computing with Network and Mobile Communications	7	0
	LY737	BSc in Computing with Computer Security and Digital Forensics	7	0
Limerick IoT (LIT)		BSc (Hons) in Computer Networks & Systems Management	8	0
Sligo IoT (IT Sligo)	No Information Available			
Tallaght IoT (ITT)	TA302	BSc in Information Systems	7	1 (Mandatory)
	TA312	BSc in Computing	7	1 (Mandatory)
	TA322	BSc (Honours) in Computing	8	1 (Mandatory)
Tipperary IoT (Tipp Inst)	TI003	BSc in Computing	7	0
	TI006	Higher Certificate in Science in IT Support	6	0
	TI009	Higher Certificate in Computing	6	0
	TI015	BSc (Hons) in Computing (Software Development)	8	0
	TI016	BSc Degree in Computing in IT Support	7	0
	TI018	BSc (Hons) Degree in Computing (Games Design and Development)	8	0
Tralee IoT (IT Tralee)	TL310	Higher Certificate In Science in Computing	6	0
	TL325	BSc in Computing with Games Development	7	0
	TL330	BSc (Hons) in Computing with Games Development	8	0
	TL355	BSc In Computing with Multimedia	7	0
	TL360	BSc (Hons) in Computing with Multimedia	8	0

Institute	Course Number	Course Name	NQAI Level	Number of Entre'ship Modules
Waterford IoT (WIT)	WD151	BSc in Commercial Computing	7	0
	WD068	BSc (Hons) in Commercial Computing	8	1 (Mandatory)
	WD153	BSc in Multimedia	7	1 (Mandatory)
	WD131	BSc (Hons) in Multimedia	8	1 (Mandatory)
	WD155	BSc in Information Technology	7	0
	WD131	BSc (Hons) in Information Technology	8	0
	WD028	BSc (Hons) in Applied Computing	8	0
	WD161	BSc (Hons) in Forensics	8	0

Table 4-7
Summary of ICT Courses offered by Irish Institutes of Technology

WIT consisted of six academic schools, namely: Business, Humanities, Science, Engineering, Health Sciences and Adult Education. The students selected for this study were all ISD students from the School of Science. ISD students were divided into two categories: inbound students and outbound students. Inbound students (described in Section 3.2) arrived to third level via one of two channels: the CAO process (described in Section 2.4.2) or as a mature students (also described in Section 2.4.2). Typically, inbound students did not possess any prior knowledge of entrepreneurship, having not previously studied it formally nor engaged in any entrepreneurial endeavour.

The curriculum at WIT was divided into modules, worth five credits each; modules may be mandatory or elective. If a student demonstrated that they achieved the learning objectives of a module, they were awarded credits which they accumulated towards their degree. Notionally, a credit was equated to 27 hours of study for the average learner.

	Tuition Hours devoted to Entrepreneurship	Total Tuition Hours*	Entrepreneurship as a percentage of total tuition hours	NQAI Level
BSc in Commercial Computing	0	648	0%	7
BSc (Hons) in Commercial Computing	36	864	4%	8
BSc in Multimedia	36	648	6%	7
BSc (Hons) in Multimedia	36	864	4%	8
BSc in Information Technology	0	648	0%	7
BSc (Hons) in Information Technology	0	864	0%	8
BSc (Hons) in Applied Computing	0	864	0%	8
BSc (Hons) in Forensics	0	864	0%	8

* Total Hours is the total cumulative hours off all pre-requisite coursers added to the hours for the selected course.

Table 4-8
Tuition Hours Devoted to Entrepreneurship on ISD Courses at WIT

The BScs in Multimedia, Information Technology and Commercial Computing offered at WIT are ab-initio ordinary degrees offered at NQAI level 7. All three of these degrees require three years of full-time study. The BSc (Hons) in Applied Computing is an ab-initio honours degree programme, requires four years of full-time

study and is offered at NQAI level 8. The BSc (Hons) in Commercial Software Development is a one year add-on degree which may be pursued once students have successfully graduated from the BSc in Commercial Computing. The BSc Hons in Multimedia and the BSc Hons in Information Technology are both one year add-on honours degree courses available to graduates of the BSc in Multimedia and the BSc in Information Technology respectively. All three of these one year add-on courses are offered at NQAI level 8 (WIT, 2007). NQAI levels were described in section 2.4.3.

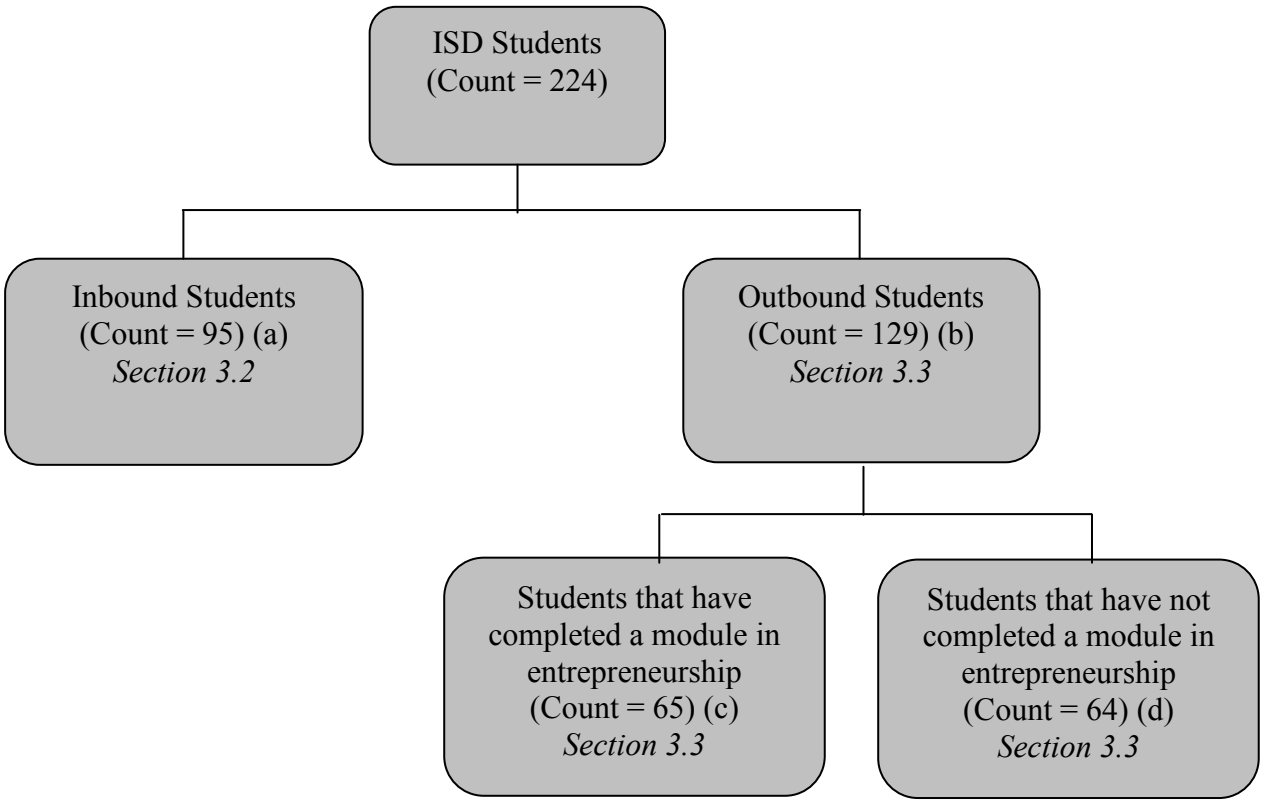

Figure 4-2
Relationships between Sample Components

The Department of Computing, Maths and Physics in WIT offered eight NQAI level 7 and 8 undergraduate ISD degrees. Three of the eight courses offered one single mandatory module in entrepreneurship, in direct contrast to Souitaris, et al's (2007)

description of good practice. Entrepreneurship on all three of these courses took the form of one 36 hour, semester long module. The remaining five degrees did not offer any entrepreneurship modules - mandatory or elective. Table 4-8 listed the level 7 & 8 ISD degrees offered in WIT and compared the number of hours of formal tuition devoted to entrepreneurship to the total hours of tuition on that course

The sample for this study was divided into two groups – outbound students and inbound students. The outbound student group was subdivided into two sub-groups – the first sub-group consisted of outbound ISD students that had studied at least one module in entrepreneurship, the second consisted of outbound ISD students that had not taken any entrepreneurship modules. Figure 4-2 illustrated the relationships between the components of the study's sample.

Inbound students (a) were required to test hypotheses 1(a), 1(b), 2(a) and 2(b). Outbound students with entrepreneurship (c) were required to test hypotheses 2(a), 2(b), 3(a) and 3(b). Outbound students that have not studied entrepreneurship were required to test hypotheses 3(a) and 3(b). (Hypotheses were detailed in table 3-1).

Table 4-9 provided a breakdown of the survey sample with regard to inbound and outbound students, the courses taken, the year of study, and the numbers of registered students. BSc in Commercial Computing first years were omitted from sample group (a) – inbound students. The numbers enrolled in year 1 of this course were too small to justify the time and expense of deploying the research instrument to them – they were therefore omitted from the sample.

	Course	Received Entrepreneurship Education?	Year of Study	Inbound/ Outbound	Number of Students	Component Total
Sample group (a)	BSc in Multimedia	No	1	Inbound	49	
	BSc in Information Technology	No	1	Inbound	24	
	BSc (Hons) in Applied Computing	No	1	Inbound	22	
	Inbound student total **% of sample total**					**95** **42.4%**
Sample group (c)	BSc (Hons) in Commercial Software Development	Yes	4	Outbound	26	
	BSc (Hons) in Multimedia	Yes	4	Outbound	15	
	BSc in Multimedia	Yes	3	Outbound	24	
	Outbound with entrepreneurship total **% of sample total**					**65** **29.0%**
Sample group (d)	BSc (Hons) in Information Technology	No	4	Outbound	19	
	BSc (Hons) in Applied Computing	No	4	Outbound	10	
	BSc in Commercial Computing	No	3	Outbound	11	
	BSc in Information Technology	No	3	Outbound	24	
	Outbound without entrepreneurship total **% of sample total**					**64** **28.6%**
	Total to be surveyed					**224**

Table 4-9
Survey Sample with regard to Inbound and Outbound Students, Courses Taken, Year of Study, and the Numbers of Registered Students

4.5 Survey Deployment

The survey was administered over a two week period in March 2007. It was administered to students during timetabled classes and returned to the researcher in the same class session. Completion of the survey was optional. The presence of the researcher during survey administration helped to ensure that any questions relating to the research instrument were promptly answered. Survey completion time ranged from 10 to 40 minutes, with an average of 25 minutes. Students who did not possess English as their first language tended to take considerably longer to complete the questionnaire.

The third section of the instrument – the Short Schwartz Value Survey - caused some confusion. A small number of respondents required clarification of the section instructions, which was duly supplied by the researcher. Despite this, some students still did not complete the section properly. The most frequent error involved respondents failing to select a -1 or 0 and/or a 7, thereby failing to identify values that were opposed to their principles or not important and/or of supreme importance.

Section 2 (GET) and section 4 (Bradley's open-mindedness survey) posed fewer problems. Nine respondents failed to notice that the last page of section 4 contained questions; consequently no responses were supplied for questions 9, 10, 11 and 12 of section 4 for these respondents. The surveys returned by these respondents were deemed to be spoiled; all nine were removed from the sample.

4.6 Survey Response Rate

Excluding spoiled responses, the overall response rate was 52%. The response rate for inbound and outbound students and the response rate for each course are detailed in Table 4-10.

