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Entrepreneurial Self-Efficacy (ESE): A Business Model Approach

Seán F. Keane

Thesis submitted for the Degree of Doctor of Philosophy



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Location: College of Engineering & Informatics,
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Declaration

I hereby declare that, except where duly acknowledged, the work presented in this thesis is my own, and I have not obtained a degree in this University, or elsewhere, on the basis of this work.

Seán F. Keane (10233133), February 2016

Executive Summary

Entrepreneurial Self-Efficacy (ESE): A Business Model Approach

Seán F. Keane

Researchers of entrepreneurship lack a general, yet distinct, conceptual framework that both describes how entrepreneurial action occurs and predicts who does it. Some scholars have noted that the emerging concept of “business model” may help to address this problem, yet little is understood about the transformational mechanisms by which a person moves from her business model to creating a new firm and or a new market. Conceptually, at least, “entrepreneurial self-efficacy” (ESE) is one such mechanism, and a key feature of this activity-specific, theoretical construct is that it can be developed. However, researchers have not, as yet, used ESE to link the business model to entrepreneurial cognition and action.

So, while building on existing studies in the area of entrepreneurial processes, this thesis develops a conceptual framework that describes the distinctive role of the business model in entrepreneurial thought and action. Drawing on ideas from social cognitive theory, hypotheses are generated to test the accuracy of the conceptual framework’s description vis-à-vis ESE. Having selected firms (as opposed to markets) as the empirical object of interest, a process of scale development is used to provide an empirical estimate of ESE (*beliefs in one’s capabilities to perform a set of business model activities involved in firm creation*). A classification scheme of business model activities is developed so as to guide the construction of 54 Likert-type items, which are the variables used to define ESE. A survey containing these and other items (e.g. questions pertaining to Age) was conducted to collect data, and usable responses were returned by 111 entrepreneurs and 92 non-entrepreneurs.

The results of rigorous methods of statistical inference suggest that “Total Efficacy” (which is a sum of 54 Likert-type items) is a variable that may lead to a person being an entrepreneur, and that distinguishes entrepreneurs from non-entrepreneurs. These findings are important for a number of reasons. In particular, they provide initial support for the conceptual framework’s description and predictions vis-à-vis ESE (as defined in the 54 underlying variables). In this way, the conceptual framework lays the foundation for future researchers who may wish to study how entrepreneurial action occurs and who does it. The new ESE scale, which is based in theory and appears psychometrically sound, may be of interest to people who intend to create a firm. Also, because capability beliefs can be developed, the new ESE scale may be of interest to other stakeholders of entrepreneurship, such as educators and policymakers, who wish to unlock entrepreneurial capabilities through learning efforts.

Dedication

This dissertation is dedicated to my family: First and foremost, I would like to take this opportunity to express my sincere thanks to my parents, Jo and John, for all your love, help, encouragement and support over the past five years, and more. None of this would have been possible without you. Thank you both for everything. Thanks to my daughter, Samantha, and sisters, Joann and Jacinta, for being other great sources of inspiration. You are all loved very much.

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“No man is an island, entire of itself; every man is a piece of the continent, a part of the main” (Meditation XVII by John Donne, 1572 - 1631)

My getting to this stage of the PhD dissertation process would not have been possible without the help of many others over the past five years. Accordingly, I would like to take this opportunity to acknowledge some of those people.

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CHAPTER ONE: Introduction

1.1 Introduction

This chapter presents a summary of the research undertaken on ‘Why some people are more likely than others to become entrepreneurs?’. As a cognitive approach is used herein to address this question, the entrepreneur is viewed as an agent: agency refers to acts performed intentionally. First, this chapter provides a background to the study of entrepreneurship in general and entrepreneurial action in particular. Then, the broad research problem and specific gaps to be investigated are presented. Next, the goals of the research are outlined. Fourth, the two-phase research process used to study the problem is presented. Fifth, the study’s findings and contributions are summarised. Finally, an outline of the thesis structure is provided.

1.2 Background

We are continuing to experience a major shift in the functioning of the economy; this shift refers to the emergence of the entrepreneurial society (Audretsch, 2009, 2010; Audretsch & Thurik, 2001). Entrepreneurship is the process by which people bring something new with value to the marketplace (Baron & Shane, 2008; Dew et al., 2009; Hisrich et al., 2005). It occurs when individuals interact with their environment to create legal entities (e.g. firms) or use market mechanisms (e.g. licensing) to exploit opportunities (Bird et al., 2012; Dew et al., 2009; Eckhardt & Shane, 2010; Shane, 2003). In broad terms, entrepreneurship occurs at two levels of analysis: the individual level (e.g. solo entrepreneurs) and the group level (e.g. team entrepreneurs and corporate entrepreneurs). This thesis sets out to study the individual entrepreneur.

The entrepreneur is the essence of entrepreneurship (Baumol, 1968; Bygrave & Hofer, 1991). As the free market system is propelled by entrepreneurship, entrepreneurs are a vital cog in the capitalist engine (Schumpeter, 1943). They create jobs (Ayyagari et al., 2014; Birch, 1981; Haltiwanger et al., 2014; Headd, 2010), innovate, and contribute to economic renewal (Hisrich et al., 2007; Kuratko, 2005, 2013). If entrepreneurship is a function of the entrepreneur, then we must understand entrepreneurial behaviour if we are to understand entrepreneurship (Baumol, 1968; Gartner, 1989; Shook et al., 2003). In this

way, we might influence the supply of potential entrepreneurs and increase the occurrence of entrepreneurship. In this regard, Hisrich et al. (2007) note how research on the entrepreneur and has focussed on two broad questions: '*Why do some individuals but not others become entrepreneurs?*' and 'Why do some individuals make more successful entrepreneurs than others?'. This thesis focuses on the former question (in italics).

Traditionally, this broad question has been addressed in terms of either 'who' the entrepreneur is (Carland et al, 1988) or 'what' she does (Gartner, 1988). The 'who' approach is usually associated with research on entrepreneurs' personality traits (Brandstätter, 2011), while the 'what' approach tends to focus on entrepreneurs' observable behaviours (Gartner et al., 2010). However:

- the literature on entrepreneurship appears to suggest that entrepreneurs' behaviours are not homogenous (Shaver & Renko, 2015) and that cognition both shapes and motivates behaviour (Bird et al., 2012);
- likewise, it seems that traits not matched to the activities of entrepreneurs, such as generalised self-efficacy¹ (GSE; Judge et al., 1998) and need for achievement (nAch; McClelland, 1961), come with limited ability to distinguish entrepreneurs from non-entrepreneurs (Mitchell et al., 2002).

Hence, *distal* traits such as GSE and nAch do not fall within the scope of this research on why some people are more likely than others to become entrepreneurs. That is, more general self-efficacy scales and other theories of motivation and action are excluded from the scope of this research. Instead, in an effort to better understand how entrepreneurial action occurs and who does it, the focus here is on an activity-specific or *proximal* proxy of entrepreneurs' behaviour, namely entrepreneurial self-efficacy (ESE). Unlike GSE, for instance, ESE is a cognitive mechanism but more on this theoretical construct later. For now, it is suffice to say that social cognitive theory (SCT; Bandura, 2001) is the theoretical lens used herein to study the factors that may lead to becoming an entrepreneur, and that distinguish entrepreneurs from non-entrepreneurs.

¹ Generalised self-efficacy (GSE) is a personality trait that refers to peoples' beliefs in their capabilities to perform across situations (Judge et al., 1998).

Aside: It is important for the reader to note that entrepreneurship is viewed herein as an *act* that occurs at a point in time, not as a *journey* that takes place over time. However, as noted by McMullen & Dimov (2013), it appears that most empirical research on the entrepreneurial process also tends to be of the cross-sectional (as opposed to longitudinal) variety.

Without action, there is no entrepreneurship (Alvarez et al., 2013; Bird, et al., 2012; Frese & Gielnik, 2014; Moroz & Hindle, 2012). In other words, whether entrepreneurship is understood as the creation of firms (Gartner, 1988) or defined as the discovery, evaluation and exploitation of opportunities (Shane, 2012), action is at the heart of the matter. Action is usually distinguished from mere thought or from mechanical behaviour (Berglund, 2005), so this thesis uses a cognitive approach to study entrepreneurship wherein the entrepreneur is viewed as an intentional decision-maker and actor, that is, an agent. Much research in this area centres on the cognitive process by which a person reaches the decision to act entrepreneurially or not (Audretsch, 2014). In this research tradition, for instance:

- “entrepreneurial self-efficacy” (ESE; belief in one’s capabilities to perform the activities of entrepreneurs) is an activity-specific construct from social cognitive theory (SCT; Bandura, 2001). ESE is a transformational mechanism by which individual’s can move from thought to action in the area of entrepreneurship (Bandura, 2012). Research shows that ESE can be used to (a) predict the likelihood of a person becoming an entrepreneur and (b) distinguish entrepreneurs from non-entrepreneurs (Chen et al., 1998; Townsend et al., 2010). Further, ESE can be developed and, in addition to providing a theory to predict behaviour, SCT also provides a theory of learning and change (Bandura, 2012);
- recent work suggests that the variable “entrepreneurial status” (ES; being an entrepreneur or not being an entrepreneur, respectively) is based on some form of “business model” (George & Bock, 2011; Moroz & Hindle, 2012; Trimi & Berbegal-Mirabent, 2012; Zott & Amit, 2007). The business model is a relatively new unit of analysis concerned with the creation and

capture of value (Brea-Solis et al., 2015; Carayannis et al., 2014; Klang et al., 2014; Zott & Amit, 2013). It may be understood as a cognitive map of the various activities involved in entrepreneurship (Brännback & Carsrud, 2009; Tikkanen et al., 2005).

Again, entrepreneurship *requires* action (Corbett & Katz, 2012; Hébert & Link, 1989; McMullen & Shepherd, 2006). Accordingly, this thesis uses a cognitive or behavioural approach to study the factors (concepts, constructs, variables) that may lead to becoming an entrepreneur and that distinguish entrepreneurs from non-entrepreneurs. To elaborate on this study's *raison d'être*, the next section outlines the research problem in more detail and it identifies specific gaps in knowledge related to the broad question of why some people but not others become entrepreneurs.

1.3 Problems and Gaps

Entrepreneurship is difficult to define (Eisenmann, 2013; Shaver & Scott, 1991). In the behavioural approach to the study of entrepreneurship, some scholars define it in terms of firms (Gartner, 1988), others define entrepreneurship in terms of opportunities (Shane & Venkataraman, 2000), yet others define it in terms of perception and action (Hébert & Link, 1989). Entrepreneurs create something new with value (Hisrich et al., 2005), such as new firms and new markets (Shane, 2012; Venkataraman et al., 2012). While scholars seem to agree that entrepreneurship is a process, the entrepreneurial process is not understood well enough to provide an exact description. Indeed, its scholars do not appear to agree on “what goes in, what comes out, and how the transformation takes place” (Moroz & Hindle, 2012: 812). As good description triggers the why questions of explanatory research (De Vaus, 2001), this gap in knowledge makes it difficult to predict the likelihood of a person becoming an entrepreneur and to distinguish entrepreneurs from non-entrepreneurs.

So, as there is neither a widely accepted definition of entrepreneurship nor a basic theory to explain why it occurs, the broad problem is that the behaviour of the entrepreneur is difficult to explain, predict and control. The remainder of this

section identifies specific gaps in knowledge and research opportunities related to this broad problem area.

1.3.1 Alternative Viewpoints

Entrepreneurship is a multidisciplinary topic; it is studied across all of the social sciences (e.g. economics, engineering, management, and psychology). Indeed it appears that there is no one best way to view entrepreneurship, rather there are several models and or theories to account for entrepreneurial action (e.g. Alvarez et al., 2013; Leyden & Link, 2015; McMullen & Shepherd, 2006; Sarasvathy, 2001a; Shane, 2003). These conceptual viewpoints tend to be based on different, sometimes conflicting, assumptions about the source of entrepreneurial action (Ardichvilli et al., 2003; McMullen & Shepherd, 2006). Indeed, depending on their assumptions about the social world, the different models can yield different predictions about entrepreneurship (Alvarez & Barney, 2007). For instance, whereas ‘positivists’ hold that the social world has an objective existence independent of people’s perceptions (e.g. the entrepreneur *discovers* an opportunity), ‘constructionists’ hold that reality does not exist independent of perception (e.g. the entrepreneur *creates* an opportunity). In short, scholars do not agree on whether the entrepreneur responds to her environment or if she creates an opportunity via her actions, and this assumption has implications for the study of entrepreneurial action.

The above paradigm war is not exclusive to research on the entrepreneur, rather it is a perennial problem for researchers across the social sciences (e.g. economics and management). To sidestep this longstanding (conceptual) problem (Hébert & Link, 1989), scholars seem to have come full circle, that is, there appears to be growing support for the view that the entrepreneur may discover as well as create an opportunity (Renko, 2012; Sarasvathy & Venkataraman, 2011). Hence, whether entrepreneurship is viewed as a discovery process (e.g. Shane, 2003) or as a creation process (e.g. Sarasvathy, 2001a), perception seems to be an important component of most person-centred models or theories of entrepreneurial action.

Entrepreneurship involves activities of broad scope that range from perception to action. It is a complex process because it invariably involves an act of interpretation (Audretsch, 2014; Bandura, 2012 Hébert & Link, 1989; Renko, 2012). As entrepreneurial action refers to any activity an entrepreneur might take to perceive and pursue opportunities (Alvarez & Barney, 2007), it is inherently difficult to explain and predict, and hence control (Bird, 2014; Bird & Schjoedt, 2009; Bird et al., 2012). For instance, according to Bandura (2008):

- in the partially bidirectional model of human thought and action (e.g. personality theory), where people discover opportunities (e.g. Frese & Gielnik. 2014), the behaviour of the entrepreneur is a product of individual factors, environmental factors, and the interactive effects of these two factors;
- in an alternative model of thought and action (i.e. social cognitive theory), which is called triadic reciprocal causation, entrepreneurial behaviour is a product of the reciprocal interplay of individual, environmental, and behavioural factors. In this view of entrepreneurial action, the entrepreneur may either create an opportunity or respond to environmental cues.

The above two interactionist models of causation show that entrepreneurial action involves complex relationships. Since it is usually not practicable to control for all possible relationships in a given study (Reynolds, 2014), research on entrepreneurship typically precludes 'true experiment'. Indeed it is inherently difficult to establish causality in research on entrepreneurial action, where most causal thinking is probabilistic as opposed to deterministic. Fortunately, by way of hypothetical-observational data (after Collins, 1990), researchers can use a blend of information supplied by theory and observation to help study entrepreneurial action without having to mount a Herculean effort to control for all possible relationships at once.

In light of the above, entrepreneurial self-efficacy (ESE: one's entrepreneurial capability beliefs) is a construct from social cognitive theory (Bandura, 2001) that seems to come with some predictive power vis-à-vis "entrepreneurial status" (ES; being an entrepreneur versus not being an entrepreneur). Indeed it is thought to be a distinctive characteristic of the entrepreneur (Chen et al.,

1998; Krueger & Brazeal, 1994), but it is important to note that people higher in ESE are more likely rather than certain to become entrepreneurs. However, despite its predictive utility, it seems that the full potential of ESE remains to be realised in research on the entrepreneur (Krueger & Day, 2010; Mauer et al., 2009), and some opportunities for further research on ESE are explored in the following subsections.

1.3.2 Empirical Objects: Firms *and* Markets

Entrepreneurial self-efficacy (ESE; belief in one's capabilities to perform the activities of entrepreneurs) appears to provide a hypothetical-observational basis for addressing the question of why some individual's are more likely than others to become entrepreneurs (Chen et al., 1998; Townsend et al., 2010). The extant ESE scale development research shows this latent variable possesses good predictive power as long as the efficacy measure is tailored to the entrepreneurial process: 'what entrepreneurs do and how they do it'. For instance, ESE is a robust predictor of firm creation (Townsend et al., 2010), and individual's who create firms tend to have higher ESE than those who do not create firms (Chen et al., 1998). Indeed, the three main ESE scale development studies in the literature (i.e. Chen et al., 1998; De Noble et al., 1999; McGee et al., 2009) appear to have adopted the firm-centric (as opposed to opportunity-centric) definition of entrepreneurship, and the resulting measures seem to be built on ideas about the process of firm creation.

However, while most entrepreneurial activity is thought to occur through firm creation, it appears that the field of entrepreneurship research has come to view "opportunity" as its central construct (Alvarez et al., 2013; Sarasvathy & Venkataraman, 2011; Shane & Venkataraman, 2000; Short et al., 2010). The opportunity-centric view of entrepreneurship holds that not all entrepreneurial activity results in the creation of firms; rather, people—acting alone or in groups—sometimes use other market processes (e.g. selling or licensing) to engage in entrepreneurial activity. So, if entrepreneurship is bigger than the creation of firms, it seems that ESE researchers lack a generic, yet distinct, opportunity-based conceptual framework to understand how entrepreneurial action occurs, and to help predict who does it. This gap in knowledge makes it difficult to

delineate and measure ESE, which represents a major impediment to the advancement of research on entrepreneurial thought and action. In this regard, recent work on the entrepreneurial process suggests that the emerging concept of business model could potentially help to address such difficulties.

1.3.3 From Opportunities to Business Models

Although opportunity is a central construct in research on entrepreneurship, the concept of *business model* is becoming increasingly recognised as key to understanding entrepreneurial thought and action (George & Bock, 2011; Hindle, 2010; Moroz & Hindle, 2012; Trimi & Berbegal-Mirabent, 2012). For example, business models are thought to represent the cognitive bridge between the evaluation of an opportunity and its exploitation (Fiet & Patel, 2008). Entrepreneurs turn their opportunities into business models via evaluation, and the decision to act entrepreneurially is based on some form of business model (Hindle, 2010; Moroz & Hindle, 2012). Further, as George & Bock (2011: 102—emphasis added) stated provocatively,

“the firm formation decision *is* based on the enactment of an opportunity through an explicit or implicit business model” .

So, in light of the above literature, a salient feature of the business model concept is that it appears to be opportunity-centric as well as firm-centric, and this feature could potentially help to unlock the mystery of entrepreneurial thought and action. Indeed the concept of business model may potentially help not only researchers to bridge the gap between theory and practice, but also practitioners to navigate between thought and action (Morris et al., 2005). Hence, linking the business model to entrepreneurial thought and action presents an opportunity for research on entrepreneurship.

However, like the word *entrepreneurship*, the term *business model* is elastic (Eisenmann, 2013; Morris et al., 2005). In other words, scholars do not agree on what a business model is. It can be defined in physical as well as cognitive terms (Doz & Kosonen, 2010). Herein, after Tikkanen et al. (2005), the business model is defined as a cognitive map of the various activities involved in

entrepreneurship. Cognitive maps are suggested to present a useful way to examine how entrepreneurs think and act, and to help distinguish entrepreneurs from non-entrepreneurs, but cognitive mapping seems to be quite uncharted waters in research on entrepreneurship (Brännback & Carsrud, 2009). Cognitive maps, such as the business model, are important in research on entrepreneurial thought and action because major shifts in a person's ESE should be associated with significant changes in her maps (Krueger & Day, 2010). Yet ESE researchers have not used a business model lens to explore such a relationship, but more on this in the next subsection.

While there is no one cognitive map of the business model, the Business Model Canvas (BMC; Österwalder & Pigneur, 2009) appears popular both in the literature and in practice. It is a firm-level concept that presents knowledge of *what* businesses do via nine building blocks including, for example, the customers, products/services, and resources that lie behind the creation, delivery and capture of value. In short, at least according to Österwalder & Pigneur (2009), the BMC provides the rules of doing business. However, it is possible for a person to know what firms do and still not know *how* to do it. In this regard, the BMC seems to fall short in terms of *how* firms create, deliver and capture such value. This gap seems important not least because scholars have called for more precise concepts of the business model that consider not only the *what* of doing business but also the *how* (Zott et al., 2011).

1.3.4 From Business Models to Entrepreneurial Action

Although the concept of business model—a cognitive map of entrepreneurial activities e.g. the Business Model Canvas or BMC—is becoming increasingly recognised as fundamental to understanding entrepreneurial thought and action, little is understood about the transformational mechanisms by which people move from their business models to creating new firms and new markets. This subsection draws on key ideas from social cognitive theory (Bandura, 2001) to understand this transformation problem.

To borrow from Sandelands' (1990) treatise on the practicality of theory in the social sciences: it is one thing to know the rules of entrepreneurial behaviour,

and another to act in accordance with those rules. This distinction draws attention to a subtle problem in research on the entrepreneur in general and her cognitive maps (e.g. business models) in particular. That is, the problem of relating theory to the practice of entrepreneurship, and entrepreneurial thought to action. In terms of the entrepreneur's cognitive map of the business model, for instance, this problem leaves unexplained the transformational mechanisms by which the business model is converted into entrepreneurial action. In the cognitive perspective, which emphasises the idea that what people think or do is influenced by mental mechanisms (Baron, 2004), one widely accepted solution for the transformation problem in a given area of activity, such as entrepreneurship, involves a two-dimensional knowledge structure or taxonomy table—declarative knowledge and procedural knowledge (Anderson, 1980; Bandura, 1997; Krathwohl, 2002):

- declarative knowledge provides the rules of the game, or knowledge of *what* to do (i.e. 'know-*what*'), while
- procedural knowledge involves performance skills, or knowledge of *how* to play the game well (i.e. 'know-*how*').

Capabilities are widely accepted to be a function of both types of knowledge: 'know-what' and 'know-how' (Bloom et al., 1956). Capabilities are thought to be important in entrepreneurship (Arthurs & Busenitz, 2006; Busenitz & Arthurs, 2007), and scholars have called for a capabilities analysis of the entrepreneurial process (e.g. Hisrich et al., 2007; Markman, 2007). In terms of the BMC, for example, where capabilities are not a first-order theme (Zott et al., 2011), a two-dimensional knowledge structure could potentially be developed to help create a more precise concept of this view of the business model concept. Such a capabilities-based view of business model activities could potentially be used by researchers to explore the cognitive maps of entrepreneurs at deeper levels. Also, as called for by Baron & Henry (2010), the dual knowledge system could potentially enable researchers to understand how entrepreneurs' cognitive processes or performance skills (i.e. 'know-*how*') ultimately influence entrepreneurial action.

In a world where unlocking entrepreneurial capabilities is thought to be of vital importance in promoting entrepreneurial activity (Volkman et al., 2009), knowledge structures seem particularly important because they can be developed (Walsh, 1995). In this regard, social cognitive theory provides a theory of learning and change, which specifies the four ways in which knowledge structures are formed: mastery experience, role modelling, verbal persuasion, and emotional arousal (Bandura, 1977, 2012). In this world view of entrepreneurship, however, knowledge structures are necessary but not sufficient for proficient entrepreneurial action. Rather, the social cognitive model of thought and action calls for self-efficacy—belief in one’s capabilities to perform certain actions—as an additional transformational mechanism by which people move from their two-dimensional knowledge structures to proficient action in complex areas of human functioning (Bandura, 1986, 1997).

Social cognitive theory provides not only a theory of learning and change but also knowledge for predicting entrepreneurial behaviour (Bandura, 2012). So, conceptually, at least, entrepreneurial self-efficacy (ESE) is a transformational mechanism that could potentially be used by researchers to both understand and assess the role of a two-dimensional, or capabilities-based, view of the business model in entrepreneurial thought and action. More specifically, if the business model is indeed a good proxy for entrepreneurial activities to begin with, it appears that a ‘business model’-based view of ESE could potentially be used by researchers to:

- predict the likelihood of a person becoming an entrepreneur, and
- distinguish entrepreneurs from non-entrepreneurs

But, perhaps because the business model has only recently emerged as a new unit of analysis in research on entrepreneurship in general and solo entrepreneurship in particular, the extant scale development research on ESE has not used a business model lens to describe how entrepreneurial action occurs and to predict why some people but not others are more likely to create new firms and new markets. Hence, this study’s *raison d’être* is to set out to address these related gaps in knowledge, which have the potential to link the business model to entrepreneurial thought and action.

1.4 Goals of the Research

Upon analysis of the broad problem explored in the previous section, and the overall idea of conceptually and empirically linking the *business model* to entrepreneurial thought and action via *entrepreneurial self-efficacy* (ESE), the goals of this research on the entrepreneur's business model are as follows:

- to examine and synthesise the literature in relation to why some people are more likely than others to become entrepreneurs through a review of existing scholarship on:
 - theories and models of entrepreneurial action,
 - individual characteristics and traits, and cognitive mechanisms,
 - cognitive maps in general and the “business model” in particular, and
 - the construct of “entrepreneurial self-efficacy” (ESE);
- to propose a generic, yet distinct, conceptual framework that describes the role of the business model—*a cognitive map of the various activities involved in entrepreneurship*—in entrepreneurial thought and action;
- to use the construct of ESE from social cognitive theory to understand the role of the business model in the proposed conceptual framework of entrepreneurial thought and action, and generate hypotheses to test the accuracy of its description vis-à-vis creating new firms and new markets;
- while treating “firm creation” as a proxy for being an entrepreneur, to develop a two-dimensional, capabilities-based view of the Business Model Canvas (BMC; Österwalder & Pigneur, 2009) in order to:
 - classify a general set of business model activities involved in the area of firm creation, and
 - guide the construction of a scale to provide a quantitative, albeit indirect, measure of ESE—*belief in one's capabilities to perform a set of business model activities involved in firm creation*;
- to conduct a survey containing the new ESE scale as well as questions on other variables (e.g. age, gender, and education) in order to collect data from samples of entrepreneurs and non-entrepreneurs located in Ireland;

- to statistically analyse the survey data in order to determine empirically the variables that:
 - may affect the likelihood of a person being an entrepreneur, and
 - distinguish entrepreneurs from non-entrepreneurs;
- to use the results of the statistical analysis to make inferences about the population from which the sample was drawn; and
- to report the study's findings and discuss their implications, if any, for entrepreneurship theory, research, and practice.

By attempting to link the business model to entrepreneurial thought and action in this way, it is expected that these research goals will (a) contribute to the knowledge base on why some people are more likely than others to become entrepreneurs, (b) provide potential entrepreneurs with a reliable and valid measure of ESE to assess their entrepreneurial capability beliefs, and (c) provide a stimulus for future research on the entrepreneur's business model in general and ESE in particular.

1.5 The Research Process

Entrepreneurship is fundamentally a social activity (Shaver & Scott, 1991), so a key challenge for researchers of entrepreneurship is to develop conceptual frameworks, models, and/or theories built on sound foundations from the social sciences (Bygrave & Hofer, 1991). The development and validation of such conceptual "maps" are closely related, yet distinct, parts of researching entrepreneurship, and this scientific process aims to both describe and predict certain entrepreneurial phenomena in the real world (Bygrave & Hofer, 1992). So, in order to study whether or not the business model is a factor (concept, construct, variable) that may lead to becoming an entrepreneur and that distinguishes entrepreneurs from non-entrepreneurs, the research process used in this thesis involved two broad phases: development and validation. And, in this regard, the overall system of methodologies and methods used to study this problem are summarised in Table 1.1 below, while the two-phase research process is outlined and justified in the remainder of this section.

Table 1.1: The research process

Phase 1: Development	Phase 2: Validation
<ul style="list-style-type: none"> • Review literature on who the entrepreneur is and what she does. • Construct conceptual framework of entrepreneurial thought and action. • Provide theoretical foundations, list assumptions, and generate hypotheses. 	<ul style="list-style-type: none"> • Classify a set of business model activities involved in firm creation. • Construct self-efficacy scale and conduct survey to collect data. • Statistically analyse survey data, report findings and make recommendations.

1.5.1 Developing the Conceptual Framework

The first phase of the research process used Whetten’s (1989) methodology for theory development in order to develop a generic, yet distinct, conceptual framework of entrepreneurial thought and action. Whetten (1989) uses Kipling’s honest serving-men as an organising framework to guide the process of theory development, and he notes that a complete theory requires four key elements: ‘what’, ‘how’, ‘why’, and ‘who-where-when’.

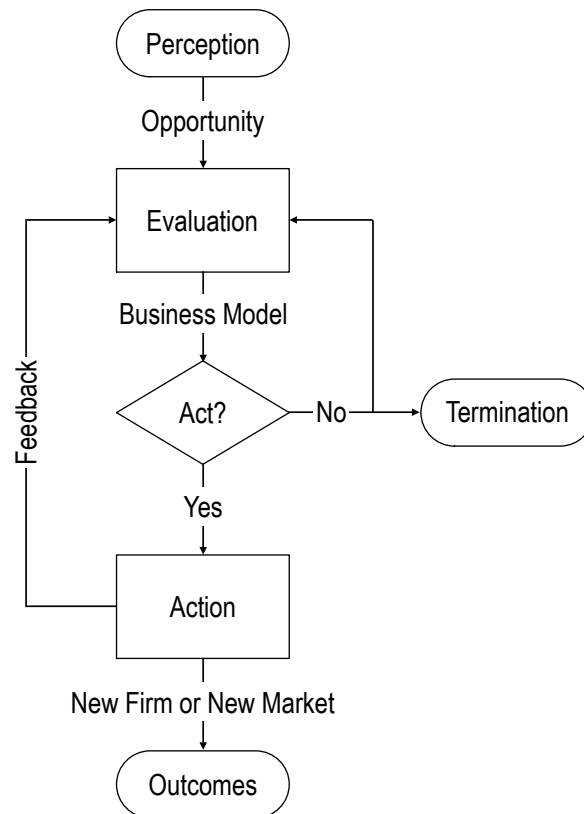
“I keep six honest serving-men
 (They taught me all I knew);
 Their names are What and Why and When
 And How and Where and Who” (Kipling, 1902/1988: 3)

Whetten’s (1989) methodology is deemed appropriate as it (a) is systematic in nature, (b) requires the researcher/theorist to both identify and connect the factors that form part of the description, (c) demands that the researcher identify the theoretical glue (e.g. social cognitive theory) that holds the conceptual framework together, (d) requires the generation of testable propositions from the conceptual framework, (e) lays the foundation for empirical testing, and (f) has been used previously by other scholars of entrepreneurship (e.g. Compans & McMullen, 2007; Fisher, 2012).

So, while drawing on existing theoretical and empirical work in two broad areas of research—the entrepreneur and the entrepreneurial process, the following factors (concepts, constructs, variables) were identified to help describe

entrepreneurial thought and action: perception, opportunity, evaluation, business model, decision to act (or not), and action. The flowchart below in Figure 1.1 shows how these factors are related to one another. It highlights the distinctive role of the business model—a cognitive map of the various activities involved in entrepreneurship—in creating new firms and new markets.

Figure 1.1: Flowchart of entrepreneurial thought and action



In light of the above conceptualisation of entrepreneurial thought and action, this thesis draws on the self-efficacy portion of social cognitive theory (Bandura, 2012) in order to:

- weld the elements of the conceptual framework together,
- understand the dynamic role played by the business model in the decision to act entrepreneurially, and
- generate hypotheses to test the accuracy of the conceptual framework's description.

The above theoretical lens suggests another aspect of the entrepreneurial self-efficacy (ESE) construct—*belief in one's capabilities to perform a set of business model activities involved in entrepreneurship*—as a transformational mechanism by which an entrepreneur moves from her business model to creating a new firm and/or a new market. To evaluate the direct effects of ESE on entrepreneurial thought and action, it is hypothesised that:

- the likelihood of a person being an entrepreneur increases with her ESE score, and
- entrepreneurs tend to have higher ESE than non-entrepreneurs.

However, in terms of hypothesis testing, it is vital to specify which market process is under investigation (namely firms *or* markets). So for the purposes of validating the conceptual framework, creating a firm (firm creation) is treated as a proxy for being an entrepreneur. This distinction is important because it allows one to define the variable “entrepreneurial status” (ES): *being an entrepreneur or not being an entrepreneur, and defined as creating a firm or not, respectively.*

The above distinction also has implications for how one defines the theoretical construct of interest, that is, ESE. In this regard, since it is an activity-specific construct, ESE is defined as *belief in one's capabilities to perform a set of business model activities involved in firm creation*. Accordingly, in order to test the accuracy of the conceptual framework's description and predictions in a firm creation context vis-à-vis ESE, attention now turns to providing an empirical estimate of this latent construct for empirical testing.

1.5.2 Validating the Conceptual Framework

Having specified firms (versus markets) as the empirical object of interest, the second phase of the research process used the guidelines for constructing self-efficacy scales (Bandura, 2006) and good practice in scale development (DeVellis, 2012) in order to provide a quantitative (albeit indirect) measure of ESE for statistical hypothesis testing.

A rigorous, seven-step process of scale development was used to construct a new ESE scale: (a) establish the construct's boundaries, (b) generate a pool of

efficacy items, (c) determine the item response format, (d) have experts review the efficacy items, (e) consider inclusion of validation items, (f) collect data on the specified items, and (g) evaluate the measured efficacy items.

The scale development process was guided by a two-dimensional view of the business model: content (knowledge of what to do, or ‘know-what’), and process (knowledge of how to do it, or ‘know-how’). This knowledge structure or classification scheme of business model activities is presented in Figure 1.2 below. It was used to establish the boundaries of ESE, its content and structure:

Figure 1.2: Classification scheme of business model activities

'Know-How'

<i>Create</i>									
<i>Evaluate</i>									
<i>Implement</i>									
<i>Plan</i>									
<i>Select</i>									
<i>Identify</i>									
	<i>Customer Segments</i>	<i>Value Propositions</i>	<i>Channels</i>	<i>Customer Relationships</i>	<i>Revenue Streams</i>	<i>Key Resources</i>	<i>Key Activities</i>	<i>Key Partners</i>	<i>Cost Structure</i>

'Know-What'

- the content or ‘know-what’ dimension includes nine elements from the business model canvas (BMC)—*customer segments*, *value propositions*, *channels*, *customer relationships*, *revenue streams*, *key resources*, *key activities*, *key partnerships*, and *cost structure* (Österwalder & Pigneur, 2009), while
- the process or ‘know-how’ dimension involves six elements—*identify*, *select*, *plan*, *implement*, *evaluate*, and *create* (Baron & Henry, 2010). Together, after Krathwohl (2002), these processes are used to represent the breadth and depth of each element of the BMC, and they range from less to more cognitively complex: i.e. from *identify* to *create*.

So, the process dimension of the classification scheme of business model activities is a hierarchy of cognitive complexity. Scholars have noted how cognitive complexity is a broad individual-level factor used by people to make sense of their social world (Carraher & Buckley, 1996). This individual difference factor is important in terms of how people process information not least because cognitive complexity is related to both content and underlying structure (Benet-Martínez et al., 2006). And, in terms of assessing efficacy beliefs, scales of perceived self-efficacy should include items that vary in terms of level of task demand (Bandura, 1997, 2006).

Thus, in conjunction with entrepreneurship texts (e.g. Baron & Shane, 2008) and literature (e.g. Gatewood et al., 1995) in general and the BMC in particular, the classification scheme (shown in Figure 1.2 above) was used to guide the construction of 54 efficacy items, where the items along each column were designed to vary in terms of cognitive complexity. For instance, in terms of the customer segments column, the efficacy items range from “*I can identify potential customers*” to “*I can create enough customers for a viable business*”. Respondents were asked to indicate their current level of agreement with each item on a 7-point scale, ranging from *strongly disagree* (1) to *strongly agree* (7). A survey containing the 54 Likert-type and other specified items (e.g. questions pertaining to age, gender, and education) is conducted to collect data from samples of entrepreneurs and non-entrepreneurs located in Ireland.

The next step involved the evaluation of Likert scale items, which were created by calculating a composite score (i.e. sum) of 6 or more Likert-type items. For instance, as pointed out above, ESE is defined in the 54 underlying Likert-type items or variables. Since it has potential values 54, 55, 56, ..., 378, the variable *Total Efficacy* can be treated as being essentially continuous. It is also important to note that, by way of its construction, the two-dimensional knowledge structure creates 6 column sum variables (e.g. Total Identify) and 9 row sum variables (e.g. Total Customer Segments). So, as outlined further below, only these Likert scale items will be used to assess the psychometric properties (e.g. reliability and validity) of ESE test scores.

First, Cronbach's alpha will be used to assess the internal consistency reliability of entrepreneurs' scores on the Likert scale items. Next, if their scores on these variables are highly intercorrelated, principal components analysis (PCA) will be used to assess the two-dimensional structure of ESE so as to, hopefully, reduce the number of variables along each dimension to a smaller number of principal components (which are independent variables by construction). In this regard, for example, it would be nice to reduce the nine variables from Österwalder & Pigneur's (2009) business model canvas to a smaller number of independent variables. Then, in terms of rigorous methods of statistical inference,

- binary logistic regression analysis will be used to model "entrepreneurial status" (ES) as a function of ESE and other variables (e.g. age), while
- a general linear model (GLM) will be used to model ESE as a function of ES and other variables.

1.6 Findings and Contributions

As science is fundamentally about evidence and conclusions (e.g. Anderson & Burnham, 2002), this section considers the study's findings and contributions.

Findings

Usable responses to the survey were returned by 111 entrepreneurs and 92 non-entrepreneurs based in Ireland. The findings of the statistical analysis suggest that:

- scores returned by entrepreneurs on the efficacy items used to assess "entrepreneurial self-efficacy" (ESE) showed good reliability evidence.
- in terms of analysing the two-dimensional structure of ESE, the number of summative variables on each dimension could be reduced to a smaller number of principal components without loss of much information:
 - 1 principal component, called "Total Efficacy", emerged from a PCA on the 6 'know-how' variables, and
 - 2 principal components, namely "Operations" and "Marketing", emerged from a PCA on the 9 'know-what' variables;

- in terms of hypothesis testing, after adjusting for the effects of other variables (e.g. age and gender), results showed evidence that:
 - Total Efficacy score (which is a sum of 54 variables) is a good predictor of entrepreneurial status (ES), and
 - Entrepreneurial status (ES) is a good predictor of Total Efficacy. In fact, in the data, entrepreneurs had a significantly higher mean Total Efficacy score than non-entrepreneurs.

Contributions

While it is best to view the results of this research as exploratory, some important contributions flow from this study:

- A key contribution involves the generic, yet distinct, “conceptual framework” of entrepreneurial thought and action. It both describes and explains the role of the business model in creating new firms and new markets. This contribution provides a sound conceptual basis for future research on entrepreneurial cognition and action not only at the individual level of analysis via “entrepreneurial self-efficacy” (ESE) and, indeed, other theoretical constructs (e.g. entrepreneurial intent), but also at the group level of analysis (e.g. team entrepreneurs) via collective efficacy and, of course, other group-level factors (e.g. collective intent);
- The study’s findings provide additional support for using the self-efficacy portion of social cognitive theory in future research on entrepreneurial decision and action. Indeed, in terms of initially validating the proposed conceptual framework of entrepreneurial thought and action, they seem to provide initial support for the accuracy of the framework’s description and predictions vis-à-vis ESE. Although more evidence will be required to better understand the role of the business model in the conceptual framework, the theory based ESE scale appears to provide a psychometrically sound tool for future research on solo entrepreneurs:
 - to predict the likelihood of individual firm creation and to distinguish those person’s who create firms from those who do not, and
 - to explore the measure’s ability to predict the likelihood of other modes of solo entrepreneurship (e.g. creating new markets).

- The detailed account of the process used to develop the new ESE scale may be of interest to future researchers. For instance, those who use the new ESE scale and gather data on other variables (e.g. market creation) that measure the activities of an entrepreneur might like to replicate the statistical analysis detailed in the thesis. Future scale developers might like to use the classification scheme of business model activities to operationalise ESE in new and improved ways, and then replicate the full process of scale development both in Ireland and in other countries.
- Another noteworthy contribution concerns the more precise concept of the Business Model Canvas (BMC; Österwalder & Pigneur, 2009). This classification scheme emphasises the “how” as well as the “what” of business model activity so, as called for by others (e.g. Moroz & Hindle, 2012), it considers the practical aspects of how entrepreneurial action occurs. In addition to making capabilities a first-order theme in the BMC and answering Zott et al.’s (2011) call to action for more precise concepts of the business model, the classification scheme of business model activities may be of benefit to those who study what entrepreneurs do when they create new firms (e.g. Bird et al., 2012) and, perhaps to some extent, new markets. Indeed, this contribution will likely be of interest to those scholars who study business models (e.g. the BMC) in general and the entrepreneur’s business model in particular.
- The new ESE scale provides a tool to help current and future entrepreneurs evaluate their perceived strengths and weaknesses vis-à-vis a set of business model activities empirically linked to the existence of firms. In this regard, since the study’s findings suggest that a person higher in ESE is more likely to be an entrepreneur and, as others have shown (e.g. Zhao et al., 2005), ESE can be developed through entrepreneurship courses, the new scale may provide other stakeholders (e.g. educators and policymakers) with a theory based way to unlock entrepreneurial capabilities through education.

To sum up, the study’s findings appear to suggest that the research process used to link the business model to firm creation via entrepreneurial self-efficacy (ESE) was a worthwhile enterprise. However it is important to note that future

research will be required to determine if the findings can be replicated in larger datasets, with randomly selected samples of entrepreneurs and non-entrepreneurs located both in Ireland and beyond. In addition, since entrepreneurship was viewed as an act that occurs at a point in time, it is not clear whether ESE is the cause or the effect of creating a firm. Therefore, longitudinal research designs will be required to determine if ESE is indeed a factor that may lead to a person creating a new firm (and or a new market).

1.7 Thesis Structure

This section provides an overview of the subsequent chapters in this thesis:

- **Chapter Two: Literature Review**, presents a review of the literature on who the entrepreneur is and what she does. It begins by highlighting key economic benefits of entrepreneurship. Then, the chapter introduces and discusses two key definitions in the field of entrepreneurship research. Third, divergent theories and models of entrepreneurial action are compared and contrasted, which points to the mechanisms that enable the entrepreneur to act. Fourth, the chapter reviews research on the entrepreneur in terms of her characteristics and traits, and her cognitive mechanisms. Next, the chapter introduces the business model concept and discusses it as a cognitive map that may enable entrepreneurial action. Finally, since entrepreneurial self-efficacy (ESE) is a mechanism by which an entrepreneur could move from her business model to action, the chapter examines extant work on self-efficacy in general and ESE in particular.
- **Chapter Three: The Research Process**, outlines the overall system of methodologies and methods used to link the business model to entrepreneurial thought and action. First, it uses a methodology for theory development to propose a conceptual framework of entrepreneurial thought and action, where the business model is shown to play a distinctive role. In order to test the accuracy of this description, ESE is proposed as the transformational mechanism by which a person moves from her business model to entrepreneurial action and hypotheses are generated for testing. Second, having selected firms (versus markets) as the empirical object of interest and, also, guided by a two-dimensional

view of the business model, the chapter outlines the process of scale development used to construct and initially validate a new ESE scale.

- **Chapter Four: Statistical Analysis**, presents and interprets the results of the data analysis. First, the data is summarised and descriptive statistics are provided. Next, the internal consistency reliabilities of entrepreneurs' test scores are evaluated using Cronbach's alpha. Third, the results of a principal components analysis (PCA) on the 6 'know-how' variables and a PCA on the 9 'know-what' variables are presented and discussed. Then, since the primary goal of analysing the survey data is inferential (as opposed to descriptive) statistics, rigorous methods of statistical inference are used to model certain response variables as a function of other variables. Some issues pertaining to statistical inference are also identified throughout the chapter.
- **Chapter Five: Discussion and Conclusions**, provides a conclusion to this exploratory research on how entrepreneurial action occurs and who does it. It explains the meaning of the results by way of discussion. First, the chapter states the study's key findings. Then, it considers the meaning and importance of these findings. Next, the chapter relates the findings to previous research on ESE. Fourth, it considers alternative explanations of the results. Then, the chapter summarises the study's contributions. Sixth, acknowledges the study's limitations. Finally, the chapter concludes with some suggestions for further research.

1.8 Conclusion

This chapter presented a summary of the research undertaken to address the broad problem of why some people but not others become entrepreneurs. First, a background to the study of entrepreneurs was provided, and a particular emphasis was placed on the cognitive (or behavioural) approach to entrepreneurship. Next, the particular problems guiding the research were identified. Third, the goals and objectives of the study were outlined. Fourth, the research process used to study the problem was presented. Fifth, the study's findings and contributions were summarised. Finally, an outline of the thesis structure was provided.

CHAPTER TWO: Literature Review

2.1 Introduction

Entrepreneurship is widely thought to be a driver of economic activity. Yet it is difficult to define, and scholars do not agree on who the entrepreneur is and what she does. As scholars differ on how entrepreneurial action occurs and who does it, entrepreneurial action is difficult to explain and predict, and hence control. Accordingly, the purpose of this chapter is to review and synthesise relevant literature on the person in, and the process of, entrepreneurship so as to guide the development of a conceptual framework of entrepreneurial thought and action. The chapter begins by highlighting key economic benefits of what entrepreneurs do. Then, in terms of how renowned scholars have defined the field, it introduces and discusses the 'operational' and 'conceptual' definitions of entrepreneurship. Third, the chapter compares and contrasts divergent theories and conceptual models of entrepreneurial action in order to understand the range of activities involved in entrepreneurship. This review points towards two mechanisms, specific teachable and learnable techniques, that seem to enable entrepreneurial action: cognitive maps (e.g. business models) and entrepreneurial self-efficacy (ESE). Next, in terms of the entrepreneur, the chapter introduces existing research on individual characteristics and traits, and cognitive mechanisms. Fifth, the concept of the business model is introduced and discussed as a cognitive map that may help the entrepreneur to navigate between thought and action. Finally, since ESE is a transformational mechanism by which an entrepreneur could move from her business model to action, the chapter examines the self-efficacy portion of social cognitive theory and synthesises the existing empirical work conducted on ESE.

2.2 Economic Benefits of Entrepreneurship

Entrepreneurship is widely assumed to be a "good" thing, with beneficial effects accruing to the system in which it occurs (Ayyagari et al., 2014; Haltiwanger et al., 2013; Hisrich et al., 2007; Kuratko, 2013; McMullen & Shepherd, 2006; Schultz, 1980; Schumpeter, 1943). It is long agreed that "what entrepreneurs do has an economic value" (Schultz, 1980: 443). Indeed, entrepreneurship is thought to be "the fundamental impulse that sets and keeps the capitalist engine in motion" (Schumpeter, 1943: 83). It not only promotes competition, economic flexibility, and product and service quality (Hisrich et al., 2007), but

also entrepreneurship is a key source of economic renewal, innovation, and job creation (Kuratko, 2005, 2013). Entrepreneurs seem to be an important cog in the engine of the capitalist system.

Start-ups and young firms play an important role in job creation (Ayyagari et al., 2014; Haltiwanger et al., 2013). The Global Entrepreneurship Monitor (GEM) 2012 Global Report notes an upsurge in entrepreneurial activity around the globe, where there are now nearly 400 million entrepreneurs operating in 54 countries (Xavier et al., 2013). Of these, more than 140 million entrepreneurs planned to create a minimum of five new jobs during the next five years. In the Irish context, where firms less than five years old create 66% (approx.) of all new jobs, the GEM Ireland (2013) Report notes how 32,000 new firms were created during 2013 (Fitzsimons & O’Gorman, 2014); while the comparable figure for new firms started in Ireland during 2011 was 26,000 (Fitzsimons & O’Gorman, 2012). In addition, Kuratko (2013) estimates that between 600,000 and 800,000 new firms are created each year in the U.S., and he has labelled the generation of the 21st century as Generation E—the most entrepreneurial since the Industrial Revolution (Kuratko, 2005). It seems that a large number of people become entrepreneurs, and entrepreneurship is a major source of jobs.

Scholars have long agreed that the entrepreneur, in some shape or form (e.g. role or person), is the essence of entrepreneurship (Bygrave & Hofer, 1991; Gartner, 1988; Kirzner, 1979, 1997; Schumpeter, 1934, 1943; Shook et al., 2003). Yet, there is no equation to tell us what an entrepreneur is, absolutely. This makes it difficult to predict entrepreneurship and distinguish entrepreneurs from non-entrepreneurs. Accordingly it seems that entrepreneurship is not only of much practical benefit (e.g. as a source of innovation and job creation), but also it is a theoretically interesting problem for researchers to study.

2.3 Defining Entrepreneurship

Entrepreneurship is a multidisciplinary topic (Gartner, 1989, 2008; Hébert & Link, 1989; Low & MacMillan, 1989). Researchers of the topic are found in all social sciences: anthropology (Lalonde, 2010), economics (McMullen & Shepherd, 2006), management (Stevenson, 1983, 2006), political science

(Slaughter & Leslie, 1997), psychology (Brandstätter, 2011), science and technology (Bailetti, 2012), sociology (Thornton, 1999), and beyond (e.g. history and geography). These researchers tend to define entrepreneurship in a way suited to their particular perspective, while Shane (2003: 10) notes how

“The domains of psychology, sociology and economics all seem to provide insight into a piece of the puzzle, but none seem to explain the phenomenon completely.”

In a broad sense, entrepreneurship is the study of change over time (Audretsch et al., 2006; McGrath & Desai, 2010), and change is the territory of the entrepreneur (Schumpeter, 1934, 1943; Hébert & Link, 1989). For example,

“entrepreneurship is about change, just as entrepreneurs are agents of change; entrepreneurship is thus about the process of change.” (Audretsch, Keilbach, & Lehmann, 2006: 7)

However, as change is not a static property, the word “entrepreneurship” is hard to define (Eisenmann, 2013; Landström, 2005; Sharma & Chrisman, 1999). “Entrepreneurship has meant different things to different people” (Sharma & Chrisman, 1999: 12). Numerous definitions have been developed, yet none have endured (Venkataraman, 1997). Despite this, Shane (2012) notes how the field seems to rely on Gartner (1988) for its ‘operational’ definition and Shane & Venkataraman (2000) for its ‘conceptual’ definition:

Operational: “Entrepreneurship is the creation of organisations. What differentiates entrepreneurs from non-entrepreneurs is that entrepreneurs create organizations, while non-entrepreneurs do not” (Gartner, 1988: 11)

Conceptual: “we define the field of entrepreneurship as the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited” (Shane & Venkataraman, 2000: 218).

The operational definition emanates from social psychology (Gartner, 2001), while the conceptual definition seems consistent with a rich legacy of economic theories of entrepreneurial action. Indeed, both definitions highlight a key idea, that is, entrepreneurship requires action (Corbett & Katz, 2012; McMullen & Shepherd, 2006; Santos et al., 2013; Townsend et al., 2010; Wood et al., 2014).

However, while each definition advances a behavioural viewpoint of entrepreneurship, the language used by these renowned scholars is noticeably different. The former is firm-centric, and the latter is opportunity-centric. In fact, the word “opportunity” does not appear in Gartner’s (1988) article. He views the entrepreneur as a role or set of activities involved in firm creation, while Shane and Venkataraman’s (2000) entrepreneur is a person (an agent or intentional actor) who discovers, evaluates, and exploits opportunities.

On the other hand, the operational and conceptual definitions are not mutually exclusive but overlap to a certain extent. Both view entrepreneurship as an organising process: Gartner says it is distinguished by the organising process of firm creation; while Shane & Venkataraman note how firm creation *and* market creation (e.g. selling opportunities to existing firms) can be used to organise opportunities in the economy. So, despite some overlaps, it seems that these scholars have different ideas about what the word entrepreneurship means.

As its point of departure, this thesis tentatively adopts the more elaborate, ‘conceptual’ definition of entrepreneurship in order to guide a review of the extant theories and conceptual models of entrepreneurial action.

2.4 Entrepreneurial Action: Theories and Models

Entrepreneurship *is* a process (Anderson et al., 2012; Drakopoulou-Dodd et al., 2013; Onetti et al., 2012; McMullen & Dimov, 2013). Axiomatic perhaps but, to the extent that a ‘good’ theory or model explains and predicts (Weick, 1995), the entrepreneurial process is not understood well enough to provide a ‘good’ description (de Jong & Marsili, 2015; Gartner et al., 2010; Leyden & Link, 2015; Shane, 2012; Sarasvathy & Venkataraman, 2011; Venkataraman et al., 2012). This key gap in knowledge is important because “Good description provokes

the ‘why’ questions of explanatory research” (De Vaus, 2001: 2), for example, why do some individuals but not others become entrepreneurs? (Hisrich et al., 2007). Indeed, it is long held that a good model or theory of the entrepreneurial process is key to unlocking the mystery of entrepreneurship:

“If researchers could develop a model or theory to explain entrepreneurial processes, they would have the key that unlocks the mystery of entrepreneurship... With that kind of predictive power, we would have the key to economic growth!” (Bygrave & Hofer, 1991: 15)

It is important to note that the concept of “opportunity” looms large in several economic theories of the entrepreneur. The dictionary entry defines *opportunity* as “a time or set of circumstances that makes it possible to do something.” Indeed, the field of entrepreneurship has come to view opportunity as the key construct of its distinctive domain (Alvarez Sarasvathy & Venkataraman, 2011; Shane, 2012; Short et al., 2010; Venkataraman, 1997). Also, scholars of entrepreneurship appear to agree that the environment is a key source of opportunities and resources (Cuervo, 2005; Hindle, 2010b; Krasniqi, 2014; Puffer et al., 2010; Reynolds, 2014; Thornton, 1999; Welter, 2011). However, they do not seem to agree on the role of opportunities in entrepreneurial action.

2.4.1 Seminal Economic Theories

Economic theories of the entrepreneur (e.g. Kirzner, 1979; Schumpeter, 1934), which are basically theories of entrepreneurial action (Alvarez & Barney, 2007, 2013; McMullen & Shepherd, 2006), have a long tradition in research on entrepreneurship (Hébert & Link, 1989, 2009; Leyden & Link, 2015)

- in Schumpeter’s (1934) Theory of economic development, the function of the entrepreneur is not to “find” or to “make” opportunities. Rather, as opportunities are always present, the entrepreneur’s function consists in “doing the thing” (Schumpeter 1934: 34)—that is, to organise and execute the courses of action required to create a new product, process, source of supply, market, or organisational form (Schumpeter, 1943). While it is not the focus of his theory, Schumpeter points to psychological aspects of the entrepreneurial process as a source of entrepreneurial action; while

- in Kirzner's (1979) Theory of entrepreneurship, "*perception, opportunity, and profit*", the entrepreneur "recognises" an overlooked profit opportunity. Entrepreneurial alertness, which refers to an "attitude" of receptiveness (Kirzner, 1997), exploits these opportunities when others overlook them (Kirzner, 1979). This theory has roots in Austrian economics, and adopts the philosophical stance of critical realism. It identifies two forms of opportunity: (a) an imprecisely defined market need, or 'value sought', and (b) underemployed resources or capabilities, or 'value creation capability' (Ardichvili et al., 2003).

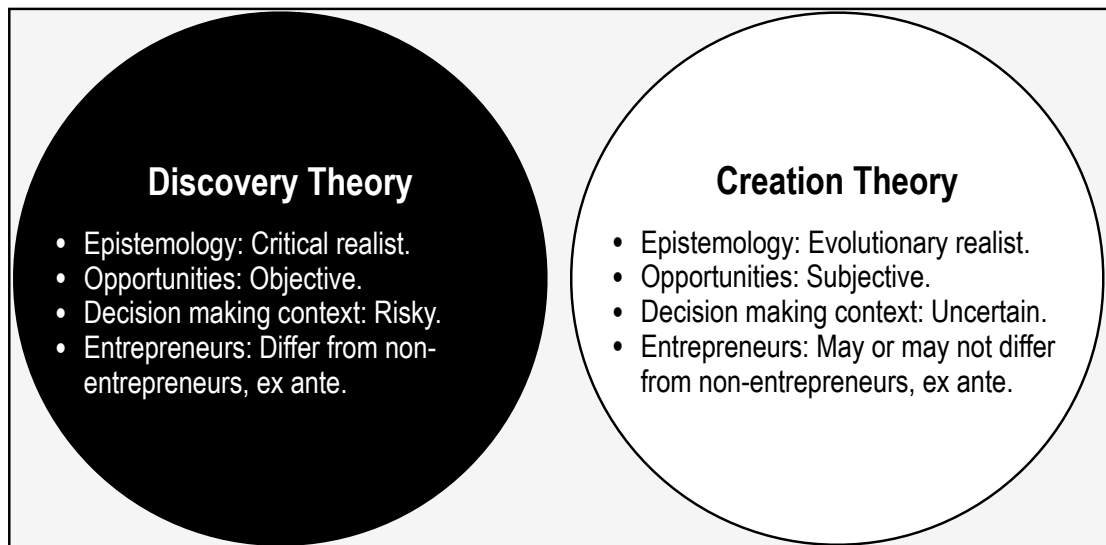
Aside: Not all economic theories of entrepreneurship are theories of the entrepreneur: "Almost all prevalent economic theories of entrepreneurship are theories of the firm" (Sarasvathy, 2004: 520). For instance, in Knight's (1921) theory—*risk, uncertainty and profit*—the context for entrepreneurship is an existing firm. In this theory, since profit is thought to flow from uncertainty, the discovery or creation of opportunities is rendered insignificant, and Knight discusses entrepreneurial action purely in terms of the "evaluation" process (McMullen & Shepherd, 2006). Likewise, in neoclassical economics, there is no room for the entrepreneur in the economic theory of the firm: "The theoretical firm is entrepreneurless—the Prince of Denmark has been expunged from the discussion of *Hamlet*" (Baumol, 1968: 66). Indeed, there are neither people nor institutions in neoclassical economics: firms in this system are actually formulas (Hughes, 1986). Yet, entrepreneurship without the entrepreneur "is like *Hamlet* without the Danish prince" (Schumpeter, 1943: 86). Since the economic theory of the firm does not make room for the behaviour of the entrepreneur, it is not well placed to account for how entrepreneurial action occurs and who does it.

To sum up, Kirzner's economic theory of the entrepreneur is usually linked with the view that entrepreneurship is a discovery process, whereas Schumpeter's theory of entrepreneurial action is usually associated with the idea that entrepreneurship is a creation process (Leyden & Link, 2015).

2.4.2 Discovery Theory versus Creation Theory

In light of the above, Alvarez & Barney (2007) present two internally consistent theories of entrepreneurial action—*discovery theory* and *creation theory*. As shown in Figure 2.1 below (which is also inspired by Alvarez & Barney, 2013 and Alvarez et al., 2013), each theory comes with different assumptions about the social world:

Figure 2.1: Two theories of entrepreneurial action



- *Discovery Theory* adopts a critical realist epistemology. In this view, where the social world is assumed to have an objective existence, opportunities exist independent of the perceptions of entrepreneurs. In addition, as possible outcomes and their likelihoods can be known, the decision making context is said to be risky. Further, ex ante differences (e.g. alertness and entrepreneurial self-efficacy or ESE) enable entrepreneurs to exploit opportunities. A problem with the critical realist epistemology in discovery theory is that the idea that opportunities exist independent of perception is not testable; while
- *Creation Theory* adopts an evolutionary realist epistemology. In this view, where the social world is assumed to have both objective and subjective properties, opportunities do not exist independent of the perceptions of entrepreneurs. Instead, they are created through entrepreneurial action. In addition, as neither possible outcomes nor their likelihoods can be known, the decision making context is said to be uncertain. Further, differences in

entrepreneurs may be the effect (as opposed to the cause) of enacting an opportunity. ESE also seems salient in this regard, as it is not only a source of entrepreneurial action, but also ESE is an outcome of enacting an opportunity via the system of triadic codetermination (see Figure 2.2).

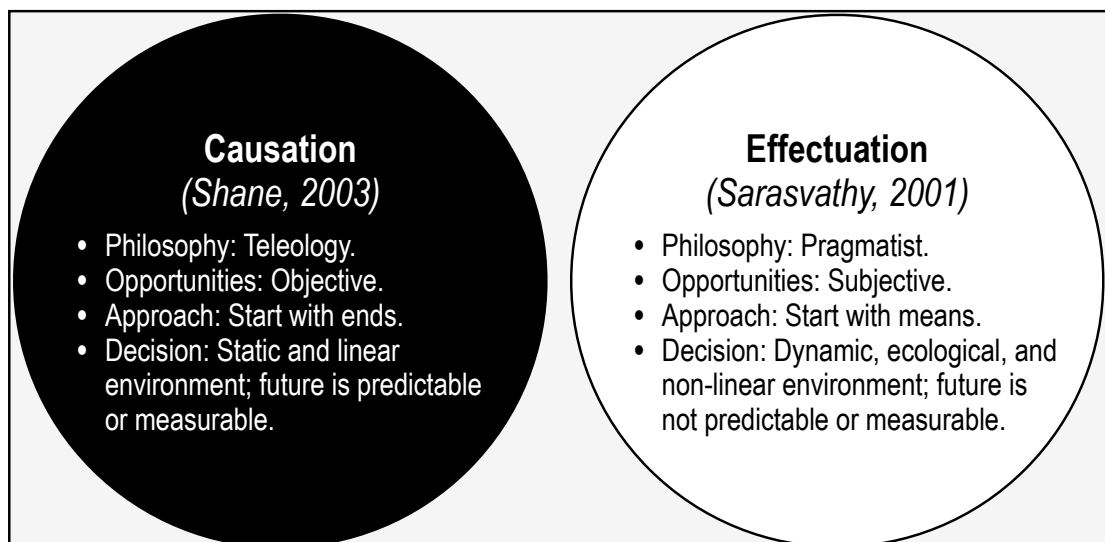
Both of the above theories are based on a form of backwards causation (i.e. teleology), where entrepreneurial action is thought to be ends (as opposed to means) driven. However, assuming that opportunities are discovered rather than created may have important consequences for entrepreneurial action:

“In the latter case, entrepreneurs may find that business plans can only be written after an opportunity has been created, and that rigorous planning too early in this process can be, at best, a waste of resources, and at worst, fundamentally misleading – to both entrepreneurs and those that invest in them.” (Alvarez & Barney, 2007: 12)

2.4.3 Causation versus Effectuation

Other scholars (e.g. Fisher, 2012; Moroz & Hindle, 2012) have reviewed *causation* (e.g. Shane, 2003) and *effectuation* (e.g. Sarasvathy, 2001a) as two potentially dichotomous, conceptual models of the entrepreneurial process. In this regard, Figure 2.2 below shows these differences in summary form:

Figure 2.2: Two conceptual models of the entrepreneurial process



- Like Alvarez & Barney's (2007) theories of entrepreneurial action, Shane's (2003) causal model of the entrepreneurial process (i.e. *causation*) is teleological in nature. Causation holds that objective opportunities exist waiting to be discovered. Yet, while opportunities are assumed to exist independent of people's perception in this general theory of entrepreneurship, Shane's entrepreneurial process begins with the perception of these situations in which people can make a profit. His entrepreneur starts with her ends. She operates in a static and linear environment, where the future is predictable or measurable.
- Unlike the three teleological models introduced above, the creative process perspective advanced in Sarasvathy's (2001a) effectual model of the entrepreneurial process (i.e. *effectuation*) is a pragmatist one. While it does not deny the existence of objective opportunities (Sarasvathy & Dew, 2005), effectuation holds that opportunities can be subjective, socially constructed and created through the entrepreneurial process itself. Sarasvathy's expert entrepreneur frames decisions using an effectual (as opposed to predictive) logic. These frames (e.g. knowledge structures or cognitive maps) are key as, for example, they influence the alternatives that people perceive, create and focus on: "There is some evidence that framing alters the problem space itself" (Dew et al., 2009: 302). An expert entrepreneurs starts with her means (e.g. who I am, what I know, and whom I know) and operates in a dynamic, ecological and non-linear environment, where the future is not predictable or measurable.

There are other theories and/or conceptual models of entrepreneurship (e.g. Ardichvili et al., 2003; Baker & Nelson, 2005; Bruyat & Julien, 2000; Gartner, 1985; Knight, 1921; Leyden & Link, 2015; McMullen & Shepherd, 2006; Renko et al., 2012; Sautet, 2003). For instance, in their theory of the entrepreneur, McMullen & Shepherd's (2006) conceptual model of entrepreneurial action involves two stages: attention and evaluation. In this view, entrepreneurship requires a person who decides to act on her opportunity. Furthermore, Renko et al. (2012) present a framework in which *all* opportunities have both objective dimensions (e.g. market need or means to satisfy market need) and subjective

dimensions (e.g. perceived market need or perceived means to satisfy market need). However, as noted by Ardichvili et al. (2003: 107),

“These models are based on different, often conflicting, assumptions borrowed from a range of disciplines, ranging from cognitive psychology to Austrian economics.”

2.4.4 Epistemological Debates

The discourse on the source of entrepreneurial opportunities (e.g. whether entrepreneurship is a discovery or a creation process) is embedded in a broader epistemological debate involving ‘positivists’ and ‘constructionist’ paradigms (Acs & Audretsch, 2010; Audretsch, 2014; Hébert & Link, 1989; Leyden & Link, 2015 McMullen & Shepherd, 2006). Positivists argue that the social world has an objective existence independent of perception, whereas constructionists assume that reality is a function of the social interactions of people and does not exist independent of perception (Acs & Audretsch, 2010).

This debate is not confined to research on entrepreneurship, rather it has plagued the social sciences (e.g. scholars of economics, innovation, and management) for decades. Nonetheless, Shane & Venkataraman’s (2000) conceptual definition of entrepreneurship—the *discovery*, evaluation and exploitation of opportunities—helped (re)ignite the debate among researchers (e.g. social psychologists and economists) about the role of opportunities in entrepreneurial action:

- “Discussions about the nature of opportunity are discussions about how circumstances external to the entrepreneur are construed ... We argue that in many circumstances, opportunities are enacted, that is, the salient features of an opportunity only become apparent through the ways that entrepreneurs make sense of their experiences” (Gartner et al., 2010: 114)
- “The idea that opportunities—situations in which people have the potential to make a profit—are objective is not a semantic point. It is a necessary concept to preserve the ideas that entrepreneurship can be unsuccessful and that entrepreneurship depends on the nexus of people and opportunities.” (Shane, 2012: 16)

The longstanding debate about the source of opportunities (e.g. discovery theory versus creation theory) will likely rage on for the foreseeable future despite the best arguments of theorists on either side of the debate (Sharma & Chrisman, 1999). To overcome this difficulty, some scholars of the individual-opportunity nexus are increasingly moving towards the viewpoint that the entrepreneur may either discover or create her opportunity:

“An opportunity is an idea or dream that is discovered or created by an entrepreneurial entity and that is revealed through analysis over time to be potentially lucrative.” (Short et al., 2010: 55)

“we can begin our exposition of the entrepreneurial method with the provisional assertion that entrepreneurs recognize, find and make opportunities.” (Sarasvathy & Venkataraman, 2011: 118)

Indeed, researchers of the individual-opportunity nexus have recently shifted their attention to understanding the processes by which entrepreneurs form and exploit opportunities (Alvarez et al., 2013; Shane, 2012; Venkataraman et al., 2012). For instance, Venkataraman et al. (2012) suggest a new nexus around action and interaction in order to identify the transformational mechanisms by which entrepreneurs create new firms and new markets. Likewise, although Shane seems interested in preserving the view that opportunities exist independent of the perception of the entrepreneur, he notes that more research needs to be performed on the entrepreneurial process (Shane, 2012). However, recent research on published models of the entrepreneurial process shows that scholars do not agree on what entrepreneurs do and how they do it:

“Until there is greater clarity and scholarly agreement about the absolutely fundamental process issues of entrepreneurship—what goes in, what comes out, and how the transformation takes place—it is a delusion to think that entrepreneurship qualifies as a research field with genuine philosophical integrity.” (Moroz & Hindle, 2012: 812)

To sum up, while there may not be one best theoretical lens with which to view entrepreneurial action, entrepreneurship scholars seem to agree that more

research needs to be performed on the entrepreneurial process and its subprocesses (e.g. evaluation).

2.4.5 Some Points of Convergence

Basic Elements of Entrepreneurial Action

Audretsch (2014) notes how there are two defining elements to entrepreneurial action: creating or discovering an opportunity is the first dimension, while the commercialising or exploitation of that opportunity is the second element. He also notes that the capacity to create or discover opportunities along with the ability to act on these opportunities through commercialising represents the essence of entrepreneurial action. And, in this regard,

“The behavioral approach to entrepreneurship has a particular focus on the cognitive process by which individuals reach the decision to launch a new venture” (Audretsch, 2014: 58).

The behavioural approach to the study of entrepreneurship is not new (e.g. Gartner, 1988; Hébert & Link, 1989; Low & MacMillan, 1988). Indeed, following their synthesis of economic theories of the entrepreneur (e.g. Kirzner, 1979; Schumpeter, 1934), Hébert & Link (1989: 48) concluded that meaningful analytical progress vis-à-vis who the entrepreneur is and what she does may require a move beyond the question of where do opportunities come from:

“Entrepreneurial action may mean creation of an opportunity as well as response to existing circumstances. The basic elements of entrepreneurship are perception, courage, and action”

So, rather than discussing the sources of opportunities, scholars must look to the three basic elements in order to study entrepreneurial action.

From Perception through Action

Entrepreneurial action begins with the perception of opportunities (Baron, 2006; Bygrave, 2004; Bygrave & Hofer, 1991; Hébert & Link, 1989; Holcomb et al., 2009; Kirzner, 1979; Krueger & Day, 2010; Renko et al., 2012; Mitchell et al.,

2007; Seawright et al., 2013; Shane, 2003). Perceptions are interpretations of what people see, mental models created by information processing (Smith & Kosslyn, 2009). Hébert & Link (1989) note how all perception is an act of interpretation, and that what marks the entrepreneur is her activity of thought. However, because entrepreneurship requires action and the courage to act, perception is necessary but not sufficient for entrepreneurial action.

In terms of the entrepreneur's courage to act, as well as other individual and environmental factors that may influence her intentional decision making and action, existing research shows that individuals higher in entrepreneurial self-efficacy (ESE¹; belief in one's capabilities to perform the various activities of entrepreneurship) are more likely to commercialise opportunities (Audretsch, 2014; Chen et al., 1998; Eckhardt & Shane, 2010). Conceptually, to borrow from Bandura (2012), ESE affects the quality of entrepreneurial action through affective, cognitive, *decisional*, and motivational processes.

The postulated affect of ESE on entrepreneurial action through decisional processes seems important because entrepreneurship requires a person to decide to act (Baron, 2009; Chen et al., 1998; Dew et al., 2009; Elston & Audretsch, 2011; Hayward et al., 2006; McMullen, 2013; McMullen & Shepherd, 2006; Miao & Liu, 2010; Mitchell et al., 2002; Palich & Bagby, 1995; Sarasvathy, 2001b; Shepherd, 2011; Shepherd et al., 2015; Townsend et al., 2010):

“Entrepreneurial decision making refers to the choices made by entrepreneurs when faced with entrepreneurial opportunities” (Miao & Liu, 2010: 357)

The decision to act entrepreneurially can be framed as a two-step process (e.g. Eckhardt & Shane, 2010; Leyden & Link, 2015; McMullen, 2013; McMullen & Shepherd, 2006; Miao & Liu, 2010; Shane, 2003; Shepherd et al., 2007). In this regard, for example, Tversky & Kahneman's (1981) general model of human choice distinguishes between two phases in the decision process:

¹ It is important to distinguish between activity specific self-efficacy (e.g. ESE) and generalised self-efficacy (i.e. GSE). The former is a cognitive mechanism, the latter is a personality trait. And, as already pointed out, more general self-efficacy scales are not used in this research.

“an initial phase in which acts, outcomes, and contingencies are framed, and a subsequent phase of *evaluation*” (1981: 454—emphasis added).

So, having perceived an opportunity through framing, the individual enters a subsequent phase of evaluation (Ardichvili et al., 2003; Autio et al., 2013; Baron, 2004, 2006; Baron & Henry, 2010; Baron & Shane, 2008; Bygrave, 2009; Dimov, 2007a, 2007b, 2010, 2011; Haynie et al., 2009; Hindle, 2010a; McMullen, 2013; McMullen & Shepherd, 2006).

For some scholars, evaluation is the quintessential entrepreneurial skill (Dimov, 2010; Moroz & Hindle, 2012). Indeed, across published models of the entrepreneurial process (e.g. Bruyat & Julien, 2000; Gartner, 1985; Sarasvathy, 2001a; Shane, 2003), Moroz & Hindle (2012) find that entrepreneurs seem to perform some kind of evaluation in order to create new value for stakeholders (e.g. customers). Hindle (2010a: 108) defines evaluation as:

“the systematic determination of merit, worth, and significance of something or someone using criteria against a set of standards. ”

Further, as the scholars referenced below have noted, evaluation is an iterative step in the method of entrepreneurial thought and action:

“an opportunity is continuously re-evaluated in the light of the nascent entrepreneur’s actions and their outcomes” (Dimov, 2010: 1124);

“an entrepreneur is likely to conduct evaluations several times at different stages of development” (Ardichvili et al., 2003: 106).

The business model is emerging as a key point of convergence across published models of the entrepreneurial process (Hindle, 2010a; Moroz & Hindle, 2012). Although it is not a process (George & Bock, 2011), the business model represents the cognitive bridge between the evaluation of an opportunity and its exploitation (Fiet & Patel, 2008). In other words, to borrow from Tikkanen et al. (2005), the business model creates a cognitive map through which the entrepreneur decides on her actions. The entrepreneur turns her opportunity

into a business model via evaluation, and the decision to act entrepreneurially is based on some form of business model (Hindle, 2010; Moroz & Hindle, 2012).

The business model—a cognitive map of the various activities involved in entrepreneurship—is not only an opportunity-centric concept, but also a firm-centric one. Indeed, firm activities play a key role in the different ideas of business models found in the literature (Zott et al., 2011), and the decision to create a firm is based on some form of business model (George & Bock, 2011). For example, the Business Model Canvas (Österwalder & Pigneur, 2009—see section 2.6.2) provides a relative description of organisational activities via nine building blocks (e.g. customers). So, whether one is discussing firm creation or market creation, it seems that the decision to act entrepreneurially can be framed as a decision on whether (or not) to implement one's business model.