	Course	Year of Study	Number of Students Enrolled	Number of completed questionnaires	Response Rate
Sample group (a)	BSc in Multimedia	1	49	24	49%
	BSc in Information Technology	1	24	13	54%
	BSc (Hons) in Applied Computing	1	22	8	36%
	Inbound totals and response rate		**95**	**45**	**47%**
Sample group (c)	BSc (Hons) in Commercial Software Development	4	26	20	77%
	BSc (Hons) in Multimedia	4	15	8	53%
	BSc in Multimedia	3	24	12	50%
	Outbound with entrepreneurship totals and response rate		**65**	**40**	**62%**
Sample group (d)	BSc (Hons) in Information Technology	4	19	11	58%
	BSc (Hons) in Applied Computing	4	10	6	60%
	BSc in Commercial Computing	3	11	5	45%
	BSc in Information Technology	3	24	10	42%
	Outbound without entrepreneurship totals and response rate		**64**	**32**	**50%**
	Total and overall response rate		**224**	**117**	**52%**

Table 4-10
Analysis of Survey Response Rate

The response rate varied from 36% for BSc in Applied Computing first years to 77% for students of the BSc (Hons) in Commercial Software Development. The high response rate for the latter was due to the fact that the author was a lecturer on that course and was able to re-deploy the research instrument to students who were absent for the initial deployment.

4.7 Statistical Confidence

The sample size of the study was 224. 117 valid questionnaires were returned by respondents. Respondents were placed into one of three categories: inbound students, outbound students with no entrepreneurship and outbound students with entrepreneurship. A Chi-square goodness-of-fit analysis was used to test the statistical confidence of the response rate for each of the three categories.

df=2	Inbound Students	Outbound students with no entrepreneurship	Outbound students with entrepreneurship	Total
Observed	45	32	40	**117**
Expected	95	64	65	**224**

Table 4-11
Crosstabs of Observed and Expected results for Outbound Students

This goodness-of-fit test compared the observed and expected frequencies in each category to test that all categories contained a similar proportion of values. A chi-square value of 3.285 with 2 degrees of freedom was calculated based upon the category frequencies recorded in Table 4-11. The resulting *p* value was 0.194. As the *p* value was considerably greater than 0.05 it was clear that there was insufficient evidence to suggest that there was any significant difference in the response rate of the three student categories.

4.8 Conclusion

This chapter outlined the methods and techniques of research that were used to test the hypotheses outlined in chapter 3, Table 3-2. A Classical Approach to research design was deemed the most appropriate research method for this research. A relationship between a student's education and changes in their personality traits and cognitions was proposed and a method of empirically measuring this relationship was devised. The chapter described design, pre-test and deployment of the research instrument. WIT ISD courses were identified as being a representative sample of ISD courses offered throughout the IoT sector. It has also outlined the survey response rate and the statistical confidence of the sample. The chapter has also prepared variables that will be used in testing of the hypotheses in Chapter 6. Table 4-12 listed the topics addressed in this chapter.

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Research Hypothesis
Chapter 4	Research Design
4.1	Introduction
4.2	Research Design
4.2.1	The conceptual level
4.2.2	The empirical level
4.3	Research Instrument
4.3.1	Instrument Layout
4.3.2	General Enterprising Tendency Test
4.3.3	Instrument Presentation
4.3.4	Pre-test of the Research Instrument
4.4	The Survey Sample
4.5	Survey Deployment
4.6	Survey Response Rate
4.7	Statistical Confidence
4.8	Conclusion
Chapter 5	Classification Of Data
Chapter 6	Analysis Of Statistical Data
Chapter 7	Discussion of Findings

Table 4-12
Structure of Chapter 4 and the Research Process

Chapter 5 – Classification of Data

5.1 Introduction

This chapter classified the respondents to the study's research instrument (described in section 4.3).

5.2 General Classification of the Survey Sample

The tables presented in this section pertained directly to the research hypotheses. Background demographic and educational information such as respondents' gender, age, nationality and mode of study were presented in Appendix C, Tables 1, 2 and 3 respectively.

Table 5-1 categorised respondents into inbound and outbound students. Inbound students consisted of first year students only. Outbound students consisted of students in the final year of their courses. 38.5% of all respondents were inbound students and 61.5% were outbound students. The majority of outbound students were pursuing four year honours degrees (63% of outbound students) the remainder were registered on ordinary degrees. Second year students were precluded as only inbound and outbound students formed the sample for this study (see Sections 3.2 and 3.3).

n=117				Total	
Inbound/Outbound	**Year of Study**	**Count**	**%**	**Category total**	**Category %**
Inbound	1	45	38.5%		
	2	0	0.0%	45	**38.5%**
Outbound	3	27	23.1%		
	4	45	38.5%	72	**61.5%**
Total		**117**	**100.0%**	**117**	**100.0%**

Table 5-1
Classification of Respondents into Inbound and Outbound Categories

n = 117		**Year of Study**				
		1	2	3	4	**Course Total**
Respondent's Course	BSc in Commercial Computing			4.3%		**4.3%**
	BSc (Hons) in Commercial Computing				17.1%	**17.1%**
	BSc in Multimedia	20.5%		10.3%		**30.8%**
	BSc (Hons) in Multimedia				6.8%	**6.8%**
	BSc in Information Technology	11.1%		8.5%		**19.6%**
	BSc (Hons) in Information Technology				9.4%	**9.4%**
	BSc (Hons) in Applied Computing	8.0%			5.1%	**13.1%**
Year Total		**38.5%**	**0%**	**23.1%**	**38.5%**	**100.0%**

Table 5-2
Respondents' Year of Study and Course Compared

Respondents' course and respondents' year of study were cross tabulated in Table 5-2. First year multimedia students were the most frequently occurring category. Table 5-2 reflected the fact that the BSc in Multimedia was the largest course (in terms of student enrolment) in the Computing, Maths and Physics department at WIT. Responses from BSc in Multimedia students accounted for 30.8% of all returned questionnaires. The second largest set of responses came from the students of the BSc in Information Technology (19.6%).

Just over 34% of all respondents have studied one single module of entrepreneurship in college, all of whom were outbound students. Entrepreneurship was not offered as a first year module on ISD courses at WIT, consequently not one inbound student reported that they had studied entrepreneurship in college. Not all outbound students studied entrepreneurship however; 56% of outbound students had studied at least one module of entrepreneurship as part of their degree, the remainder, 44%, had not studied entrepreneurship. See Table 5-3 for more detail.

n=117		Inbound		Outbound		Total	
		Count	**%**	**Count**	**%**	**Count**	**%**
Studied Entrepreneurship in College	**Yes**	0	0.0%	40	34.2%	40	34.2%
	No	45	38.4%	32	27.4%	77	65.8%
Total		**45**	**38.4%**	**72**	**61.6%**	**117**	**100.0%**

Table 5-3
Respondents who have taken a Third-Level Module in Entrepreneurship

Figure 5-1 showed the results for section 2 of the research instrument, the GET test Section 4.3.2 explained that the GET test and the composite GET score was a measure of entrepreneurial tendency. The histogram in Figure 5.1 showed the results for the overall GET score for inbound students. The maximum a respondent could have

scored on the GET was 54, the minimum was 0. Superimposed over the histogram was a normal curve.

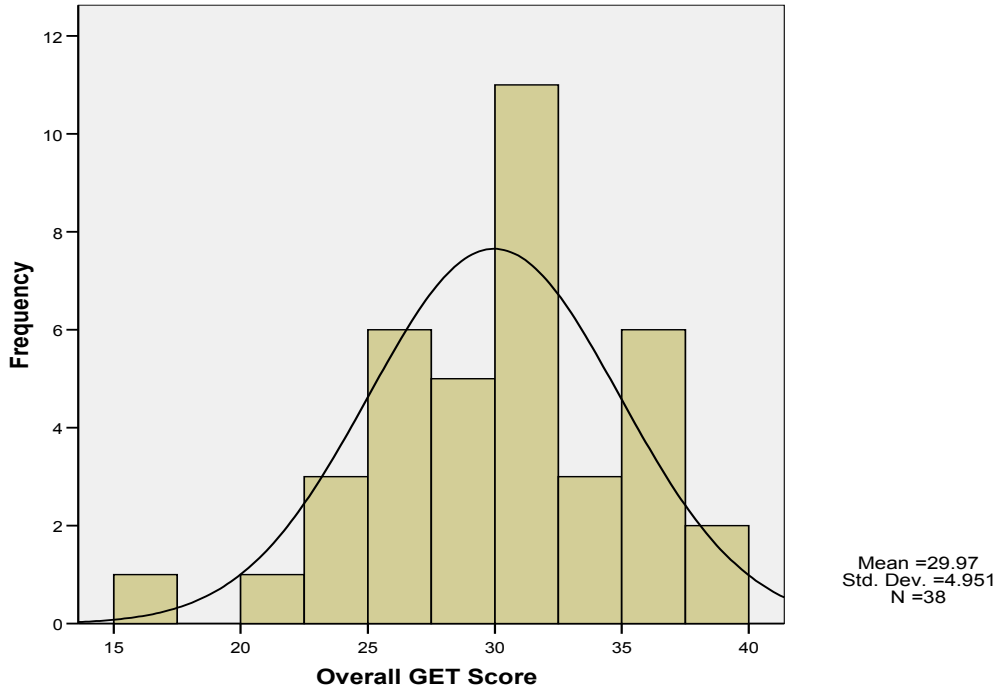

Figure 5-1
Histogram and Normal Curve for GET Score for Inbound Students

A number of measures could have been employed to assess the goodness of fit of a distribution. Two such measures were the Kolmogorov-Smirnov (K-S) test and the Shapiro-Wilk (S-W) test, both of which were available in SPSS (see section 2.6.3). Both tests used the null hypothesis to test if a sample has come from a normally distributed population. The *p* values for the overall GET score for inbound students for both statistical tests were considerably greater than the 0.05 significance level (K-S = 0.200>0.05, S-W = 0.651>0.05), implying that the results for the overall GET score were randomly distributed.

Figures 5-2 and 5-3 showed the results for section 3 of the research instrument, the SSVS test (see section 4.3). Figure 5-2 pertained to the entrepreneurial leadership variable and Figure 5-3 pertained to the creative response variable (both variables

were described in Table 4-2). Both entrepreneurial leadership and creative response have a maximum score of 8 and a minimum of -8.

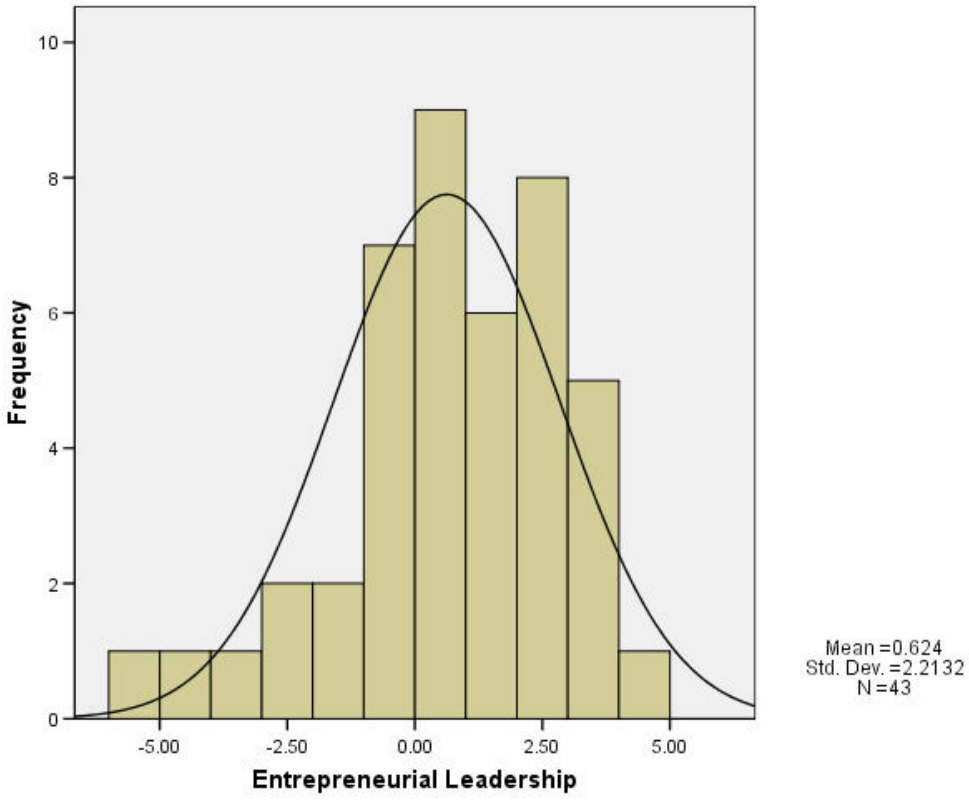

Figure 5-2
Histogram and Normal Curve for SSVS Entrepreneurial Leadership for Inbound Students

The results of the goodness of fit tests suggested that the results for both variables were normally distributed. The *p* values for cognitions for inbound students using both Kolmogorov-Smirnov and Shapiro-Wilk were once again considerably greater than the 0.05 significance level (entrepreneurial leadership: K-S = 0.200>0.05, S-W = 0.981>0.05; creative response: K-S = 0.200>0.05, S-W = 0.730>0.05). This meant that there was insufficient evidence to reject the hypothesis that the results for entrepreneurial leadership and creative response were randomly distributed.