However, the implementation of a business model is not just an isolated activity or event, entrepreneurship requires action over time (e.g. Corbett & Katz, 2012; McMullen & Shepherd, 2006; Santos et al., 2013; Townsend et al., 2010; Wood et al., 2014). It is an organising process (Berglund, 2005; Bird et al., 2012; Bird & Schjoedt, 2009; Brandstätter, 2011; Frese & Gielnik, 2014; Gartner, 1988; Gartner et al., 2010; Hisrich et al., 2007; Shane, 2003, 2012). Entrepreneurial action requires organising. This includes obtaining resources, building firms or creating markets, and developing strategies to make the business model work.

To sum up, from a review of key literature on the behavioural approach to entrepreneurship, this subsection highlighted some basic elements of the cognitive process by which people reach the decision to become entrepreneurs. Indeed, this literature showed how entrepreneurship involves activities of broad scope that range from perception through evaluation to action. However, since the review also highlights the importance of psychological aspects of the entrepreneurial process, such as the business model concept and the entrepreneurial self-efficacy (ESE) construct, attention now turns to research on the enterprising individual to better understand these cognitive mechanisms and, indeed, other individual factors that may lead to a person being an entrepreneur and that distinguish entrepreneurs from non-entrepreneurs.

2.5 The Entrepreneur

“Entrepreneurship requires entrepreneurs” (Drakopoulou-Dodd et al., 2013: 69). Axiomatic perhaps, but the question of why some individuals but not others become entrepreneurs has not been fully addressed. Entrepreneurs are not homogenous:

“entrepreneurs tend to defy aggregation” (Low & MacMillan, 1988: 148)

“differences among entrepreneurs and among their ventures are as great as the variation between entrepreneurs and nonentrepreneurs and between new firms and established firms.” (Gartner, 1985: 696)

Although entrepreneurs come in different shapes and sizes—e.g. individual entrepreneurs, team entrepreneurs and corporate entrepreneurs (Hisrich et al., 2007), the focus of this section is on the individual entrepreneur. Its purpose is to review the literature on individual characteristics, personality traits, and cognitive mechanisms. As a point of departure, however, the review begins with the following proviso: “a startling number of traits and characteristics have been attributed to the entrepreneur” (Gartner, 1988: 21).

2.5.1 Individual Characteristics

This subsection identifies a number of individual characteristics that have been attributed to the entrepreneur.

Age, Education, and Gender

In research on the entrepreneur, Seawright et al. (2013: 202) note how “age and education explanations have been consistently supported, and hence, are used as standard control variables in most studies.” In the Irish context, for example, people in the 35-44yrs age category are more likely to be entrepreneurs both as a percentage of all adults and as a percentage of all early stage entrepreneurs² (Fitzsimons & O’Gorman, 2014). Likewise, GEM

² “total early stage entrepreneurial activity refers to the total rate of early stage entrepreneurial activity among the adult population aged 18-64 years inclusive” (Fitzsimons & O’Gorman, 2014: 17)

Ireland (2013) also reports how people with post-secondary and graduate education represent 70% of all early stage entrepreneurs.

Gender seems to be another important factor in research on the entrepreneur (DeTienne & Chandler, 2007; Fitzsimons & O’Gorman, 2014; Gupta et al., 2009; Marlow & McAdam, 2013; Wilson et al, 2007). In Ireland, for instance, the rate of early stage entrepreneurial activity for males is 12.1% and for females is 6.4% (Fitzsimons & O’Gorman, 2014). That is, Irish males are 1.9 times more likely than Irish females to be engaged in early stage entrepreneurial activity.

To sum up, it appears that age, education and gender are important characteristics in research on the entrepreneur.

Capabilities

Capabilities, which are a function of knowledge and skills (Bloom et al., 1956; Padilla-Perez et al., 2009), seem to be important individual characteristics across all areas of human activity (Granovetter, 1985, 2005), such as entrepreneurship (Lanza & Passarelli, 2014) and management (Hitt et al., 2007). Indeed, it is important to note that:

“The entrepreneurial and managerial domains are not mutually exclusive but overlap to a certain extent. The former is more opportunity-driven, and the latter is more resource- and “conversation”-driven” (Kuratko, 2005: 581)

Much research suggests that entrepreneurial and managerial capabilities are individual characteristics that can make an important contribution to entrepreneurial performance (Abdelgawad et al., 2013; Arthurs & Busenitz, 2006; Busenitz & Arthurs, 2007; Eggert & Kaplan, 2013; Hisrich et al., 2007; Kuratko, 2005; Lockett, et al., 2013; Markman, 2007; Moroz & Hindle, 2012; Teece, 2007; Volkmann et al., 2009; Newbert, 2005; Ucbasaran et al., 2008; Zahra et al., 2006). For example, in their research, Ucbasaran et al. (2008) found that these particular human capital variables, rather than general human capital variables (e.g. education), explained more of the variance in terms of identifying and pursuing opportunities.

Entrepreneurial capabilities refer to “the ability to identify new opportunities and develop the resource base needed to start a firm” (Busenitz & Arthurs, 2007: 134). While entrepreneurial capability may be important, low levels of entrepreneurs’ managerial capability is frequently cited as a contributor to the high failure rates observed in firm creation (Baron & Henry, 2010; Busenitz & Arthurs, 2007; Bygrave, 2009; Hisrich et al., 2005; Markman, 2007). As these capabilities are developed through experience, some scholars have called for a knowledge and skills analysis of the entrepreneurial process (Hisrich et al., 2007; Markman, 2007). Others (Bird et al., 2012; Bird, 2014) have called for researchers to develop a taxonomy of entrepreneurs’ behaviour that will inform scholars, practitioners and other stakeholders about what the entrepreneur does when she creates new enterprises.

To sum up, it seems that both entrepreneurial and managerial capabilities are important individual characteristics of the entrepreneur.

Relevant Experience

Relevant experience appears to be another important characteristic of successful entrepreneurs (Baron, 1998; Fitzsimons & O’Gorman, 2014; Gartner, 1985; Stuart & Abetti, 1990; Ucbasaran et al., 2008). In this regard,

“entrepreneurs should have experience in the same industry or a similar one” (Bygrave, 2004: 16)

Potential entrepreneurs might increase their odds of success if they have management experience in the same market or, at least, a similar one (Bygrave, 2004). Likewise, while profiling Irish entrepreneurs, Fitzsimons & O’Gorman (2014) highlight the importance of strong management and business experience, and previous experience of starting a firm.

Role Models

Entrepreneurial role models seem to be important in understanding why some people but not others become entrepreneurs (Bygrave, 2004; Colombier & Masclat, 2008; Fitzsimons & O’Gorman, 2014; Kirkwood, 2007; Lindquist et al., 2015; Parker, 2009; Sherer et al., 1989):

“Role models are very important because knowing successful entrepreneurs makes the act of becoming one yourself seem much more credible” (Bygrave, 2004: 7)

For instance, Scherer et al. (1982) found that parental role models influence entrepreneurial capability beliefs, while Lindquist et al. (2015) found that having entrepreneurial parents increased the likelihood of children’s entrepreneurship by almost 60%. Indeed, Parker (2009) explains that entrepreneurial parents may pass on the taste for entrepreneurship to their children via role modelling. In the Irish context, males report knowing somebody who had recently launched a new firm more frequently than do females: 35% versus 28%, respectively (Fitzsimons & O’Gorman, 2014).

To sum up, research shows that the following individual characteristics have been used to mark the entrepreneur: age, education, and gender; capabilities, relevant experience; and role models.

2.5.2 Personality Traits

This subsection first provides a brief summary of research on three personality traits often linked to the status of being an entrepreneur. Then, a distinction is made between the trait and cognitive approaches to studying the entrepreneur.

“Personality traits are defined as (relatively stable) dispositions to exhibit a certain kind of response across various situations” (Rauch & Frese, 2007: 355—parentheses added).

The search for the entrepreneurial personality has traditionally dominated psychology’s effort to address the question of why some people but not others become entrepreneurs (Brandstätter, 2011; Collins et al., 2004; Frese & Gielnik, 2014; McClelland, 1961; Rauch & Frese, 2007; Zhao & Seibert, 2006; Zhao et al., 2010). In the trait approach, entrepreneurs are born, not made.

Early efforts to model the entrepreneur as a function of her traits focussed on need for achievement, or nAch (Collins et al., 2004; McClelland, 1961). More

recent trait studies (e.g. Rauch & Frese, 2007; Zhao & Seibert, 2006) have focussed on conscientiousness from the Big Five personality system (Costa & McCrae, 1992), and generalised self-efficacy (GSE)—belief in one’s capabilities to perform across situations (Judge et al., 1998). Meta-analytic evidence for the effect of nAch, GSE, and conscientiousness on firm creation is presented in Table 2.1 below.

Table 2.1 The effect of personality traits on firm creation

Trait	Effect on firm creation	Author
Need for achievement (nAch)	$r = .21$	Collins et al. (2004)
Conscientiousness (Big Five factor)	$r = .22$	Zhao & Seibert (2006)
Generalised self-efficacy (GSE)	$r = .38$	Rauch & Frese (2007)

In light of the above meta-analytic evidence, the reader should note that predictions from psychological variables (e.g. GSE) to outcome measures for complex activities (e.g. firm creation) are regarded ‘satisfactory’ in the .10 to .20 range, ‘good’ in the .20 to .30 range, and still ‘better’ when greater than .30 (Mayer et al., 2008; Meyer et al., 2001). Accordingly, the evidence for the effect of personality traits in Table 2.1 above shows that GSE has a greater effect on firm creation than either nAch or conscientiousness.

Some scholars note that general traits like those presented in Table 2.1 above are not the preserve of entrepreneurs, but instead traits common to many successful people (Gartner, 1988, 1989; Low & MacMillan, 1988; Mitchell et al., 2002; Sánchez et al., 2011; Shaver & Renko, 2015). So, as these distal (as opposed to proximal) traits artificially separate actor from action, psychological aspects not matched to the activities of entrepreneurship are thought to come with limited ability to distinguish entrepreneurs from non-entrepreneurs. Indeed, Mitchell et al. (2002) are unequivocal on this matter:

“The failure of past “entrepreneurial personality”—based research to clearly distinguish the unique contributions to the entrepreneurial process of entrepreneurs as people, has created a vacuum within the entrepreneurship literature that has been waiting to be filled.”

From his examination of data from five meta-analyses on personality aspects of entrepreneurship, Brandstätter (2011) notes that, while traits not matched to the activities of entrepreneurs (e.g. GSE) come with some predictive utility vis-à-vis “entrepreneurial status” (ES; being an entrepreneur versus not being an entrepreneur), future psychological research should begin by analysing the activities of entrepreneurs (e.g. cognitive and behavioural processes). In terms of activity-specific (i.e. proximal versus distal) predictors of ES, for example, he draws attention to the cognitive construct of entrepreneurial self-efficacy (ESE; belief in one’s capabilities to perform the various activities of entrepreneurs).

“The cognitive perspective emphasizes the fact that everything we think, say, or do is influenced by mental processes—the cognitive mechanisms through which we acquire store, transform, and use information” (Baron, 2004: 221).

In the cognitive (as opposed to trait) approach to entrepreneurship, entrepreneurs are made, not born (Hisrich, 1990; Kuratko, 2005; Matlay, 2006; Raposo & Do Paço, 2011). Indeed, whereas personality traits (e.g. GSE) are relatively stable predictors of action across situations, cognitive mechanisms (e.g. ESE) are not only domain specific, but also they are malleable. These transformational mechanisms—“specific learnable and teachable techniques” (Sarasvathy & Venkataraman, 2011: 129)—can be developed (Hisrich et al., 2007; Palich & Bagby, 1995) through learning efforts: practice, social persuasion, role modelling and physiological stimulation (Bandura, 1997, 2006, 2012; Zhao et al., 2005). These mechanisms of learning will receive more attention in section 2.7 of this chapter, while the next subsection first introduces some cognitive mechanisms that have been used to study the entrepreneur.

2.5.3 Cognitive Mechanisms

The cognitive approach to entrepreneurship emerged as a response to the shortcomings of the trait approach (Baron, 2004; Chen et al., 1998; Kuratko, 2013; Mitchell et al., 2002; Randolph-Seng et al., 2014; Sánchez et al., 2011; Shaver & Renko, 2015). Both approaches seek to explain why some people but not others become entrepreneurs. However, whereas trait researchers (or

dispositionalists) ask ‘who is an entrepreneur?’ (Carland et al., 2002), cognitive researchers (or rationalists) ask ‘how do entrepreneurs think?’ (Mitchell et al., 2007). The key idea in the cognitive approach to entrepreneurship is that thinking is a source of entrepreneurial action.

“Entrepreneurial cognition is a wave of research on the psychological aspects of the entrepreneurial process” (Kuratko, 2013: 22)

In the cognitive tradition, which has roots in the idea of information processing as a mediator between environment and action (Randolph-Seng et al., 2014), the entrepreneur is viewed as an intentional decision maker and actor (i.e. an agent) who engages in the rational evaluation of environmental as well as individual factors (e.g. Chen et al., 1998). In the model of entrepreneurial choice (Parker, 2009), for example, the decision to become an entrepreneur “is framed around the wage that the individual would earn as an employee compared to the expected profits she would earn as an entrepreneur” (Audretsch, 2014: 54). While it is usually assumed that this agent seeks to maximise her goals, such as utility or profit, her rationality is widely thought to be bounded as opposed to being fundamentally rational (e.g. Simon, 1955, 1959, 1979, 1982, 1986, 2000). This distinction is important in research on entrepreneurial cognition and action, since it is not a secret that most new firms fail (Baron & Henry, 2010; Townsend et al., 2010; Shane, 2003). Indeed, as the decision to become an entrepreneur does not seem entirely rational, researchers are interested to understand the role of various cognitive mechanisms in shaping entrepreneurial action.

“A “good” decision is one that leads to the outcome that best satisfies the decision maker’s goals at the time the decision was made.” (Smith & Kosslyn, 2009: 407)

Quite a number of cognitive mechanisms, such as *attitudes* (Athayde, 2009; Kirzner, 1997; Robinson et al., 1991), *beliefs* (Krueger, 2007; McMullen & Shepherd, 2006; Shepherd et al., 2007), *effectuation* (Read et al., 2009; Sarasvathy, 2001a, 2001b), *heuristics* (Busenitz & Barney, 1994; Forbes 2005a; Gustafsson, 2009; Holcomb et al., 2009), *entrepreneurial intent* (Krueger & Day, 2010; Shook et al., 2003; Thompson, 2009), *cognitive maps* (Brännback &

Carsrud, 2009; Holcomb et al., 2009; Mitchell et al., 2002; Seawright et al., 2013; Smith et al., 2009; Walsh, 1995), and *entrepreneurial self-efficacy* (Chen et al., 1998; De Noble et al., 1999; McGee et al., 2009; Townsend et al., 2010), have surfaced to study how entrepreneurs think. In this regard, Table 2.2 below provides a representative definition for each of these cognitive mechanisms.

Table 2.2 Some cognitive mechanisms in entrepreneurship

Mechanism	Representative definition (Author)
Attitudes	“a predisposition toward a particular object ... The concept of “attitude” is more dynamic than that of “trait” as attitudes are responsive to external objects, and are capable of change.” (Athayde, 2009: 482)
Beliefs	“beliefs are becoming increasingly recognized as fundamental to understanding entrepreneurial cognition and strategic action” (Shepherd et al., 2007: 75)
	“deeply held strong assumptions that underpin our sensemaking and our decision making.” (Krueger, 2007: 124)
Effectuation	“Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means.” (Sarasvathy, 2001a: 245)
Heuristics	“when people make everyday judgments under uncertainty, they ... rely on simplifying strategies, commonly termed heuristics, which are decision rules that reduce complex judgmental tasks to relatively simple cognitive operations.” (Holcomb et al., 2009: 167)
Entrepreneurial Intent	“entrepreneurial intent is ... a self-acknowledged conviction by a person that they intend to set up a new business venture and consciously plan to do so at some point in the future.” (Thompson, 2009: 676)
Cognitive Maps: cognitions, knowledge structures, schemas or scripts.	“Maps of minds, sense making, and action are known as cognitive maps.” (Brännback & Carsrud, 2009: 78)
	“entrepreneurial cognitions are the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth.” (Mitchell et al., 2002: 97)
	“A knowledge structure is a mental template that individuals impose on an information environment to give it form and meaning.” (Walsh, 1995: 281)
Entrepreneurial Self-Efficacy (ESE)	“ESE refers to the strength of a person’s belief that he or she is capable of successfully performing the various roles and tasks of entrepreneurship” (Chen et al., 1998: 295)

Each of the seven cognitive mechanisms defined above have merit in their own right, yet some of these factors are not mutually exclusive but overlap to a certain extent. For instance, while cognitive maps (e.g. the business model) are forms of heuristics (Brännback & Carsrud, 2009), entrepreneurial self-efficacy (ESE) is a heuristic-based capability belief. Indeed, ESE is a transformational mechanism that builds on the idea of a dual knowledge system: e.g. knowledge regarding what entrepreneurs do ('know-what') and how they do it ('know-how'); and

“by influencing the choice of activities and the motivation level, beliefs of personal efficacy make an important contribution to the acquisition of the knowledge structures on which skills are founded” (Bandura, 1997: 35).

Also, conceptually at least, ESE is an antecedent of intentional action, yet ESE beliefs influence action directly and by affecting entrepreneurial intent (Bandura, 1997). On the other hand, recent research (Brännback et al., 2006; Brännback et al., 2007; Krueger & Kickul, 2006) on the effect of ESE on intent suggests that ESE may prove—statistically—to be the response variable (Krueger & Day, 2010). Notwithstanding this problem of whether is ESE is the cause or the effect of intent³, it appears important to explore the relationship between levels and changes in efficacy beliefs with the cognitive maps (e.g. business models) that underlie them:

“If Bandura is correct, major shifts in self-efficacy should be associated with significant change in scripts and maps” (Krueger & Day, 2010: 340)

In terms of future research on how entrepreneurs think and act, it seems that the full potential of cognitive maps (Brännback & Carsrud, 2009; Krueger & Day, 2010) and ESE (Krueger, 2007; Mauer et al., 2009; Sánchez et al., 2011; Vecchio, 2003) remains to be realised. Thus, since a detailed review of each of

³ In general, Collins (1990) notes how the notion of causality in the social sciences is fundamentally different from causality in the physical sciences. In terms of hypothesis testing, he states that it is not always clear which variables are to be regarded as the response variable and which are to be considered the input variable; indeed, “there are many problems in the social sciences where this luxury is not present” (Collins, 1990: 198). For instance, as we will see, conceptually ESE can be viewed both as cause and effect of being an entrepreneur (Chen et al., 1998).

the seven cognitive mechanisms is beyond the scope of this thesis, the remaining sections of the literature survey will focus on the role of cognitive maps (e.g. the business model) and ESE in entrepreneurial thought and action.

Before turning to the next section, and in light of the literature reviewed on personality traits (e.g. GSE) in the previous subsection and cognitive mechanisms (e.g. ESE) in this subsection, Table 2.3 below provides a summary of trait and cognitive approaches to the study of entrepreneurship.

Table 2.3 Trait and cognitive approaches to entrepreneurship

Approach	Trait	Cognitive
Question	Who is an entrepreneur?	How do entrepreneurs think?
Paradigm	Dispositionalism	Rationalism (Mentalism)
Explanatory factors	<ul style="list-style-type: none"> • Need for achievement (nAch) • the Big Five—e.g. conscientiousness • <i>Generalised self-efficacy (GSE)</i> 	<ul style="list-style-type: none"> • Intentional Action • Knowledge structures (or scripts) e.g. business models • <i>Entrepreneurial self-efficacy (ESE)</i>
Main Idea(s)	<ul style="list-style-type: none"> • Entrepreneurs are born. • Traits predict entrepreneurial behaviour. Distal traits may not distinguish entrepreneurs from non-entrepreneurs. 	<ul style="list-style-type: none"> • Entrepreneurs are made. • Cognitive mechanisms predict entrepreneurial behaviour and distinguish entrepreneurs from non-entrepreneurs.
References	Brandstätter, 2011; Frese & Gielnik, 2014; McClelland, 1961; Rauch & Frese, 2007; Seibert, 2006; Stewart & Roth, 2007; Zhao & Seibert, 2006; Zhao et al., 2010	Chen et al., 1998; De Noble et al., 1999; Grégoire et al., 2011; Mitchell et al., 2002; Randolph-Seng et al., 2014; Sánchez et al., 2011; Seawright et al., 2013; Townsend et al., 2010.

In line with the goals of this research on entrepreneurial action, herein the entrepreneur is studied using a cognitive as opposed to a trait approach.

2.6 Cognitive Maps

Cognitive maps, which are sometimes called cognitions, knowledge structures, schemas or scripts, are concepts from the domain of cognitive psychology (Brännback & Carsrud, 2009; Krueger, 2007; Randolph-Seng et al., 2014; Sánchez et al., 2011). In this regard, top-down information processing theory holds that all individuals form knowledge structures to represent their world and

hence, simplify information processing and decision making (cf. Walsh, 1995). A knowledge structure is a mental model that helps people to 'connect the dots' and, in this way, facilitates action in complex areas of human activity like entrepreneurship (Baron, 2006; Krueger, 2007; Holcomb et al., 2009; Renko et al., 2012).

“knowledge structures are formed from the results of observational learning, exploratory activities, verbal instruction, and innovative cognitive syntheses of acquired knowledge” (Bandura, 1997: 34)

The knowledge structures that individuals use to make assessments, decisions, or judgements about opportunity evaluation, enterprise creation and growth are sometimes called entrepreneurial cognitions (Mitchell et al., 2002). These mental models contain and represent knowledge about entrepreneurial activity (Sánchez et al., 2011). They are important in research on entrepreneurship as they provide not only a bridge between entrepreneurial thinking and action, but also a way to distinguish entrepreneurs from non-entrepreneurs (Mitchell et al., 2007; Seawright et al., 2013; Smith et al., 2009). Further, entrepreneurial cognitions are formed by experience and can be developed through training (Hisrich et al., 2007; Palich & Bagby, 1995).

“Research in entrepreneurial cognition is about understanding how entrepreneurs use simplifying mental models to piece together previously unconnected information that helps them to identify and invent new products or services, and to assemble the necessary resources to start and grow businesses.” (Mitchell et al., 2002: 97).

While there is no one knowledge structure, several studies have shown how three particular scripts separate expert entrepreneurs from non-entrepreneurs (e.g. Mitchell et al., 2002; Seawright et al., 2013; Smith et al., 2009). Seawright et al. (2013: 206) have defined these three scripts as follows:

- *Arrangement scripts*: “knowledge structures that individuals possess about funding and financial resources, asset and idea protection, and contacts/networks necessary for new value-creating economic relationships”;

- *Willingness scripts*: “knowledge structures that underlie the readiness or receptivity to exploring economic possibilities, urgency and risk-taking motivation, and a tolerance for making commitments in new economic relationships”;
- *Opportunity-Ability scripts*: “knowledge structures that individuals have about new venture scenarios and patterns, new venture situations, the needed orientation toward success, and opportunity-recognition skills required to create a venture”

Each of the above scripts can be measured indirectly using a script-scenario model, whereby mastery is inferred from respondent choice among paired cue items: (a) mastery cue and (b) distractor cue. For example, in terms opportunity-ability scripts, one paired item in the Seawright et al. (2013: 222) study asks respondents to decide whether “new venture success” (a) follows a particular script or (b) depends heavily on the pluses and minuses in a given situation. However, while they expect entrepreneurial experts to select response (a) for this paired item, Seawright et al. do not elaborate on the attributes (e.g. content and structure) of this particular knowledge structure. In other words, this opportunity-ability script sheds little light on the the specific activities that drive new venture success.

2.6.1 Business Models

In light of the above, the concept of “business model” seems salient because it “creates a cognitive map of the various aspects of business activities” (Tikkanen et al., 2005: 789). The business model helps entrepreneurs to “see” the big picture (Daly & Walsh, 2012), and it is linked with entrepreneurial action and firm outcomes (Zott & Amit, 2007). So, as business models are thought to benefit entrepreneurs via more informed decisions, they can potentially increase the odds of success (Trimi & Berbegal-Mirabent, 2012). In fact, the business model is so central to the future of entrepreneurship research that George & Bock (2011: 102—emphasis added) stated provocatively,

“The firm formation decision *is* based on the enactment of an opportunity through an explicit or implicit business model.”

Yet, like the word entrepreneurship, the term “business model” is elastic (Eisenmann, 2013). That is, there is no widely agreed definition of the term (Morris et al., 2005). For instance, while some scholars distinguish business model from strategy elements (George & Bock, 2011), such as growth strategy and competitive strategy, other scholars note how the business model and strategy overlap (Casadesus-Masanell & Ricart, 2010). In addition, the business model can be defined both subjectively, such as the cognitive structures that shape decision and action, and objectively, such as the structure of the firm’s procedures and relationships (Brea-Sofis et al., 2015). This thesis explores the role of business models in shaping entrepreneurial thought and action.

In broad terms, since it provides a relative as opposed to absolute description of business activities, the business model is a metaphor for doing business—e.g., architecture (Österwalder & Pigneur, 2009), conceptual tool (George & Bock, 2011), description (Applegate, 2001), framework (Afuah, 2004), representation (Morris et al., 2005), and or story (Magretta, 2002). Nonetheless, while the concept may mean different things to different scholars, one need only substitute the word “entrepreneur(s)” for “manager(s)” in the statements below to get a sense of the important role played by business models in entrepreneurial thought and action:

“A good business model answers Peter Drucker’s age-old questions: Who is the customer? And what does the customer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?” (Magretta, 2002: 87)

“The business model is a cognitive system through which managers decide on their actions” (Parvinen et al., 2007; Tikkanen et al., 2005)

2.6.2 The Business Model Canvas

While there is no one business model, and as others have noted its popularity in the practice community and popular press (Daly & Walsh, 2012; George &

Bock, 2011; Trimi & Berbegal-Mirabent, 2012), this thesis turns to the Business Model Canvas (BMC; Österwalder & Pigneur, 2009) for conceptual guidance. It is important to note that the BMC did not emerge from the entrepreneurship literature, per se, but from the literature on e-Business models (Österwalder, 2004). The BMC is a firm-level concept:

“A business model describes the rationale of how an organization creates, delivers, and captures value” Österwalder & Pigneur (2009: 14)

However the above definition not only introduces a breezy concept (i.e. value), but also it is directed at the firm (as opposed to individual) level. First, in terms of the word “value”, this concept seems to be intertwined with business and economics in general and entrepreneurship in particular. For example, “The entrepreneur is the individual responsible for the process of creating new value” (Bruyat & Julien, 2000: 169), and “Entrepreneurship is the process of creating something new with value” (Hisrich et al., 2005: 8). Yet, the concept of value is inherently subjective: *what is the value to you, the decision maker?* (Smith & Kosslyn, 2009). Indeed, like the words “market” and “economy”, the word “value” is a construct of the mind (Derman, 2011). For example:

- as noted earlier, the founding of a failed firm is the modal outcome of entrepreneurial action. But since this outcome is not a closely guarded secret, one must assume that the decision to become an entrepreneur is guided, at least partly, by more subjective aspects of value (e.g. perceived self-satisfaction, sense of pride and or social recognition);
- the perceived value of an opportunity seems important in the decision to become an entrepreneur (Dimov, 2010); and
- in terms of the buyer decision process (or cost-benefit analysis), “value is the customer’s perception of the product’s or service’s effectiveness in meeting his or her needs” (Doyle, 2008: 80).

Second, in terms of using Österwalder & Pigneur’s (2009) firm-level definition of the business model to understand the cognitive structures of entrepreneurs, Brännback & Carsrud (2009: 82) note (albeit in a simplified sense) how “the cognitive map for the entrepreneur is that of the individual, or singular of the

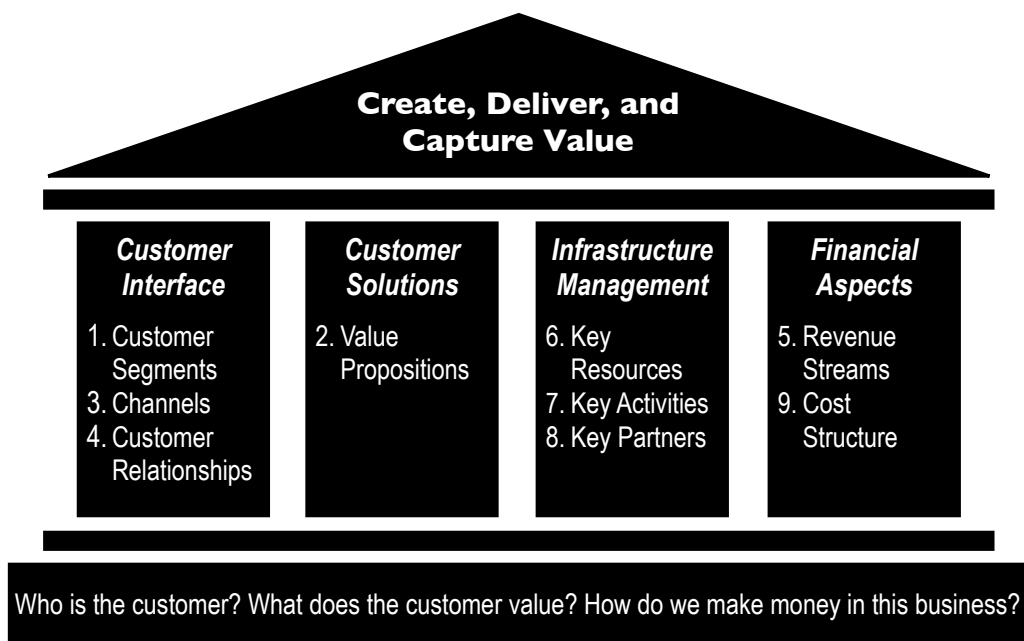
collective or plural organizational strategy.” In that sense then, the BMC is used here to represent a person’s cognitive map of entrepreneurial action in a firm context. The BMC identifies nine building blocks, which are defined as follows (after Andersson et al., 2006; Tongur & Engwall, 2014; Österwalder, 2004):

1. *customer segments*: the group(s) of customers to which an entrepreneur will offer value;
2. *value propositions*: the value of the mix of products and services that the entrepreneur wants to offer to her customers
3. *channels*: the distribution channels by which an entrepreneur will deliver value to her customers;
4. *customer relationships*: the type of links an entrepreneur wishes to establish between herself and her customer;
5. *revenue streams*: the way in which an entrepreneur plans to generate revenue from delivering value to customers;
6. *key resources*: the assets (e.g. financial and non-financial) required by an entrepreneur in order to create, deliver and capture value
7. *key activities*: the processes by which the entrepreneur can transform resources into products and or services for the customer;
8. *key partnerships*: the type of partner-links (e.g. outsourcing) an entrepreneur can use to create value for her customer;
9. *cost structure*: the costs involved in doing business, which are a function of the entrepreneur’s business model elements.

However, since it provides only a relative description of business activities, the BMC is not absolute. It is a metaphor for creating, delivering and capturing value. For instance, the BMC does not (a) specify the links with strategy elements (Trimi & Berbegal-Mirabent, 2012), or (b) consider the modeller's assumptions in its structure (Daly & Walsh, 2012). The latter limitation may be important because, inasmuch as the explanatory and predictive value of a scientific model is intertwined with its assumptions, the outcomes that flow from a given business model are intertwined with the modeller's assumptions.

As shown below in Figure 2.3, while stood on the three age-old questions a good business model should answer—e.g. ‘Who is the customer?’ (Magretta, 2002), the nine building blocks of the BMC can be grouped under four distinct but related pillars of knowledge: (a) customer interface, (b) customer solutions, (c) infrastructure management, and (d) financial aspects. According to Österwalder (2004), these four pillars have links to firm performance as understood via the Balanced Scorecard (e.g. Kaplan & Norton, 1992).

Figure 2.3: Adapted view of the Business Model Canvas (BMC)



To sum up, the diagram presented above attempts to represent knowledge of *what* firm creators ought to do in order to create, deliver and capture value.

2.6.3 Capabilities and Cognition

Capabilities and Cognitive Processes

As pointed out previously, capabilities are a function of declarative knowledge and cognitive processes (Bloom et al., 1956). However, capability—“the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customer” (Andersson et al., 2006: 485)—is not a first order theme in the BMC (Zott et al., 2011). In particular, the reader will note that the nine elements of the BMC are rather quiet on the performance skills or cognitive processes (e.g. ‘know-how’) involved in creating, delivering and capturing value.

One caveat. The terms “cognitive processes” and “cognitive complexity” appear to be used interchangeably throughout the literature on cognition:

“Cognitive structures represent and contain knowledge, while cognitive processes relate to the manner in which that knowledge is received and used.” (Sánchez et al., 2011: 434)

“Cognitive complexity is the capacity to construe people, objects, and ideas in a multidimensional way ... Cognitive complexity is related to both content (properties and features) and underlying structure (relationships and dynamics). (Benet-Martínez et al., 2006: 388)

Cognitive processes influence how people think and act; they relate to the way in which information is acquired, used and processed by people (Benet-Martínez et al., 2006; Carraher & Buckley, 1996; Krathwohl, 2002; Sánchez et al., 2011). According to Krathwohl (2002), the cognitive process dimension is a six-element hierarchy of cognitive complexity where, for instance, the cognitive processes associated with ‘evaluate’ are believed to be less cognitively complex than the ones associated with ‘create’. Although he uses 19 cognitive processes (e.g. planning and implementing) to characterise the breadth and depth of this dimension, six achievement verbs are often associated with entrepreneurs: *identify*, *select*, *plan*, *implement*, *evaluate*, and *create* (Alvarez & Barney, 2007; Baron & Henry, 2010). These six verbs are listed in ascending order of cognitive complexity in some sense made precise by Krathwohl (2002), and Table 2.4 below presents dictionary definitions for each of them.

Table 2.4 Definitions for six cognitive processes

Cognitive Process	Definition
Identify	Establish or indicate who or what (someone or something) is.
Select	Carefully choose as being the best or most suitable.
Plan	A detailed proposal for doing or achieving something.
Implement	Put (a decision, plan, agreement, etc.) into effect.
Evaluate	Form an idea of the amount, number, or value of; assess.
Create	Bring (something) into existence.

The cognitive process dimension is important because the cognitive domain for a given activity may be defined as the intersection of the content (what) and process (how) dimension for that activity (e.g. Anderson, 1980; Bandura, 1997; Krathwohl, 2002). Indeed, it is possible to know the rules of doing business (i.e. 'know-what') and still not know *how* to do it well (Sandelands, 1990). Rather, a cognitive process or skill dimension is usually required (Baron, 2004; Baron & Henry, 2010; De Carolis & Saporito, 2006; Drucker, 1985; Sánchez et al., 2011).

Research shows that cognitive processes, such as planning, can be a source of bias in the decision to become an entrepreneur (Baron, 2004; Hayward et al., 2006; Koellinger et al., 2007; Townsend et al., 2010). For instance, a prevalent bias in human decision making known as the 'planning fallacy', which is common among entrepreneurs via their sense of 'optimistic overconfidence', shows that people may think that they can get the job done (e.g. create a new firm) quicker than they actually can. However, it seems that research has not fully explained the influence of entrepreneurs' cognitive processes on entrepreneurial action and performance outcomes (Baron & Henry, 2010).

To sum up, capabilities are not a first-order theme in the BMC, and cognitive processes (e.g. identify, select,..., create) take a back seat in this view of the business model. This gap is important because statements of activities, such as business model activities, usually involve a content and process dimension.

Linking the Business Model to Entrepreneurial Cognition

It appears that the business model remains theoretically and empirically underdeveloped for advancing research on entrepreneurial cognition (George & Bock, 2011; Trimi & Berbegal-Mirabent, 2012; Wiklund et al., 2011). Indeed, Zott et al. (2011) note that the business model concept is difficult to operationalise for research purposes, in part, because it involves both content (e.g. 'know-what') and process (e.g. 'know-how') aspects of doing business. That is, the business model can be understood as a two-dimensional knowledge system. In this regard, they have called for more precise concepts of the business model that simultaneously consider both dimensions. This call to action seems salient for linking the BMC to entrepreneurial thought and action because, as already pointed out, a dual knowledge structure provides a transformational mechanism

by which people move from cognition to action in complex areas of activity (Anderson, 1980; Bandura, 1997; Bloom et al., 1956; Krathwohl et al., 2002).

“A capability is only as good as its execution.” (Bandura, 1997, 35)

From the sociocognitive perspective, Bandura (1997) argues that declarative knowledge (e.g. ‘know-what’) and cognitive processes (e.g. ‘know-how’) are necessary but insufficient for competent action. In this regard, he states that “People’s beliefs in their efficacy affect almost everything they do: how they think, motivate themselves, feel, and behave” (Bandura, 1997: 19). For him, self-efficacy (belief in one’s capabilities to perform certain activities) is a transformational mechanism by which people move from their two-dimensional knowledge structures to competent action in complex areas of activity. Activity-specific self-efficacy seems important in the study of entrepreneurial action because entrepreneurship encompasses activities of broad scope (Bandura, 2012) that, as already pointed out, range from perception through evaluation to action. In the cognitive approach to entrepreneurship, where social cognition is thought to be the key to unlocking the decision to become an entrepreneur (Randolph-Seng et al., 2014; Shaver, 2010), Hindle et al. (2009: 38) state:

“The true parent of entrepreneurial cognition as a field is not “cognition” – unadorned – but “social cognition” whose seminal scholar is Albert Bandura.”

Social cognition is the study of how individuals make sense of other individuals and themselves (Fiske & Taylor, 2013). Social psychologists hold that intentional human behaviour (i.e. agency) is influenced by how people perceive their world, and also that agency influences the environment. So, to borrow from Eisenhardt (1989), as entrepreneurship is a problem that has a cooperative structure (e.g. the actions and interactions of entrepreneurs and their customers, suppliers, and other stakeholders), researchers can benefit from incorporating an agency perspective.

In social cognitive theory (Bandura, 2001), agency refers to acts performed intentionally, and self-efficacy is the key mechanism of agency in this view of

human thought and action, where outcomes flow from actions (Bandura, 1997). Conceptually, entrepreneurial self-efficacy (ESE; belief in one's capabilities to perform the activities of entrepreneurs) is a transformational mechanism by which a person moves from her cognitive maps (e.g. her business model) to creating new firms and new markets. However, previous research on ESE has not used a business model lens (e.g. the BMC) to understand the activities of entrepreneurs. Accordingly, the next section examines existing literature on the construct of self-efficacy in general and the ESE construct in particular.

2.7 Self-Efficacy and Entrepreneurial Action

The purpose of this section is threefold. First, to examine literature on the self-efficacy construct from social cognitive theory. Second, to understand the sources and dimensions of self-efficacy beliefs across areas of activity. Third, to synthesise the extant empirical work conducted on the self-efficacy construct in the area of entrepreneurship—i.e., entrepreneurial self-efficacy (ESE), and to identify opportunities for further research in this area.

Aside: Efficacy beliefs operate at the individual level of analysis via self-efficacy, and at the group level of analysis via collective efficacy. Because interest lies here with the behaviour of the individual entrepreneur, this section focuses on the self-efficacy construct as it applies to solo entrepreneurship.

2.7.1 The Self-Efficacy Construct

Self-efficacy—“beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997: 3)—is the key mechanism of agency (Bandura, 1997, 2012) in social cognitive theory (SCT; Bandura, 1986, 2001). “The theory predicts a variety of effects on thought, affect, action, and motivation” (Bandura, 1997: 46). In terms of the label SCT,

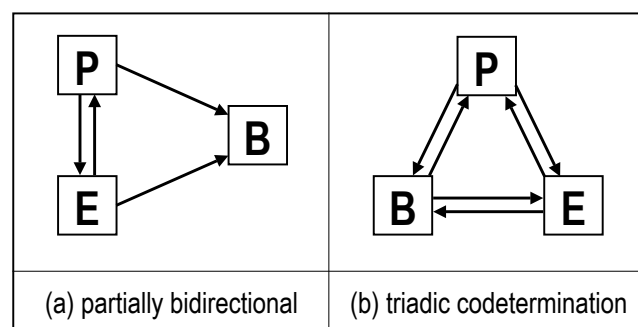
- the *social* part of the phrase recognises that behaviour is affected by the environment, while
- the *cognitive* part acknowledges that people can exercise control over what they do.

Self-efficacy—belief in one’s capabilities to perform certain activities—is related (albeit probabilistically versus inevitably) to one’s choice of behaviours, goals, perseverance, and performance attainment across areas of activity (Bandura, 1997, 2012; Bird et al., 2012; Chen et al., 2004; Gist, 1987; Gielnik et al., 2015; Rauch & Frese, 2007; Zhao et al., 2005). In other words, SCT provides knowledge for predicting behaviour via self-efficacy, as long as the measure is tailored to the activity area being assessed. People assess their self-efficacy in relation to *perceived* challenges, opportunities and resources particular to their environment (Bandura, 2012; Chen et al., 1998).

“How people perceive the structural characteristics of their environment—the impediments it erects and the opportunity structures it provides—also influences the course of human action.” (Bandura, 2012: 14)

The SCT model of causation is called *triadic codetermination*. As shown below in Figure 2.4 (cf. Bandura, 2008), it differs from the *partially bidirectional* model used by trait researchers. In SCT, human functioning is a product of the reciprocal interplay of personal (P), environmental (E), and behavioural (B) factors. So, while behaviour does not influence the interaction between the person and the environment in the partially bidirectional model, behaviour is an interacting determinant in the model of triadic codetermination: people not only respond to the environment (e.g. *discover* opportunities), they can also *create* it (Bandura, 2008). Thus, this key assumption from SCT aligns with the idea that entrepreneurial action may be a discovery as well as a creation process, and perception is a basic element of entrepreneurship (Hébert & Link, 1989).

Figure 2.4: Two causal models of human action



Also, in triadic codetermination, behaviour is not just an outcome of self-efficacy, it is also a determinant of self-efficacy (Bandura, 1977, 2012; Chen et al., 1998). Thus, whereas the trait view of self-efficacy (e.g. generalised self-efficacy or GSE) posits a relatively stable construct, Bandura's task-specific construct (e.g. entrepreneurial self-efficacy or ESE) is relatively malleable:

“Social cognitive theory provides not only knowledge for predicting behavior but also a theory of learning and change.” (Bandura, 2012: 13)

Before turning to the property of malleability, it is worth noting that triadic codetermination does not preclude the possibility that entrepreneurial action *is* a discovery process (Shane, 2003, 2012; Eckhardt & Shane, 2010: 67):

“People higher in self-efficacy are more likely to exploit entrepreneurial opportunities” (Eckhardt & Shane, 2010: 67).

2.7.2 Sources and Dimensions of Self-Efficacy

Sources of Self-Efficacy

Self-efficacy builds on the idea of a dual knowledge structure, and SCT outlines four mechanisms by which people can develop their knowledge structures and self-efficacy (Bandura, 1977, 1997, 2012):

- *mastery experience*: deliberate practice is the most effective (i.e. most authentic and influential) way for people to develop their sense of self-efficacy (Boyd & Vozikis, 1994; Goddard et al., 2004) and knowledge structures (Walsh, 1995);
- *role modelling*: people seek role models who possess the capabilities to which they aspire (Bandura, 1997), while perceived similarity with the model strongly influences the impact of role modelling on the modeller's self-efficacy (Dávila, 2010);
- *verbal persuasion*: when people are persuaded that they have what it takes to perform given activities they are more likely to engage and persevere in the face of obstacles. While persuasion may be less effective in developing self-efficacy than mastery experience or role modelling, it is

key that verbal persuasion be based on objective and realistic observations if it is to be beneficial to the individual being persuaded (Bandura, 1997); and

- *physical and emotional states*: a positive frame of mind enhances one's self-efficacy, while a negative frame diminishes it (Bandura, 1997, 2012). People's emotional states and actions "are based more on what they believe than on what is objectively true" (Bandura, 1997: 2). It is difficult for people to operate effectively when they are harbouring feelings of self-doubt.

In practical terms (e.g. the classroom), "one advantage of self-efficacy is that it is malleable in a way that may be relatively costless" (Judge et al., 2007: 118). In fact, various teaching practices generally used in education can be linked to each of the four mechanisms by which self-efficacy is developed (Zhao et al., 2005). This feature of self-efficacy seems important in a world where a wide array of stakeholders (e.g. policymakers and educators) seem interested in developing people's entrepreneurial capabilities.

In addition, if Bandura is correct, major changes in a person's self-efficacy should be accompanied by significant changes in her cognitive maps (Krueger & Day, 2010). Accordingly, by way of triadic codetermination, self-efficacy provides a conceptual basis for exploring the cognitive maps (e.g. business models) of entrepreneurs at deeper levels.

Dimensions of Self-Efficacy

Self-efficacy beliefs vary on three dimensions: level, strength and generality (Bandura, 1997, 2006; Chen et al., 2001; Urban, 2006):

- *level* (or magnitude) pertains to a particular level of task difficulty. For instance, as outlined earlier in Table 2.4, activities may vary in terms of cognitive complexity: from less cognitively complex activities (identify) to more cognitively complex (create) ones;
- *strength* refers to certainty of successfully performing a certain level of task difficulty. For example, efficacy strength for a given activity can range from a weak belief (lower self-efficacy) to a strong belief (higher self-

efficacy) for that task. A certain threshold of efficacy strength is required for a given course of action (Bandura, 1997). And, in general, efficacy strength is a more sensitive and revealing measure than efficacy level (Bandura, 2006); and

- *generality* is the extent to which the efficacy construct is matched or not to a particular activity domain. For instance, as outlined previously, GSE is not specific to the activities of entrepreneurs, while ESE is activity specific. Likewise, a given activity specific self-efficacy construct, such as ESE, can range in nature and structure from relatively abstract to relatively specific.

Although scholars of self-efficacy seem to agree that efficacy beliefs vary on these three dimensions, there remains debate regarding the need for a task-specific view of self-efficacy (Chen et al., 2001, 2004; McGee et al., 2009). On the other hand, we know that different knowledge and skills are required to operate effectively in different areas of activity. In this regard, Bandura (1997) notes that one cannot be all things; it would require a significant amount of effort, resources, and time to master every area of human activity. Perhaps, this is why he is unequivocal on the matter:

“the efficacy belief system is not a global trait but a differentiated set of self-beliefs linked to distinct realms of functioning ... Scales of perceived self-efficacy must be tailored to the particular domain of functioning that is the object of interest.” (Bandura, 2006: 307)

In the domain of entrepreneurship, one’s self-efficacy for the activities of entrepreneurs is usually referred to as entrepreneurial self-efficacy (ESE). The next subsection introduces the ESE construct and synthesises the extant empirical work conducted by others in this area.

2.7.3 Entrepreneurial Self-Efficacy (ESE)

Entrepreneurial self-efficacy (ESE; belief in one’s capabilities to perform the various activities involved in entrepreneurship) is especially useful in the study of entrepreneurs as it includes individual as well as environmental factors (McGee et al., 2009). It is widely thought to be a distinctive characteristic of

entrepreneurs (Bird et al., 2012; Chen et al., 1998; De Noble et al., 1999; Dimov, 2010; Drnovšek et al., 2010; Eckhardt & Shane, 2010; Krueger & Brazeal, 1994; Krueger & Day, 2010; McGee et al., 2009; Markman et al., 2002; Mauer et al., 2009; Sánchez et al., 2011; Shane & Venkataraman, 2000; Shaver & Renko, 2015; Townsend et al., 2010). In short, to borrow from Krueger & Brazeal (1994), ‘no ESE, no entrepreneurial action’. Indeed,

“Bandura’s description of the self-efficacious individual (optimistically persistent) sounds as though he is referring to entrepreneurs” (Krueger & Day, 2010: 338)

The entrepreneurial self-efficacy (ESE) construct has been defined by scholars of entrepreneurship as follows:

- “a person’s belief that he or she is capable of successfully performing the various roles and tasks of entrepreneurship” (Chen et al., 1998: 295);
- “a person’s belief in their own abilities to perform on the various skill requirements necessary to pursue a new venture opportunity” (De Noble et al., 1999: 73);
- “a person’s belief in their ability to successfully launch an entrepreneurial venture” (McGee et al., 2009: 965); and
- “confidence in one’s ability to perform tasks relevant to entrepreneurship” (Townsend et al., 2010)

In terms of the above definitions and, indeed, the empirical studies to which they pertain, the measures of ESE used by these scholars can be viewed on a scale that ranges from distal to proximal: i.e., measures of the ESE construct range from relatively general (e.g. Townsend et al., 2010) to relatively specific (e.g. Chen et al., 1998; De Noble et al., 1999; McGee et al., 2009).

“If one places the frequently used entrepreneurial self-efficacy scales (e.g., Chen et al. 1998) into a continuum from general to specific or from distal to proximal to action, they usually fall between a highly general construct and a clearly specific one.” (Frese & Gielnik, 2014: 430)

Distal Measures

In terms of distal or relatively general measures of ESE, while using one of three abstract efficacy items—“Overall, my skills and abilities will help me start a business?” (2010: 197), Townsend et al. found that this judgement of entrepreneurial capability was correlated with the decision to start a firm ($r = .182$; $p < .001$). They also showed that ‘mean total ESE score’⁴ had a direct main effect (.261) on start-up decision ($p < .05$). In short, Townsend et al. (2010) found that their distal measure of ESE was a robust predictor of firm creation.

Yet, while the level of prediction from the individual ESE item above to the outcome measure (i.e. start-up) may be considered ‘good’ (e.g. Mayer et al., 2008), especially because the study was a longitudinal (as opposed to cross-sectional) design, the item used to measure this aspect of ESE is vague. Similar to more trait-like measures (e.g. general self-efficacy or GSE), it sheds little light on the particular capabilities—declarative knowledge and cognitive processes—and/or activities involved in starting a business. Indeed, as the other two efficacy items used by Townsend et al. (2010) pertain to ‘prior experience’ and ‘commitment to action’, it seems that the specific activities involved in firm creation do not loom large in this overall measure of ESE.

However, an understanding of a relatively specific set of activities involved in creating firms is vital if we are to increase people's beliefs in their capabilities to create new firms through training, particularly among specific groups that seem to be underrepresented in this mode of entrepreneurship (e.g. females)⁵. In this regard, as discussed next, some scholars have developed measures of ESE that are specific to what entrepreneurs do when they create firms.

“Vague items obscure what, in fact, is being measured” (Bandura, 1997: 40)

⁴ By calculating a composite score (i.e. mean) of their three Likert-type items, Townsend et al. (2010) assume Likert scale data in order to use a hierarchical Cox regression procedure. Yet, in terms of analysing Likert data, Boone & Boone (2012) note: “Likert scale data ... are created by calculating a composite score (sum or mean) from four or more type Likert-type items”.

⁵ In Ireland, for example, just one in three females report having a positive view of their entrepreneurial capabilities (Fitzsimons & O’Gorman, 2014).

Proximal Measures

In terms of proximal or relatively specific measures of ESE, the literature (e.g. Bae et al., 2014; Karlsson & Moberg, 2013; Moberg, 2011, 2013) reveals that at least three activity-specific scales have been developed to study the effect of various entrepreneurial capability beliefs on the decision to create a firm: (a) Chen, Greene, & Crick (1998), (b) De Noble, Jung, & Ehrlich (1999), and (c) McGee, Peterson, Mueller, & Sequeira (2009). These firm-centric measures of ESE have been labelled the Chen-scale, the DeNoble-scale and the McGee-scale, respectively (cf. Moberg, 2011, 2013).

Aside: While the literature reveals other measures to capture judgements of entrepreneurial capabilities (e.g. Cassar & Friedman, 2009; Dimov, 2010; Forbes, 2005a, 2005b; Marlino & Wilson, 2003; Moberg, 2013; Sequeira et al., 2005; Sequeira et al., 2007; Sherer et al., 1982; Zhao et al., 2005), these three activity-specific ESE scales seem to have captured the interest of researchers who study why some people are more likely than others to create firms.

Accordingly, Table 2.5 over first summarises the process used to construct each of these activity-specific ESE measures and, then, the three ESE scale development studies are further explored via four headings:

- (i) conceptual schemes,
- (ii) measurement formats,
- (iii) validity evidence, and
- (iv) research opportunities.

Table 2.5: Three extant (activity-specific) measures of ESE

Key Aspects	Chen et al. (1998)	De Noble et al. (1999)	McGee et al. (2009)
Conceptual Scheme	<ul style="list-style-type: none"> • Marketing • Innovation • Management • Risk-taking • Financial control 	<ul style="list-style-type: none"> • Developing new product or market opportunities • Building an innovative environment • Initiating investor relationships • Defining core purpose • Coping with unexpected challenges • Developing critical human resources 	<ul style="list-style-type: none"> • Searching • Planning • Marshalling • Implementing • People • Financial
Measurement Approach	<ul style="list-style-type: none"> • "Degree of certainty in performing each of the roles/tasks" • 5-point scale: from completely unsure (1) to completely sure (5) 	<ul style="list-style-type: none"> • "How capable do you believe you are in performing each of the following tasks?" • 5-point scale: from strongly disagree (1) to strongly agree (5) 	<ul style="list-style-type: none"> • "How much confidence do you have in your ability to ...?" • 5-point scale: from very little (1) to very much (5)
Sample Characteristics	<ul style="list-style-type: none"> • Students: MBA students (112) and senior undergraduates (29) • Practitioners: small business owners (103) and executives (72) 	<ul style="list-style-type: none"> • Students: MBA students (87) and undergraduate students (272) 	<ul style="list-style-type: none"> • Students: senior business undergrads (88) • Early stage activity: nascent entrepreneurs (109) and those interested in starting their own business (185)
Original (Final) Number of Items	<ul style="list-style-type: none"> • 36 (22) 	<ul style="list-style-type: none"> • 35 (22) 	<ul style="list-style-type: none"> • 75 (19)
Sample Item	<ul style="list-style-type: none"> • <i>New products and services</i> 	<ul style="list-style-type: none"> • <i>I can create products that fulfill customers' unmet needs</i> 	<ul style="list-style-type: none"> • <i>Design a product or service that will satisfy customer needs and wants</i>
Main Findings	<ul style="list-style-type: none"> • Entrepreneurs type of ESE differed from that of Managers • ESE was positively related to students' entrepreneurial intent 	<ul style="list-style-type: none"> • ESE distinguished entrepreneurship from non-entrepreneurship students • Positive association between ESE and entrepreneurial intent 	<ul style="list-style-type: none"> • Positive relationship between nascent entrepreneurship and the ESE construct, as well as attitude towards venturing

(i) *Conceptual Schemes*

The summary provided in Table 2.5 above highlights how each of the three ESE scale development studies used a different conceptual scheme to understand the set of activities involved in firm creation:

- *the Chen-scale* was developed around five factors: marketing, innovation, management, risk-taking, and financial control;
- *the DeNoble-scale* was built using five factors: developing new product or market opportunities, building an innovative environment, initiating investor relationships, defining core purpose, coping with unexpected challenges, and developing critical human resources; and
- *the McGee-scale* used the factors identified by other researchers (e.g. Cox et al., 2002; Mueller & Goic, 2003) to develop their linear phase-based measure: searching, planning, marshalling, and implementing.

The above factors show that ESE is not only a multidimensional construct, but also the three firm-centric measures seem to capture different aspects of ESE. In addition, the main findings presented above in Table 2.5 suggest that (a) firm creation encompasses activities of broad scope (e.g. there are a total of 63 ESE items or variables for researchers and practitioners to consider), and (b) each activity-specific measure of ESE has a positive influence on a person's decision to create a firm, that is, either by its direct effect on firm creation or by its influence on other determinants (e.g. intentions and attitudes) of firm creation.

On the other hand, after DeVellis (2012), since the different scales capture distinct parts of ESE, these instruments may not necessarily produce convergent results. Notwithstanding the findings from the McGee-scale study, scholars have already suggested the need for a validity study to rigorously compare the Chen-scale and the De Noble-scale (Kickul & D'Intino, 2005).

(ii) Measurement Formats

In general, the development process used to construct each of the three activity-specific measures of ESE appears to follow good practice in developing psychological measures (DeVellis, 2012). However, in terms of the guidelines for constructing self-efficacy scales (Bandura, 2006), it is worth noting that not one of these studies used the suggested 100-point scale to score ESE items.

In his guide, Bandura (2006) states that people should rate the strength of their self-efficacy on a 100-point scale—e.g. ranging in 10-unit intervals from cannot

do (0) to highly certain can do (100), and a scale with a percent confidence response format is a more sensitive measure of self-efficacy and, thus, a better predictor of behaviour than the 5-point Likert-type alternative. Yet, in each of the three scale development studies, a 5-point Likert-type measurement format was used to score the items or variables used to capture ESE (see Table 2.5 above).

On the other hand, Maurer & Pierce (1998) showed evidence that a Likert scale provides an acceptable alternative to Bandura’s approach to measuring efficacy beliefs. Indeed, it appears that the disagree—agree response format has been the most commonly used measure of self-efficacy across areas of activity in general (Smith & Betz, 2000) and entrepreneurial activity in particular

(iii) Validity Evidence

Student samples are quite common in psychological research, indeed, “most experimental subjects are college student-volunteers” (Chow, 2002: 30). Likewise, it seems important to note that each of the three existing ESE scale development studies used student samples (at least in part) to validate their respective measures. However, to the extent that ESE is a judgement of firm creation capability, Shook et al. (2003) note that student samples are inappropriate and insufficient proxies of entrepreneurial judgements.

On the other hand, to borrow from Bandura (1997), there is no absolute index of ESE against which to gauge the validity of a specific measure employed to assess it. Rather, the sufficiency of a given ESE measure is evaluated by verifying that it is fit-for-purpose (e.g. matched to the activities of entrepreneurs) and intended use (e.g. ability to predict entrepreneurial outcomes). In this regard, as outlined in Table 2.6 below, some of the more recent empirical evidence for the three extant measures of ESE also involves student samples.

Table 2.6: More empirical evidence for the three measures of ESE

Author(s)	Measure of ESE	Findings
Ahlin et al. (2014)	11-item version of Chen et al. (1998)	Both entrepreneur’s creativity and ESE directly and by interaction influence a firm’s innovation (e.g. product and process innovations).

Author(s)	Measure of ESE	Findings
Hallak et al. (2012)	De Noble et al. (1999)	Tourism business owners' (family and nonfamily entrepreneurs) ESE is an important predictor of firm performance.
Hmieleski & Baron (2008)	De Noble et al. (1999)	A three-way interaction between ESE, optimism, and environmental dynamism was found with respect to firm performance.
Hmieleski & Corbett (2008)	De Noble et al. (1999)	The relationship between entrepreneur improvisational behaviour and new firm performance is influenced by ESE; ESE had a negative moderating effect on the relation between improvisational behaviour and work satisfaction.
Karlsson & Moberg (2013)	McGee et al. (2009)	Entrepreneurship education enhanced ESE, attitude towards venturing and start-up activity, which was not found in the control group.
Kickul et al. (2009)	Cox et al. (2002)	MBA students cognitive style (i.e. intuitive as opposed to analytical preference) influences her entrepreneurial intentions.
Naktiyok et al. (2010)	Chen et al. (1998) De Noble et al. (1999)	While ESE may influence entrepreneurial intentions of undergraduate students in the Turkish context, the underlying dimensions of ESE have different impacts on intentions.
Pihie & Bagheri (2011)	Adapted version of De Noble et al. (1999)	Malaya secondary school students (both vocational and technical) show moderate overall levels of ESE on all dimensions. These students have a moderately high entrepreneurial attitude orientation.
Schenkel et al. (2014)	Chen et al. (1998)	ESE is positively related to entrepreneurial intent prior to learning intervention; ESE is unrelated to intent post intervention. ESE is positively related to entrepreneurial intensity prior to learning; while ESE is even more positively related with entrepreneurial intensity post intervention

The table above presents a summary of some additional research conducted on ESE that was not reported in McGee et al.'s (2009) review. It shows that most of this recent empirical work on ESE uses some variant of either the Chen-scale or the DeNoble-scale to predict various entrepreneurial outcomes (e.g. intentions and firm performance). In addition to the initial validity evidence summarised earlier in Table 2.5, the more recent studies presented above in Table 2.6 also demonstrate the effect of ESE on entrepreneurial decision and action, which provides additional support for using the existing ESE scales in research on why some people are more likely than others to create firms.

(iv) Research Opportunities

It is long agreed that firm creation is at the centre of entrepreneurship (Gartner, 1985, 1988; Shook et al., 2003). However, as previously pointed out, recent work in this field of research highlights that:

“Without an opportunity, there is no entrepreneurship” (Short et al., 2010: 40).

Thus, since ‘opportunity’ is increasingly recognised as the key construct in the entrepreneurship field (Alvarez & Barney, 2007, 2010, 2013; Short et al., 2010; Shane, 2003, 2012), and each of the three ESE scale development studies appear to adopt Gartner’s (1988) ‘firm-centric’ (as opposed to Shane & Venkataraman’s (2000) ‘opportunity-centric’) definition of entrepreneurship, it seems that ESE researchers lack a generic, yet distinct, opportunity-based conceptual framework of entrepreneurial thought and action to help study the factors (concepts, constructs, variables) that may lead to creating new firms and new markets, and that distinguish entrepreneurs from non-entrepreneurs.

“Business models are opportunity-centric” (George & Bock, 2011: 102)

“Entrepreneurs turn opportunities into business models.” (Hindle, 2010a: 111)

The concept of business model is thought to present an opportunity to unlock the mystery of the entrepreneurial process (George & Bock, 2011; Hindle, 2010a; Moroz & Hindle, 2012). However, existing measures of ESE have not used a business model lens to (a) understand the activities of entrepreneurs, (b) predict the likelihood of a person being an entrepreneur, and (c) distinguish entrepreneurs from non-entrepreneurs. These gaps in knowledge seem salient because, as already pointed out, ESE is a transformational mechanism by which a person can potentially move from her cognitive maps (e.g. her business model) to creating new firms and new markets.

So, in light of the above, and as noted by others (Krueger, 2007; Mauer et al., 2009; Sánchez et al., 2011; Vecchio, 2003), it appears that the full potential of ESE remains to be realised in research on entrepreneurial thought and action.

2.8 Conclusion

This chapter began by highlighting some key economic benefits of entrepreneurship (e.g. job creation). Next, the ‘conceptual’ and ‘operational’ definitions of entrepreneurship were introduced and discussed. Then, divergent theories and conceptual models of entrepreneurial action were compared and contrasted so as to understand the set of activities involved in entrepreneurship. Cognitive maps (e.g. business models) and entrepreneurial self-efficacy (ESE) were identified as important mechanisms in this area of activity. Fourth, the chapter introduced existing research on the entrepreneur under two headings: individual characteristics and traits, and cognitive mechanisms. Fifth, the concept of the business model was introduced and discussed as a cognitive map that may help the entrepreneur to move from thought and action. Finally, as ESE is a mechanism by which the the entrepreneur can move from her business model to action, the chapter introduced the construct of self-efficacy from social cognitive theory and synthesised the extant empirical work on ESE.

Upon analysis of the theoretical and empirical studies on the person in and the process of entrepreneurship reported in this chapter, it appears that in order to develop and validate a generic, yet distinct, conceptual framework of entrepreneurial thought and action, the following ‘factors’ (concepts, constructs, variables) should be taken into consideration:

- Entrepreneurship is a complex, iterative process by which new firms and new markets emerge. Conceptually, it involves activities of broad scope that range from *perception* through *evaluation* to *action*. Therefore, a conceptual framework of entrepreneurial thought and action should encompass these three activities.
- The conceptual definition of entrepreneurship highlights the importance of *opportunities* in the entrepreneurial process, and there is growing support for the view that entrepreneurs create as well as discover opportunities.

The conceptual framework of entrepreneurial thought and action should therefore describe the role of opportunities in the entrepreneurial process.

- *Business models* are a key point of convergence across published models of the entrepreneurial process: opportunities are converted into business models through evaluation, and the decision to act entrepreneurially is based on some form of business model. Therefore, the conceptual framework of entrepreneurial thought and action should also describe the role of business models in the entrepreneurial process:
 - However, the business model is difficult to define and operationalise in research on entrepreneurship partly because it requires consideration of *what* entrepreneurs do and *how* they do it. That is, the entrepreneur's business model is a two-dimensional concept. It involves joint consideration of the *content* and *process* aspects of performing entrepreneurship.
 - So, although the business model is becoming increasingly recognised as key to understanding entrepreneurial thought and action, little is understood about the transformational mechanisms by which people move from their business models to creating new firms and new markets. One sociocognitive solution for the transformation problem involves a two-dimensional *knowledge structure*: declarative knowledge and cognitive processes.
- Conceptually, while drawing on assumptions from social cognitive theory, *entrepreneurial self-efficacy* (ESE) is a cognitive mechanism by which an entrepreneur could move from a two-dimensional view of her business model to action. The conceptual framework of entrepreneurial thought and action could therefore use this theoretical lens in order to:
 - weld its elements together, and
 - generate hypotheses to test the accuracy of its description.
- In terms of hypothesis testing, ESE is a latent construct and must be measured indirectly by determining its effect to responses on measured efficacy items, which rely on a sound conceptual scheme of the specific activities being assessed (e.g. creating new firms). In short, valid ESE scales must be tailored to what entrepreneurs do and how they do it.

- In terms of a set of business model activities involved in firm creation, the *business model canvas* (BMC) provides a conceptual scheme that considers the content (what) aspects of business activity. However, since statements of activities usually consist of a content element and a process (how) aspect, it would be necessary to add a cognitive process or skill dimension to the BMC in order to guide the construction of ESE items.
- Finally, quite a number of other individual variables, such as age, gender, education, management experience and role models, have been used to mark the entrepreneur. So, in terms of establishing the accuracy of the conceptual framework's predictions via ESE, it will be important to adjust for the effects of the other aforementioned individual variables.

CHAPTER THREE: The Research Process

3.1 Introduction

In “Researching Entrepreneurship”, the heart of the research process is to develop ever more precise conceptual “maps” (e.g. frameworks) that both describe and predict phenomena in the social world (Hofer & Bygrave, 1992). So, drawing on the literature review chapter, the purpose of the research process outlined in this chapter is to develop a generic, yet distinct, conceptual framework that both describes *how* entrepreneurial action occurs and predicts *who* does it. First, the chapter introduces the methodology for theory building used to develop a conceptual framework of entrepreneurial thought and action, which specifies the distinctive role of the “business model” in the person’s decision to act entrepreneurially (or not). Ideas from social cognitive theory are used to weld the elements of the conceptual framework together, and hypotheses are generated to test the accuracy of its description vis-à-vis “entrepreneurial self-efficacy” (ESE; belief in one’s capabilities to perform a set of business model activities involved in entrepreneurship). It is hypothesised that ESE is a factor that may lead to a person being an entrepreneur and that distinguishes entrepreneurs from non-entrepreneurs. Second, having selected *firms* (versus markets) as the empirical object of interest, the chapter details the process of scale development that is used to provide a quantitative measure of ESE for hypothesis testing. In this regard, a two-dimensional view of a popular business model is created to guide the construction of 54 efficacy items, a survey containing these Likert-type and other items (e.g. questions pertaining to age and gender) is conducted to collect data, and the statistical procedures used to evaluate the performance (e.g. reliability and validity) of respondents’ scores on the new ESE scale are summarised.

3.2 Conceptual Framework

By way of introduction, in “Theorizing About Entrepreneurship”, it was noted that a key challenge confronting researchers of entrepreneurship is to develop ever more accurate conceptual “maps” (i.e. conceptual frameworks, models, and/or theories) with solid foundations in the social sciences (Bygrave & Hofer, 1991). In this regard, for instance, the literature surveyed in the previous chapter (e.g. Bandura, 2012; Chen et al., 1998) suggests that the self-efficacy portion of

social cognitive theory can be used to study ‘why some people but not others decide to become entrepreneurs’ as long as a sound conceptual map of the activity area being assessed—i.e., entrepreneurship—guides the construction of efficacy items employed to assess people’s beliefs in their entrepreneurial capabilities. Likewise, some empirical support for the idea that “entrepreneurial self-efficacy” (ESE) is a factor that may lead to a person being an entrepreneur and that distinguishes entrepreneurs from non-entrepreneurs was provided.

However, it was also pointed out in the literature chapter that scholars of entrepreneurship do not appear to agree on the fundamental aspects of how entrepreneurial action occurs (e.g. Moroz & Hindle, 2012). Indeed, the lack of a general, yet distinct, conceptual map of the entrepreneurial process seems to have hindered research on entrepreneurship in general (e.g. Bygrave & Hofer, 1991) and ESE in particular (McGee et al., 2009). This, of course, makes it difficult to delineate the activities of entrepreneurship which, in turn, makes it difficult to construct efficacy items and ESE scales that are linked to *what* entrepreneurs do and *how* they do it. Perhaps because there is not (and likely never will be) an absolute map of the entrepreneurial process, it may be why the full benefit of ESE remains to be realised in research on the entrepreneur.

Despite such difficulties and to the extent that difficult does not necessarily mean impossible, scholars of entrepreneurship have long noted the need for better conceptual maps of the entrepreneurial process to advance research in the field. In “Researching Entrepreneurship”, for instance, it was stated that:

“The essence of the scientific process is to develop ever more precise and accurate conceptual “maps” that both describe and predict different phenomena in the “real world. Theory building involves the construction of such maps.” (Hofer & Bygrave, 1992: 91).

In terms of the need for such conceptual maps, the literature reviewed previously on the entrepreneurial process (George & Bock, 2011; Hindle, 2010a; Moroz & Hindle, 2012) suggests that the business model may provide a way for researchers to bridge the gap between entrepreneurship theory and practice and, in this way, can help practitioners (e.g. nascent entrepreneurs) to

navigate the chasm between entrepreneurial thought and action. Indeed, this literature also suggests that linking the business model to entrepreneurial cognition and action could provide a way for researchers to unlock the longstanding problem of finding a ‘good’ map of the entrepreneurial process. Despite this specific research opportunity, the extant scale development research on ESE has not used a business model to conceptualise how entrepreneurial action occurs and to predict who does it.

So, while using a cognitive or behavioural approach to the study of entrepreneurship, this section develops a conceptual framework of entrepreneurial thought and action, the so-called “entrepreneurial method” (e.g. Sarasvathy & Venkataraman, 2011), which describes and explains the relationship between the factors selected to represent the cognitive process by which one reaches the decision to act entrepreneurially (or not):

- First, it outlines the methodology of theory building used to guide the development process.
- Second, a flowchart is used to visually represent the relationship between the selected factors (e.g. evaluation, opportunity, and business model), some caveats which concern this particular view of entrepreneurial thought and action are highlighted, and a description of the entrepreneurial method is provided.
- Third, in terms of explaining how entrepreneurial action occurs and predicting who does it, the theoretical glue (namely social cognitive theory) that welds the elements of the conceptual framework together is provided, and hypotheses are generated to test the accuracy of its description vis-à-vis “entrepreneurial self-efficacy” (ESE).

3.2.1 Methodology

Whetten’s (1989) methodology for theory building provides a systematic way to develop a conceptual framework of entrepreneurial thought and action. It is built on the idea that a complete theory or model requires four key elements: ‘What’, ‘How’, ‘Why’, and ‘Who-Where-When’. Before using this approach to propose a

tentative conceptual framework of the entrepreneurial method, it is worth spending a moment on each element of Whetten's (1989) methodology.

First, the *what* element considers "Which factors (variables, constructs, concepts) logically should be considered as part of the explanation of the social or individual phenomena of interest?" (Whetten, 1989: 490). Then, the *how* element considers the way in which the proposed set of factors are related to one another. Next, the *why* element considers the "underlying psychological, economic, or social dynamics that justify the selection of factors and the proposed causal relationships" (Whetten, 1989: 491). Thus, in Whetten's approach, the what and how elements describe, while only the why element explains. Fourth, the *who-when-where* element identifies the conditions that place limitations on the propositions generated from a theoretical model. In terms of this last element, Whetten (1989: 492) notes: "These temporal and contextual factors set the boundaries of generalizability, and as such constitute the range of the theory", and it is mostly informed via hypothesis testing.

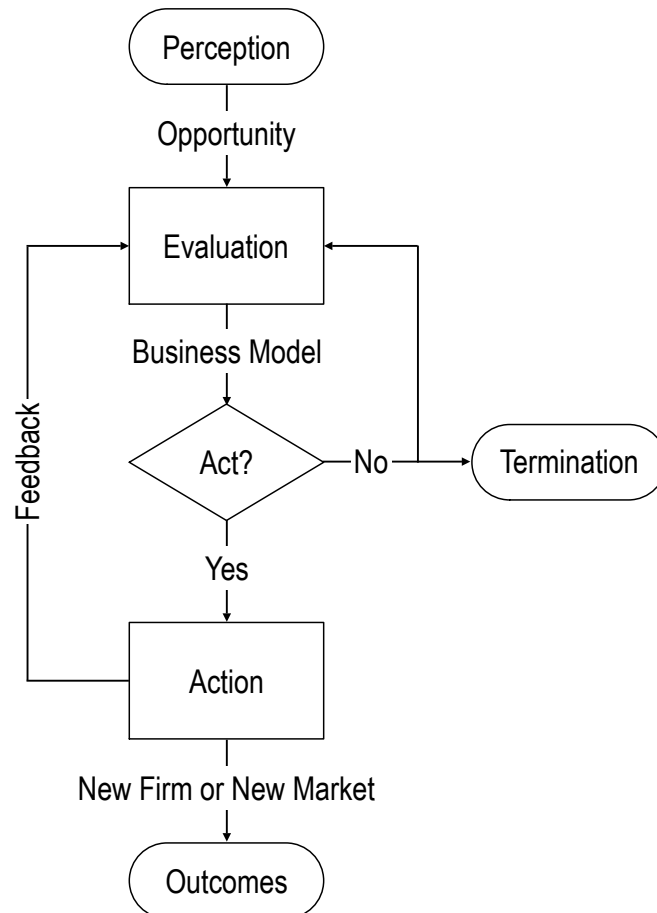
Attention now turns below to the conceptual framework developed in order to describe entrepreneurial thought and action.