Therefore it was implied that the entrepreneurial leadership and creative response results for inbound students were normally distributed.

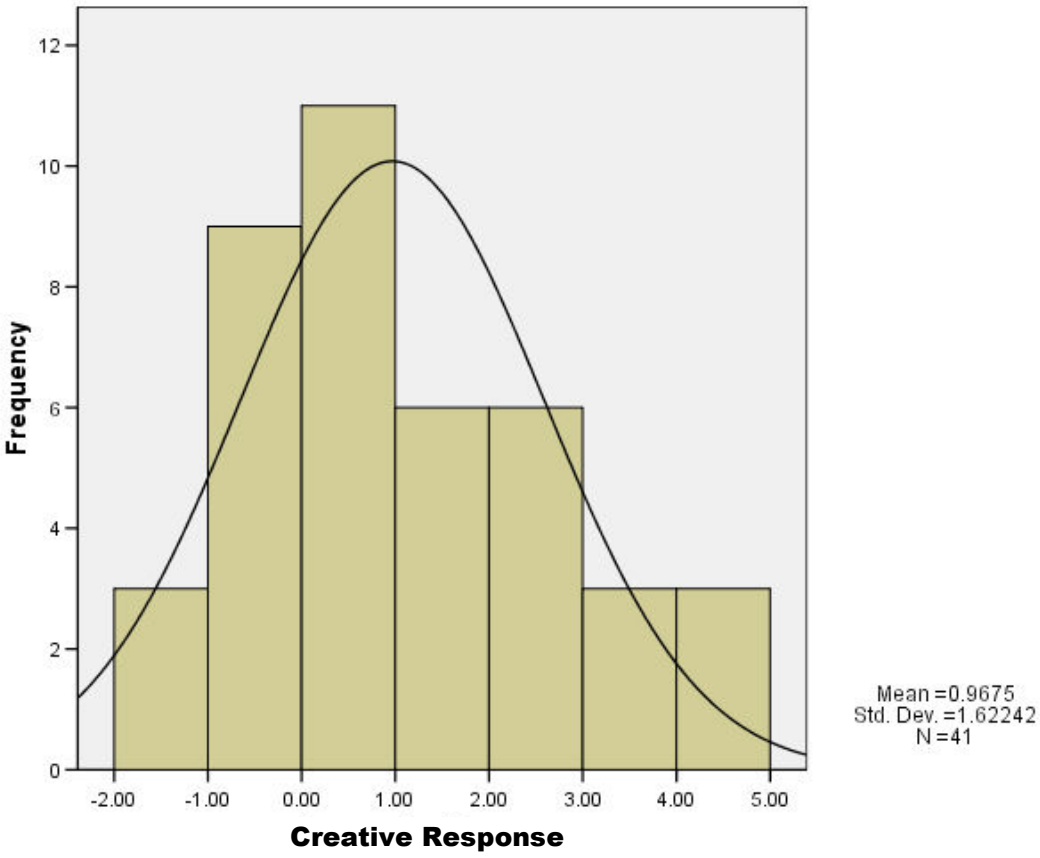

Figure 5-3
Histogram and Normal Curve for SSVS Creative Response for Inbound Students

Figure 5-4 mapped the results for section 4 of the research instrument, the Bradley open-mindedness scale (see section 4.3). The histogram showed the results for the open-mindedness score for inbound students. Bradley's open-mindedness test had a possible maximum of 5 and a minimum of 1. Superimposed over the histogram, once again, was a normal curve.

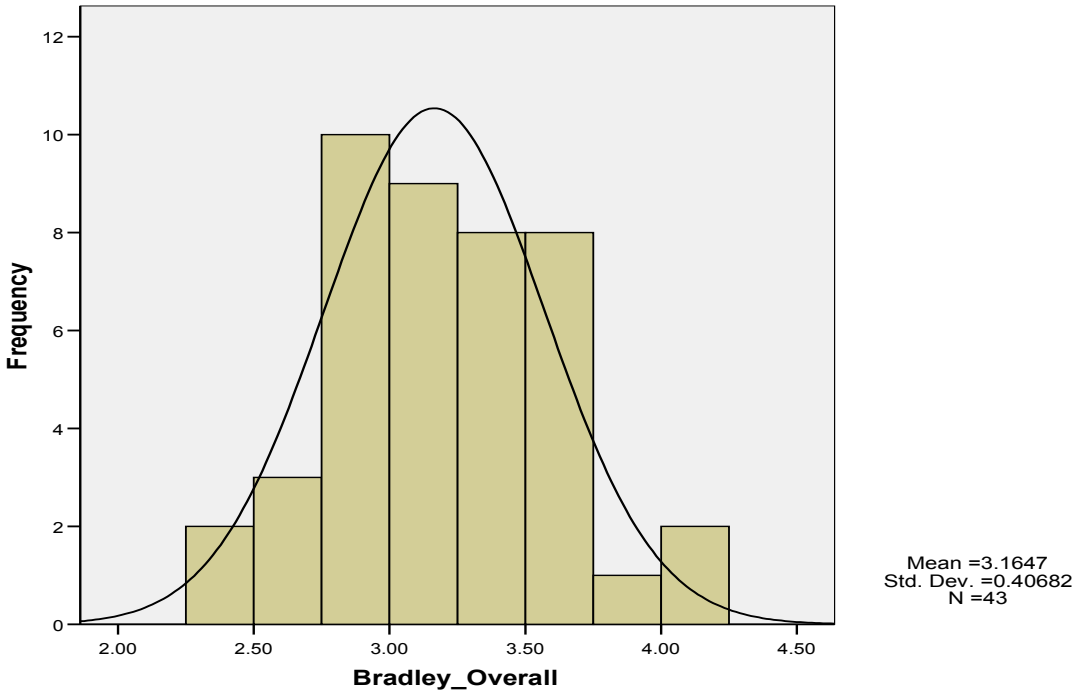

Figure 5-4
Histogram and Normal Curve for Bradley's Measure of Open-Mindedness for Inbound Students

The results of the statistical tests of goodness of fit suggested that the results for Bradley's measure of open-mindedness were normally distributed. The *p* values (for inbound students) using Kolmogorov-Smirnov and Shapiro-Wilk were once again considerably greater than the 0.05 significance level (K-S = 0.200>0.05, S-W = 0.858>0.05). This meant that there was insufficient evidence to reject the hypothesis that the results for Bradley's measure of open-mindedness were randomly distributed. Therefore it was interpreted that the open-mindedness results for inbound students were normally distributed.

5.3 Conclusion

This chapter classified the respondents to the research instrument outlined in section 4.3. Respondents were classified according to their course, mode and year of study, inbound vs. outbound status and if they had previously studied entrepreneurship. This

chapter also analysed the variables used to test the hypotheses in Chapter 6. It was found that the results for GET, entrepreneurial leadership, creative response and open-mindedness were all normally distributed. Table 5-4 listed the topics addressed in this chapter.

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Research Hypothesis
Chapter 4	Research Design
Chapter 5	Classification Of Data
5.1	Introduction
5.2	Respondent Classification
5.3	Conclusion
Chapter 6	Analysis Of Statistical Data
Chapter 7	Discussion of Findings

Table 5-4
Structure of Chapter 5 and the Research Process

Chapter 6 - Testing of Hypotheses

6.1 Introduction

This chapter tested the research hypotheses H1(a), H1(b), H2(a), H2(b), H3(a) and H3(b) in order to test the theory induced in sections 3.2 and 3.3.

6.2 A Review of the Research Hypotheses

Table 6-1 summarised the research hypotheses for this study.

Hypothesis	Hypothesis	Section
1(a)	The entrepreneurial personality traits of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.	3.2
1(b)	The entrepreneurial cognitions of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.	3.2
2(a)	Entrepreneurship education would develop definable entrepreneurial personality traits in outbound ISD students.	3.3
2(b)	Entrepreneurship education would develop definable entrepreneurial cognitions in outbound ISD students.	3.3
3(a)	Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial personality traits than outbound students that have not studied entrepreneurship.	3.3
3(b)	Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial cognitions than outbound students that have not studied entrepreneurship.	3.3

Table 6-1
Summary of Research Hypotheses

6.3 Testing the Hypotheses

This section analysed the data collected using the research instrument described in section 4.3. The analysis of the data described in this section was conducted to verify or reject the hypotheses listed in table 6-1.

6.3.1 H1(a)

H1(a) was stated as follows:

> *The entrepreneurial personality traits of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.*

H_0(1a) can therefore be stated as follows:

> *The entrepreneurial personality traits of unfiltered inbound ISD students would not be found to be distributed randomly as per the normal curve.*

Irish ISD courses did not employ filtering mechanisms to assess the entrepreneurial personality traits of prospective students. The only requirement for admission to ISD degrees in the ROI was that the applicant have obtained the requisite number of CAO points (in the case of school leavers) or performed to a satisfactory standard in an interview (in the case of mature students). Therefore it was highly likely that inbound ISD students possessed entrepreneurial personality traits in line with the wider population. Therefore it was expected that inbound ISD students' entrepreneurial personality traits would be randomly distributed.

The GET test was shown in section 2.5.2 to be a measure of five personality traits often associated with entrepreneurship (namely: locus of control, need for achievement, autonomy, creativity and risk-taking). A composite score, known as the overall GET score, was calculated from the responses provided by a respondent. The Bradley test for open-mindedness was shown in section 2.5.3 to be a quantitative assessment of a respondent's degree of open-mindedness.

Section 5-2 stated that the K-S and S-W test results for inbound students' open-mindedness and overall GET scores were normally distributed. The *p* values for both personality measures using both statistical tests were considerably greater than the 0.05 significance level (GET: K-S = 0.200>0.05, S-W = 0.651>0.05; open-mindedness: K-S = 0.200>0.05, S-W = 0.858>0.05). These figures suggested that there was sufficient evidence to reject the null hypothesis that the results for GET and open-mindedness were not randomly distributed.

H1(a) was therefore affirmed – in short, the entrepreneurial personality traits of non-pre-tested inbound students were randomly distributed, as per the normal curve.

Table 6-2 was set out in order to provide a résumé of the analysis, testing and interpretation of results pertaining to H1(a).