3.2.2 Description

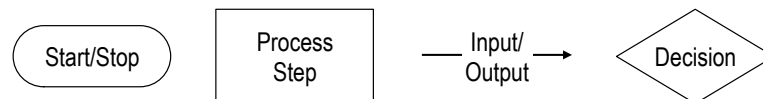
Factors and Flowchart

The literature review chapter revealed that a generic, yet distinct, conceptual framework of entrepreneurial thought and action should consider the following factors: (a) perception, (b) opportunity, (c) evaluation, (d) business model, (e) decision to act (or not), (f) action or termination, and (f) outcomes. Accordingly, in terms of the so-called "entrepreneurial method" (e.g. Sarasvathy & Venkataraman, 2011), these factors are used as part of the explanation of entrepreneurial thought and action. A basic flowcharting methodology, such as the flowchart of the entrepreneurial method presented in Figure 3.1 below, can be used to show how these factors are related to one another. An explanation of geometric shapes used below is provided in the flowchart's legend.

Figure 3.1: Flowchart of the entrepreneurial method (with legend)



Legend (explanation of geometric shapes used above):



The flowchart used above to visually represent the entrepreneurial method shows an ordered set of connected activities (e.g. perception and evaluation) with specific inputs and outputs (e.g. opportunity and business model) involved in creating a new firm or a new market. Before describing the flowchart of the entrepreneurial method in more detail, some caveats are outlined below.

Caveats

- First, in the sense that a behavioural approach must balance between specificity and generality (e.g. McGee et al., 2009), the flowchart aims to adequately but parsimoniously capture the idea that entrepreneurship involves activities of broad scope that range from perception to action. However, since these activities are “chunked” (cf. Bird et al., 2012) at a

relatively abstract level, the flowchart of the entrepreneurial method is clearly a relative as opposed to absolute description.

- Second, environmental factors are noticeably absent from the flowchart of the entrepreneurial method. This does not imply that entrepreneurship occurs in a vacuum, since the decision to become an entrepreneur is a function of individual factors and environmental factors (e.g. Shook et al., 2003), and the business model is shaped by processes and events at levels of analysis other than the individual (George & Bock, 2011). Rather, the focus here is on the cognitive process by which one reaches the decision to create a new firm or a new market.
- Third, the flowchart presents an ordered view of the entrepreneurial method in which perception precedes evaluation, which always precedes the decision to act. So, it is important to note some of the limitations associated with this view of entrepreneurial thought and action:
 - although scholars of entrepreneurial cognition usually distinguish between the activities of perception and evaluation (e.g. Baron, 2006), it may be possible to have perception with near instantaneous evaluation;
 - while entrepreneurial action is more likely among people who engage in the evaluation of opportunities (e.g. Autio et al., 2013), it may be possible for individuals to reach the decision to act opportunistically without a separate evaluation step;
 - although it has subprocesses (Shane, 2012), the entrepreneurial process rarely unfolds itself in an ordered, linear way (e.g. Eckhardt & Shane, 2010; Kickul et al., 2009), so the activities involved in the entrepreneurial method may be iterative and nonlinear in practice;
 - the business model plays a pivotal role in the decision to act entrepreneurially (or not), however the business model is difficult to define and operationalise because it involves two dimensions, that is, the content and process aspects of doing business (Zott et al., 2011).
- Fourth, to the extent that a conceptual framework should both describe and explain the relationship between various factors (e.g. Kimando et al., 2012), the flowchart leaves unanswered the question of what theoretical

glue holds its elements or factors together. Before turning to this key building block of the conceptual framework, the flowchart of the entrepreneurial method is described below.

Flowchart Description

By way of summary: The flowchart of the entrepreneurial method frames the cognitive process by which a person reaches the decision to create a new firm or a new market as a two-step process: an initial phase of perception in which actions, contingencies, and outcomes are framed, and an ensuing phase of evaluation in which the individual turns her opportunity into a business model. In its turn, the person's decision to act (or not) is based on her business model, and entrepreneurial action can be measured by the existence of a new firm or a new market. Finally outcomes arise from entrepreneurial actions, and the various steps of the entrepreneurial method are described below in more detail:

First, the entrepreneurial method begins with the activity of *perception* in which a person “connects the dots” between environmental and other factors (e.g. prior experience) to perceive an opportunity (Baron, 2006; Hébert & Link, 1989; Walsh, 1995). To do so, she uses her cognitive frameworks that are formed by experience, and how the individual perceives the characteristics of her environment, such as the opportunities it provides and the obstacles it presents, influences the course of entrepreneurial action (Bandura, 2012). Since the perceived environment can have both objective and subjective dimensions, entrepreneurial action may mean responding to existing circumstances as well as creating an opportunity. In both situations, an opportunity—a perceived means of creating new value—flows from the activity of perception:

“The perceived value of the opportunity is an important aspect of the opportunity exploitation process” (Dimov, 2010: 1127)

“The distinctive domain of entrepreneurship consists of the study of opportunities for value creation” (Venkataraman et al., 2012: 25)

Second, having framed her opportunity through perception, the individual enters a subsequent phase of *evaluation*—i.e., the making of a judgement about the

value of a perceived opportunity using various types of set standards, such as objective or subjective criteria (Hindle, 2010). In this step, she performs some form of evaluation, or assessment, so as to create new value for stakeholders (e.g. herself or her customer). Indeed, the person continuously re-evaluates her opportunity in the light of her actions and the outcomes that flow from them (Dimov, 2010), and she will likely conduct several evaluations at various stages of development (Ardichvili et al., 2003). So the activity of evaluation is iterative, and a business model—a cognitive map of the various activities involved in entrepreneurship—flows from this activity.

Third, having turned her opportunity into a business model through evaluation, the person must make a *decision* on whether or not to act upon her business model. The business model is key not least because it is a cognitive mechanism by which the individual decides to act entrepreneurially (or not):

- if she decides not to act upon her business model, the process either ends (i.e. termination) or the person may revisit the evaluation phase, or
- if she decides to act upon her business model, the person must also decide on how best to organise it in the economy.

In addition, having decided to *act* upon her business model by creating a new firm or a new market over time (i.e. neither mode of organising occurs instantly), the nascent entrepreneur continuously re-evaluates her business model in the light of her actions (e.g. resource assembly) and their outcomes. So, while the activities of an entrepreneur can be measured by the existence of either a new firm or a new market, the business model is a dynamic and iterative factor in the flowchart of entrepreneurial thought and action.

Finally, *outcomes* arise from entrepreneurial actions (Arora et al., 2013; Bird et al., 2012; Drnovšek et al., 2010; Gartner et al., 2010; Krueger & Day, 2010; Mitchell & Shepherd, 2010). Consistent with a comprehensive functionalist approach (cf. Bandura, 1997), since entrepreneurship usually does not pay in monetary terms (Benz, 2009), three distinct classes of outcome can flow from the entrepreneur's actions: (a) physical effects (e.g. pain/pleasure), (b) social effects (e.g. profit/loss), and (c) self-evaluative effects (e.g. pride/shame). In

other words, creating either a new firm or a new market can have intended as well as unintended consequences for the entrepreneur.

Attention now turns below to using this description of the conceptual framework so as to explain how entrepreneurial action occurs and to predict who does it.

3.2.3 Explanation

The flowchart of the entrepreneurial method described above highlights that entrepreneurship is multidimensional. It encompasses activities of broad scope, which range from perception through evaluation to action, and each activity requires its own set of higher-order “capabilities”:

- the capability to perceive an opportunity by interpreting the environment,
- the capability to turn that opportunity into a business model via evaluation, and
- the capability to act upon that business model by creating a new firm or a new market.

Although the flowchart’s description highlights the distinctive role of the business model in the cognitive process by which a person reaches the decision to act entrepreneurially (or not), little is understood about the transformational mechanisms (i.e. the mechanisms of agency and change) by which a person’s business model is converted into entrepreneurial action. In fact, it is not entirely clear how the various elements of the entrepreneurial method are welded together conceptually. For this, one needs an appropriate theory of human thought and action so as to justify the proposed relationships, and to generate hypotheses to test the accuracy of the flowchart’s description.

“Self-efficacy is concerned with people’s beliefs in their capabilities to produce given attainments.” (Bandura, 2012: 15)

“People’s level of motivation, affective states, and actions are based more on what they believe than on what is objectively true.” (Bandura , 1997: 2)

“A certain threshold of self-assurance is needed to attempt a course of action, but higher strengths of self-efficacy will result in the same attempt. The stronger the sense of personal efficacy, however, the greater the perseverance and the higher the likelihood that the chosen activity will be performed successfully.” (Bandura, 1997: 43)

In light of the above, while drawing on propositions from social cognitive theory (SCT; Bandura, 2001) and related research on entrepreneurial decision (e.g. Chen et al., 1998), “entrepreneurial self-efficacy” (ESE; belief in one’s capabilities to perform the various activities involved in entrepreneurship) is the theoretical construct proposed to weld the elements of the entrepreneurial method together. This latent construct is proposed for the following reasons:

- Entrepreneurship is a multidimensional area of activity that involves activities ranging from perception to action. Likewise, ESE is a multidimensional construct that conceptually reflects the broad scope of activities involved in entrepreneurship, for example, people higher in ESE are more likely to perceive opportunities and to become entrepreneurs;
- To the extent that entrepreneurs are made (not born), people can develop the capabilities (declarative knowledge and cognitive processes) required to perform the activities of entrepreneurship, and not only can ESE be developed but also it builds on the idea of a dual knowledge structure. In this regard, SCT provides a theory of learning and change;
- The intentional decision to act entrepreneurially (or not) is influenced by individual as well as environmental factors. ESE is a mechanism of agency and change that considers both factors and, also, it influences the quality of entrepreneurial action through decisional processes. In this regard, SCT provides knowledge for predicting entrepreneurial behaviour;
- The business model is also influenced by individual and environmental factors. While it creates a cognitive map through which one decides on whether to act entrepreneurially, previous ESE-based research on entrepreneurial decision has not used a business model lens to understand the activities of entrepreneurs.

In order to assess the postulated causal role of the business model in the entrepreneurial method, another aspect of ESE is proposed as the transformational mechanism by which a person moves from her business model to creating a new firm and or a new market. This new aspect of ESE is defined here as *belief in one's capabilities to perform a set of business model activities involved in entrepreneurship*. It should be noted that there are two ways for researchers to empirically test the accuracy of the flowchart's description by way of ESE:

- first, as it is possible to view the entrepreneurial method as a journey that takes place over time, researchers can use longitudinal methods to determine if this aspect of ESE is a factor that may lead to becoming an entrepreneur, and that distinguishes entrepreneurs from non-entrepreneurs.
- second, as it is also possible to view the entrepreneurial method as an act that occurs at a point in time, researchers can use cross-sectional methods to determine if this aspect of ESE is a factor that may lead to being an entrepreneur, and that distinguishes entrepreneurs from non-entrepreneurs

In this exploratory study, a cross-sectional research design was used to begin the process of empirically linking the business model to entrepreneurial thought and action vis-à-vis ESE. In this regard, when one views the entrepreneurial method as an act that occurs at a point in time, it is presumed that the set of activities advanced in the flowchart are conducted between two particular points in time, but “process is represented empirically as a fixed entity measured by relevant (fixed) attributes that are then related to particular outcomes of interest” (McMullen & Dimov, 2013: 1482). Also, when one views the entrepreneurial method as an act, entrepreneurs are treated as in a state of being: “she *is* an entrepreneur” (Anderson, 2005: 591—original emphasis). This line of reasoning should be generally acceptable to researchers who use linear models to guide their empirical studies, however it does raise the question of how one measures the activities of an entrepreneur.

The flowchart of the entrepreneurial method shows that the activities of an entrepreneur can be measured by the existence of a new firm or a new market. To the extent that firms are an empirical object that must be explained (e.g. Sautet, 2003) and firm creation is at the centre of entrepreneurship (e.g. Shook et al., 2003), it is natural as a first step to use Gartner's (1988) definition to operationalise the entrepreneurial method for testing:

Entrepreneurship is the creation of firms. What distinguishes entrepreneurs from non-entrepreneurs is that entrepreneurs create firms, whereas non-entrepreneurs do not.

So, for the purposes of the statistical portion of this thesis, "firm creation" is treated as a proxy for being an entrepreneur. While defining entrepreneurship in this way does not allow one to differentiate large organisations from small firms, Gartner's (1988) operational definition allows us to define the qualitative variable "*entrepreneurial status*" (ES):

"being an entrepreneur or not being an entrepreneur, and defined as creating a firm or not, respectively."

However, since it was already pointed out that ESE is an activity-specific construct, the above definition of entrepreneur also impacts on how one defines the theoretical construct. Hence, for the purposes of initially testing the conceptual framework's description, "*entrepreneurial self-efficacy*" (ESE) is defined herein as:

"belief in one's capabilities to perform a set of business model activities involved in firm creation."

Noting that a person's belief in her capabilities to perform a set of business model activities involved in firm creation does not mean she will create a firm, it is vital to determine the relationship between ESE and firm creation. So, in terms of testing the accuracy of the flowchart's description by way of ESE, it is hypothesised that:

H₀(¹): the likelihood of a person being an entrepreneur is not associated with her ESE score.

H₁(¹): the likelihood of a person being an entrepreneur increases with her ESE score.

Also, to the extent that ESE is not only a cause but also an effect of creating a firm (cf. Chen et al., 1998), it is important to determine the relationship between firm creation and ESE. So, in order to determine if ESE is a factor that distinguishes entrepreneurs from non-entrepreneurs, it is hypothesised that:

H₀(²): there is no difference between the population mean ESE score of entrepreneurs and that of non-entrepreneurs.

H₁(²): the population mean ESE score of entrepreneurs is higher than that of non-entrepreneurs.

Finally, because hypotheses call for measures (Whetten, 1989) and ESE cannot be measured directly, a process of scale development is required to provide an empirical estimate of the latent construct for hypothesis testing.

3.3 Scale Development Process

In "Researching Entrepreneurship", Hofer & Bygrave (1992) noted how the heart of the research process is to develop ever more accurate conceptual "maps" (frameworks, models, and/or theories) that both describe and predict different phenomena, such as the cognitive process by which a person reaches the decision to create a new firm, in the real world. In this regard, they (Hofer & Bygrave, 1992: 91) also stated that:

"Theory testing (also known as "researching") ultimately involves the "testing" of such maps against phenomena in the real world to establish the accuracy and precision of their descriptions and predictions."

Having laid the foundations for linking the business model to firm creation vis-à-vis “entrepreneurial self-efficacy” (ESE), this section turns to the problem of providing an empirical estimate of this latent construct for hypothesis testing:

“The purpose of measurement in theory testing and development research is to provide an empirical estimate of each theoretical construct of interest.” (Gerbing & Anderson, 1988: 186)

“A latent construct can be measured indirectly by determining its influence to responses on measured variables.” (Suhr, 2005: 1)

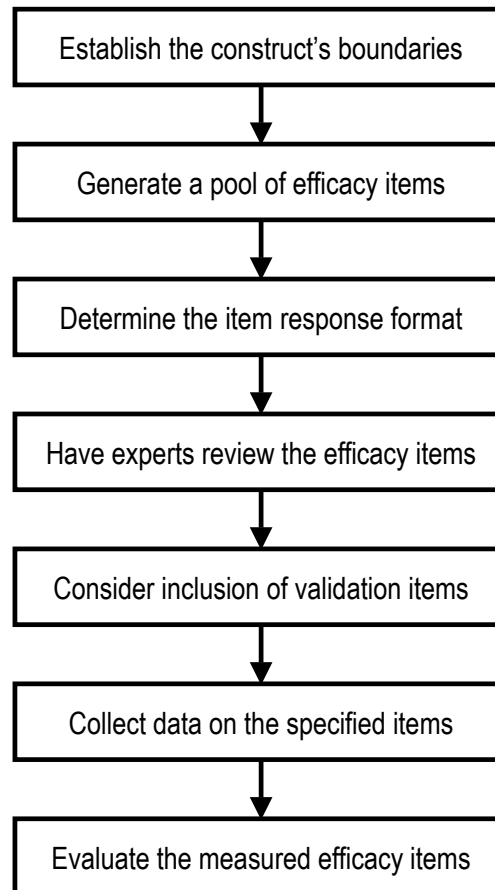
In the area of psychometrics, which is concerned with measuring psychological and social phenomena (e.g. knowledge structures and self-efficacy beliefs), a primary goal of scale construction is to develop a valid measure of the latent construct (Clark & Watson, 1995; DeVellis, 2012; Gerbing & Anderson, 1988):

“We develop scales when we want to measure phenomena that we believe to exist because of our theoretical understanding of the world but that we cannot assess directly.” (DeVellis, 2012: 11)

So scale development offers a systematic way to provide an empirical estimate of the theoretical construct, namely “entrepreneurial self-efficacy” (ESE). It is an iterative process that emerges through a series of interrelated steps (Anastasi, 1988; Clark & Watson, 1995; DeVellis, 2012; Gerbing & Anderson, 1988; Slavec & Drnovšek, 2012; Worthington & Whittaker, 2006).

The development process used to construct the new ESE scale is presented in Figure 3.2 below. It identifies seven steps: (a) establish the construct’s boundaries, (b) generate a pool of efficacy items, (c) determine the item response format, (d) have experts review the efficacy items, (e) consider inclusion of validation items, (f) collect data on the specified items, and (g) evaluate the measured efficacy items. This process borrows from best practice in scale development (e.g. DeVellis, 2012) and the guidelines for constructing self-efficacy scales (i.e. Bandura, 2006).

Figure 3.2: The process used to develop the ESE scale



Before describing each step of the scale development process in more detail, one caveat. Although a number of scholars have outlined steps similar to those identified above (e.g. Worthington & Whittaker, 2006), it is important to distinguish between two distinctly different methods of scale development that are used in the area of psychometrics (cf. Hinkin, 1995, 1998):

- the *deductive* approach, which is also labeled “classification from above” or “logical partitioning”, requires researchers to define their theoretical construct via a review of the literature and, prior to data collection, to use a classification scheme or taxonomy so as to generate their scales.
- the *inductive* approach, which is also called “classification from below” or “grouping”, does not usually emphasise theory at the outset of the process and, subsequent to data collection, researchers attempt to identify their constructs and generate their measures.

The distinction between deductive and inductive approaches to scale development is important because a scale of perceived ESE should be tailored

to the activities of entrepreneurs (Chen et al., 1998). Hence, as firm creation is being treated as a proxy for being an entrepreneur, a deductive approach to scale development is required to provide an empirical estimate of ESE.

3.3.1 Establish the construct's boundaries

Scale developers should clearly specify what it is they want to measure (DeVellis, 2012), as it is inherently difficult to measure that which is ill-defined (Worthington & Whitaker, 2006). In this regard, it was already pointed out that the latent construct, ESE, is indeed a person's belief in his or her capabilities to perform a set of business model activities involved in firm creation. Likewise, ESE conceptually builds on the idea of a dual knowledge structure, so it is vital to establish its content and structure from the outset.

Aside: Although there is no theory to tell us exactly what the 'business model' is, it was already pointed out in the literature chapter how the **Business Model Canvas** (BMC; Österwalder & Pigneur, 2009) is a firm-level concept that is popular in press and in practice. However, to the extent that ESE is a judgement of firm creation capability, capabilities are not a first-order theme in the BMC. Also, although a capability is but as good as its performance, capabilities are a function of two types of knowledge: declarative knowledge ('know-what'), and procedural knowledge or cognitive processes ('know-how').

After Krathwohl (2002), to the extent that statements of activities usually involve a verb or verb phrase—procedural knowledge ('know-how')—as well as a noun or noun phrase—declarative knowledge ('know-what'), statements of business model activities can be classified using a two-dimensional taxonomy table such as the classification scheme presented in Figure 3.3 below:

- the procedural knowledge or cognitive processes (*'know-how'*) dimension involves six elements—identify, select, plan, implement, evaluate, and create (e.g. Baron & Henry, 2010);
- the declarative knowledge (*'know-what'*) dimension includes nine elements from the BMC—customer segments, value propositions, channels,

customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure (cf. Österwalder & Pigneur, 2009).

Figure 3.3: Classification scheme of business model activities (with nomenclature)

'Know-How'

<i>Create</i>	f ₁	f ₂	f ₃	f ₄	f ₅	f ₆	f ₇	f ₈	f ₉
<i>Evaluate</i>	e ₁	e ₂	e ₃	e ₄	e ₅	e ₆	e ₇	e ₈	e ₉
<i>Implement</i>	d ₁	d ₂	d ₃	d ₄	d ₅	d ₆	d ₇	d ₈	d ₉
<i>Plan</i>	c ₁	c ₂	c ₃	c ₄	c ₅	c ₆	c ₇	c ₈	c ₉
<i>Select</i>	b ₁	b ₂	b ₃	b ₄	b ₅	b ₆	b ₇	b ₈	b ₉
<i>Identify</i>	a ₁	a ₂	a ₃	a ₄	a ₅	a ₆	a ₇	a ₈	a ₉

Customer Segments Value Propositions Channels Customer Relationships Revenue Streams Key Resources Key Activities Key Partners Cost Structure

'Know-What'

Although the classification scheme of business model activities in Figure 3.3 above represents a reduction in dimensionality, since it builds on a relative description to begin with (i.e. the BMC), it does come with some benefits:

First, it helps to establish the initial ¹ construct boundaries of ESE along two dimensions: 'know-how' (e.g. identify), and 'know-what' (e.g. customer segments). While this two-dimensional view of the BMC appears to create a more precise concept of the business model as called for by Zott et al. (2011), adding a 'know-how' dimension to the 'know-what' outlined in the BMC helps to make capabilities a more important theme in Österwalder & Pigneur's (2009) view of the business model. In fact, as it is a hierarchy of cognitive complexity (ranging from 'identify' to 'create'), the 'know-how' dimension introduces a gradation of challenge (i.e. level or magnitude of difficulty) as per the guide for constructing self-efficacy scales. Crucially, since ESE builds on the idea of a

¹ Future ESE scale developers might like to explore other business model elements (e.g. the modeller's assumptions and or strategy elements), and they might also like to assess how other cognitive processes (e.g. interpreting and or organising) influence the decision to create a firm.

dual knowledge structure, this classification scheme allows the BMC and the ESE construct to “hang together” conceptually.

Second, by way of its two underlying dimensions, the classification scheme of business model activities helps to logically partition ESE prior to data collection. As it contains 6 rows and 9 columns, this classification scheme reveals 54 individual cells to guide the generation of efficacy items: a_1, a_2, \dots, a_9 , b_1, b_2, \dots, b_9 , c_1, c_2, \dots, c_9 , d_1, d_2, \dots, d_9 , e_1, e_2, \dots, e_9 , f_1, f_2, \dots, f_9 . Indeed, by construction, the intersection cell for each row and column consists of a verb (e.g. identify) and a noun or noun phrase (e.g. customer segments). For instance, cell ‘ a_1 ’ in the classification scheme suggests an individual efficacy item that consists of the verb ‘identify’ and the noun phrase ‘customer segments’. So, this scheme can potentially be used to classify a parsimonious, yet comprehensive, set of 54 business model activities involved in firm creation.

Having developed a classification scheme to establish the construct boundaries of ESE, attention turns below to using this two-dimensional structure to guide the construction of efficacy items.

3.3.2 Generate a pool of efficacy items

This step of the scale development process involved using the classification scheme of business model activities to generate a pool of items to capture ESE. In addition to being guided by literature on the business model (Österwalder & Pigneur, 2009), this researcher consulted entrepreneurship texts (Baron & Shane, 2008) as well as literature (Gatewood et al., 1995) and obtained input from practicing entrepreneurs so as to develop the efficacy items. For instance, Gatewood et al. (1995: 375) note how “finding potential customers” is likely to be a critical activity in creating a firm. Item-writing is of crucial importance (Clark & Watson, 1995), since each item may be viewed as a test of the strength of the theoretical construct (DeVellis, 2012), and poorly worded items may introduce possible sources of error variance (Worthington & Whitaker, 2006). Some characteristics of item quality include clarity, conciseness, readability and distinctiveness (Anastasi, 1988; Dawis, 1987; DeVellis, 2012; Hinkin, 1995, 1998).

“Efficacy items should accurately reflect the construct. Self-efficacy is concerned with perceived capability. The items should be phrased in terms of *can do* rather than *will do*. *Can* is a judgment of capability; *will* is a statement of intention.” (Bandura, 2006: 308)

With the definition of ESE and the classification scheme providing conceptual guidance, 54 efficacy items were generated to capture ESE. After best practice in constructing self-efficacy scales (Bandura, 2006), each item was carefully worded using “can do” rather than “will do” and, in order to avoid ceiling effects, a gradation of challenge (i.e. cognitive complexity) was built into the efficacy items to the extent provided for by the classification scheme (i.e. identify, select,...,create). For instance, in terms of the ‘customer segments’ element of the ‘know-what’ dimension (see Figure 3.3), the efficacy item for variable “a₁” was worded as “*I can identify potential customers*”, while the item “f₁” was phrased as “*I can create enough customers for a viable business*”. In this way, the cognitive process associated with efficacy item “f₁” is designed to be more cognitively complex than the cognitive process associated with item “a₁”.

As the variables are behaviourally focussed, negatively worded items were not generated. This appears to be a common practice in developing self-efficacy scales (Smith & Betz, 2000). The 54 efficacy items generated to capture ESE are presented in Table 3.1 below, and the items are presented in ascending order of cognitive complexity (identify, select,...,create) by element of the BMC (customer segments, value propositions,...,cost structure). It should be noted that the scale displayed below is the final version (i.e. post expert review), and the items align with the nomenclature presented in Figure 3.3 above.

Table 3.1: The 54 efficacy items generated to capture ESE

Name	Efficacy Item
a ₁	I can identify potential customers
b ₁	I can select potential customers worth pursuing
c ₁	I can plan how to win new customers
d ₁	I can win new customers as planned

Name	Efficacy Item
e ₁	I can evaluate the performance of new customers (e.g. sales or market share)
f ₁	I can create enough customers for a viable business
a ₂	I can identify what customers value (i.e. solutions to their needs/problems)
b ₂	I can select customer problems worth developing solutions for
c ₂	I can plan the development of new products and/or services
d ₂	I can develop a new product/service that customers value
e ₂	I can evaluate the performance of new products/services (e.g. sales or market share)
f ₂	I can create solutions that enough customers are willing and able to pay for
a ₃	I can identify channels to communicate with, and deliver solutions to, customers
b ₃	I can select channels best suited for communication with, and delivery of solutions to, customers
c ₃	I can plan the development of channels to communicate with, and deliver solutions to, customers
d ₃	I can develop channels that enhance communication with, and delivery of solutions to, customers
e ₃	I can evaluate the performance of the channels used to communicate with, and deliver solutions to, customers (e.g. customer satisfaction)
f ₃	I can create effective channels that produce a positive brand image and awareness
a ₄	I can identify various ways to establish relationships with customers
b ₄	I can select ways to best build trust with customers (e.g. reliable on time delivery)
c ₄	I can plan how to develop relationships with customers
d ₄	I can develop strong relationships with customers
e ₄	I can evaluate the performance of customer relationships (e.g. customer retention)
f ₄	I can create strong and profitable relationships with customers
a ₅	I can identify potential revenue streams from the sale of products/services
b ₅	I can select a bundle of products/services that offer solid revenue projections
c ₅	I can plan sales revenue from the delivery of value to customers
d ₅	I can generate revenue streams from the successful delivery of value to customers
e ₅	I can evaluate revenue performance from business activity (e.g. sales growth)
f ₅	I can create strong and sustainable revenue streams from business activity
a ₆	I can identify potential resources to create, deliver, and capture value (e.g. people, financial, etc.)

Name	Efficacy Item
b ₆	I can select the resources best suited to the creation, delivery, and capture of value
c ₆	I can plan the acquisition of the resources needed to create, deliver, and capture value
d ₆	I can acquire the resources needed for the creation, delivery, and capture of value
e ₆	I can evaluate the performance of key resources in terms of value creation, delivery, and capture (e.g. productivity)
f ₆	I can create a sustainable source of competitive advantage with available resources
a ₇	I can identify possible ways to create, deliver, and capture value
b ₇	I can select the processes best suited to the creation, delivery, and capture of value
c ₇	I can plan the development of key processes required to create, deliver, and capture value
d ₇	I can develop a system of interrelated processes that create, deliver, and capture value
e ₇	I can evaluate the performance of key processes in terms of value creation, delivery, and capture (e.g. consistency, reliability, etc.)
f ₇	I can create a system of interrelated processes that continuously improves the creation, delivery, and capture of value
a ₈	I can identify potential partners with whom to do business
b ₈	I can select partners based on their ability to help us do what we do better
c ₈	I can plan the development of relationships with key partners (e.g. manage risk)
d ₈	I can develop relationships with key partners that help create, deliver, and/or capture value
e ₈	I can evaluate the performance of key partners in terms of their ability to enhance what we do (e.g. cost, quality, etc.)
f ₈	I can create strong partner relationships that are often a source of competitive advantage
a ₉	I can identify the costs associated with doing business (e.g. start-up costs, recurring costs, etc.)
b ₉	I can select an overall cost structure that makes broad financial sense
c ₉	I can budget for the costs associated with performing various business model tasks (e.g. insurance)
d ₉	I can manage the costs associated with successfully performing business model tasks (e.g. wages)
e ₉	I can evaluate budgetary performance in terms of value creation, delivery, and capture (e.g. cost variance)
f ₉	I can create a sustainable cost structure that shows how we make money in this business

To sum up, the theoretical definition of ESE and the conceptual scheme of business model activities were used to generate a pool of 54 efficacy items.

3.3.3 Determine the item response format

This step of the scale development process involved determining and justifying the measurement format for the 54 efficacy items or variables.

Aside: After good practice (DeVellis, 2012), this step actually occurred in conjunction with item generation so as to ensure compatibility between the efficacy variables and their measurement.

The challenge of measuring perceived self-efficacy lies in the method for transferring capability beliefs (e.g. ESE) into a quantitative measure for the purpose of data analysis. Although a number of formats, such as Likert scaling and continuous interval measures, have been used to score efficacy items, there remains debate on how researchers should obtain their numerical values. For instance, the guide for constructing self-efficacy scales suggests a 100-point scale, ranging in 10-unit intervals, to record the strength of efficacy beliefs:

“an efficacy scale with the 0-100 response format is a stronger predictor of performance than one with a 5-interval scale” (Bandura, 2006: 312).

However, while the response alternatives used by researchers vary greatly², the agree-disagree response format is the most commonly used measure in research on social self-efficacy (Smith & Betz, 2000). Indeed, Maurer & Pierce (1998) showed evidence that a Likert scale appears to provide an acceptable alternative to the 100-point response format. In the area of psychometrics, Likert scaling (Likert, 1932) assumes the existence of an underlying (or latent) continuous variable whose numerical value captures the respondents' attitudes, beliefs, and opinions (Clason & Dormody, 1994; DeVellis, 2012):

“Each Likert-type item provides a discrete approximation of the continuous latent variable” (Clason & Dormody, 1994: 32)

² In their survey of 95 articles that analysed individual Likert-type items, Clason & Dormody (1994) found that the response alternatives used ranged from 3 to 8 (or more e.g. 99) points.

“the item is presented as a declarative sentence, followed by response options that indicate varying degrees of agreement with or endorsement of the statement” (DeVellis, 2012: 93)

As outlined in the literature chapter, each of the three main ESE scales used a 5-point response alternatives to rate efficacy strength. For instance, De Noble et al. (1999) used a 5-point scale, ranging in 1-unit intervals from 1 (“strongly disagree”) to 5 (“strongly agree”). So, in some shape or form, a 5-point Likert scale is the most frequently used measurement format in research on ESE.

However, in terms of say scoring the 54 statements presented in Table 3.1, researchers of Likert scaling in general (e.g. Allen & Seaman, 2007; Jamieson, 2004; Likert, 1932) and self-efficacy measurement in particular (e.g. Bandura, 2006) seem to agree that it is best to use as many points as possible. Indeed, it appears that the 7-point response alternative reaches the upper bounds of the scale’s reliability (Allen & Seaman, 2007; Nunnally, 1978). In addition:

“Scales that use only a few steps should be avoided because they are less sensitive and less reliable. People usually avoid the extreme positions so a scale with only a few steps may, in actual use, shrink to one or two points.” (Bandura, 2006: 312)

So each of the 54 efficacy variables were scored on a 7-point scale, ranging in 1-unit intervals from 1 (“strongly disagree”) through 4 (“neutral”) to 7 (“strongly agree”). In this way, a set of Likert-type items was created to provide 54 discrete approximations of the continuous latent variable (i.e. ESE). However, while the response alternatives for each Likert-type item do have a meaningful order, it is important to note that the numbers themselves (i.e. 1,2,...,7) do not reflect a meaningful “relative” distance between scale points (Boone & Boone, 2012).

After good practice, reverse-scored items were avoided so as not to confuse subjects (DeVellis, 2012; Hinkin, 1995), and respondents were asked to rate the strength of their business model capability beliefs “as of now” (Bandura, 2006).

3.3.4 Have experts review the efficacy items

This step of the scale development process involved having “experts”—people who are knowledgeable about the activities of entrepreneurs—review the item pool vis-à-vis *content validity* (DeVellis, 2012: 59): “the extent to which a specific set of items reflects a content domain”; it is inferred from the way in which the scale was developed. In short, this step served as a test of content validity.

Two expert groups were enlisted to formally review the pool of 54 Likert-type items with a view to maximising content validity. The first group involved a panel of 2 academic experts, both of whom had direct experience with the activities of entrepreneurs and the process of scale development. While the second group consisted of 5 experienced entrepreneurs, all of whom had created at least two firms. Appendix 1 provides more information on both expert panels. Whilst using the aforementioned criteria for item quality (e.g. clarity), both expert groups were asked separately to review the item pool vis-à-vis (a) the conceptual definition of ESE, (b) the classification scheme of business model activities, and (c) the selected measurement format.

As part of this review of item validity, statements deemed ambiguous or unclear were made ever more precise and, in some cases, alternative wordings were suggested by the experts. In this way, improvements were made to the efficacy statements until such time as the item pool was deemed fit for purpose and intended use. The experts generally agreed that the final set of items aligned well with both the definition of ESE and the classification scheme of business model activities. Likewise, they agreed that the 7-point response alternative was an adequate measurement format.

Since this review of content validity suggests that the set of efficacy items reflects the area of activity (namely “firm creation”), ESE is hereafter defined by the 54 Likert-type items.

3.3.5 Consider inclusion of validation items

In this step of the process, the scale developer must decide whether or not to include additional scales in order to (a) assess construct validity, and (b) detect

problems or flaws (DeVellis, 2012; Worthington & Whittaker, 2006). However, there remains debate on whether or not to include additional scales in the early stages of a scale's development.

In terms of construct validity, which concerns the theoretical relationship of one variable to another (DeVellis, 2012), it was already pointed out that ESE should be a determinant of entrepreneurial intentions so known measures of the latter latent construct could have been used to determine the relationship between ESE and entrepreneurial intent. At the same time, as Worthington & Whittaker (2006) note, introducing additional scales can have adverse consequences, such as lower response rates and contamination, for participants' responses on the items of primary interest. Indeed, they suggest that researchers should limit the use of additional scales in the early stages of a scale's development. So, since interest lies with testing the direct effect of ESE on being an entrepreneur or not being an entrepreneur (i.e. ES; defined as creating a firm or not, respectively) as opposed to its effect on her intentions to create a firm, it was decided not to include additional scales to assess construct validity.

In terms of detecting problems or flaws, DeVellis (2012) notes how this step of the process offers the scale developer an opportunity to include additional items to detect problems with subjects' responses, such as social desirability. On the other hand, in the guide for constructing self-efficacy scales Bandura (2006) notes that efficacy judgements are not affected by a response bias to "appear" socially desirable, regardless of the activities involved. Yet, he notes that self-efficacy beliefs should be recorded in private and without personal identification, and that the label of self-efficacy should not appear in the scale title. So these additional safeguards were incorporated into the survey used to collect data. At the same time, however, these measures may not eliminate consistency expectations and evaluative concerns entirely (Bandura, 2006). For instance,

"Respondents might not be answering the items of primary interest for the reasons you assume" (DeVellis, 2012: 101)

As there is always a possibility that some respondents may have ulterior motives influencing their responses (DeVellis, 2012), an additional safeguard

was built into the final survey used to collect data. More specifically, a 9-item consistency scale was created to help detect the faking good or bad of scores on the original 9 items along the ‘identify’ cognitive process (or ‘know-how’) dimension. For instance, as presented in Table 3.2 below,

- the efficacy item ‘a₁’, ‘I can *identify* potential customers’, was slightly reworded by substituting the word ‘recognise’ for the word ‘identify’ to create the consistency item, ‘g₁’, ‘I can *recognise* potential customers’.