Hypothesis Number	**1(a)**	
Hypothesis	The entrepreneurial personality traits of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.	
Null Hypothesis	The entrepreneurial personality traits of unfiltered inbound ISD students would not be found to be distributed randomly as per the normal curve.	
Test	Kolmogorov-Smirnov and Shapiro-Wilk tests of goodness of fit performed on Overall GET score and Bradley's measure of open mindedness.	
Purpose	To test if the personality traits of inbound students were normally distributed.	
Result	**GET Score:** K-S: 0.200 S-W: 0.651	**Bradley:** K-S: 0.200 S-W: 0.858 Null Hypothesis Rejected.
Interpretation	Hypothesis was affirmed. The entrepreneurial cognitions of unfiltered inbound ISD students were distributed randomly as per the normal curve.	

Table 6-2
Résumé of the Testing of H1(a)

6.3.2 H1(b)

H1(b) was stated as follows:

> *The entrepreneurial personality traits of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.*

H_0(1b) can therefore be stated as follows:

> *The entrepreneurial cognitions of unfiltered inbound ISD students would not be found to be distributed randomly as per the normal curve.*

Section 6.3.1 discussed the absence of filtering mechanisms when assessing the applications of prospective inbound students ISD courses in the ROI do not employ. In a similar fashion to entrepreneurial personality traits, it was likely that inbound ISD students possessed entrepreneurial cognitions in line with the wider population, i.e. the entrepreneurial cognitions of inbound students would be randomly distributed.

The SSVS test was shown in section 2.5.2 to be an effective measure of values. Section 4.3.1 showed that data pertaining to two entrepreneurial cognitions could be calculated using the SSVS. These two entrepreneurial cognitions were entrepreneurial leadership and creative response (described in section 2.2.3).

Section 5.2 stated the K-S and S-W test results for inbound students' for both entrepreneurial leadership and creative response scores were normally distributed. The *p* values for both cognitions using both statistical tests were considerably greater than the 0.05 significance level (entrepreneurial leadership: K-S = 0.200>0.05, S-W = 0.981>0.05; creative response: K-S = 0.200>0.05, S-W = 0.730>0.05). These figures suggested that there was sufficient evidence to reject the null hypothesis that the results for entrepreneurial leadership and creative response were not randomly distributed.

H1(b) was therefore affirmed – in short, that the entrepreneurial cognitions of non-pre-tested inbound students were randomly distributed, as per the normal curve.

Table 6-3 contained a résumé of the analysis, testing and interpretation of results pertaining to H1(b).

Hypothesis Number	**1(b)**	
Hypothesis	The entrepreneurial cognitions of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.	
Null Hypothesis	The entrepreneurial cognitions of unfiltered inbound ISD students would not be found to be distributed randomly as per the normal curve	
Test	Kolmogorov-Smirnov and Shapiro-Wilk tests of goodness of fit performed on Entrepreneurial Leadership and Creative Response	
Purpose	To test if the cognitions of inbound students were normally distributed	
Result	**Entrepreneurial Leadership:** K-S: 0.200 S-W: 0.981	**Creative Response:** K-S: 0.200 S-W: 0.730 Null Hypothesis Rejected
Interpretation	Hypothesis was affirmed. The entrepreneurial cognitions of unfiltered inbound ISD students were distributed randomly as per the normal curve.	

Table 6-3
Résumé of the Testing of H1(b)

6.3.3 H2(a)

H2(a) was stated as follows:

> *Entrepreneurship education would develop definable entrepreneurial personality traits in outbound ISD students.*

H_0(2a) can therefore be stated as follows:

> *Entrepreneurship education would not develop definable entrepreneurial personality traits in outbound ISD students.*

Section 3.3 showed that students of courses featuring entrepreneurship modules were expected to possess heightened entrepreneurial personality traits as a direct result of their education. It was argued that outbound students that received entrepreneurship education should have exhibited stronger performance in the six personality traits associated with entrepreneurship when compared to the same traits possessed by inbound students. Outbound students that have studied entrepreneurship should have possessed a greater internal locus of control, greater creativity, greater desire for autonomy, be more open minded, possess a higher need for achievement and a greater propensity for risk taking than inbound students.

The GET test was deployed to collect data on locus of control, creativity, autonomy, need for achievement and risk-taking propensity. Data relating to the sixth trait, open-mindedness, was collected using Bradley's scale. An independent samples *t*-test was employed to compare data collected from outbound students that have studied entrepreneurship to data collected from inbound students.

Tables 6-4 and 6-5 showed that none of the five personality traits tested were statistically significant at the 0.05 level. A similar result was found for the overall GET score. Therefore H_0(2a) was not rejected which meant that there were no significant differences in the overall entrepreneurial personality traits of outbound students who received entrepreneurship education when compared to the same personality traits of inbound students.

		Inbound Students	Outbound students that have studied entrepreneurship	*p* values
Need for Achievement Max score = 12	n	44	38	
	$\bar{x}$	7.89	7.89	
	δ	1.73	1.52	0.982
Autonomy Max score = 6	n	44	40	
	$\bar{x}$	3.32	3.03	
	δ	1.20	1.17	0.259
Creativity Max score = 12	n	41	38	
	$\bar{x}$	6.61	6.89	
	δ	1.41	2.70	0.554
Risk Taking Max score = 12	n	42	40	
	$\bar{x}$	6.55	6.95	
	δ	1.85	1.72	0.312
Locus Of Control Max score = 12	n	43	38	
	$\bar{x}$	5.42	4.63	
	δ	2.04	1.89	0.077
GET Score Max score = 54	n	38	37	
	$\bar{x}$	29.97	29.14	
	δ	4.95	5.78	0.502

Table 6-4
Means and Standard Deviations of Inbound and Outbound Students on Measures of Enterprising Tendency

		Inbound students	Outbound students that have studied entrepreneurship	*p* values
Open-mindedness Max score = 5	n	43	39	
	$\bar{x}$	3.17	3.23	
	δ	0.41	0.36	0.456

Table 6-5
Means and Standard Deviations of for Categories of Outbound Students on Measures of Bradley's Openness to Change

Hypothesis Number	2(a)
Hypothesis	Entrepreneurship education would develop definable entrepreneurial personality traits in outbound ISD students.
Null Hypothesis (H_0)	Entrepreneurship education would not develop definable entrepreneurial personality traits in outbound ISD students.
Statistical statement of null hypothesis	$\mu_1 = \mu_2$ where: μ_1 = the mean personality trait score for inbound students μ_2 = the mean personality trait score for outbound students who received entrepreneurship education
Test	Independent samples *t*-tests comparing outbound students that received entrepreneurship education to outbound students that did not. The comparison was performed using six personality traits measures.
Purpose	To test if entrepreneurship education made any impact upon the entrepreneurial personality traits of those who receive it.
Result	The null hypothesis was not rejected.
Interpretation	Entrepreneurship education had no significant impact on the entrepreneurial personality traits of outbound students when compared to inbound students.

Table 6-6
Résumé of the Testing of H2(a)

Table 6-6 contained a résumé of the analysis, testing and interpretation of results pertaining to H2(a).

6.3.4 H2(b)

H2(b) was stated as follows:

> *Entrepreneurship education would develop definable entrepreneurial cognitions in outbound ISD students.*

H_0(2b) can therefore be stated as follows:

> *Entrepreneurship education would not develop definable entrepreneurial cognitions in outbound ISD students.*

Section 3.3 also addressed the role of entrepreneurship education in improving the entrepreneurial cognitions of ISD students. Not alone were students of courses featuring entrepreneurship modules expected to possess heightened entrepreneurial personality traits, they were expected to possess heightened entrepreneurial cognitions. It was argued that outbound students that received entrepreneurship education should have exhibited higher performance in two cognitions associated with entrepreneurship when compared to the same traits possessed by inbound students. Outbound students that have studied entrepreneurship should have possessed greater entrepreneurial leadership and a heightened creative response relative to inbound students. Inconsistency

The SSVS test was deployed to collect data on entrepreneurial leadership (calculated using Self-Transcendence and Self-Enhancement) and creative response (calculated from Conservation and Openness to Change). (See table 4-2 for the calculation of entrepreneurial leadership and creative response.) Once again, an independent

samples *t*-test was employed to compare data collected from outbound students that have studied entrepreneurship to data collected from inbound students.

		Inbound students	Outbound students that have studied entrepreneurship	*p* values
Self-Transcendence Max score = 7	n	45	39	
	$\bar{x}$	4.53	4.81	
	δ	1.68	1.72	0.462
Self-Enhancement Max score = 7	n	43	37	
	$\bar{x}$	3.90	3.40	
	δ	1.29	1.42	0.101
Entrepreneurial Leadership Max score = 6	n	43	37	
	$\bar{x}$	0.62	1.58	
	δ	2.21	2.15	0.055
Openness to Change Max score = 7	n	43	37	
	$\bar{x}$	4.22	4.23	
	δ	1.15	1.10	0.970
Conservation Max score = 7	n	42	39	
	$\bar{x}$	3.29	3.10	
	δ	1.24	1.56	0.558
Creative Response Max score = 6	n	41	37	
	$\bar{x}$	0.97	1.05	
	δ	1.62	2.08	0.837

Table 6-7
Means and Standard Deviations for Inbound and Outbound Students on Measures of Enterprising Cognitions

Table 6-7 showed that not one of the six cognitive variables tested were statistically significant at the 0.05 level. A substantial difference was found in the mean Entrepreneurial Leadership scores of Inbound Students compared to Outbound Students that had not studied entrepreneurship. However, the results were not statistically significant; a *p* value of 0.55 indicated that the Entrepreneurial Leadership results were marginally outside of the 0.05 significance level. Therefore H_0(2b) was

not rejected which meant that there were no significant differences in the overall entrepreneurial personality traits of outbound students who received entrepreneurship education when compared to the same personality traits of inbound students.

Hypothesis Number	2(b)
Hypothesis	Entrepreneurship education would develop definable entrepreneurial cognitions in outbound ISD students.
Null Hypothesis (H_0)	Entrepreneurship education would not develop definable entrepreneurial cognitions in outbound ISD students.
Statistical statement of null hypothesis	$\mu_1 = \mu_2$ where: μ_1 = the mean cognition score for inbound students μ_2 = the mean cognitions score for outbound students who received entrepreneurship education
Test	Independent samples *t*-tests comparing outbound students that received entrepreneurship education to outbound students that did not. The comparison was performed using six cognitive variables.
Purpose	To test if entrepreneurship education made any impact upon the entrepreneurial personality traits of those who receive it.
Result	The null hypothesis was not rejected.
Interpretation	Entrepreneurship education had no significant impact on the entrepreneurial cognitions of outbound students when compared to inbound students.

Table 6-8
Résumé of the Testing of H2(b)

Table 6-7 compared the entrepreneurial cognitions of outbound students who received entrepreneurship education relative to the same cognitions of inbound students. None of the cognitions considered in the test were statistically significant at the 0.05 level. Therefore H_0(2b) was rejected which meant that there were no significant differences

in the overall entrepreneurial cognitions of outbound students who received entrepreneurship education when compared to the same cognitions of inbound students. Table 6-8 was set out in order to provide a résumé of the analysis, testing and interpretation of results pertaining to H2(b).

6.3.5 H3(a)

H3(a) was stated as follows:

> *Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial personality traits than outbound students that have not studied entrepreneurship.*

H_0(3a) can therefore be stated as follows:

> *Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial personality traits than outbound students that have not studied entrepreneurship*

Section 3.3 argued that where an ISD degree had very few modules in entrepreneurship, the effect on the entrepreneurial personality traits of students would be negligible. In such situations entrepreneurship would account for such a small percentage of course content, it would have become so diluted as to have any appreciable effect on the personality traits of inbound students. Modules in entrepreneurship on IoT ISD degrees represented between 4% and 6% of total contact

hours. Such a small percentage of contact time, it was argued, would have had little or no effect on the personality traits of ISD students.

Once again, the GET test was deployed to collect data on locus of control, creativity, autonomy, need for achievement and risk-taking propensity. Bradley's scale was employed to measure the sixth trait, open-mindedness. Data using these two tests was collected from outbound students that had studied entrepreneurship and outbound students that had not studied entrepreneurship. The data from these two groups was compared using an independent samples *t*-test to discern the impact of entrepreneurship education on outbound students.

		Outbound students that have not studied entrepreneurship	**Outbound students that have studied entrepreneurship**	***p* values**
Need for Achievement Max score = 12	n	32	38	
	$\bar{x}$	8.00	7.89	
	δ	1.59	1.52	0.778
Autonomy Max score = 6	n	32	40	
	$\bar{x}$	3.53	3.03	
	δ	1.16	1.17	0.071
Creativity Max score = 12	n	31	38	
	$\bar{x}$	6.74	6.89	
	δ	1.71	2.70	0.785
Risk Taking Max score = 12	n	32	40	
	$\bar{x}$	7.22	6.95	
	δ	1.60	1.72	0.496
Locus Of Control Max score = 12	n	32	38	
	$\bar{x}$	5.38	4.63	
	δ	1.74	1.89	0.094
GET Score Max score = 54	n	31	37	
	$\bar{x}$	30.55	29.14	
	δ	4.52	5.78	0.273

Table 6-9
Means and Standard Deviations for Categories of Outbound Students on Measures of Enterprising Tendency

		Outbound students that have not studied entrepreneurship	Outbound students that have studied entrepreneurship	*p* values
Open-mindedness Max score = 5	n	29	39	
	$\bar{x}$	3.02	3.23	
	δ	0.33	0.36	0.016

Table 6-10
Means and Standard Deviations for Categories of Outbound Students on Measures of Bradley's Openness to Change

Tables 6-9 and 6-10 showed that not a single personality trait tested using the GET was statistically significant at the 0.05 level. In other words, no significant difference was found between among the GET personality traits of the two groups of students at a 5% confidence interval. Nevertheless, a different result was recorded for Bradley's measure of open-mindedness; it was found that outbound ISD students who studied entrepreneurship had a marginally (but significantly) greater mean open-mindedness score (0.21) than outbound ISD students who had not studied entrepreneurship (p = 0.016 < 0.05). Therefore H_0(3a) was not rejected. This implied that there was a significant difference of 0.21 in the overall entrepreneurial personality traits of outbound students who received entrepreneurship education when compared to the same personality traits of outbound students that did not receive entrepreneurship education. Table 6-11 was set out in order to provide a résumé of the analysis, testing and interpretation of results pertaining to H3(a).

Hypothesis Number	3(a)
Hypothesis	Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial personality traits than outbound students that have not studied entrepreneurship
Null Hypothesis (H_0)	Outbound ISD students that have studied only one entrepreneurship module would not possess stronger entrepreneurial personality traits than outbound students that have not studied entrepreneurship
Statistical statement of null hypothesis	$\mu_1 = \mu_2$ where: μ_1 = the mean personality trait scores for outbound students that have not studied entrepreneurship μ_2 = the mean personality trait scores for outbound students that have studied entrepreneurship
Test	Independent samples *t*-tests comparing outbound students that received entrepreneurship education to outbound students that did not. The comparison was performed using six personality traits measures.
Purpose	To test if small quantities of entrepreneurship education have any appreciable effect on the entrepreneurial personality traits of those who receive it.
Result	The null hypothesis was rejected.
Interpretation	Entrepreneurship education had a statistically significant impact on the open-mindedness personality trait of outbound students that received entrepreneurship education relative to outbound students that have not received entrepreneurship education.

Table 6-11
Résumé of the Testing of Hypothesis 3(a)

6.3.6 H3(b)

H3(b) was stated as follows:

> *Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial cognitions than outbound students that have not studied entrepreneurship.*

H_0(3b) can therefore be stated as follows:

> *Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial cognitions than outbound students that have not studied entrepreneurship*

The limited impact of one entrepreneurship module on ISD students' entrepreneurial cognitions was also considered in section 3.3. In situations where entrepreneurship accounts for a very small percentage of timetabled hours on an ISD degree, it was hypothesised that the module will have no effect on a student's entrepreneurial cognitions. Therefore it was argued that the entrepreneurial cognitions of outbound students that have studied entrepreneurship will not be significantly greater than the entrepreneurial cognitions of outbound students that have not studied entrepreneurship.

The SVSS test was deployed to both groups of outbound students. Data was collected pertaining to two cognitions associated with entrepreneurship: entrepreneurial leadership (calculated using Self-Transcendence and Self-Enhancement) and creative

response (calculated from Conservation and Openness to Change). The data for the two groups of students was compared using an independent samples *t*-test.

		Outbound students that have not studied entrepreneurship	Outbound students that have studied entrepreneurship	*p* values
Self-Transcendence Max score = 7	n	32	39	
	$\bar{x}$	4.09	4.81	
	δ	1.65	1.72	0.079
Self-Enhancement Max score = 7	n	31	37	
	$\bar{x}$	3.88	3.40	
	δ	1.31	1.42	0.150
Entrepreneurial Leadership Max score = 6	n	31	37	
	$\bar{x}$	0.18	1.58	
	δ	2.56	2.15	0.017
Openness to Change Max score = 7	n	32	37	
	$\bar{x}$	4.31	4.23	
	δ	1.10	1.10	0.769
Conservation Max score = 7	n	32	39	
	$\bar{x}$	3.34	3.10	
	δ	1.47	1.56	0.508
Creative Response Max score = 6	n	32	37	
	$\bar{x}$	0.97	1.05	
	δ	1.92	2.08	0.861

Table 6-12
Means and Standard Deviations for Categories of Outbound Students on Measures of Enterprising Cognitions

Table 6-12 showed that one of the six cognitive variables tested was statistically significant at the 0.05 level – entrepreneurial leadership ($p = 0.017 < 0.05$). The mean difference between the two groups of students was substantial: those who had studied entrepreneurship possessed a mean entrepreneurial leadership score of 1.58 compared to 0.18 for those that did not. No significant difference was found for the remaining entrepreneurial cognition, creative response ($p = 0.861 < 0.05$).

H_0(3b) was therefore rejected, i.e. a significant difference was found in the overall entrepreneurial cognitions of outbound students who received entrepreneurship education when compared to the same cognitions of outbound students who had not received entrepreneurship education. Table 6-13 was set out in order to provide a résumé of the analysis, testing and interpretation of results pertaining to H3(b).

Hypothesis Number	3(b)
Hypothesis	Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial cognitions than outbound students that have not studied entrepreneurship
Null Hypothesis (H_0)	Outbound ISD students that have studied only one entrepreneurship module would not possess stronger entrepreneurial cognitions than outbound students that have not studied entrepreneurship
Statistical statement of null hypothesis	$\mu_1 = \mu_2$ where: μ_1 = the mean cognition scores for outbound students that have not studied entrepreneurship μ_2 = the mean cognition scores for outbound students that have studied entrepreneurship
Test	Independent samples *t*-tests comparing outbound students that received entrepreneurship education to outbound students that did not. The comparison was performed using six cognitive variables.
Purpose	To test if small quantities of entrepreneurship education have any appreciable effect on the entrepreneurial cognitions of those who receive it.
Result	The null hypothesis was rejected.
Interpretation	Entrepreneurship education had a significant impact on the Entrepreneurial Leadership cognitive variable of outbound students that received entrepreneurship education relative to outbound students that have not received entrepreneurship education.

Table 6-13
Résumé of the Testing of H3(b)

6.4 Summary of Hypotheses

The outcomes of the null hypotheses tests outlined in this chapter are summarised in Table 6-14.

Number	Hypothesis	Outcome
1(a)	The entrepreneurial personality traits of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.	Affirmed
1(b)	The entrepreneurial cognitions of unfiltered inbound ISD students would be found to be distributed randomly as per the normal curve.	Affirmed
2(a)	Entrepreneurship education would develop definable entrepreneurial personality traits in outbound ISD students.	Rejected
2(b)	Entrepreneurship education would develop definable entrepreneurial cognitions in outbound ISD students.	Rejected
3(a)	Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial personality traits than outbound students that have not studied entrepreneurship.	Rejected
3(b)	Outbound ISD students that have studied only one entrepreneurship module would not possess significantly stronger entrepreneurial cognitions than outbound students that have not studied entrepreneurship.	Rejected

Table 6-14
Summary of Hypotheses Testing and Results

6.5 Conclusion

This chapter tested the research hypotheses developed in sections 3.3 and 3.4. The hypotheses were presented individually in their null forms and were tested using appropriate statistical techniques. The results of each test was recorded and interpreted. The results of the hypotheses tests formed the basis of chapter 7. Table 6-15 listed the topics addressed in this chapter.

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Research Hypothesis
Chapter 4	Research Design
Chapter 5	Classification Of Data
Chapter 6	Analysis Of Statistical Data
6.1	Introduction
6.2	A Review of the Research Hypotheses
6.3	Testing the Hypotheses
6.3.1	Hypothesis 1(a)
6.3.2	Hypothesis 1(b)
6.3.3	Hypothesis 2(a)
6.3.4	Hypothesis 2(b)
6.3.5	Hypothesis 3(a)
6.3.6	Hypothesis 3(b)
6.4	Summary of Null Hypotheses
6.5	Conclusion
Chapter 7	Discussion of Findings

Table 6-15
Structure of Chapter 6 and the Research Process

Chapter 7 – Discussion of Findings

7.1 Introduction

This chapter draws conclusions and implications from the research findings.

7.2 General Findings

The stated objective of this research was to ascertain the degree to which entrepreneurial personality traits and cognitions were developed by the third-level educational process. Chapters 3, 4, 5 and 6 detailed the various personality traits and cognitions associated with entrepreneurship. A representative sample of ISD students studying in Irish IoTs was selected and a research instrument was designed and deployed to measure entrepreneurial personality traits and cognitions. The resulting data was analysed and the effects that the third-level educational process had upon the entrepreneurial personality traits and cognitions of third-level students was measured. Therefore the research objective was successfully achieved.

The research objective gave rise to four research questions (RQs). The research questions and answers which emerged from this study were:

RQ1: How entrepreneurial are ISD students?

Answer: ISD students in IoTs were no more entrepreneurially-minded than the general population. The lack of pre-testing of applicants to ISD courses resulted in courses being populated by students that did not have a proclivity towards entrepreneurship.

RQ2: How effective are entrepreneurship modules on ISD courses at strengthening entrepreneurial personality traits amongst ISD students?

Answer: Entrepreneurship modules had no significant effect on the following entrepreneurial personality traits: need for achievement, autonomy, creativity, locus of control or propensity to take risks. Entrepreneurship modules increased the open-mindedness of final year students who studied entrepreneurship when compared to final year students who did not study entrepreneurship.

RQ3: How effective are entrepreneurship modules on ISD courses at strengthening entrepreneurial cognitions amongst ISD students?

Answer: Entrepreneurship modules had no significant effect upon the creative response entrepreneurial cognition. A significant increase in entrepreneurial leadership was measured amongst final year students who studied entrepreneurship when compared to final year students who did not study entrepreneurship.

RQ4: Are ISD courses designed to improve the entrepreneurial potential of students who partake in these courses?

Answer: In short, the vast majority of ISD courses were not designed to improve the entrepreneurial potential of students who undertook these courses. Table 4-7 showed that approximately 80% of IoT ISD courses did not offer any entrepreneurship tuition whatsoever; those that did offered a maximum of one single module in entrepreneurship. One single module in entrepreneurship was sufficient to positively impact only one of the six personality traits considered and one entrepreneurial cognition (of the two considered).