Table 3.2: The 9-item consistency scale

Original Item	Consistency Item	Lie-Scale Item
a ₁	g ₁	I can recognise potential customers
a ₂	g ₂	I can recognise what customers value (i.e. solutions to their needs/problems)
a ₃	g ₃	I can recognise channels to communicate with, and deliver solutions to, customers
a ₄	g ₄	I can recognise various ways to establish relationships with customers
a ₅	g ₅	I can recognise potential revenue streams from the sale of products/services
a ₆	g ₆	I can recognise potential resources to create, deliver, and capture value (e.g. people, financial, etc.)
a ₇	g ₇	I can recognise possible ways to create, deliver, and capture value
a ₈	g ₈	I can recognise potential partners with whom to do business
a ₉	g ₉	I can recognise the costs associated with doing business (e.g. start-up costs, recurring costs, etc.)

The above procedure was followed for the original 9 items that comprised the ‘identify’ aspect of ESE’s process dimension (i.e. a₁, a₂,...,a₉) and, in this way, a 9-item consistency scale was developed (i.e. g₁, g₂,...,g₉). These so-called consistency items retained the 7-point approach to efficacy measurement.

3.3.6 Collect data on the specified items

Having generated the variables of primary interest (i.e. the 54 Likert-type items) and developed a type of safeguard against faking good or bad of scores (i.e. the 9 consistency items), a survey containing these and other items (e.g.

questions pertaining to age and gender) was conducted to collect data. In other words, this step of the scale development process involved administering the efficacy and other items to a development sample:

“Administer items to a development sample” (DeVellis, 2012: 102)

Before turning to the sampling procedures used in this survey research, four salient features of the final questionnaire administered to respondents are noted below:

First respondents were presented with the 54 efficacy variables, which were presented in the order outlined in Table 3.1, albeit in groups of 6 (e.g., a_1, b_1, \dots, f_1). In other words, the items were presented in ascending order of cognitive complexity (i.e. from identify to create) by element of the business model canvas (e.g. customer segments). In this regard, it is important to note that presenting items in ascending order is not thought to bias efficacy beliefs (e.g. Bandura, 1997).

Second, the following items pertaining to important demographic characteristics and socioeconomic variables were placed directly after the 54 Likert-type items:

- **Entrepreneurial Status** (ES; “being an entrepreneur or not being an entrepreneur, and defined as creating a firm or not, respectively”) is a nominal (binary) variable with two categories: non-entrepreneur (1) or entrepreneur (2), respectively.
- **Age** is a nominal (ordinal) variable with six categories: 18-24 (1), 25-34 (2), 35-44 (3), 45-54 (4), 55-64 (5), or 65-74 (6).
- **Gender** is a nominal variable with two categories: female (1) or male (2).
- **Education Level** is an ordinal variable with six categories: primary (1), secondary (2), undergraduate (3), postgraduate (4), doctorate (5), and other (6).
- **Family History of Self-employment** is a nominal variable with two categories, where a person either has (2; yes) or does not have (1; no) a family history of self-employment.

- **Management Experience** is a nominal variable with two categories, where a person either has (2; yes) or does not have (1; no) management experience.

Third, respondents were then presented with the 9 consistency items (e.g. g_1) as a type of safeguard against faking good or bad of scores on each of the original 9 efficacy variables (e.g. a_1).

Fourth, an online platform (SurveyMonkey) was used to create two Internet-based surveys which were then used to collect data. The entrepreneur version of the survey differed from the non-entrepreneur one in that entrepreneurs were asked additional questions about their firm, such as its age, size and business classification category.

Sampling procedures

Surveys are carried out to collect data about a population. Information can be collected from all units in the population (a *census*) or from a subset of that population (a *sample*). In sample survey research generally, the objective of a survey design is to minimise cost for a fixed sample size, or to maximise the amount of information contained in the sample for a fixed cost.

In terms of this Internet-based survey research, while the sample size was ultimately determined by time and cost, accessing both entrepreneurs and non-entrepreneurs proved to be a major challenge (e.g. no sampling frame of Irish entrepreneurs existed). However the problem of accessing real-world entrepreneurs is not new in the study of entrepreneurial judgement (Shook et al., 2003), or in research on ESE:

“the solicitation of real-world entrepreneurs proved to be a challenge to us.” (Chen et al., 1998: 311)

Statistical methods can be used to make valid inferences about a population (e.g. entrepreneurs) based on information obtained from a sample of that population *only* when sample selection is random (Chow, 2002; Slavec & Drnovšek, 2012; Fricker, 2008; Smith, 1983; Wilkinson & Task Force, 1999). In

particular, randomisation can be employed to reduce the likelihood of bias e.g. non-response (Fricker, 2008). However, in practice,

“data from social surveys are always subject to non-response and so the analysis of social survey data always requires the statistician to make assumptions beyond those of randomization” (Smith, 1983: 398).

A non-randomly selected sample is sometimes labelled a “convenience sample”: “It is a label apparently applicable to most samples used in psychological research because most experimental subjects are college student-volunteers” (Chow, 2002: 30). While non-random selection of subjects typically threatens the generality of survey research, randomisation may not be required for generality in the area of cognitive psychology (Chow, 2002). Thus, in this research on entrepreneurial cognition, a non-randomly selected sample (i.e. convenience sample) was used to collect data from subjects.

“We intuitively think of a good sample as one that is representative of the population from which the sample has been drawn” (Fricker, 2008: 197).

According to Fricker (2008), specific types of non-random samples include, for example, “quota sampling” and “snowball sampling”: *quota sampling* demands that the survey researcher establish a quota for the desired number of subjects with certain qualities, while *snowball sampling* depends on referrals from initial subjects to generate additional subjects. However, he also notes that both quota sampling and snowball sampling have a higher probability of creating a biased sample (i.e. one that is not representative of the population of interest). Yet, as already pointed out, even with randomisation, it seems that surveys of and about individuals are always subject to non-response bias.

Regarding sample size, it is generally agreed that the sample size of respondents should be large (Clark & Watson, 1995; DeVellis, 2012; Dillman et al., 2009; Fricker, 2008; Kummerow, 2002; Slavec & Drnovšek, 2012; Worthington & Whitaker, 2006). This is because, by way of the Central Limit Theorem, having a large sample size (say $n > 30$) helps to ‘average away’ random errors. However, as “there is no established rule about the size of the

sample” (Slavec & Drnovšek, 2012: 59), this assertion naturally leads to the question of “how large is large?” (DeVellis, 2012: 103).

In light of the above, the Rule of 100 (i.e. $n = 100$) is often discussed as a minimum sample size in “factor analysis”³ (e.g. Kline, 1979; MacCallum et al., 1999; MacCallum et al., 2001; Zhao, 2009). For such procedures, some suggest a minimum of 10 observations per variable as a rule of thumb in PCA (Bruin, 2006), and others specify conditions where $n = 50$ is a reasonable absolute minimum for EFA (de Winter et al., 2009). Although it appears safe to conclude that the sample size in this research should be large, Fricker (2008) cautions that taking larger samples does not necessarily correct for bias, nor does a large sample provide evidence for the absence of bias.

Accordingly, while bigger samples are not always better (Kummerow, 2002), this survey researcher first specified a quota of 100 entrepreneurs and 100 non-entrepreneurs for the desired number of subjects. Then, in order to overcome the obstacle of accessing entrepreneurs, the specific approaches outlined by other scholars were used to reach the specified quota for this “elite” group:

“contact through industry, trade, or professional groups; university contact with visiting professors and alumnae; and personal and professional contacts.” (Shook et al., 2003: 393)

Similar approaches were used to reach the specified quota of non-entrepreneurs. There were no restrictions based on demographics, such as age and gender. However, since they are suggested to be an inappropriate and insufficient proxy for entrepreneurial judgement (cf. Shook et al., 2003), university students were specifically not targeted for participation in the survey. The respondents invited to participate in the survey were also asked to generate additional subjects.

³ Seaman & Allen (2012) note that *factor analysis* is a collection of procedures that includes principal components analysis (PCA), exploratory factor analysis (EFA), and confirmatory factor analysis (CFA). Both PCA and CFA are variable reduction techniques (Suhr, 2005).

The development sample

Data were collected between July 2013 and February 2014. A total of 203 entrepreneurs and 241 non-entrepreneurs returned survey responses. In terms of data pruning, first surveys that did not contain responses on the 54 Likert-type items, the 9 consistency variables, and the major demographic characteristics (e.g. age and gender) were removed. Then for the 9 consistency items used to identify undesirable response tendencies on the comparable 9 efficacy variables, a cut-off point was selected for total consistency score: individual responses with a total consistency score (absolute difference) greater than or equal to 11 were removed from the dataset. Likewise, since there were 31 former entrepreneurs who reported in the non-entrepreneur category, certain ambiguous individuals (i.e. in terms of the variable entrepreneurial status, or ES) were not included in the final sample.

Aside: Respondents' scores on the measured efficacy items, or variables, are not reported in this chapter. Rather, the focus here is on other characteristics of the development sample (e.g. age and gender). After Boone & Boone (2012), descriptive statistics recommended for data on these variables include modes (or medians) for central tendency and frequencies for variability.

Accordingly, as presented in Table 3.3 below, the final usable sample consisted of 111 entrepreneurs (53.6%) and 96 non-entrepreneurs (46.4%). Of the 207 respondents, 101 (48.8%) were female. A noticeable quirk of the development sample pertains to *Gender* e.g. in terms of female subjects, there were 33 entrepreneurs (29.7%) and 68 non-entrepreneurs (70.8%). Thus, females were overrepresented in the non-entrepreneur category, but underrepresented in the entrepreneur category. The modal *Age* group of the sample was in the 35-44 category and represented 101 (48.8%) respondents, while 41.5% of those surveyed had an undergraduate *Education Level*. Next, 100 respondents (48.3%) reported a *Family History of Self-employment* (Fam_His), while 177 subjects (85.5%) reported that they had *Management Experience* (Mgmt_Exp). Indeed, it was decided to drop the variable Mgmt_Exp because of its high correlation with entrepreneurial status (ES).

Table 3.3: Characteristics of the development sample

Variable	Entrepreneur (n = 111) 53.6%		Non-Entrepreneur (n = 96) 46.4%		Total (N = 207)	
	Frequency	%	Frequency	%	Frequency	%
Age						
18-24	0	0.0	4	4.2	4	1.9
25-34	9	8.1	20	20.8	29	14.0
35-44	45	40.5	56	58.3	101	48.8
45-54	37	33.3	13	13.5	50	24.2
55-64	14	12.6	2	2.1	16	7.7
65-74	6	5.4	1	1.0	7	3.4
Total	111	100.0	96	100.0	207	100.0
Gender						
Female	33	29.7	68	70.8	101	48.8
Male	78	70.3	28	29.2	106	51.2
Total	111	100.0	96	100.0	207	100.0
Education Level						
Secondary	21	18.9	26	27.1	47	22.7
Undergraduate	45	40.5	41	42.7	86	41.5
Postgraduate	33	29.7	16	16.7	49	23.7
Doctorate	6	5.4	2	2.1	8	3.9
Other	6	5.4	11	11.5	17	8.2
Total	111	100.0	96	100.0	207	100.0
Fam_His						
Yes	55	49.5	45	46.9	100	48.3
No	56	50.5	51	53.1	107	51.7
Total	111	100.0	96	100.0	207	100.0
Mgmt_Exp						
Yes	111	100.0	66	68.8	177	85.5
No	0	0.0	30	31.3	30	14.5
Total	111	100.0	96	100.0	207	100.0

A summary description of the 111 entrepreneurs who participated in the survey is provided in Table 3.4 below. It aims to provide the reader with a more textured sense of the entrepreneurs surveyed: 72 (64.9%) entrepreneurs had previously created a firm, while 73 (65.8%) reported that the age of their current firm was greater than or equal to 3.5 years old; the modal firm size was 0-9 employees, while 'other service activities' was the modal business classification category ⁴.

Table 3.4: The entrepreneurs ($n = 111$) and their firms

Variable	Frequency	Percent
Previously Created a Firm		
Yes	72	64.9
No	39	35.1
Total	111	100.0
Age of Current Firm		
$x < 3.5$ years old	38	34.2
$x \geq 3.5$ years old	73	65.8
Total	111	100.0
Firm Size (number of employees)		
0-9	89	80.2
10-19	7	6.3
20-49	9	8.1
50-249	5	4.5
250 or more	1	0.9
Total	111	100.0
Business Classification Category		
Other service activities	31	27.9
Professional, scientific, and technical activities	15	13.5
Manufacturing	14	12.6
Education	11	9.9
Information and communication	8	7.2
Construction	6	5.4

⁴ European industrial activity classification (NACE Rev.2)

Variable	Frequency	Percent
Arts, entertainment, and recreation	5	4.5
Accommodation and food service activities	4	3.6
Administrative and support service activities	4	3.6
Human health and social work activities	4	3.6
Wholesale and retail trade; Repair of motor vehicles and motorcycles	4	3.6
Financial and insurance activities	3	2.7
Public administration and defence: Compulsory social security	1	0.9
Transportation and storage	1	0.9
Total	111	100.0

Having conducted a survey to collect data on the ESE variables (as defined in the 54 underlying Likert-type items) and provided descriptive statistics (e.g. frequencies and modes) for data collected on the categorical variables (e.g. entrepreneurial status (ES) and age), attention turns below to the statistical procedures used to analyse these data so as to determine the variables that affect firm creation.

3.3.7 Evaluate the measured efficacy items

The purpose of this step is to evaluate the performance of the 54 Likert-type items. Indeed, item evaluation is at the heart of scale development and, in terms of importance, is second perhaps only to item generation (DeVellis, 2012). Accordingly, this subsection outlines and justifies the various statistical procedures used to evaluate the psychometric properties of ESE test scores.

“If a questionnaire is used to collect data, summarize the psychometric properties of its scores with specific regard to the way the instrument is used in a population. Psychometric properties include measures of validity, reliability, and any other qualities affecting conclusions.” (Wilkinson & Taskforce, 1999: 597)

Evaluating Likert response items

It is good practice to report the psychometric properties (e.g. internal consistency reliability) of test scores for newly developed scales (DeVellis, 2012; Wilkinson & Taskforce, 1999). Likewise, this requirement applies to newly constructed self-efficacy scales (Bandura, 2006). In this regard, however, it is important to distinguish between *Likert-type* items and *Likert scale* items (cf. Boon & Boone, 2012; Clason & Dormody, 1994):

- *Likert-type* items, such as item “a₁” from Table 3.1, are single statements that provide a discrete approximation of the continuous latent variable (i.e. ESE). For instance, “a₁” is a discrete random variable with potential values 1, 2, 3, ..., 7;
- *Likert scale* items are quantitative variables which are created by calculating a composite score (e.g. sum) from at least four Likert-type items. For instance,
 - the variable “Total Efficacy” is a sum of 54 Likert-type items and, since it has potential values 54, 55, 56, ..., 378, this quantitative variable can be treated as being essentially continuous, and
 - by way of its construction, the classification scheme of business model activities (see Figure 3.3) also reveals:
 - 6 row sum variables (e.g. “Total Identify”) each of which is a sum of 9 Likert-type items with potential values 9, 10, 11, ..., 63, and
 - 9 column sum variables (e.g. “Total Customer Segments”) each of which is a sum of 6 Likert-type items with with potential values 6, 7, 8, ..., 42.

The above distinction between Likert-type items and Likert scale items is important here for at least three reasons:

“Typically the researcher is only interested in the composite score that represents the character/personality trait.” (Boone & Boone, 2012)

First, after Boone & Boone (2012), by combining respondents' scores on the 54 Likert-type items into a single summative score, the variable "Total Efficacy" can be used to provide a quantitative measure of ESE. So, when compared with analysing their scores on the Likert-type item "a₁", respondents' composite scores on the Likert scale item, "Total Efficacy", should be evaluated at the interval (as opposed to ordinal) measurement scale. So, in terms of appropriate methods of statistical inference, Likert-type items should be assessed using non-parametric procedures (e.g. ordinal logistic regression), while Likert scale items can be evaluated using parametric procedures (e.g. general linear model). In contrast with parametric procedures, non-parametric methods are not dependent on underlying assumptions about the shape of the distribution generating the observed variables. So non-parametric procedures require fewer assumptions, but are also less powerful.

"single-item questions pertaining to a construct are not reliable and should not be used in drawing conclusions." (Gliem & Gliem, 2003: 82)

Second, after Gliem & Gliem (2003), it is likely that the individual Likert-type items (e.g. "a₁") pertaining to ESE are not reliable and, therefore, they should not be used to make inferences. Instead, the analysis of the data should use respondents's scores on the summated scales (e.g. "Total Efficacy") or subscales (e.g. "Total Identify"). Indeed, as Cronbach's alpha does not provide a measure of internal consistency reliability for individual Likert-type items, it is vital to compute coefficient alpha values for each of the Likert scale items.

"Since PCA is suitable for continuous variables which are scaled at the numerical level of measurement such that interval or ratio and it also assumes linear relationship among variables, it is not an appropriate method of dimension reduction for categorical variables." (Kemalbay & Korkmazoğlu, 2014: 731)

Third, in terms of using variable reduction techniques, ordinary (linear) principal components analysis (PCA) is not an appropriate method of dimension reduction for the Likert-type items, which are also called categorical variables (Kemalbay & Korkmazoğlu, 2014; Linting & van der Kooij, 2012). Instead,

optimal scaling (nonlinear PCA) is an appropriate method of dimension reduction for such variables (Bradley et al., 1962; Moss, 2008), while linear PCA is appropriate for Likert scale data.

So, for the three reasons outlined above, only Likert scale items will be used to evaluate the psychometric properties of respondents' ESE test scores.

Evaluating the performance of Likert scale items

First, good "reliability" is a fundamental issue in developing scales (DeVellis, 2012; Gliem & Gliem, 2003; Goodman et al., 1989; Hinkin, 1995; Santos, 1999; Slavec & Drnovšek, 2012).

"The reliability of a scale refers to the consistency with which it performs its measurements" (Goodman et al., 1989: 1008).

Without reliability, there is no validity. So, after DeVellis (2012), the first quality this research seeks of the Likert subscale items is that they be highly intercorrelated. High inter-item correlations would suggest that these items are measuring the same latent construct, that is, ESE.

While the reliability of efficacy test scores could be examined using a number of methods (e.g. test-retest reliability), the guidelines for constructing self-efficacy scales (Bandura, 2006) state that internal consistency reliability should be assessed using Cronbach's Alpha (Cronbach, 1951). In terms of an acceptable lower bound for coefficient alpha, Nunnally (1978) proposes a value of .70, but for other psychometric theorists an alpha value greater than .80 constitutes a reliable scale (e.g. Clark & Watson, 1995). Thus, in order to determine if scores on the Likert scale and subscale items performed in consistent and predictable ways, Cronbach's alpha will be used to assess internal consistency reliability.

However, while reliability is a prerequisite for validity in psychological assessment, highly intercorrelated items can also lead to problems (multicollinearity) when one wants to run a regression model (Kemalbay & Korkmazoğlu, 2014; Suhr, 2005).

Second, since it is hoped the Likert subscale items are highly intercorrelated, linear “principal components analysis” (PCA) is a variable reduction technique that can be used to replace the original Likert scale items on either of ESE’s dimensions (e.g. the 9 column sum variables of the ‘know-what’ dimension) by an equal number of so-called principal components, each of which is a linear combination of the original variables (e.g. Suhr, 2005). In this regard, Bandura (1997: 45—parenthesis added) states:

“Guided by a sound conceptual scheme in the construction of efficacy items, factor analysis (e.g. principal components analysis) can help to verify the multifaceted structure of efficacy beliefs.”

Principal components are independent variables by construction. In terms of the 9 column sum variables (e.g. “Total Customer Segments”), for instance, it would be nice to reduce these Likert scale items to a smaller number of principal components in order to explain a majority of the variation in the data on the original 9 variables. While it is not necessary to interpret the factors in PCA (Seaman & Allen, 2012), it is hoped that each of the principal components has a nice interpretation in terms of what factors may be accounting for the variability in the measurements taken on the original 9 variables.

Likewise, in terms of the 6 row sum variables (e.g. Total Identify”), it would be nice to reduce these Likert scale items to a smaller number of principal components in order to explain a majority of the variation in the data on the original 6 variables. As above, it is also hoped that the resulting principal components have a nice interpretation in terms of the latent construct that may account for the variance in the original 6 variables.

“Self-efficacy measures gain validity from their demonstrated success in predicting the effects specified by the social cognitive theory in which the efficacy factor is embedded” (Bandura, 1997: 45)

“There is no single validity coefficient. Construct validation is an ongoing process in which both the validity of the postulated causal structure in the

conceptual scheme and the self-efficacy measures are being assessed.” (Bandura, 2006: 319)

Third, in line with the idea that prediction is the main goal of science, the reader will recall how the new ESE scale’s *raison d’être* is to provide an empirical estimate of the latent construct so as to test the accuracy of the conceptual framework’s description via hypothesis testing, that is, to determine whether or not ESE is a factor that can be used to (a) predict the likelihood of a person being an entrepreneur, and (b) distinguish entrepreneurs from non-entrepreneurs.

Regarding how one determines the variables that may influence a person being an entrepreneur, the thesis will attempt to model the qualitative variable “entrepreneurial status” (ES) ⁵ as a function of Total Efficacy and other variables (e.g Age). Since the response is dichotomous (one is either an entrepreneur or she is not), an appropriate analysis involves binary logistic regression.

Then, as a kind of inverse regression, by way of a general linear model (GLM), the thesis will also attempt to model Total Efficacy as a function of ES (and other variables e.g. Age) so as to determine whether or not entrepreneurs tend to have higher ESE scores than non-entrepreneurs, after adjusting for the influence of other variables.

3.4 Conclusion

This chapter outlined the research process used to develop a generic, yet distinct, conceptual framework in order to describe *how* entrepreneurial action occurs and predict *who* does it. The research process involved two closely related, yet distinct, phases. First, a methodology for theory building was used to develop a conceptual framework of entrepreneurial thought and action, which specified the distinctive role of the “business model” in the person’s decision to act entrepreneurially or not. Ideas from social cognitive theory were used to

⁵ ES: “being an entrepreneur or not being an entrepreneur, and defined as creating a firm or not, respectively.”

weld the elements of the conceptual framework together, and hypotheses were generated to test the accuracy of its description vis-à-vis “entrepreneurial self-efficacy” (ESE). In this regard, it was hypothesised that ESE is a factor that may lead to an individual being an entrepreneur and that distinguishes entrepreneurs from non-entrepreneurs. Second, having selected *firms* (as opposed to markets) as the empirical object of interest, the chapter detailed the process of scale development used to provide an empirical estimate of ESE (“belief in one’s capabilities to perform a set of business model activities involved in firm creation”) for hypothesis testing. Guided by a two-dimensional classification scheme of business model activities, ESE was defined by 54 Likert-type items and a survey containing these and other items (e.g. questions pertaining to Age) was conducted to collect data. The scale development section concluded by identifying and justifying the statistical procedures (e.g. logistic regression) to be used in order to evaluate the psychometric properties (e.g. predictive validity) of respondents’ scores on the new ESE scale.

CHAPTER FOUR: Statistical Analysis

4.1 Introduction

This chapter presents the results of the statistical analysis. It begins by delineating 16 summative efficacy variables (e.g. Total Efficacy) and appropriate statistical methods for these quantitative variables are suggested. Next, a portion of the data set is presented and explained, descriptive statistics (e.g. sample means) are provided for respondents' scores on each of the summative efficacy variables, and graphical summaries are used to visually display some descriptive statistics on these data. Third, for entrepreneurs' test scores, the pairwise correlations among the efficacy variables are examined, while Cronbach's Alpha is used to assess internal consistency reliabilities. Then, the results of applying a linear principal components analysis (PCA) on their test scores for both the 6 'know-how' variables (e.g. Identify) and the 9 'know-what' variables (e.g. Customer Segments) are presented and discussed. The former analysis points to the variable "Total Efficacy" in order to define "entrepreneurial self-efficacy" (ESE) for the purposes of regression analysis. Fifth, since the goal of the statistical analysis is to test the accuracy of the conceptual framework's description and predictions vis-à-vis this theoretical construct, the remainder of the chapter presents the results of statistical hypothesis testing. In terms of determining the variables that may influence "entrepreneurial status" (ES), since the response is dichotomous (entrepreneur versus non-entrepreneur), binary logistic regression is used to model the response as a function of Total Efficacy and other variables (e.g. Age). Then, in terms of whether or not entrepreneurs tend to have higher Total Efficacy scores than non-entrepreneurs, as a kind of inverse regression, a general linear model (GLM) procedure is used to model this response as a function of ES and other variables.

4.2 The Efficacy Variables

While the previous chapter provided descriptive statistics for data collected on some categorical variables, such as entrepreneurial status (ES), this section delineates 16 Likert scale items (e.g. Total Efficacy) that are used to define the sample, and these quantitative variables are called the efficacy variables. It also identifies appropriate statistical methods for analysing data on these variables. However, before turning to the so-called efficacy variables, it is worth spending a moment on how respondents' scored the individual Likert-type items.

The 54 Likert-type items (e.g. “a₁”) used to define ESE (“beliefs in one’s capabilities to perform a set of business model activities involved in firm creation”) are ordinal variables. Each of these discrete random variables has seven potential values: strongly disagree (1), disagree (2), disagree somewhat (3), neutral (4), agree somewhat (5), agree (6), and strongly agree (7). Yet, as it is uncertain whether the intervals between each value are equal, the distance between a 1 and a 2 is not necessarily the same distance as the distance between a 5 and a 6. Thus, since measurements made on the 54 Likert-type items are made on the ordinal scale, the resulting Likert-type data are assessed using non-parametric methods: modes for central tendency and frequencies for variability. In this regard, while descriptive statistics are not provided for these qualitative variables, the reader may find Appendix 2 useful in terms of seeing how respondents used the 7-point measurement format to score two Likert-type items, which were designed to vary in terms of cognitive complexity.

Likert scale items are created by calculating a composite score (e.g. sum) from four or more Likert-type items; Likert scale data are evaluated on the interval measurement scale (Boone & Boone, 2012). Since a two-dimensional table (6 rows by 9 columns; see Figure 3.3) was used to generate the set of 54 efficacy variables (a₁,a₂,...,a₉, b₁,b₂,...,b₉, c₁,c₂,...,c₉, d₁,d₂,...,d₉, e₁,e₂,...,e₉, f₁,f₂,...,f₉), scores obtained from respondents on the 54 Likert-type items can be summed to provide a quantitative measure of the latent construct (i.e. ESE). Herein, this Likert scale item is called “Total Efficacy”. Since it is a sum of 54 variables, by the Central Limit Theorem, Total Efficacy can be treated as an approximately normal random variable. Also, as it has potential values 54, 55,...,378, Total Efficacy can be treated as being essentially continuous (although technically it is ordinal categorical). So, for instance, when modelling the influence of certain input variables (e.g. ES) on Likert scale items, such as Total Efficacy, it will be possible to use parametric methods, such as the General Linear Model (GLM) in SPSS¹ or some other software (e.g. Minitab²), to construct a model (but more on this later).

¹ IBM SPSS Statistics for Windows, Version 20.0 (2011). Armonk, NY: IBM Corp.

² Minitab 16 Statistical Software (2010). [Computer software]. State College, PA: Minitab, Inc. (www.minitab.com)

By way of its construction, the two-dimensional table revealed 6 row sum or ‘know-how’ variables, each of which is a sum of 9 individual variables. For example, the Likert scale item “Identify” is created by calculating a summative score from the following 9 Likert-type items: a_1, a_2, \dots, a_9 . This quantitative variable, which has potential values 9, 10, ..., 63, provides an overall measure of the Identify aspect of ESE. When the response is a sum of just 9 Likert-type items (e.g. Identify), it does not matter that such variables are not normal, provided that the sample size is large. While there is no established rule on how large is large, as there are 111 entrepreneurs, there are a minimum of 18 observations for each of the 6 ‘know-how’ variables (i.e. $111/6 = 18.5$).

Similarly, the taxonomy also revealed 9 column sum or ‘know-what’ variables, each of which is a sum of 6 individual variables. For instance, the Likert scale item “Customer Segments” is created by calculating a summative score from the following 6 Likert-type items: a_1, b_1, \dots, f_1 . This quantitative variable, which has potential values 6, 7, ..., 42, provides an overall measure of the Customer Segments aspect of ESE. For entrepreneurs, there are a minimum of 12 observations for each of the 9 ‘know-what’ variables (i.e. $111/9 = 12.3$). So, Table 4.1 below provides a guide in selecting statistical procedures for analysing the 16 efficacy variables. It also specifies the two-dimensional table cell reference for and the potential values of each variable. It is assumed for now that the 16 efficacy variables in the left hand column are not being used as inputs for a regression analysis.

Table 4.1. The 16 efficacy variables used in the analysis

Efficacy Variables	Variable Names and Cell References	Potential Values	Appropriate Statistical Methods
1 overall variable, which is a sum of 54 Likert-type items.	• Total Efficacy = $\Sigma (a_1, a_2, \dots, a_9, b_1, b_2, \dots, b_9, c_1, c_2, \dots, c_9, d_1, d_2, \dots, d_9, e_1, e_2, \dots, e_9, f_1, f_2, \dots, f_9)$	54, 55, ..., 378.	Parametric
6 ‘know-how’ variables, each of which is a sum of 9 Likert-type items.	<ul style="list-style-type: none"> • Identify = $\Sigma (a_1, a_2, \dots, a_9)$ • Select = $\Sigma (b_1, b_2, \dots, b_9)$ • Plan = $\Sigma (c_1, c_2, \dots, c_9)$ • Implement = $\Sigma (d_1, d_2, \dots, d_9)$ • Evaluate = $\Sigma (e_1, e_2, \dots, e_9)$ • Create = $\Sigma (f_1, f_2, \dots, f_9)$ 	9, 10, ..., 63.	Parametric

Efficacy Variables	Variable Names and Cell References	Potential Values	Appropriate Statistical Methods
9 'know-what' variables, each of which is a sum of 9 Likert-type items.	<ul style="list-style-type: none"> • Customer Segments = $\Sigma (a_1, b_1, \dots, f_1)$ • Value Propositions = $\Sigma (a_2, b_2, \dots, f_2)$ • Channels = $\Sigma (a_3, b_3, \dots, f_3)$ • Customer Relationships = $\Sigma (a_4, b_4, \dots, f_4)$ • Revenue Streams = $\Sigma (a_5, b_5, \dots, f_5)$ • Key Resources = $\Sigma (a_6, b_6, \dots, f_6)$ • Key Activities = $\Sigma (a_7, b_7, \dots, f_7)$ • Key Partners = $\Sigma (a_8, b_8, \dots, f_8)$ • Cost Structure = $\Sigma (a_9, b_9, \dots, f_9)$ 	6, 7, ..., 42.	Parametric (sometimes non-parametric)

Having delineated the efficacy variables and identified appropriate statistical methods for analysing data on these variables, attention turns below to data summarisation.

4.3 Data Summarisation

It is good practice to give a summary of a data set, so this section summarises the data collected via three headings: portion of the data set, descriptive statistics, and graphical summaries. This process is used to identify themes in the data set and to point out anomalies that may impact the statistical analysis.

4.3.1 Portion of the Data Set

This subsection presents and describes a portion of the data set, which is given in Table 4.2 below: the variables used in the analysis are listed in the column labelled "Variables", while the columns labelled "Observations" show the measurements made on these variables for the first five entrepreneurs who provided complete data and whose scores on the efficacy variables were deemed close-to-consistent, that is, vis-à-vis the 9-item consistency scale.

Table 4.2 Portion of the data set

Variables	Observations				
	1	2	3	4	5
a. Entrepreneurial Status (ES)	2	2	2	2	2
b. Age	3	3	3	3	3
c. Gender	1	1	2	1	2

d. Education Level	3	6	4	4	4
e. Family History	1	2	1	1	1
1. Identify	53	47	50	49	39
2. Select	50	49	55	52	43
3. Plan	48	48	53	51	43
4. Implement	51	48	47	53	37
5. Evaluate	47	47	43	58	38
6. Create	54	46	40	55	41
7. Customer Segments	33	30	30	31	29
8. Value Propositions	34	33	31	35	31
9. Channels	33	35	30	37	24
10. Customer Relationships	34	35	32	40	32
11. Revenue Streams	35	30	33	29	19
12. Key Resources	34	30	31	33	26
13. Key Activities	34	30	33	39	26
14. Key Partners	34	30	32	39	24
15. Cost Structure	32	32	36	35	30
16. Total Efficacy	303	285	288	318	241

Note: Variable: e. Family History = Family History of Self-Employment.

Aside: the five categorical variables (e.g. a. Age) that appear first in the table above were already defined in the previous chapter (section 3.3.6), where it was pointed out that it was decided to drop the variable Management Experience because of its high correlation with Entrepreneurial Status (ES). Thus, data collected on the variable Management Experience are not provided here.

As an explanation of the entries in the data table above, the entries for the first person in the column labelled “1” are described: (a) this individual was an entrepreneur (2); (b) she reported in the 35-44 age category (3); (c) this person was female (1); (d) she had an undergraduate education level (3); (e) she did not report a family history of self-employment (1). Next, in terms of data

collected on the 6 'know-how' variables (e.g. Identify), her summative scores were 53, 50, 48, 51, 47 and 54, respectively. Then, in terms of data collected on the 9 'know-what' variables (e.g. Customer Segments), her composite scores were 33, 34, 33, 34, 35, 34, 34, 34 and 32, respectively. Finally, her score on the measured variable Total Efficacy was 303.

Aside: In statistics, this particular combination of factor levels (a 35-44 year old female entrepreneur with an undergraduate education who does not have a family history of self-employment) is typically called a "treatment".

Having given and described a portion of the data set, descriptive statistics for the measured efficacy variables are provided in the next subsection.

4.3.2 Descriptive Statistics

This subsection provides descriptive statistics for data collected on the efficacy variables: namely sample means (central tendency) and standard deviations (variability). As we have seen above (Table 4.2), there are 16 efficacy variables measured on the entrepreneurs and non-entrepreneurs, and the data on each of these variables shows some variability. This variability is summarised by way of the sample standard deviations (Std. Dev.) in the columns labelled Non-Entrepreneurs and the columns labelled Entrepreneurs in Table 4.3 below.

Table 4.3 Descriptive statistics for the 16 efficacy variables

Efficacy Variables	Non-Entrepreneurs		Entrepreneurs	
	Mean	Std. Dev.	Mean	Std. Dev.
1. Identify	43.92	8.48	51.96	5.66
2. Select	45.21	7.44	53.78	4.78
3. Plan	44.24	7.96	52.38	5.28
4. Implement	43.34	8.31	51.83	5.22
5. Evaluate	43.70	8.71	51.14	6.02
6. Create	42.28	8.75	51.14	6.13
7. Customer Segments	29.02	5.49	35.09	3.91

8. Value Propositions	30.29	5.69	35.70	3.71
9. Channels	29.47	6.71	33.86	4.58
10. Customer Relationships	33.26	5.96	36.73	3.25
11. Revenue Streams	26.90	7.15	33.72	5.06
12. Key Resources	28.19	6.62	33.32	5.05
13. Key Activities	28.92	6.55	33.92	4.50
14. Key Partners	30.04	6.84	35.11	5.09
15. Cost Structure	26.60	8.36	34.77	5.38
16. Total Efficacy	262.69	47.91	312.23	30.09

In terms of measurements made on the variable “Total Efficacy”, for example, Table 4.3 shows that the sample standard deviation for non-entrepreneurs is 47.91, while the comparable descriptive statistic for entrepreneurs is 30.09. Indeed, one can see from this table that the sample standard deviation is higher for non-entrepreneurs than it is for entrepreneurs on each of the 16 measured efficacy variables. This means that, in the data set, the efficacy scores of non-entrepreneurs showed more variability than the efficacy scores of entrepreneurs. Also, for entrepreneurs and non-entrepreneurs, one can see that the variable “Select” showed least variability for data gathered on the 6 ‘know-how’ variables, and it was the variable “Customer Relationships” which showed least variability for data collected on the 9 ‘know-what’ variables.

In addition, Table 4.3 above provides the sample mean total scores for data gathered on the 16 efficacy variables. For example, the mean Total Efficacy score for entrepreneurs is 312.23, while the comparable average for non-entrepreneurs was lower at 262.69. Indeed, the sample mean total score for entrepreneurs was higher than that of non-entrepreneurs on each of the 16 efficacy variables. For both groups, as when the sample was described by its variability, one can see that it is the mean total scores for the variables “Select” and “Customer Relationships” (from the ‘know-how’ and ‘know-what’ dimensions of ESE, respectively) that appear when one describes the sample in terms of central tendency. That is, in addition to their scores on these variables showing less variability, respondents’ mean total scores on the variables

“Select” and “Customer Relationships” are higher not only in the entrepreneur data, but also in the non-entrepreneur data.