7.3 Detailed Findings

7.3.1 Unfiltered ISD Students

This research assessed the entrepreneurial personality traits of inbound students. Entrepreneurial personality traits consisted of: need for achievement, internal locus of control, creativity, autonomy, a propensity for taking risks and open-mindedness. It was found that the distribution of all six personality traits, along with a composite measure of entrepreneurial tendency (the overall GET score) were distributed normally. The distribution of entrepreneurial personality traits among inbound students followed a bell-curve in much the same way as would any other random variable.

Irish IoT ISD courses did not profile applicants based upon their entrepreneurial ability. This has resulted in the entrepreneurial personality traits of inbound students being distributed no differently from those of the background general population.

A similar test was conducted on the cognitions of inbound students. Two cognitions were identified as being relevant to entrepreneurial endeavour: creative response and entrepreneurial leadership. It was found once again that the absence of pre-testing for entrepreneurship led to the random distribution of entrepreneurial cognitions among inbound ISD students.

Ducheneaut (2001) proposed that prospective students should be psychologically profiled before being admitted to university entrepreneurship courses. If psychological profiling of ISD degree applicants for the six entrepreneurial personality traits and both cognitions were conducted and positions on the courses

were awarded to those with a high entrepreneurial tendency, it would lead to a greater prevalence of potential entrepreneurs studying for ISD degrees.

7.3.2 Effectiveness of Entrepreneurship Modules on ISD Courses

No statistical difference was found between the entrepreneurial personality traits of inbound students and outbound students that had studied entrepreneurship. Therefore the logical conclusion was that modules in entrepreneurship offered on ISD degrees in IoTs do not create definable personality traits amongst students of these courses.

Section 2.4 described how effective entrepreneurship education should develop a student's proclivity towards entrepreneurial intention. If outbound students' tendency toward entrepreneurship had strengthened, it was not evidenced by changes in their entrepreneurial personality traits. The results showed that students had not increased their need for achievement, their autonomy, their creativity, they will have not have shifted their locus of control to a more external focal point and they will be no more likely to take risks or be open-minded than if they had never studied entrepreneurship.

It is possible that the entrepreneurship modules featured in this study are in some way deficient. This deficiency may lie in the design or implementation of these entrepreneurship modules. For example, problems may exist with the lack of applicant screening or poor timetabling of these modules. It was shown in Section 2.4.4 that little uniformity existed between entrepreneurship courses; this too is true of entrepreneurship courses featured in this research. The ensuing confusion that arises from an apparent lack of uniformity may have impacted curriculum design and structure.

The findings relating to entrepreneurial cognitions were consistent with those for personality traits: no statistical difference was found between entrepreneurial cognitions of inbound students and outbound students that had studied entrepreneurship. ISD entrepreneurship modules were ineffective at developing either entrepreneurial leadership or a creative response cognition among students that had taken entrepreneurship modules.

Therefore graduates of IoT ISD degrees will lack the ability to recognise opportunities to do things in new ways, outside of the range of existing practice. This apparent inability to open themselves to change, this lack of a creative response mechanism, inhibits their ability to act in an entrepreneurial fashion.

Graduates too will possess under-developed entrepreneurial leadership cognitions; they will be found short of self-transcendence relative to their self-enhancement values. In short they will lack humility, and as shown in Section 2.2.3.2, a person who values humility will possess a key entrepreneurial cognition: entrepreneurial leadership. A lack of entrepreneurial leadership would inhibit the inclination toward future entrepreneurial endeavour.

The underlying causes for the ineffectiveness of entrepreneurship modules offered on ISD courses at creating an entrepreneurial mind-set are unclear. However, any re-appraisal of entrepreneurship education should first target the application process or timetabling of these modules.

7.3.3 ISD Education and Entrepreneurial Tendencies

The statistical comparison of the entrepreneurial personality traits of outbound students who studied one entrepreneurship module and the entrepreneurial personality

traits of outbound students that had not studied entrepreneurship gave rise to some interesting findings. No significant differences were found in all but one of the six personality traits tested. Further, the composite score of enterprising tendency showed no significant difference between the two groups. The only difference of statistical significance was encountered on Bradley's measure of open-mindedness (p=0.016<0.05). The mean open-mindedness score for outbound students that had not studied entrepreneurship (from a theoretical maximum of 5) was 3.02. The mean for outbound students that had studied entrepreneurship was 3.23. A mean difference of 0.21 was calculated from subtracting the first score from the second, indicating that students who studied entrepreneurship had a statistically significant slightly higher score in open-mindedness. At a 5% confidence interval, no significant difference was found between the two groups in measures of need for achievement, autonomy, locus of control, creativity and risk-taking propensity. Entrepreneurship modules had little effect on the students of ISD courses.

The evidence in favour of one module in entrepreneurship being sufficient to impact the personality traits of students in general was weak. It has been demonstrated that studying one module had no effect on five entrepreneurial personality traits and no significant effect on overall entrepreneurial tendency. Its effect on the sixth personality trait, open-mindedness, although statistically significant, was minimal (an improvement of 0.21 on a scale of 1 to 5).

Insufficient timetabling of entrepreneurship modules may have been the cause of this problem. One module, 36 hours of lectures, represented 6% of contact hours on an ordinary degree and 4% on an honours degree. It appeared that one module in

entrepreneurship is sufficient to heighten one entrepreneurial personality trait (open-mindedness).

The entrepreneurial cognitions of outbound students who studied entrepreneurship were compared to the entrepreneurial cognitions of outbound students that had not studied entrepreneurship. The variables of interest were the entrepreneurial cognitions creative response and entrepreneurial leadership. Section 5.2 reported that significant differences were found between the two groups in entrepreneurial leadership (p=0.017<0.05), no difference of any significance was found for creative response (p=0.861>0.05). One single module in entrepreneurship appeared to be sufficient to have a positive effect on one of the two cognitions considered.

The inability of entrepreneurship education to develop a creative response cognition echoed the work of Ward (discussed in section 2.2.2.5). Ward was of the opinion that a paradoxical relationship existed between knowledge and creativity: that organising knowledge into cognitive structures (i.e. education in this context) prevented people from developing new ideas (i.e. to act or think in an innovative fashion). Third-level ISD education may have played a similar role in inhibiting the creative response cognition of both groups in outbound students.

The results for entrepreneurial leadership suggested a positive relationship between entrepreneurship education and this cognition. The score for outbound students that had not studied entrepreneurship was very low at 0.18 (out of a possible maximum of 6). By comparison, the mean entrepreneurial leadership score for outbound students that had studied entrepreneurship was considerably greater, at 1.58, leading to a mean difference of 1.40 in favour of those who studied entrepreneurship. Viewed in terms of order of magnitude, outbound students that studied entrepreneurship possessed an

entrepreneurial leadership score that was 7.8 times greater than outbound students that had not studied entrepreneurship.

Therefore it was clear that outbound students who studied entrepreneurship possessed a heightened entrepreneurial leadership relative to their outbound colleagues who did not study entrepreneurship. It was possible that one module of entrepreneurship education was sufficient to increase one of the two entrepreneurial cognitions considered in this research. Based upon this finding, it would have been logical to conclude that inbound students would possess significantly weaker entrepreneurial cognitions than outbound students who had studied entrepreneurship. This was shown not to be the case in section 7.3.2, thereby giving rise to an apparent anomaly. Students who studied entrepreneurship possessed greater entrepreneurial leadership cognitions than *some* students that had not studied entrepreneurship. Interestingly, outbound students that did not study entrepreneurship possessed a lower mean entrepreneurial leadership score than inbound students. However, the difference was not statistically significant (p=0.418>0.05)

A number of conditions may have given rise to the significant difference between the entrepreneurial leadership levels amongst outbound students who studied entrepreneurship compared to outbound students that did not. It was possible that one module of entrepreneurship was sufficient to elevate the entrepreneurial leadership ability of outbound students relative to their final year peers who did not study entrepreneurship. The aforementioned anomaly confounded this line of reasoning: increased entrepreneurial leadership should have also been demonstrated amongst outbound students who studied entrepreneurship relative to inbound students. This was found not to be the case, so alternative possibilities had to be considered. A more

probable alternative was that the entrepreneurial leadership ability of inbound students declined as they progressed through college. The reasons for such a decline were not clear (clarification of these reasons will require further research). Unchecked, this decline would have resulted in lower entrepreneurial leadership scores amongst outbound students who had not studied entrepreneurship relative to those that had: this was demonstrated to be the case. Checked, the decline would have been arrested, perhaps even reversed. Evidence to confirm such a speculation would have taken the form of similar (or higher) entrepreneurial leadership scores of outbound students (who studied entrepreneurship) relative to inbound students' scores. This, again, was proved not to be the case. The intervening variable, the factor which arrested the decline in entrepreneurial leadership, may have been a single module in entrepreneurship education, or it may have been some other unrecognised variable. Further research is required to refute or affirm the speculation that third level ISD education has an adverse effect on entrepreneurial leadership, and that entrepreneurship education can arrest this decline.

7.4 Implications

This research project examined the role of ISD education in the development of the entrepreneurial personality. The objective of the research was to ascertain the degree to which entrepreneurial personality traits and cognitions were developed by the ISD third-level educational process. The implications and repercussions of the research findings are wide-ranging and manifold. The research findings (detailed in section 7.3) are relevant to fields as diverse as training and education, policy making and macro-economics.

The first implication of this research is of concern to ISD educationalists, as it relates to the design of entrepreneurship modules and courses. It was stated in section 1.1 that entrepreneurial skills can be greatly enhanced by teaching entrepreneurship, but only if entrepreneurship modules were effectively developed and integrated in a coherent fashion into the curriculum. This research found that the design and implementation of entrepreneurship modules on IoT ISD degrees was of questionable effectiveness. Two implications in particular are of interest to educationalists.

Firstly, the inputs to the ISD educational process – inbound students – are not psychologically profiled prior to admission. Therefore no effort is made to find potential ISD students that possess a natural proclivity to entrepreneurship. If the situation remains unchanged applicants that are accepted on to courses will continue to be no more likely to be entrepreneurial than the general population. If inbound students were pre-tested for entrepreneurial personality traits and cognitions two benefits may be achievable. The first benefit is that entrepreneurship modules could be tailored to meet the requirements of each group of students, depending on the group's entrepreneurial tendency. By way of example, if a group of students possessed very low creative response scores the module(s) may be tailored to meet these demands. Education could directly target the needs of the student. This leads to the second benefit – an increase in the percentage of ISD graduates willing and able to consider enterprise as a career choice. The advantages of entrepreneurial endeavour for an economy were described in section 1.1.

The second set of implications pertains to the ISD educational process. This research found that entrepreneurial modules on ISD degrees only impact one entrepreneurial personality trait (open-mindedness) and one entrepreneurial cognition (entrepreneurial

learning). No effect was recorded on five other personality traits and one other cognition. Clearly, something is defective in the ISD educational process. Administrators of timetable schedules and designers of ISD course curricula need to assess their individual inputs to the educational process for any defects which may be responsible for reducing the efficacy of entrepreneurial education on ISD courses.

Timetabling of entrepreneurship modules appears to be particularly problematic. Government policy has suggested that entrepreneurship education should be *embedded* in all technical degrees, yet only 20% of IoT ISD degrees offered a maximum of one module in entrepreneurship, the remainder offer none at all. There appears to be a disconnect between educational policy and educational practice; reasons for this disconnect are not obvious, further research is required in this area. The education of entrepreneurship takes a very low priority on those IoT ISD degrees which do elect to feature it as a module: it accounted for only 4% of contact time on honours degrees and 6% on ordinary degrees. It was obvious from this research that one single module in entrepreneurship was insufficient to significantly strengthen five of the six entrepreneurial personality traits (need for achievement, autonomy, propensity to take risks, tendency toward an external locus of control and creativity) and one of the two entrepreneurial cognitions (creative response). A statistically significant positive relationship was found between offering one module of entrepreneurship and open-mindedness, but the positive effect was very small, leading to a 0.21 improvement on a scale of 1 to 5. Offering one single module in entrepreneurship profoundly impacts only one of the psychological variables considered – a cognition - entrepreneurial leadership. Clearly timetable administrators and course leaders need to review the percentage of time allocated to

entrepreneurship modules if these modules are to have the desired effect of increasing entrepreneurial tendency on a broader scale among ISD graduates.

The findings of this research will also be of direct relevance to policy-makers and economists. Section 1.1 described how the source of economic growth in the ROI has shifted from FDI to domestic spending. Traded services, including software development, play a critical role in national economic growth. Entrepreneurship is another vital factor in creating economic growth throughout the EU. Significant quantities of government spending are targeted at promoting indigenous research and development activity and supporting entrepreneurial endeavour to create a more prosperous economy in the longer term. Section 1.1 showed that the education and development of entrepreneurs was widely believed to play a key role in fostering future economic activity. This research study found that entrepreneurship education of ISD students was, for the most part, ineffective. The vast majority of IoT ISD degrees did not offer entrepreneurship modules. Those that did offered one entrepreneurship module to their students. Despite the billions that are being spent on developing R&D activity and promoting entrepreneurship as a career option, students of IoT ISD degrees are no more inclined to engage in entrepreneurship than they were before they entered third-level education. Students are not receiving enough entrepreneurship education. ISD faculty that design ISD degrees seem to have a lack of awareness of the role that high-technology enterprise can play in future economic development; as a consequence entrepreneurship is allocated few hours (if any at all) when courses are being designed. This pattern suggests that tax-payers money is being wasted if it is not used to promote the role of entrepreneurship amongst educationalists or if it is not allocated to developing a spirit of entrepreneurship and entrepreneurial abilities in the highly-skilled ISD work-force of the future. IoTs put

considerable effort into developing the technical ISD skills of their students, but they are singularly failing in seeding entrepreneurial ability in their students.

In the words of Forfás (2007b, p.49):

> *"If Ireland is to make the leap to being one of the most entrepreneurial countries in the world, characterised by a pervasive entrepreneurial culture and recognised for the innovative quality of its entrepreneurs, education must be central to the achievement of that vision."*

Unfortunately, the Irish economy cannot depend on the ISD courses offered in its IoTs to achieve this vision.

7.5 Limitations

The research findings and implications presented in sections 7.2 and 7.3 must be considered in the light this project's limitation:

Due to time constraints, only ISD degrees taught at WIT were represented in the research sample. Whilst WIT is representative of the IoT sector, it is only one of fifteen IoTs in Ireland. This research does not conclusively establish if students of other IoTs throughout Ireland would possess similar entrepreneurial personality traits or cognitions to those in WIT.

7.6 Recommendations

Based upon the results and implications of the research presented with this work, the following recommendations can be made:

Entrepreneurship modules on IoT ISD courses have little or no effect on the personality traits or cognitions of ISD students. Existing ISD degrees should be reviewed with the aim of integrating entrepreneurship into the ISD curriculum. This would involve increasing the amount of entrepreneurship modules offered on ISD degrees; one single module is insufficient to have any lasting impact on students. Increasing both the quality and quantity of entrepreneurship modules would be in line with recent Irish government policy.

Students of ISD degrees should be profiled using measures of entrepreneurial tendency before commencing modules in entrepreneurship. The results of this exercise could inform the design and deployment of IoT ISD curricula. Thus, the module could be tailored to the learning needs of that particular group of students, addressing any shortfall in entrepreneurial personality traits or cognitions that group of students may possess.

A review of government spending on the promotion of entrepreneurship should also be conducted. For the most part, students of IoT ISD degrees are no more likely to possess entrepreneurial personality traits or cognitions than they were before they entered third-level education. These students are the highly-skilled workforce of the future; if the Irish government is to be successful in commercialising R&D activity then it needs to reconsider its spend on entrepreneurship education. Presently, it is failing to engender a sprit of enterprise among those most likely to conduct ISD research and development. Taxpayer's money would be better invested in improving the quality and quantity of entrepreneurship education on high-technology courses such as ISD.

7.7 Further Research

There is scope for further research in a number of areas:

1. The effect of third-level education on entrepreneurial personality traits and cognitions requires further research. Section 7.3.3 speculated that the educational system may have an adverse impact upon many of these traits and cognitions. Further investigation is required to refute or affirm this speculation.

2. Further research is required to determine if a template of best educational practice can be designed to maximise the effectiveness of entrepreneurship modules. The template would specify how entrepreneurship modules can be successfully embedded into IoT ISD degrees, serving to maximise the entrepreneurship personality traits and cognitions of IoT ISD students.

3. It was found that entrepreneurship education has little or no effect on ISD students in Irish IoTs. Research featuring samples from other HEIs would be required to test if this finding is repeated throughout the HEI sector in the ROI and beyond.

7.8 Conclusion

Chapter 7 analysed this research project's findings and answered the research questions posed at the outset of the study in chapter 1. Conclusions, implications and recommendations were drawn from these findings. Limitations to the research were stated and possibilities for further research were considered. The topics addressed in this chapter are outlined in Table 7-1.

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Research Hypothesis
Chapter 4	Research Design
Chapter 5	Classification Of Data
Chapter 6	Analysis Of Statistical Data
Chapter 7	Discussion of Findings
7.1	Introduction
7.2	General Findings
7.3	Detailed Findings
7.2.1	Unfiltered ISD Students
7.2.2	Effectiveness of Entrepreneurship Modules on ISD courses
7.2.3	Design of ISD Courses
7.4	Implications
7.5	Limitations
7.6	Recommendations
7.7	Further Research
7.8	Conclusion

Table 7-1
Structure of Chapter 7 and the Research Process

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Appendices

Appendix A - Tables

Rank Order	Issue
1	Breaking into new markets
2	Cash flow and liquidity
3	Staff recruitment
4	Competition
5	Exporting
6	Raising finance
7	Environmental regulations
8	Obtaining patents
9	Managing staff
10	Licensing
11	Late payment
12	Obtaining ISO 9000/quality
13	Staff retention
14	Obtaining insurance
15	Other issues

Table 1
Rank order of important issues
(Boussouara and Deakins, 1999, p.220)

Order	Needs
1	Using cash flow
2	Financing growth
3	Increasing value of business
4	Compensation for self and associates
5	Hire, train, and motivate for growth
6	Succeeding in rapidly changing world
7	Successful selling
8	Sales force management
9	Management succession
10	Problems and pitfalls of growth

Table 2
Entrepreneurial Learning Needs
(Sexton et al, 1997, p5)

Source of Information	Frequency
Business roundtable	43.0%
Half-day seminar	23.0%
Nothing or other	11.3%
Video Tape or CD	5.5%
One day seminar	5.0%
Audio cassette	4.9%
Private consultant	4.9%
Computer bulletin board	2.4%

Table 3
Preferred Sources of Information
(Sexton et al, 1997, p6)

Appendix B – Comparison of GET tests

Question Number	Question wording
2	GET: When I have to set my own targets, I set difficult rather than easy ones. GET2: I like to test boundaries and go where no one has gone before.
6	GET: I usually defend my point of view if someone disagrees with me. GET2: 1 have strong opinions and find it difficult to switch off from work.
9	GET: If I had to gamble £1, I would rather buy a raffle ticket than play cards. GET2: 1 would rather buy a lottery ticket than enter a competition.
11	GET: I would prefer to have a reasonable income in a job that I was sure of keeping rather than in a job that I might lose if I did not perform well. GET2: 1 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	GET: I like to do things in my own way without worrying about what other people think. GET2: At work, I often takeover projects and steer them my way without worrying about what other people think.
14	GET: I like to find out about things even if it means handling some problems whilst doing so. GET2: Sometimes I think about information almost obsessively until I come up with new ideas and solutions.
16	GET: When I make plans to do something, I nearly always do what I plan. GET2: When I make plans I nearly always achieve them.
17	GET: I do not like sudden changes in my life.

Question Number	Question wording
	GET2: I do not like unexpected changes to my weekly routines.
18	GET: I will take risks if the chances of success are 50/50. GET2: If I wanted to achieve something and the chances of success were 50/50 I would take the risk.
20	GET: If I had a good idea for making some money, I would be willing to borrow some money to enable me to do it. GET2: 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	GET: When I am in a group I am happy to let someone else take the lead. GET2: I like a lot of guidance to be really clear about what to do in work.
23	GET: I do not like guessing. GET2: I am wary of new ideas, gadgets and technologies.
25	GET: I will get what I want from life if I please the people with control over me. GET2: I try to accept that things happen to me in life for a reason.
30	GET: When tackling a task I rarely need or want help. GET2: I rarely need or want any assistance and like to put my own stamp on work that I do.
40	GET: For me, getting what I want has little to do with luck. GET2: For me, getting what I want is a just reward for my efforts.
43	GET: I believe that what happens to me in life is determined mostly by other people. GET2: I believe that destiny determines what happens to me in life.
44	GET: I can handle a lot of things at the same time. GET2: I like to spend time with people who have different ways of

Question Number	Question wording
	thinking.
48	GET: Most people think that I am stubborn. GET2: I get annoyed if superiors or colleagues take credit for my work.
54	GET: I like to start new projects that may be risky. GET2: I like to start interesting projects even if there is no guaranteed payback for the money or time I have to put in.

Table 1
Résumé of the Differences in Question Wording between GET and GET2

Appendix C – Classification of Survey Respondents

n = 117		Respondent's Age					Gender Total
		15-24	25-34	35-44	45-54	55-64	Table %
Respondent's Gender	Male	48.7%	17.9%	4.3%	0.9%	1.7%	**73.5%**
	Female	17.9%	5.1%	2.5%	0%	0.9%	**26.5%**
Age Total		**66.6%**	**23.1%**	**6.8%**	**0.9%**	**2.6%**	**100.0%**

Table 1
Respondents' Gender and Age Compared

n = 117		Nationality Total
		%
Respondent's Nationality	Irish	**85.5%**
	Chinese	**4.3%**
	British	**1.7%**
	Russian	**1.7%**
	Polish	**1.7%**
	Pakistani	**0.9%**
	Malawian	**0.9%**
	Ukrainian	**0.9%**
	South African	**0.9%**
	Spanish	**0.9%**
	Iraqi	**0.9%**
Gender Total	**%**	**100.0%**

Table 2
Respondents' Nationality

n = 117	Count	%
Day	102	87.2%
Night	15	12.8%

Table 3
Respondents' Mode of Study

Appendix D - Research Instrument

Section 1 - Introduction

1. There are three sections to this survey, please take some time to complete all three sections.

2. Please read all instructions carefully.

3. This survey should take no longer than 25 minutes to complete.

4. All answers will be treated with the utmost confidence.

5. Please record the name of your course and your year of study and your personal details in the table below.

Please **circle** your answer:

1. What age are you?	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65+**
2. Are you male or female?		**Male**			**Female**	
3. Are you a mature student?		**Yes**			**No**	
4. Nationality?	_____					
5. What course are you studying?	_____					
6. What year are you in?		**1**	**2**	**3**	**4**	
7. Have you ever studied entrepreneurship in **school**?		**Yes**			**No**	
8. Have you ever studied entrepreneurship in **college**?		**Yes**			**No**	
9. Have you ever set up your own company?		**Yes**			**No**	

Section 2

Instructions

There are 72 questions in section 1. It should take no more than 15 minutes to complete.

There are no right or wrong answers; you are asked to decide if you tend to agree or disagree with each statement. For each statement circle the answer which best expresses your views. Answer quickly and honestly since this gives the best picture of yourself.

Completing the Questionnaire:

For example look at Statement 1.

If you agree with this statement then circle **Agree**.

If you disagree with the statement, then circle **Disagree**.