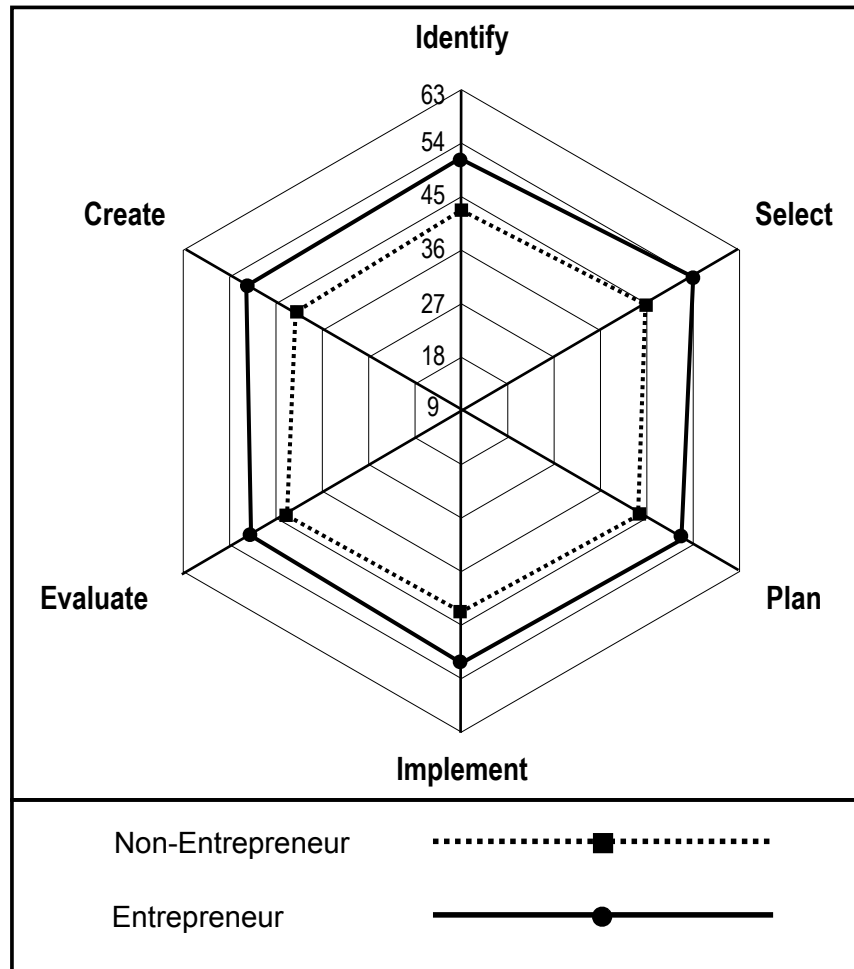
Having presented and discussed key descriptive statistics for data gathered on the efficacy variables, graphical summaries are provided for some descriptive statistics in the next subsection.

4.3.3 Graphical Summaries

A variety of graphical tools, such as radar charts, box plots and dot plots, can be used to visually display descriptive statistics (e.g. sample mean or median) for data collected on the 16 efficacy variables. Accordingly, this section uses each of the aforementioned tools to help the reader visualise some sample descriptives for some of these variables.

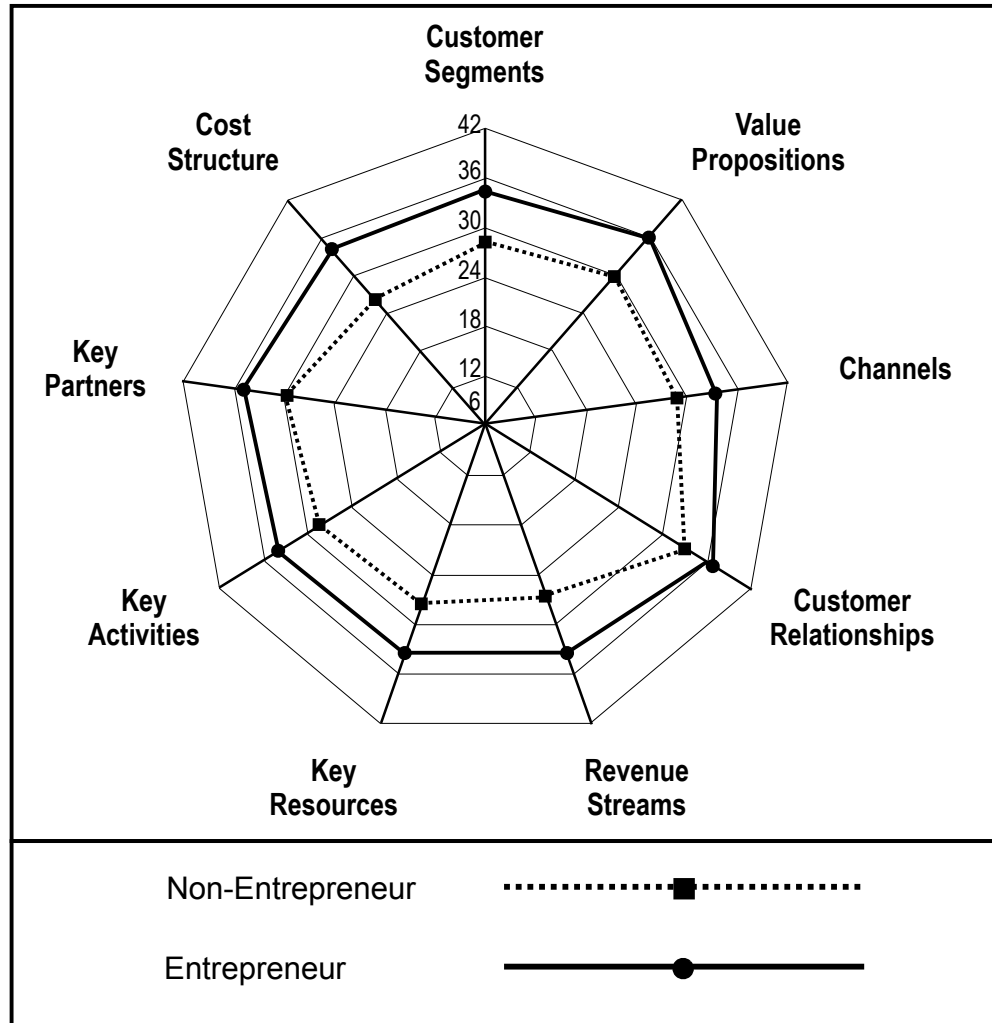
First, a radar chart or spider diagram is a graph with multiple scales (Kaczynski et al., 2008). While they can be difficult to interpret (Robbins & Heiberger, 2011), radar charts are a tool that can be used to visually display descriptive statistics for multiple variables. For entrepreneurs and non-entrepreneurs, Figure 4.1 below shows a radar chart of sample mean total scores for each of the 6 ‘know-how’ variables (e.g. Identify). One can see that the sample mean total score for entrepreneurs (represented by the solid line) is higher than the corresponding score for non-entrepreneurs (represented by the dashed line) on each of the 6 variables. While this radar chart helps to visualise patterned differences in sample mean total scores on the 6 ‘know-how’ variables, it does not show the variability in these data nor can it be used to determine if the observed differences are statistically significant.

Figure 4.1 Sample mean total scores (6 'know-how' variables)



Likewise, Figure 4.2 below shows a radar chart of sample mean total scores for the 9 'know-what' variables (e.g. Customer Segments). For each variable, one can see that the sample mean total score for entrepreneurs is higher than the corresponding score for non-entrepreneurs. Again, while this radar chart helps to visualise patterned differences in sample mean total scores on the 9 'know-what' variables, it does not show the variability in these data nor can it be used to determine if the observed differences are statistically significant.

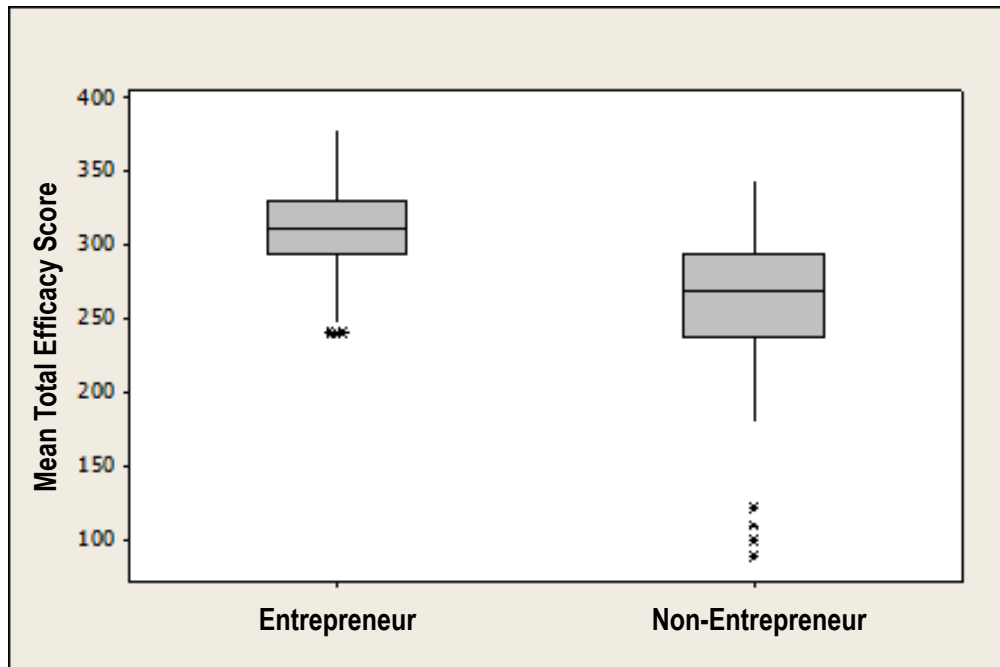
Figure 4.2 Sample mean total scores (9 'know-what' variables)



Second, box-and-whisker plots or box plots are another non-parametric tool used to visually display descriptive statistics, such as sample median (Svensson, 2001). They provide a quick way to assess what the data collected on the efficacy variables looks like and what form of distribution these data might have. For example, Figure 4.3 below shows a box plot of Total Efficacy score versus ES. One can see that the sample median for entrepreneurs (represented by the line within the left rectangle) is larger than corresponding median for non-entrepreneurs (312 versus 271.5). For entrepreneurs and non-entrepreneurs, the sample median (also known as the 2nd quartile) shows that 50% of the data in the respective samples lie below this line and 50% lie above it. So it looks like the entrepreneur data is centred, while the non-entrepreneur data is skewed to one side. Also notice that there is less variability in the Total Efficacy score of entrepreneurs versus non-entrepreneurs. In addition, there are

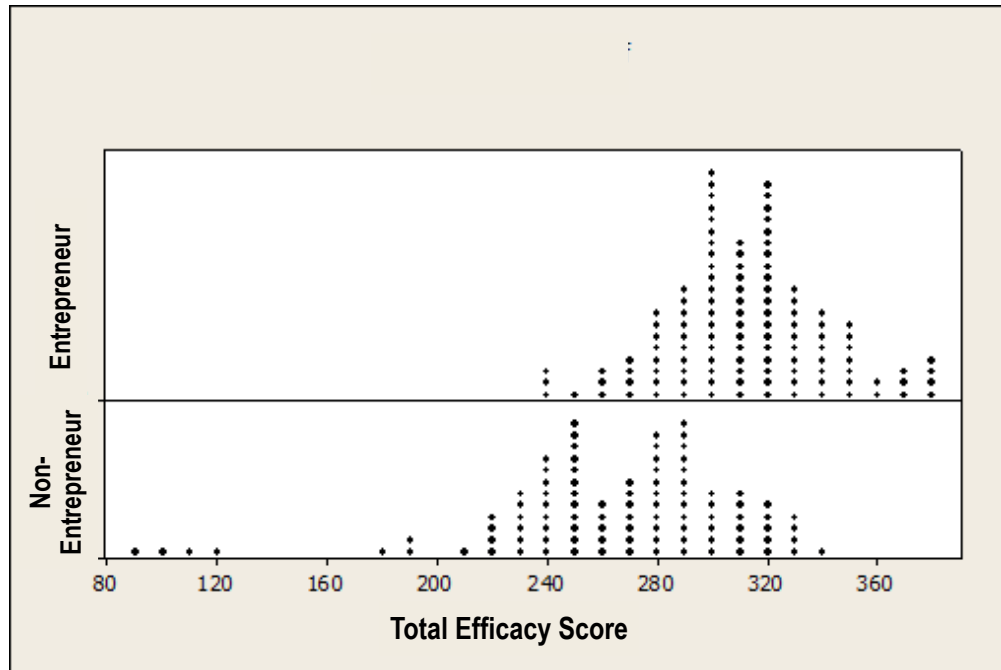
four outliers in the non-entrepreneur data (as represented by the four stacked stars), so these data have some doubtful points.

Figure 4.3 Box-and-whisker plot of Total Efficacy score versus ES



Third, dot plots (or dot charts) are another useful visualisation tool (Wattenberg, 2002). A dot plot is a graphical tool that can be used to evaluate the distribution of continuous data. For entrepreneurs and non-entrepreneurs (y-axis), Figure 4.4 below plots each of the 207 observations as a dot along a scale of Total Efficacy score (x-axis). The values on the x-axis are divided into 10-unit intervals, or “bins”, which range from 80 to 378. For entrepreneurs, where the Total Efficacy scores range from 240 to 378, the dot plot shows 20 values stacked in the ‘300 bin’ and 19 values stacked in the ‘320 bin’. For non-entrepreneurs, where the Total Efficacy scores range from 180 to 340 (i.e. excluding the four outliers), the dot plot shows 12 values stacked in the ‘250 bin’ and 12 values stacked in the ‘290 bin’. To sum up, the dot plot in Figure 4.4 shows the distributions of Total Efficacy scores for both entrepreneurs and non-entrepreneurs, and entrepreneurs seem to have higher Total Efficacy scores. Note: like the box plot, the dot plot below shows the four outliers in the non-entrepreneur data, and these doubtful points appear in the 80 to 120 range.

Figure 4.4 Dot plot of the distribution of Total Efficacy with the samples



It is important to note that none of the graphical tools used above to visually display descriptive statistics can be used to make inferences. For instance, neither the radar charts nor the box-and-whisker plot presented above can be used to determine if the displayed differences in mean total scores are statistically significant. Thus, as the primary goal of analysing the survey data is inferential (as opposed to descriptive) statistics, attention now turns to see if scores on the 16 efficacy variables performed in consistent, predictable ways:

“Authors should provide reliability coefficients of the scores for the data being analyzed even when the focus of their research is not psychometric. Interpreting the size of observed effects requires an assessment of the reliability of the scores.” (Wilkinson & Taskforce, 1999: 597)

4.4 Internal Consistency Reliability

Good “reliability” is a fundamental issue for scale developers, since it is a necessary condition for validity (DeVellis, 2012; Gliem & Gliem, 2003; Goodman et al., 1989; Hinkin, 1995; Santos, 1999; Wilkinson & Taskforce, 1999). “Reliability is a property of the scores on a test for a particular population of examinees” (Wilkinson & Taskforce, 1999: 597). Although there are a number of

ways to assess reliability, such as test-retest reliability³, Cronbach's Alpha (Cronbach, 1951) is the most widely used measure of internal consistency reliability (Hinkin, 1995). It is concerned with the homogeneity of the scale items, and Cronbach's alpha, or coefficient alpha, is a key indicator of a scale's quality (DeVellis, 2012). Indeed, the guide for constructing self-efficacy scales (Bandura, 2006) specifically states that internal consistency reliability should be calculated using Cronbach's measure.

In terms of this scale development research, the basic idea with internal consistency reliability is that if the 16 efficacy variables are indeed measuring the same latent construct (i.e. ESE), then they should be highly intercorrelated. As there are 16 variables ($n = 16$), one can calculate the correlation between any 2 of them ($r = 2$) and this is called a "pairwise correlation". The entire set of 105 pairs of variables among the 16 variables, which is calculated using the following formula below, leads to 105 pairwise correlations.

$$\frac{n!}{r!(n-r)!}$$

So, for the sample of 111 entrepreneurs, the 105 pairwise correlations among and the Cronbach alphas for the 16 efficacy variables are provided in Table 4.4 below. For the reader's convenience, this table also reintroduces the descriptive statistics, specifically sample mean total scores and sample standard deviations (SD), for each variable which are presented in columns 2 and 3 of the table.

³ "Test-retest reliability is appropriate only in those situations where the attribute being measured is not expected to change over time" (Hinkin, 1995: 978). Thus, since entrepreneurial self-efficacy (ESE) is a malleable mechanism, assessing the stability of the new measure of ESE is not of paramount importance.

Table 4.4 Descriptive statistics, intercorrelations, and Cronbach alphas for scores on the 16 efficacy variables

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Identify	51.96	5.66	(0.81)															
2. Select	53.78	4.78	0.82	(0.81)														
3. Plan	52.38	5.28	0.85	0.88	(0.81)													
4. Implement	51.83	5.22	0.84	0.79	0.82	(0.78)												
5. Evaluate	51.14	6.02	0.73	0.65	0.69	0.69	(0.84)											
6. Create	51.14	6.13	0.75	0.75	0.80	0.85	0.73	(0.85)										
7. Customer Segments	35.09	3.91	0.73	0.73	0.73	0.66	0.64	0.70	(0.79)									
8. Value Propositions	35.70	3.71	0.64	0.73	0.69	0.61	0.52	0.62	0.60	(0.79)								
9. Channels	33.86	4.58	0.58	0.59	0.62	0.58	0.50	0.57	0.55	0.51	(0.90)							
10. Customer Relations	36.73	3.25	0.54	0.61	0.63	0.66	0.55	0.65	0.55	0.54	0.51	(0.81)						
11. Revenue Streams	33.72	5.06	0.74	0.68	0.69	0.78	0.69	0.79	0.60	0.46	0.37	0.55	(0.91)					
12. Key Resources	33.32	5.05	0.79	0.69	0.74	0.75	0.72	0.71	0.55	0.54	0.39	0.44	0.67	(0.88)				
13. Key Activities	33.92	4.50	0.73	0.66	0.72	0.75	0.65	0.74	0.45	0.50	0.48	0.50	0.65	0.67	(0.87)			
14. Key Partners	35.11	5.09	0.67	0.66	0.70	0.68	0.63	0.65	0.46	0.49	0.41	0.53	0.50	0.50	0.53	(0.89)		
15. Cost Structure	34.77	5.38	0.64	0.63	0.66	0.66	0.68	0.62	0.54	0.34	0.35	0.34	0.55	0.61	0.43	0.55	(0.93)	
16. Total Efficacy	312.23	30.09	0.92	0.89	0.93	0.92	0.83	0.90	0.77	0.70	0.63	0.66	0.80	0.81	0.77	0.73	0.71	(0.96)

Note: All correlations in the table's correlation matrix are statistically significant at the 1% level of significance.

First, the 105 pairwise correlation coefficients (Spearman's rho) among the 16 efficacy variables are provided above in the table's correlation matrix. Since it is hoped that these variables measure the same latent construct (i.e. ESE), one would expect that entrepreneurs' scores on the efficacy variables should correlate with each other. Of particular interest here are the 15 pairwise correlations among scores on the 6 'know-how' variables and the 36 pairwise correlations among scores on the 9 'know-what' variables (which are highlighted in bold). One can see from Table 4.4 that there is a highly significant correlation among scores on the 6 'know-how' variables. Indeed, the lowest correlation coefficient is 0.65 and this is between scores on the variables Select (2) and Evaluate (5). In short, entrepreneurs' scores on these 6 variables had a strong positive relationship to one another, which implies that they share a common factor, ESE. Likewise, there is a significant correlation among scores on the 9 'know-what' variables. The lowest association in this set of 36 pairwise correlations is 0.34. In short, entrepreneurs' scores on the 9 'know-what' variables showed a moderate to strong positive relationship to one another, which suggests that each of the 9 variables assess one aspect of the latent variable. In addition, entrepreneurs' scores on each of the 15 variables or subscales are highly correlated with the variable Total Efficacy.

Aside: Examining the correlations among the variables is also important to the construction of a model in order to predict entrepreneurial status (ES). For instance, if one were to use all 6 of the above 'know-how' variables and as they are highly intercorrelated, this correlation can cause problems in the prediction of ES—i.e. multicollinearity among input variables can cause spurious results about the affect of any one of these inputs on the response e.g. ES. (This correlation is examined further in the next section).

Second, the Cronbach alphas for scores obtained on each of the 16 efficacy variables are shown in parentheses along the main diagonal of the correlation matrix (Table 4.4). Corresponding to any variable in the row, the bracketed entry in that row gives the value of Cronbach's Alpha for the components of that variable. Thus, for example, since the variable Identify is computed by summing the variables a_1, a_2, \dots, a_9 , the Cronbach's Alpha value of 0.81 is a measure of the

internal consistency of the measurements taken on these 9 variables. Likewise, since the variable Total Efficacy can be computed by summing the variables Identify, Select,...,Create, the Cronbach's Alpha value of 0.96 is a measure of the internal consistency of the measurements taken on these 6 variables. Finally, it is pleasing to note that all Cronbach alphas provided in Table 4.4 meet the acceptable lower bound value of 0.70 suggested by Nunnally (1989).

To sum up, test scores returned by entrepreneurs on the efficacy variables showed good reliability evidence.

4.5 Principal Components Analysis

This section presents the results of ordinary (linear) principal components analysis (PCA) that were conducted separately on the 6 'know-how' variables (e.g. Identify) and on the 9 'know-what' variables (e.g. Customer Segments). It begins by providing an overview of the PCA procedure as it applies to this statistical analysis. In particular, this overview outlines not only the preliminary steps to be performed, but also the indicated conditions to be satisfied prior to conducting any such analysis.

4.5.1 Overview

PCA is a variable reduction technique (Bruin, 2006; Field, 2005; Suhr, 2005). It is a statistical procedure that can be used when the observed variables are highly correlated. PCA replaces the original variables by an equal number of principal components, each of which is a linear combination of the original variables. Of course, since principal components are independent variables (by construction), such mathematical factors solve multicollinearity among the input variables. As outlined in the previous section, there was a highly significant correlation among scores on the 6 'know-how' variables (e.g. Identify), and also a highly significant correlation among scores on the 9 'know-what' variables (e.g. Customer Segments). Accordingly, since the primary goal is to model certain response variables as a function of other variables, it is necessary to attempt to reduce the number of variables that are required to explain the variation in the entrepreneur data.

Here, one idea for a PCA is to replace the original 9 ‘know-what’ variables by a hopefully smaller list of principal components U_1, U_2, \dots, U_3 for which the sum of the variances of these few variables is close to the total variance of the original 9 variances. Suppose for example that we find three variables U_1, U_2 and U_3 , and such that the sum of variances of observations on these variables is almost as large as the sum of the variances of the data on the original 9 variables. Then we could replace the original 9 variables by these 3 variables without losing much information. It transpires that each principal component is a linear combination of the original 9 variables, that is each U_i is of the form:

$$U_i = \alpha_1 X_1 + \alpha_2 X_2 + \dots, \alpha_9 X_9 \text{ for some constants } \alpha_1, \alpha_2, \dots, \alpha_9, \text{ called loading.}$$

Likewise, another idea for a PCA on the entrepreneur data is to replace the original 6 ‘know-how’ variables by a hopefully smaller list of principal components, where each U_i is of the form:

$$U_i = \alpha_1 X_1 + \alpha_2 X_2 + \dots, \alpha_6 X_6 \text{ for some constants } \alpha_1, \alpha_2, \dots, \alpha_6, \text{ called loading.}$$

Herein, the idea to reduce the 6 ‘know-how’ variables in the entrepreneur data is labelled “PCA 1”, while the idea to reduce the 9 ‘know-what’ variables is called “PCA 2”. The remainder of this subsection outlines the preliminary steps to be performed and also the initial conditions that need to be satisfied in order to conduct either analysis.

After Field (2005), where the first preliminary step is to examine the correlations among the variables using the Pearson (as opposed to Spearman) correlation coefficient, SPSS provides the determinant of the correlation matrix. If this value is less than 0.00001 then multicollinearity is a problem for the data. In this regard, Table 4.5 below provides the 15 pairwise correlations among the 6 ‘know-how’ variables. While there is a highly significant correlation among all pairs of variables, as the determinant value ^a is 0.001 (provided in the note below the matrix), multicollinearity is not a concern for these entrepreneur data.

Table 4.5 Correlation matrix^a (6 ‘know-how’ variables)

Variables	1	2	3	4	5	6
1. Identify	1.00					
2. Select	0.80	1.00				
3. Plan	0.85	0.89	1.00			
4. Implement	0.87	0.81	0.83	1.00		
5. Evaluate	0.81	0.68	0.74	0.74	1.00	
6. Create	0.76	0.78	0.79	0.84	0.74	1.00

Notes: All Pearson product moment correlations in the table’s correlation matrix are statistically significant at the 1% level of significance. ^a Determinant = 0.001

Likewise, Table 4.6 below provides the 36 pairwise correlations among the 9 ‘know-what’ variables. The Pearson product moment correlation coefficients show a highly significant correlation among all pairs of variables. However, since the determinant value is 0.009, multicollinearity is not a problem for these entrepreneur data.

Table 4.6 Correlation matrix^a (9 ‘know-what’ variables)

Variables	7	8	9	10	11	12	13	14	15
7. Customers	1.00								
8. Proposition	0.61	1.00							
9. Channels	0.61	0.50	1.00						
10. Relations	0.56	0.54	0.49	1.00					
11. Revenues	0.54	0.39	0.39	0.55	1.00				
12. Resources	0.54	0.46	0.35	0.50	0.71	1.00			
13. Activities	0.50	0.51	0.50	0.52	0.67	0.65	1.00		
14. Partners	0.44	0.44	0.36	0.49	0.47	0.52	0.51	1.00	
15. Costs	0.49	0.28	0.29	0.35	0.56	0.60	0.46	0.45	1.00

Notes: All Pearson product moment correlations in the table’s correlation matrix are statistically significant at the 1% level of significance. ^a Determinant = 0.009

“The reliability of factor analysis is also dependent on sample size” (Field, 2005: 1)

Second, sample size is another important preliminary consideration in PCA (Bruin, 2006; Field, 2005; Suhr, 2005). This thesis adopts Bruin's (2006) suggested minimum of 10 observations per variable. As there are 111 entrepreneurs in the sample, there are 18 observations per variable for PCA 1, while there 12 observations per variable for PCA 2. Thus, the indicated conditions for sample size are satisfied in the analysis.

After good practice (Bruin, 2006; Field, 2005), the third preliminary step in PCA is to check the entrepreneur data using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser, 1974) and Bartlett's test of sphericity (Bartlett, 1937):

- In terms of the KMO measure of sampling adequacy, which can range from 0 to 1, Kaiser (1974) suggests a minimum value of 0.5, while Bruin (2006) recommends a minimum of 0.6 to justify conducting a PCA. Thus, since the measured KMO value here is 0.89 which suggests that the patterns of correlations in the entrepreneur data are relatively compact and may be regarded as "great" (Field, 2005), it can be assumed that PCA is appropriate for these data.
- Bartlett's measure tests the null hypothesis that the correlation matrix is an identity matrix (Bruin, 2006; Field, 2005). It is important to reject this null hypothesis with a significance value below 0.05. For the entrepreneur data, a test on the:
 - 6 'know-how' variables has an approximate Chi-Square value of 748.4 which has 15 degrees of freedom and is highly significant ($p < 0.001$);
 - 9 'know-what' variables has an approximate Chi-Square value of 501.6 which has 36 degrees of freedom and is highly significant ($p < 0.001$).

Since Bartlett's test is highly significant in both cases, which means that each null hypothesis can be rejected, it can be assumed that PCA is appropriate for the entrepreneur data, that is, when the sample is defined using either the 6 'know-how' variables or the 9 'know-what' variables.

Having performed the preliminary steps and satisfied the indicated conditions required to conduct a PCA on the 6 ‘know-how’ variables (PCA 1) and a PCA on the 9 ‘know-what’ variables (PCA 2), in their turn, the results of these analyses are presented below—after Bruin (2006) and Field (2005).

4.5.2 PCA on the 6 ‘know-how’ variables (PCA 1)

This subsection introduces the results of a PCA on the 6 ‘know-how’ variables. As there are 6 variables, before extraction, SPSS identifies 6 linear components within the entrepreneur data. The output in Table 4.7 below shows the eigenvalues associated with each principal component before extraction and after extraction. Eigenvalues represent the variances associated with each component and the values are also displayed in terms of the percentage (%) of variance explained. So, in terms of the columns labelled “Initial Eigenvalues”, for example, component 1 explains 82.984% of total variance. Since SPSS extracts all components with eigenvalues greater than 1, the reader can see that only one principal component has been extracted. Thus, in terms of the columns labelled “Extraction Sums of Squared Loadings”, the eigenvalue associated this component is again displayed and, of course, the percentage of variance explained. The values in this portion of the table are equal to the values before extraction, except that the values for the components dispensed with are ignored (therefore, the table is blank after the first component). Finally, since it would be meaningless to rotate a single component (cf. Raykov & Marcoulides, 2011), a rotation attempt for this component was not made.

Table 4.7 Total variance explained (PCA 1)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.979	82.984	82.984	4.979	82.984	82.984
2	0.357	5.958	88.942			
3	0.262	4.367	93.309			
4	0.202	3.374	96.683			
5	0.108	1.807	98.490			
6	0.091	1.510	100.000			

The output in Table 4.8 below shows the communalities before and after extraction. As PCA assumes that all variance is common, all communalities before extraction (i.e. in the column labelled “Before”) are all 1. Then, in terms of the column labelled “After”, the communalities after extraction reflect the common variance in the entrepreneur data structure. So, for instance, one can say that 86.7% of the variance associated with the variable “Identify” is shared, or common, variance. One can see that some information is lost. The communalities after extraction represent the amount of variance in each of the 6 ‘know-how’ variables that is explained by the factors.

Table 4.8 Communalities before and after extraction (PCA 1)

Variable	Before	After
Identify	1.00	0.867
Select	1.00	0.826
Plan	1.00	0.874
Implement	1.00	0.872
Evaluate	1.00	0.736
Create	1.00	0.804

As already pointed out, only one principal component was extracted. The output in Table 4.9 below shows the component matrix, which contains the weights (loadings) of each of the original 6 ‘know-how’ variables onto this component.

Table 4.9 Component matrix (PCA 1)

Variable	Component 1
Identify	0.931
Select	0.909
Plan	0.935
Implement	0.934
Evaluate	0.858
Create	0.896

This mathematical variable, or component, is:

$$U_1 = 0.931(\text{Identify}) + 0.909(\text{Select}) + 0.935(\text{Plan}) + 0.934(\text{Implement}) + 0.858(\text{Evaluate}) + 0.896(\text{Create}).$$

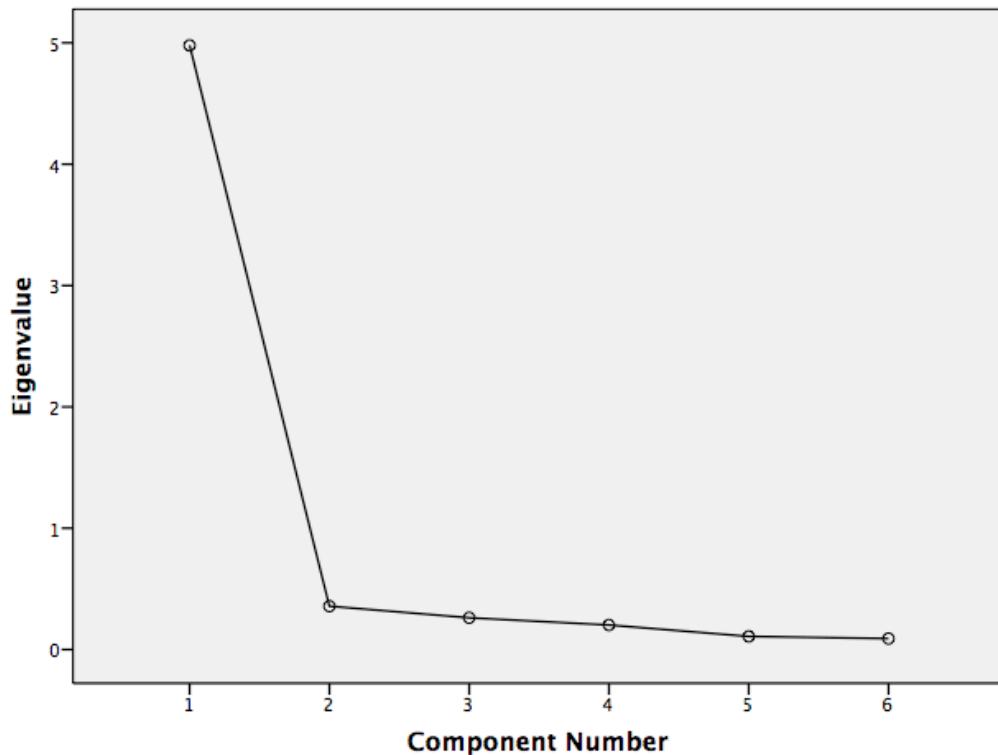
As noted above, this variable (i.e. U_1) describes 82.984% of variation in the data on the original 6 'know-how' variables. Thus, if we add the variances of the data on each of the 6 variables (e.g. for Identify, the variance is about $(5.66)^2 = 32.03$) and their sum is 183.75, the sample variance of U_1 will be roughly $0.8298 \times 183.75 = 152.48$.

Aside, from the portion of the data set provided earlier, the first observed value of U_1 is:

$$0.931(53) + 0.909(50) + 0.935(48) + 0.934(51) + 0.858(47) + 0.896(54) = 276.02$$

As evidenced by eigenvalues in Table 4.7, the remaining components describe a very small portion of the variability and are not worth including in practice.

Figure 4.5 Scree plot (PCA 1)



The scree plot above in Figure 4.5, which is a graph of the eigenvalues versus the number of components, shows a large drop after the first component: the

first eigenvalue is 4.979 (and corresponds to 82.984% of the total variance of the data on the original 6 'know-how' variables). The remaining eigenvalues are small in comparison and so as noted above really only one variable is required to explain the variation in the original 6 'know-how' variables.

It is important to highlight that, while only one component is required, the calculation of the values of this component require the values of all 6 'know-how' variables. This is clear, since as already pointed out, U_1 is a function of all 6 variables (e.g. Identify which has a coefficient of 0.931, Select which has a weight of 0.909, and so on).

One can see that the coefficients (weights) of the 6 'know-how' variables are roughly the same, so it is possible to view U_1 as the sum of the 6 variables (i.e. ESE) without loss of much information. That is, the variation in the 6 'know-how' variables can be described by the sum of the 6 variables. One can conclude that all of the information in the 6 original variables is contained in the sum of these variables. Thus, one can substitute the 6 'know-how' variables by their sum:

$$U_1 = (\text{Identity} + \text{Select} + \text{Plan} + \text{Implement} + \text{Evaluate} + \text{Create})$$

Herein, this mathematical factor is called "Total Efficacy". One may even consider using just one of the 6 'know-how' variables, perhaps just "Identify" which might be the one entrepreneurs can score most easily. This is because the coefficients assigned to each are about equal and, as shown earlier in Table 4.4, the main summary statistics (standard deviations) for each are roughly the same.

4.5.3 PCA on the 9 'know-what' variables (PCA 2)

This subsection presents the results of a PCA on the 9 'know-what' variables. As there are 9 variables, before extraction, SPSS identified 9 components. The output in Table 4.10 below shows the eigenvalues associated not only with each principal component before extraction and after extraction, but also the

eigenvalues after rotation. In this regard, we will return to the output in Table 4.10 a number of times throughout this subsection.

Table 4.10 Total variance explained (PCA 2)

Component	Initial Eigenvalues		Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.984	55.377	4.984	55.377	55.377	3.150	35.004	35.004
2	1.020	11.335	1.020	11.335	66.712	2.854	31.708	66.712
3	0.620	6.891			73.602			
4	0.569	6.320			79.922			
5	0.494	5.492			85.414			
6	0.480	5.334			90.748			
7	0.322	3.579			94.327			
8	0.276	3.069			97.396			
9	0.234	2.604			100.000			

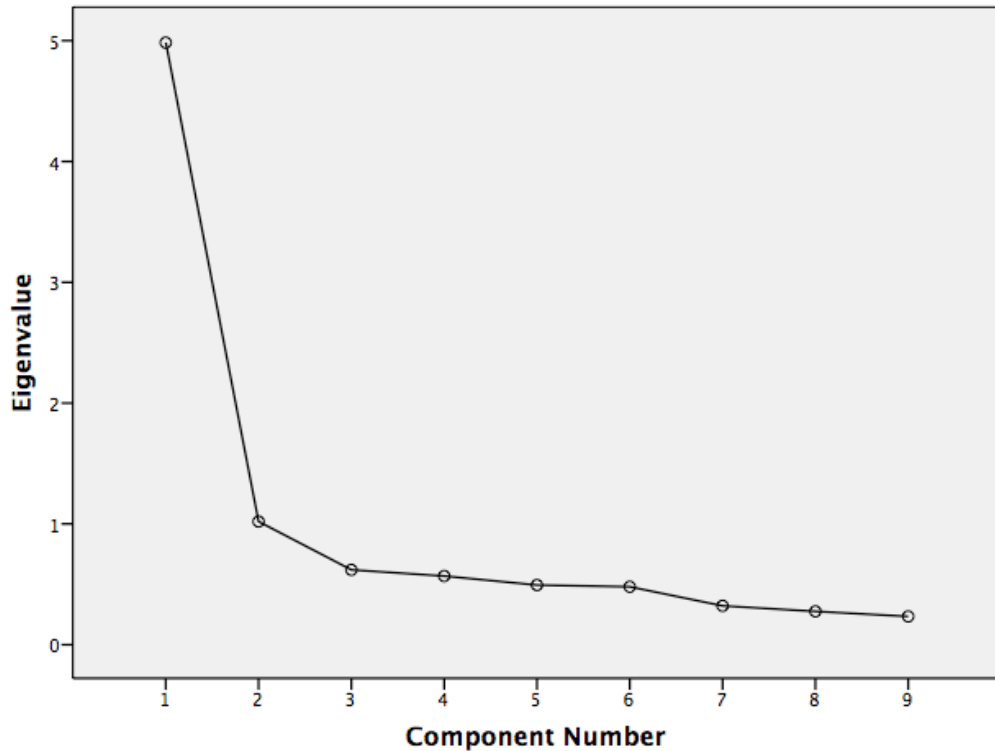
The output in Table 4.11 below identifies the communalities “before” and “after” extraction. In terms of the communalities after extraction, it is possible to say that 69.6% of the variance associated with the variable “Customer Segments” is shared, or common, variance. The communalities after extraction represent the amount of variance in each of the original 9 ‘know-what’ variables that is explained by the factors.