If you neither fully agree nor fully disagree then try to decide whether you agree with it more or whether you disagree with it more and circle Agree or Disagree.

		Please circle your answer	
Q1	I would not mind routine unchallenging work if the pay was good.	**Agree**	**Disagree**
Q2	When I have to set my own targets, I set difficult rather than easy ones.	**Agree**	**Disagree**
Q3	I do not like to do things that are novel or unconventional.	**Agree**	**Disagree**
Q4	Capable people who fail to become successful have not taken chances when they have occurred.	**Agree**	**Disagree**
Q5	I rarely need or want any assistance and like to put my own stamp on work that I do.	**Agree**	**Disagree**
Q6	I rarely day dream.	**Agree**	**Disagree**
Q7	I usually defend my point of view if someone disagrees with me.	**Agree**	**Disagree**
Q8	You are either naturally good at something or you are not, effort makes no difference.	**Agree**	**Disagree**
Q9	Sometimes people find my ideas unusual.	**Agree**	**Disagree**
Q10	I try to accept that things happen to me in life for a reason.	**Agree**	**Disagree**
Q11	For me, getting what I want is a just reward for my efforts.	**Agree**	**Disagree**
Q12	If I had to gamble €1, I would rather buy a raffle ticket than play cards.	**Agree**	**Disagree**
Q13	I like challenges that really stretch my abilities rather than things I can do easily.	**Agree**	**Disagree**
Q14	I would prefer to have a reasonable income in a job that I was sure of keeping rather than in a job that I might lose if I did not perform well.	**Agree**	**Disagree**
Q15	I like to do things in my own way without worrying about what other people think.	**Agree**	**Disagree**
Q16	Many of the bad times that people experience are due to bad luck.	**Agree**	**Disagree**
Q17	I like to find out about things even if it means handling some problems whilst doing so.	**Agree**	**Disagree**
Q18	If I am having problems with a task I leave it and move on to something else.	**Agree**	**Disagree**
Q19	When I make plans to do something, I nearly always do what I plan.	**Agree**	**Disagree**
Q20	I do not like sudden changes in my life.	**Agree**	**Disagree**
Q21	I will take risks if the chances of success are 50/50.	**Agree**	**Disagree**
Q22	I think more of the present and the past than of the future.	**Agree**	**Disagree**
Q23	If I had a good idea for making some money, I would be willing to borrow some money to enable me to do it.	**Agree**	**Disagree**
Q24	I like to start interesting projects even if there is no guaranteed payback for the money or time I have to put in.	**Agree**	**Disagree**
Q25	When I am in a group I am happy to let someone else take the lead.	**Agree**	**Disagree**

		Please circle your answer	
Q26	People generally get what they deserve.	**Agree**	**Disagree**
Q27	I do not like guessing.	**Agree**	**Disagree**
Q28	It is more important to do a job well than to try to please people.	**Agree**	**Disagree**
Q29	I do not like unexpected changes to my weekly routines.	**Agree**	**Disagree**
Q30	I will get what I want from life if I please the people with control over me.	**Agree**	**Disagree**
Q31	Other people think that I ask a lot of questions.	**Agree**	**Disagree**
Q32	I believe that destiny determines what happens to me in life.	**Agree**	**Disagree**
Q33	If there is a chance of failure I would rather not do it.	**Agree**	**Disagree**
Q34	I get annoyed if people are not on time.	**Agree**	**Disagree**
Q35	Before I make a decision I like to have all the facts no matter how long it takes.	**Agree**	**Disagree**
Q36	I like a lot of guidance to be really clear about what to do in work.	**Agree**	**Disagree**
Q37	When tackling a task I rarely need or want help.	**Agree**	**Disagree**
Q38	When I make plans I nearly always achieve them.	**Agree**	**Disagree**
Q39	Success cannot come unless you are in the right place at the right time.	**Agree**	**Disagree**
Q40	I prefer to be quite good at several things rather than very good at one thing.	**Agree**	**Disagree**
Q41	Sometimes I think about information almost obsessively until I come up with new ideas and solutions.	**Agree**	**Disagree**
Q42	I would rather work with a person I liked, but who was not very good at the job, than work with someone I did not really like who was very good at the job.	**Agree**	**Disagree**
Q43	I am wary of new ideas, gadgets and technologies.	**Agree**	**Disagree**
Q44	Being successful is the result of working hard, luck has nothing to do with it.	**Agree**	**Disagree**
Q45	I like to spend time with people who have different ways of thinking.	**Agree**	**Disagree**
Q46	I prefer doing things in the usual way rather than trying out new ways.	**Agree**	**Disagree**
Q47	Before making an important decision, I prefer to weigh up the pros and cons rather quickly rather than spending a lot of time thinking about it.	**Agree**	**Disagree**
Q48	At work, I often takeover projects and steer them my way without worrying about what other people think.	**Agree**	**Disagree**
Q49	I would rather work on a task as a member of a team than to take responsibility for it myself.	**Agree**	**Disagree**
Q50	I would rather take an opportunity that might lead to even better things than have an experience that I am sure to enjoy.	**Agree**	**Disagree**

		Please circle your answer	
Q51	I do what is expected of me and follow instructions.	**Agree**	**Disagree**
Q52	For me, getting what I want has little to do with luck.	**Agree**	**Disagree**
Q53	1 would prefer to have a moderate income in a secure job rather than a high income in a job that depended on my performance.	**Agree**	**Disagree**
Q54	I like to have my life organised so that it runs smoothly and to plan.	**Agree**	**Disagree**
Q55	When I am faced with a challenge I think more about the results of succeeding than the effects of failing.	**Agree**	**Disagree**
Q56	I believe that what happens to me in life is determined mostly by other people.	**Agree**	**Disagree**
Q57	I can handle a lot of things at the same time.	**Agree**	**Disagree**
Q58	1 would rather buy a lottery ticket than enter a competition.	**Agree**	**Disagree**
Q59	I find it difficult to ask favours from other people.	**Agree**	**Disagree**
Q60	I get up early, stay late or skip meals in order to get special tasks done.	**Agree**	**Disagree**
Q61	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.	**Agree**	**Disagree**
Q62	What we are used to is usually better than what is unfamiliar.	**Agree**	**Disagree**
Q63	Most people think that I am stubborn.	**Agree**	**Disagree**
Q64	1 have strong opinions and find it difficult to switch off from work.	**Agree**	**Disagree**
Q65	People's failures are rarely the result of their poor judgement.	**Agree**	**Disagree**
Q66	Sometimes I have so many ideas I do not know which one to pick.	**Agree**	**Disagree**
Q67	I find it easy to relax on holiday.	**Agree**	**Disagree**
Q68	I get annoyed if superiors or colleagues take credit for my work.	**Agree**	**Disagree**
Q69	I get what I want from life because I work hard to make it happen.	**Agree**	**Disagree**
Q70	It is harder for me to adapt to change than keep to routine.	**Agree**	**Disagree**
Q71	I like to start new projects that may be risky.	**Agree**	**Disagree**
Q72	I like to test boundaries and go where no one has gone before	**Agree**	**Disagree**

Section 3

Instructions

There are 10 questions in section two. The section should take no more than 5 minutes to complete.

1. Examine the *all 10 personal value types* listed in the questionnaire below. Esteem one v*alue type,* from among all the value types listed, that is the most important value type to you, *as a guiding principle in your life*. Give this value type your highest rating where 7 is the highest and minus 1(-1) the lowest. Minus 1 is a statement that *'you oppose a particular value* type *as a guiding principle in your life*'. Zero (0) is the lowest esteem you can have for a value type. Zero rating for a particular value type is a statement that the value type is not important to you *as a guiding principle in your life but you do not oppose the value type.*

2. Now esteem a value type *'you oppose as a guiding principle in your life*'. If you do not oppose any personal value type, then choose the value type (only one) that you esteem lowest, as guiding principle in your life. If 'you *oppose a particular value type as a guiding principle in your life*', then you should rate this value type as a 'minus 1' (-1). If the value type holds your lowest esteem, that is not important to you as guiding principle in your life, then esteem it as a '0' (0). At this point you should have chosen a value type of rating '-1' or '0'.

3. Proceed to esteem the remaining 8 value types. Give them a rating either towards the high end of the scale (6, 5 etc) or towards the low end of the scale (0, +1 etc.). You should not give these remaining value types, '*as a guiding principle in your life*' the esteem you gave your most important value type (7) and your least important value type (0) or the value type that *'you oppose as a guiding principle in your life*' (-1)..

4. When you have completed the questionnaire, you should have one value type rated the highest (7), one value type rated the lowest (-1 or 0) and the remaining value type s rated either towards the high (6, 5, 4) or rated towards the low (0 or 1, 2, 3). Please use whole numbers (1, 2, 3 etc).

1. Power, that is, social power, authority, wealth.
(Dictionary definition: ability to do or act; capability of doing or accomplishing something)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

2. Achievement, that is, success, capability, ambition, influence on people and events.
(Dictionary definition: something accomplished, esp. by superior ability, special effort, great courage, etc.)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

3. Hedonism, that is, gratification of desires, enjoyment in life, self-indulgence.
(Dictionary definition: devotion to pleasure as a way of life)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

4. Stimulation, that is, daring, a varied and challenging life, an exciting life.
(Dictionary definition: to rouse to action or effort)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

5. Self- Direction, that is, creativity, freedom, curiosity, independence, choosing one's own goals.
(Dictionary definition: personal independence)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

6. Universalism, that is, broad mindedness, beauty of nature and arts, social justice, a world at peace, equality, wisdom, unity with nature, environmental protection.
(Dictionary definition: a universal range of knowledge, interests, or activities)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

7. Benevolence, that is, helpfulness, honesty, forgiveness, loyalty, responsibility.
(Dictionary definition: desire to do good to others; goodwill; charitableness)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

8. Tradition, that is, respect for tradition, humbleness, accepting one's portion in life, devotion, modesty).
(Dictionary definition: a long-established or inherited way of thinking or acting)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

9. Conformity, that is, obedience, honouring parents and elders, self-discipline, politeness).
(Dictionary definition: action in accord with prevailing social standards, attitudes, practices, etc.)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

10. Security, that is, national security, family security, social order, cleanliness, reciprocation of favours.
(Dictionary definition: freedom from danger, risk, etc.; safety)

Opposed to my principles	Not Important			Important				Of Supreme Importance
-1	0	1	2	3	4	5	6	7

Section 4

Instructions

There are 12 questions in section four. The section should take no more than 5 minutes to complete.

As in sections 1 and 2, there are no correct or incorrect answers to this section. 12 statements are provided and you are asked whether you agree very strongly, agree fairly strongly, agree, disagree fairly strongly or disagree very strongly with the statement.

For example look at Statement 1.

If you disagree very strongly with the statement, circle 5 on the response sheet.

If you agree very strongly with the statement, circle 1 on the response sheet.

1. In this complicated world of ours the only way we know what's going on is to rely on experts and leaders who can be trusted.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

2. My blood boils whenever a person stubbornly refuses to admit he's wrong.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

3. If we are going to have free speech we must defend the right of those we disagree with to be heard.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

4. There are two kinds of people in this world: those who are for truth and those who are against the truth.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

5. Most people don't know what's good for them.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

6. All the philosophies which exist in the world have some truth in them and probably not one is totally correct.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

7. The main thing in life is for a person to want to do something important.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

8. Man on his own is a helpless and miserable creature.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

9. Life can be meaningful without devotion to ideals or causes.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

10. Most people just don't give a "damn" about others.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

11. It is only natural for a person to be fearful of the future.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5

12. In a discussion I often find it necessary to repeat myself several times to make sure I am understood.

Agree Very Strongly	Agree Fairly Strongly	Agree	Disagree Fairly Strongly	Disagree Very Strongly
1	2	3	4	5