Table 4.11 Communalities before and after extraction (PCA 2)

Variable	Before	After
Customer Segments	1.00	0.696
Value Propositions	1.00	0.684
Channels	1.00	0.689
Customer Relationships	1.00	0.606
Revenue Streams	1.00	0.737
Key Resources	1.00	0.766
Key Activities	1.00	0.655
Key Partners	1.00	0.500
Cost Structure	1.00	0.670

Returning to the output in Table 4.10, one can see from the columns labelled “Extraction Sums of Squared Loadings” that two principal components were extracted. These two components explain 66.712% of variation in the data on the original 9 variables. The remaining eigenvalues are less than 1, which means that each of the remaining components describe less variance than did the original 9 variable. By reference also to the output from Table 4.10, the scree plot below in Figure 4.6 shows a drop after the second component: the first eigenvalue is 4.984 (and corresponds to 55.377% of the total variance of the data on the original 9 variables), while the second eigenvalue is 1.020 (and equates to 11.335% of the total variance).

Figure 4.6 Scree plot (PCA 2)



The output in Table 4.12 below shows the component matrix (before rotation), which contains the weights (loadings) of each of the original 9 'know-what' variables onto each component. It is not very important to interpret this matrix.

Table 4.12 Component matrix (PCA 2)

Variable	Component 1	Component 2
Customer Segments	0.794	0.258
Value Propositions	0.704	0.435
Channels	0.663	0.500
Customer Relationships	0.748	0.216
Revenue Streams	0.799	-0.314
Key Resources	0.803	-0.349
Key Activities	0.804	-0.092
Key Partners	0.697	-0.118
Cost Structure	0.667	-0.475

Returning once more to Table 4.10, the reader can see that the columns labelled “Rotated Sums of Squared Loadings” display the eigenvalues of the components after rotation. Rotation has the result of optimising the component structure and one outcome for these entrepreneur data is that the relative importance (weights) of the two components is equalized. That is, before rotation, component 1 accounted for 55.377% of variance, while component 2 accounted for 11.335%. However, after an orthogonal (varimax) rotation, one can see that these two components account for 35.004% and 31.708% of variance, respectively. The output in Table 4.12 below shows the rotated component matrix. It contains the weights of each of the original 9 ‘know-what’ variables onto each component. Although each component is a linear combination of the original 9 variables, component loadings greater than 0.5 are emphasised (in bold) to make interpretation easier for the reader.

Table 4.13 Rotated component matrix

Variable	Component 1	Component 2
Customer Segments	0.407	0.729
Value Propositions	0.220	0.797
Channels	0.145	0.817
Customer Relationships	0.402	0.667
Revenue Streams	0.799	0.314
Key Resources	0.826	0.290
Key Activities	0.652	0.480
Key Partners	0.591	0.388
Cost Structure	0.811	0.105

Note: Rotation Method—Varimax with Kaiser Normalisation. The rotation converged in 3 iterations.

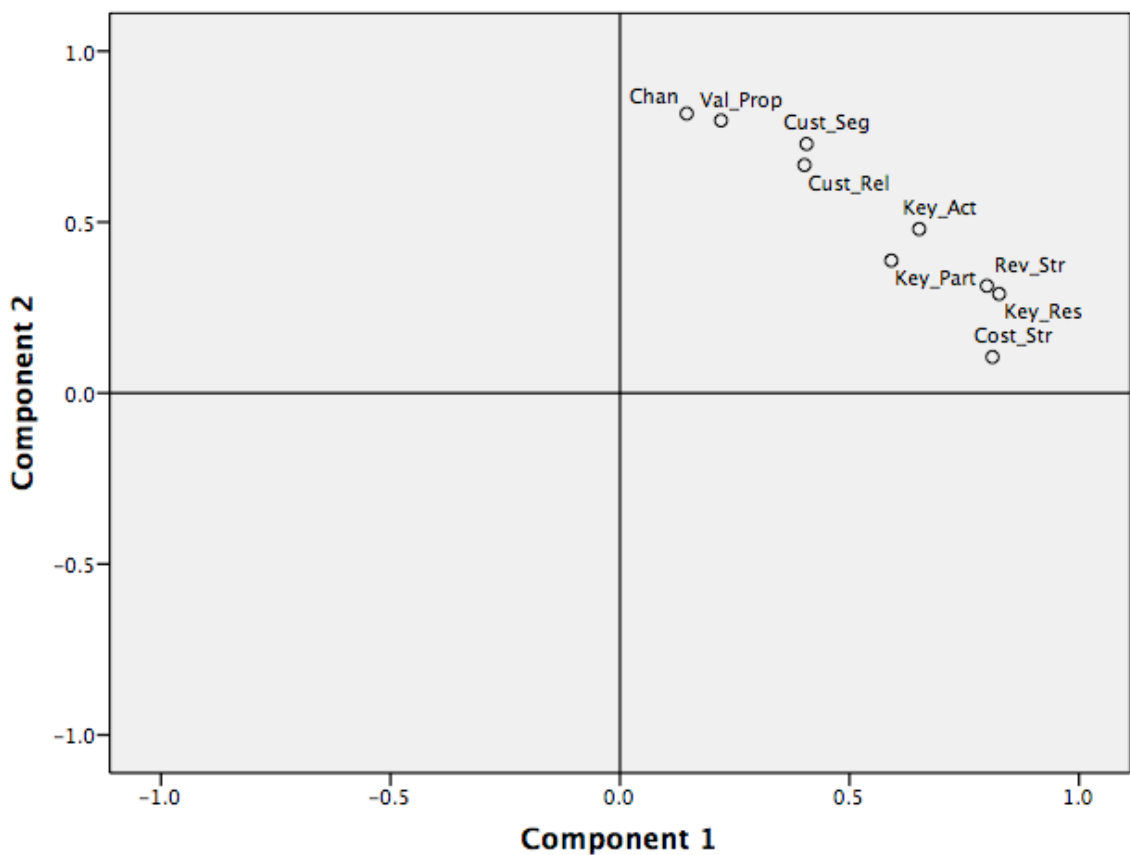
For the reader’s convenience, before plotting the weights (loadings) of the original 9 ‘know-what’ variables in the rotated component space, the component transformation matrix is presented below in Table 4.14. This is the matrix by which one can multiply the unrotated component matrix (i.e. Table 4.12) to obtain the rotated component matrix (i.e. Table 4.13).

Table 4.14 Component transformation matrix

Component	1	2
1	0.733	0.680
2	-0.680	0.733

The chart below in Figure 4.7 plots the loadings (weights) of each of the original 9 'know-what' variables (from Table 4.13) in the rotated component space. This plot helps one to see how the original 9 variables are organised in the common component space.

Figure 4.7 Component plot in rotated component space



Note. The 9 'know-what' variable labels in the above chart are suppressed not only for reasons of space, but also to make interpretation considerably easier for the reader. The abbreviations may be interpreted as follows:

- Cust_Seg = Customer Segments;
- Val_Prop = Value Propositions;
- Chan = Channels;
- Cust_Rel = Customer Relationships;
- Rev_Str = Revenue Streams;
- Key_Res = Key Resources;
- Key_Act = Key Activities;
- Key_Part = Key Partners;
- Cost_Str = Cost Structure.

These two mathematical variables, or components, are:

$$U_1 = 0.407(\text{Customer Segments}) + 0.220(\text{Value Proposition}) + 0.145(\text{Channels}) + 0.402(\text{Customer Relationships}) + 0.799(\text{Revenue Streams}) + 0.826(\text{Key Resources}) + 0.652(\text{Key Activities}) + 0.591(\text{Key Partners}) + 0.811(\text{Cost Structure})$$

and

$$U_2 = 0.729(\text{Customer Segments}) + 0.797(\text{Value Proposition}) + 0.817(\text{Channels}) + 0.667(\text{Customer Relationships}) + 0.314(\text{Revenue Streams}) + 0.290(\text{Key Resources}) + 0.480(\text{Key Activities}) + 0.388(\text{Key Partners}) + 0.105(\text{Cost Structure}).$$

As outlined above, U_1 and U_2 explain 35.004% and 31.708% of variation in the data on the original 9 'know-what' variables, respectively. That is, if we add the variances of the data on each of the 9 variables and their sum is 186.762, the sample variance of U_1 will be roughly $0.35 \times 186.762 = 65.37$, while the sample variance of U_2 will be about $0.317 \times 186.762 = 59.22$.

Aside, from the portion of the data set given earlier, the first observed value of U_1 is:

$$0.407(33) + 0.220(34) + 0.145(33) + 0.402(34) + 0.799(35) + 0.826(34) + 0.652(34) + 0.591(34) + 0.811(32) = 163.63,$$

and the the first observed value of U_2 is:

$$0.729(33) + 0.797(34) + 0.817(33) + 0.667(34) + 0.314(35) + 0.290(34) + 0.480(34) + 0.388(34) + 0.105(32) = 154.52$$

It is most informative to note that U_1 gives relatively high loadings (weights) to the variables Revenue Streams, Key Resources, Key Activities, Key Partners and Cost Structure. These variables all seem to relate to different aspect of a firm's operations; therefore, we might label U_1 "Operations".

On the other hand, one can see that U_2 has some high loadings associated with Customer Segments, Value Propositions, Channels and Customer Relationships. These variables all appear to relate to different aspect of a firm's marketing; therefore, we might label U_1 "Marketing".

This PCA appears to show that the 9 ‘know-what’ variables, in actuality, are composed of two subscales: operations and marketing. It is possible that the new scale failed to measure “entrepreneurial self-efficacy” (ESE) but does capture two related constructs. Conversely, it is also possible that these two constructs are sub-components of ESE. However, the PCA does not indicate which of these prospects is true. Either way, it is pleasing to note that U_1 and U_2 are not only independent variables (by construction) but seem to measure different aspects of ESE beliefs (essentially operations and marketing).

One caveat. Future researchers might like to explore if the findings can become more pronounced on new data. This seems especially important because some respondents might have been answering by rote (i.e. “at random”).

Since the primary goal of analysing the survey data is inferential statistics, attention now turns to this key part of the statistical analysis.

4.6 Inferential Statistics

The goal of this section is to model certain response variables as a function of other variables. Indeed, when analysing the survey data, as interest primarily centres on extrapolating meaningful results about the population from which the sample was taken, the primary aim is inferential statistics.

“Inferential statistics is a body of methods used to draw conclusions or inferences about characteristics of populations based on sample data.” (Keller, 2009: 4).

So, when making inferences in this section, the idea is to test some hypothesis, such as that there is no relationship between two variables in the study. In this regard, it was already pointed out how the latent construct “entrepreneurial self-efficacy” (ESE) is defined in the 54 underlying Likert-type items, and that scores on these items can be summed to provide a quantitative measure to represent ESE. Herein, this variable was called “Total Efficacy” and it was used to provide an overall (albeit indirect) measure of ESE for hypothesis testing. With this in mind, one such test is to determine the variables that affect “Entrepreneurial

Status” (ES; “being an entrepreneur or not being an entrepreneur, and defined as creating a firm or not, respectively”). In this regard, the idea is to test the null hypothesis ($H_0^{(1)}$) against the alternative (or research) hypothesis ($H_1^{(1)}$):

$H_0^{(1)}$: the likelihood of a person being an entrepreneur is not associated with her Total Efficacy score.

$H_1^{(1)}$: the likelihood of a person being an entrepreneur increases with her Total Efficacy score.

This test involved modelling the qualitative variable ES as a function of the quantitative variable Total Efficacy and other variables: Age, Gender, Education Level and Family History of Self-employment. The idea of determining the variables that result in firm creation and in particular of including Total Efficacy as a potential predictor means that this thesis views *Firm Creation* as a good proxy for *Entrepreneur*. It was also pointed out that ESE refers to “beliefs in one’s capabilities to perform a set of business model activities involved in firm creation”. Noting that one’s belief in one’s capabilities to perform these activities does not mean that she will become an entrepreneur. In fact, believing one has the capability to do something is quite different from actually being able to do it. So, it is vital to determine the relationship between Total Efficacy and ES.

As ES is dichotomous (entrepreneur versus non-entrepreneur), an appropriate analysis involves binary logistic regression. Using Minitab, SPSS or some other statistical software to conduct binary logistic regression on the development sample, it will be possible to determine how Total Efficacy score and values of other variables (e.g. Age) affect the probability of a person being an entrepreneur or not. The binary logistic regression procedure enables one to incorporate several predictors. It requires that the observations on the different respondents (entrepreneurs and non-entrepreneurs) be independent, and this is clearly the case (by design).

Another important test is to determine the variables that influence a person's Total Efficacy. Thus, as a "kind" of inverse regression ⁴, the idea is to test the null hypothesis ($H_0^{(2)}$) against the alternative or research hypothesis ($H_1^{(2)}$):

$H_0^{(2)}$: there is no difference between the population mean Total Efficacy score of entrepreneurs and that of non-entrepreneurs.

$H_1^{(2)}$: the population mean Total Efficacy score of entrepreneurs is higher than that of non-entrepreneurs.

To conduct this test, we will model the quantitative variable Total Efficacy as a function of ES and other variables (e.g. Age). The idea of modelling Total Efficacy as a function of ES and other factors (e.g. Age) is essentially the inverse of predicting ES from a person's Total Efficacy (and other variables). It is convenient to perform this procedure using the General Linear Model (GLM) in Minitab, SPSS, or some other statistical software. One goal of the GLM will be to see if the observed difference in Total Efficacy versus ES is statistically significant, after adjusting for other variables.

Note: The tests performed in this section are one-sided (as opposed to two-sided) tests. "The difference between a one-sided test and a two-sided test lies solely in the specification of the alternative hypothesis ... a one-sided test specifies in its alternative hypothesis that the parameter is either greater than or less than the value specified in the null hypothesis" (Salkind, 2010: 1571). An important implication for performing a one sided-test is that the p-value (Sig.) for that test, given by the statistical software (e.g. SPSS), must be halved.

In summary, this inferential statistics section treats firm creation as a proxy for *being* an entrepreneur and using (binary) logistic regression on the development sample, it will assess how Total Efficacy scores and values of other variables affect the probability of a person being an entrepreneur or not. Then, using GLM, it will determine whether or not the Total Efficacy scores of

⁴ "Inverse regression, or statistical calibration, uses the estimated relationship between a response Y and a covariate x to infer the values of unknown x's from their observed Y's" (Jones, 2008: 1533).

entrepreneurs tend to be higher than those of non-entrepreneurs, after controlling for the effect of other variables.

Before turning to the statistical procedures of statistical inference used in this study, the next subsection first highlights some issues in statistical inference.

4.6.1 Issues in Statistical Inference

In this study, the development sample ($N = 207$) was not chosen at random. For this reason one can argue that standard rigorous methods of statistical inference are not appropriate. In part because of the non-random method of data collection, but mainly because of the relatively small sample size and the desire to ask and analyse many questions, it is best to view the results of the present study as exploratory. That is, the data points are viewed as composing a pilot study whose main goal is to formulate hypotheses that may then be tested when “more reliable” and larger data sets are gathered. More reliable refers to data that is collected via some sampling design, as opposed to data gathered via non-probabilistic methods (e.g. convenience sampling). On the other hand, it is the case that a great number of samples conducted in the social sciences (e.g. psychology and management) are non-random and that one can often justify the use of standard statistical inference procedures:

“a case can be made that using such non-random samples does not necessarily detract from the findings generality. Nor does such a practice violate the requirement that data from different subjects be statistically independent. More importantly, using non-random samples is not antithetical to experimental controls.” (Chow, 2002: 30).

As there are four outliers in the non-entrepreneur data (e.g. see Figure 4.3), it was decided to drop these four observations. Of course, having dropped the outliers, it was necessary to recalculate the descriptive statistics for the 16 efficacy variables in these data: the columns labelled Before in Table 4.15 below show the sample mean total score and sample standard deviations before the outliers were removed, while the columns labelled After present the descriptive statistics on the non-entrepreneur data after the outliers were removed. As one

might expect, this table shows not only a slight increase in sample mean score on each of the efficacy variables, but also shows that there is less variability in each of these efficacy scores.

Table 4.15 The non-entrepreneur data (with and without outliers)

Efficacy Variables	Before ($n = 96$)		After ($n = 92$)	
	Mean	Std. Dev.	Mean	Std. Dev.
1. Identify	43.92	8.48	45.16	6.09
2. Select	45.21	7.44	46.23	5.65
3. Plan	44.24	7.96	45.32	6.10
4. Implement	43.34	8.31	44.50	6.28
5. Evaluate	43.70	8.71	44.86	6.79
6. Create	42.28	8.75	43.49	6.65
7. Customer Segments	29.02	5.49	29.62	4.73
8. Value Propositions	30.29	5.69	31.01	4.60
9. Channels	29.47	6.71	30.24	5.63
10. Customer Relationships	33.26	5.96	34.08	4.46
11. Revenue Streams	26.90	7.15	27.66	6.24
12. Key Resources	28.19	6.62	28.98	5.50
13. Key Activities	28.92	6.55	29.68	5.44
14. Key Partners	30.04	6.84	30.91	5.49
15. Cost Structure	26.60	8.36	27.37	7.66
16. Total Efficacy	262.69	47.91	269.55	35.30

As already pointed out, the variables Age and Education Level (Educ_Lev) each have six factor levels, while Gender and Family History of Self-employment (Fam_His) each have two levels. The number of level combinations with these four factors is 144, which (notwithstanding all possible interactions e.g. possible six factor interaction of age) may complicate the analysis of the data set. In terms of the sample of entrepreneurs ($n = 111$), for instance, the number of level combinations is actually greater than the number of observations, so the same is true for the non-entrepreneur sample ($n = 92$). Since this may yield less

powerful inferences about the respective populations, as detailed below, it was decided to collapse each of the factors Age and Educ_Lev into just two levels.

For Age, since Irish people in the 35-44yrs age category are more likely to be entrepreneurs (Fitzsimons & O’Gorman, 2014), two factor levels were created: 18-44 (1); 45 and over (2). For the variable Educ_Lev, the original categories *primary*, *secondary* and *other* were collapsed into one level called Non-University (1), while the categories *undergraduate*, *postgraduate* and *doctorate* were collapsed into a second level labelled University (2). By collapsing the number of levels for these two factors in this way, the number of level combinations is reduced to 16, which provides for more valid tests of the effects of variables in some analyses. Table 4.16 below shows the between-subjects factors for the qualitative variables measured on the development sample.

Table 4.16 Between-subjects factors

Factor (Level)		Value Label	N	Percent
ES	1	Non-Entrepreneur	111	45.32
	2	Entrepreneur	92	54.68
Age	1	18-44	132	65.02
	2	45 and above	71	34.98
Gender	1	Female	98	48.28
	2	Male	105	51.72
Educ_Lev	1	Non-University	62	30.54
	2	University	141	69.46
Fam_His	1	No	104	51.23
	2	Yes	99	48.77

Attention now turns to the results of the logistic regression analysis.

4.6.2 Binary Logistic Regression Analysis

To study the relative influence of Total Efficacy and the four factors (e.g. Age), each with two levels, on Entrepreneurial Status (ES) a series of logistic regression analyses were run. Separate logistic regressions were run on respondents Age, Gender, Education Level and Family History of Self-employment (Model 1), and Total Efficacy scores (Model 2). Then, a full model was run with all five variables in the equation (Model 3). In terms of the test’s

assumptions, by design, there is independence of the observations and the response variable, ES, has mutually exclusive categories (entrepreneur versus non-entrepreneur).

The classification table for the null model is presented in Table 4.17 below. SPSS provides for different steps in a logistic regression model, and the procedure is run in two steps (by default). In the first step (Step 0), there are no predictors included in the model. The baseline classification table shows the number of non-entrepreneurs (1) and entrepreneurs (2) observed on the response variable. SPSS predicts that all cases are 2 on the response variable. It gives the overall percentage of cases for which the response variable was correctly classified in the null model: $54.7 = 111/203$. Usually the null model, and hence this classification table, is not of major interest to the researcher.

Table 4.17 Classification table for the null model

Observed			Predicted		
			Entrepreneurial Status (ES)		Percentage Correct
			Non-Entrepreneur	Entrepreneur	
Step 0	Entrepreneurial Status (ES)	Non-Entrepreneur	0	92	0
		Entrepreneur	0	111	100
	Overall Percentage				54.7

Notes: Constant is included in the model. The cut value is .500

The output from running the series of logistic regression analyses in SPSS is presented in Table 4.18 below, which contains two parts: (a) Overall tests of the models, and (b) Variables in the equations.

Table 4.18 Summary results of logistic regression analysis

(a) Overall tests of the models

Tests	Model 1	Model 2	Model 3
Hosmer-Lemeshow	0.628	0.605	0.858
-2 Log likelihood	212.387	207.374	163.856
Overall Percent	72.90	74.40	81.30

(b) Variables in the equations

Variables	Model 1			Model 2			Model 3		
	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.
Constant	-1.965	0.426	0.000	-11.772	1.816	0.000	-13.596	2.236	0.000
Age	1.819	0.386	0.000				1.878	0.456	0.000
Gender	1.862	0.348	0.000				1.623	0.401	0.000
Education Level	0.926	0.374	0.007				0.893	0.437	0.021
Family History	0.052	0.340	0.439				0.098	0.397	0.403
Total Efficacy				0.041	0.006	0.000	0.040	0.007	0.000

In order to interpret the output for Model 3 in Table 4.18 above, this section borrowed from The UCLA Statistical Consulting Group ⁵.

Overall tests of the models

First, for a logistic regression model, the Hosmer-Lemeshow (HL) Test (Hosmer & Lemeshow, 1980) is a statistical test for “goodness of fit”. Although it is not trusted by all (e.g. Allison, 2013), the HL test is sometimes used to answer the question of how well does the model fit the data. A Sig. level (p -value) below 0.05 would indicate a poor fit. For Model 3, as Table 4.18 shows that the p -value is 0.858, the model provides a good fit for the data.

Second, the -2 log likelihood value is the log of the probability of observing the data that was observed given the fitted model. Because one wants to maximise this value, and by reference to the chi-square distribution table, it is pleasing to note that the -2 log likelihood value for Model 3 is 163.856.

Third, one can see from that the Overall Percent of cases that are correctly predicted by Model 3 is 81.3, which is an improvement in the 54.7 percent explained by the null model (see Table 4.17). In this regard, the classification table for Model 3 is presented in Table 4.19 below.

⁵ Introduction to SAS. UCLA: Statistical Consulting Group. from <http://www.ats.ucla.edu/stat/sas/notes2/> (accessed October 29, 2015).

Table 4.19 Classification table for Model 3

Observed			Predicted		
			Entrepreneurial Status (ES)		Percentage Correct
			Non-Entrepreneur	Entrepreneur	
Step 0	Entrepreneurial Status (ES)	Non-Entrepreneur	71	21	77.2
		Entrepreneur	17	94	84.7
	Overall Percentage				81.3

Notes: Constant is included in the model. The cut value is .500

The classification table above shows the number of non-entrepreneurs (1) and entrepreneurs (2) that were observed on the response variable (ES). This table indicates the number of cases that are correctly predicted by the model:

- 71 cases are observed to be non-entrepreneurs and are correctly predicted to be non-entrepreneurs;
- 94 cases are observed to be entrepreneurs and are correctly predicted to be entrepreneurs.

Also, Table 4.19 above shows the number of cases that are not correctly predicted by the model:

- 21 cases are observed to be non-entrepreneurs but are predicted to be entrepreneurs;
- 17 cases are observed to be entrepreneurs but are predicted to be non-entrepreneurs.

It is worth noting that the logistic regression model to predict ES from only a person's Total Efficacy (i.e. Model 2) successfully predicted 67.4% of non-entrepreneurs and 80.2% of entrepreneurs (p -value = 0.000+).

Finally, the classification plot for Model 3 is shown below in Figure 4.8. It is useful for visually exploring how well the model predicts the response variable, ES. Since the chart plots both the predicted and observed classifications for ES, it enables the user to see where misclassifications tend to be found with regard to the likelihoods calculated by Model 3.

Variables in the equations

Returning to Table 4.18, part (b) gives the variables in the equation for Model 3. This table shows the coefficient values for the logistic regression equation (B), the standard error associated with the values (S.E.), and the 1-tailed p-value (Sig.) used in testing the H_0 that the coefficient is 0.

The coefficient values for the logistic regression equation for predicting ES from the input variables are given in log-odds units. The prediction equation is:

$$\log(P/1-P) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + \epsilon$$

where P is the probability of being an entrepreneur, and ϵ is a random error⁶. Expressed in terms of the inputs used in this study, the fitted model is:

$$\log(P/1-P) = -13.596 + 1.878(\text{Age}) + 1.623(\text{Gender}) + 0.893(\text{Educ_Lev}) + 0.098(\text{Fam_His}) + 0.040(\text{Tot_Eff})$$

These coefficient values tell us about the relationship between the input variables and the response variable, where ES is on the logit scale. These values tell us the amount of increase (positive coefficients) or decrease (negative coefficients) in the predicted log odds of $ES = 2$ that would be predicted by a 1-unit increase or decrease for a given input variable, that is, after adjusting for the effects of the other inputs:

- Constant: -13.596 is the expected value of the log-odds of ES when all of the input variables equal to zero.
- Age: for every 1-unit increase in Age, the model predicts a 1.878 increase in the log-odds of ES;
- Gender: for every 1-unit increase in Gender, the model predicts a 1.623 increase in the log-odds of ES;

⁶ "In logistic regression, the errors are *not* assumed to have a normal distribution. Instead, it is assumed that the distribution of the errors follows a binomial distribution, which approximates a normal distribution only for large samples." (Menard, 2009: 134—original emphasis)

- Educ_Lev: for every 1-unit increase in Education Level, the model predicts a 0.893 increase in the log-odds of ES;
- Fam_His: for every 1-unit increase in Family History of Self-employment, the model predicts a 0.098 increase in the log-odds of ES; and
- Tot_Eff: for every 1-unit increase in Total Efficacy, the model predicts a 0.04 increase in the log-odds of ES.

The estimated coefficient of 0.04 for Total Efficacy is the change in the log of $P(\text{Entrepreneur})/P(\text{Non-Entrepreneur})$ with a 1-unit increase in Total Efficacy, with the other variables held constant. Also, the standard error associated with a given coefficient value can be used to calculate the Wald chi-square value for that coefficient via: $(B/S.E.)^2$.

The 1-tailed p-value is used in testing the H_0 that the coefficient is 0, where p-values less than “alpha” are statistically significant. So, for the variables:

- Age: the p-value is 0.000+, so the H_0 that the coefficient value is 0 would be rejected;
- Gender: the p-value is 0.000+, so the H_0 that the coefficient value is 0 would be rejected;
- Educ_Lev: the p-value is 0.021, so the H_0 that the coefficient value is 0 would be rejected;
- Fam_His: the p-value is 0.403, so the H_0 that the coefficient value is 0 would be accepted; and
- Tot_Eff: the p-value is 0.000+, so the H_0 that the coefficient value is 0 would be rejected

As noted above, the coefficient values in the equation are in log-odds units, which can be difficult to interpret. To help with interpretation, the odds ratio (OR) can be calculated manually by exponentiating the coefficients: e^B . An OR is defined as the probability that the event will occur divided by the probability that the event will not occur (e.g. Szumilas, 2010).

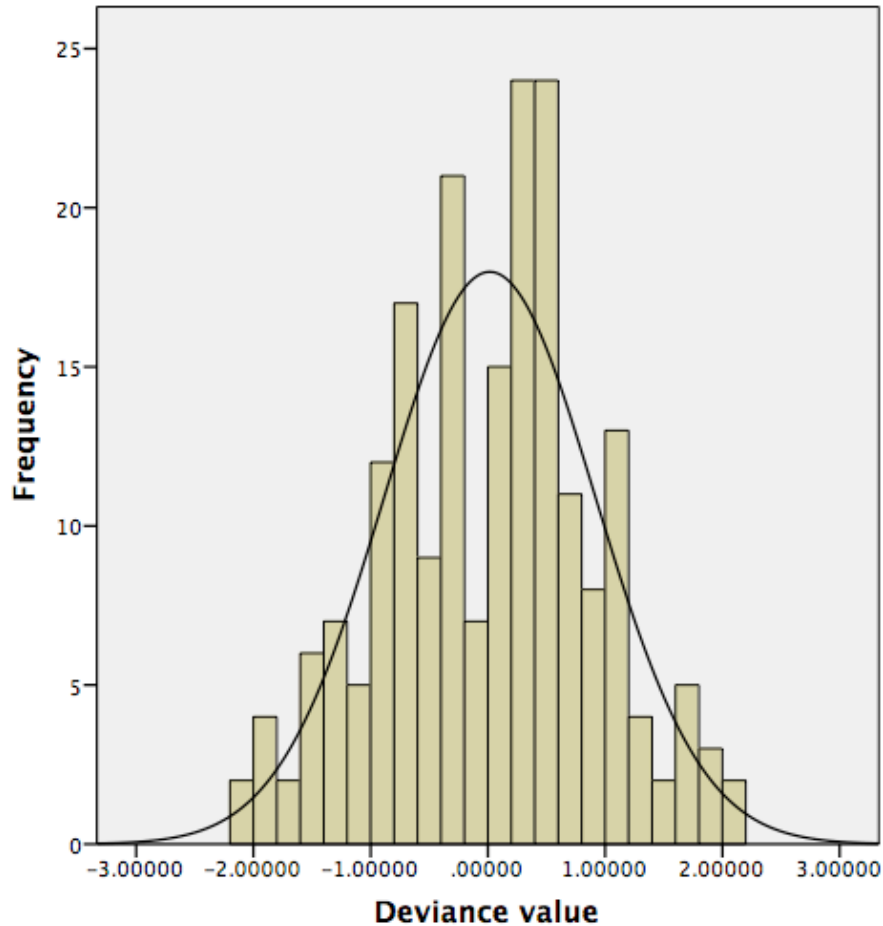
For Total Efficacy, since being an entrepreneur is set as the event, one wants to examine the odds of being an entrepreneur (i.e. the probability of being an entrepreneur divided by the probability of not being an entrepreneur). The coefficient (log-odds) of Total Efficacy is 0.04, so the OR is about $(2.71828)^{0.04} = 1.041$. This OR can be outputted by SPSS, which also computes the 95% confidence interval (CI) for the true underlying coefficient for (i.e. effect of) Total Efficacy; the lower and upper confidence limits are in fact 1.026 and 1.056. This CI does not contain the number 1, which would be the value expected if there was no significant effect of Total Efficacy on ES.

The fact that the CI does not contain 0 is, of course, equivalent to saying that the p-value for testing is less than 0.05 for the test of the H_0 that Total Efficacy has no effect on ES. Since there is evidence that the true effect of Total Efficacy is not 0, one can conclude that Total Efficacy affects ES in the underlying population of entrepreneurs and non-entrepreneurs.

The OR value of 1.041 indicates that a 1-unit increase in Total Efficacy minimally affects a person's odds of being an entrepreneur. However, since Total Efficacy has potential values 54, 55,..., 378, a 1-unit difference in two people's Total Efficacy could reflect only a tiny difference in judgement with respect to just 1 of the 54 items. One might instead be interested to compare people whose Total Efficacy differs by, for example, 5 or 10 units. So, for a change of 10 units, the above results show that the odds of being an entrepreneur is estimated to be $10 \times 1.041 = 10.4$ higher with each 10-unit increase in Total Efficacy.

In terms of the distribution of the deviances, Figure 4.9 below presents a histogram of the deviances. This chart shows the frequency of the deviances, where values on the x-axis ranges from -3 to +3. It is pleasing to note that the distribution of the deviance seem to be normally distributed, which gives more confidence that the inferences are correct (Menard, 2009).

Figure 4.9 Histogram of the deviances



Notes: Mean = 0.0165; Std. Dev. = 0.9005; N = 203.

To sum up, a series of logistic regression analyses were run to study the relative influence of Total Efficacy and four factors (e.g. Age), each with two levels, on Entrepreneurial Status (ES). In this regard, the full model (Model 3) suggests that Age, Gender, Education Level, and Total Efficacy are good predictors of Entrepreneurial Status, but Family History of Self-employment is not.

4.6.3 General Linear Model Analysis

The goal of this analysis is to model the quantitative variable Total Efficacy as a function of Entrepreneurial Status (ES) and other factors (e.g. Age).

It is convenient to perform this procedure using the General Linear Model (GLM) in Minitab, SPSS, or some other statistical software. One advantage of this procedure is that it can deal with factors and covariates automatically

without needing to recode the factors as would be required if, for example, regression was used.

GLM procedures involve a number of assumptions. These assumptions are listed briefly here and are given in more detail in Appendix 3:

- at each combination of values of the input variables, the response has a normal distribution with the same variance at each combination,
- the response variables at the different combinations of the input variables are independent, and
- a linear model relates the mean response to the input variables.

When assumptions are violated as evidenced by residual plots (e.g. a scatter plot of the residuals versus the predicted values), then it is necessary to take remedial measures or perform an alternative analysis. Note also if there is doubt about the validity of assumptions, it will always be possible to use procedures that are not dependent on underlying assumptions about the shape of the distribution generating the observed variables. That is, non-parametric procedures, such as ordinal logistic regression, which require fewer assumptions (but are also less powerful).

It is important to note that, since the sample size is reasonably large ($N = 203$), normality of Total Efficacy at each setting of the input variables is not vital. On the other hand, as there are few measurements at several combinations of setting of the input variables, it is not actually possible to test for approximate normality. However, since Total Efficacy is a principal component score, it is possible to assume normality of the underlying population associated with each combination of factor levels, or treatment. Also, since the sample size is relatively large, it will be possible to look at residual plots rather than, or in addition to, the tests.

Two general linear models were run to compare the relative effect of Entrepreneurial Status (ES) and the four factors (e.g. Age) on Total Efficacy: GLM 1 and GLM 2. First, a model was run on the sample of entrepreneurs to determine which, if any, of the four potential factors influence entrepreneurs'

Total Efficacy. Then, to test whether the Total Efficacy of entrepreneurs is higher than that of non-entrepreneurs, a model was run on the sample of entrepreneurs and non-entrepreneurs. When one runs the Univariate GLM procedure in SPSS, three tables are produced: (a) Levene's test of equality of error variances, (b) Tests of between-subjects effects, and (c) Parameter estimates. Accordingly, each of these three tables are used to interpret the results of the two general linear models that were run.

GLM 1

Here, for the GLM to be run on the sample of entrepreneurs ($n = 111$), the goal is to model Total Efficacy as a function of Age, Gender, Educ_Lev, and Fam_His. Since there are four factors, each with two levels, the number of level combinations is 16. The results of this analysis are presented below.

First, Levene's Test of Equality of Error Variances is used to test the homogeneity of the variances. From Table 4.20 below, one can see that the significance value of the test, 0.304, is greater than 0.05. Accordingly, there is no reason to think that the equal variances assumption is violated.

Table 4.20 Levene's test of equality of error variances (GLM 1)

F	df1	df2	Sig.
1.181	13	97	0.304

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Next, the Tests of Between-Subjects Effects are provided in Table 4.21 below. Each term in the model, including the full model, is tested for its ability to explain the variability in Total Efficacy. The column labelled Sig. shows the 1-tailed p-value for each term. One can see that in a model to predict Total Efficacy from Age, Gender, Educ_Lev and Fam_His, only Gender appears to have an effect (p-value = 0.009). However, the partial eta squared value of 0.052 tells us that Gender, while statistically significant, explains only 5.2% of the variability in Total Efficacy.

Table 4.21 Tests of between-subjects effects (GLM 1)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5279.020 ^a	4	1319.755	1.483	0.106	0.053
Intercept	6288102.395	1	6288102.395	7067.355	0.000	0.985
Age	11.551	1	11.551	0.013	0.455	0.000
Gender	5161.715	1	5161.715	5.801	0.009	0.052
Educ_Lev	193.861	1	193.861	0.218	0.321	0.002
Fam_His	11.495	1	11.495	0.013	0.455	0.000
Error	94312.350	106	889.739			
Total	10920381.000	111				
Corrected Total	99591.369	110				

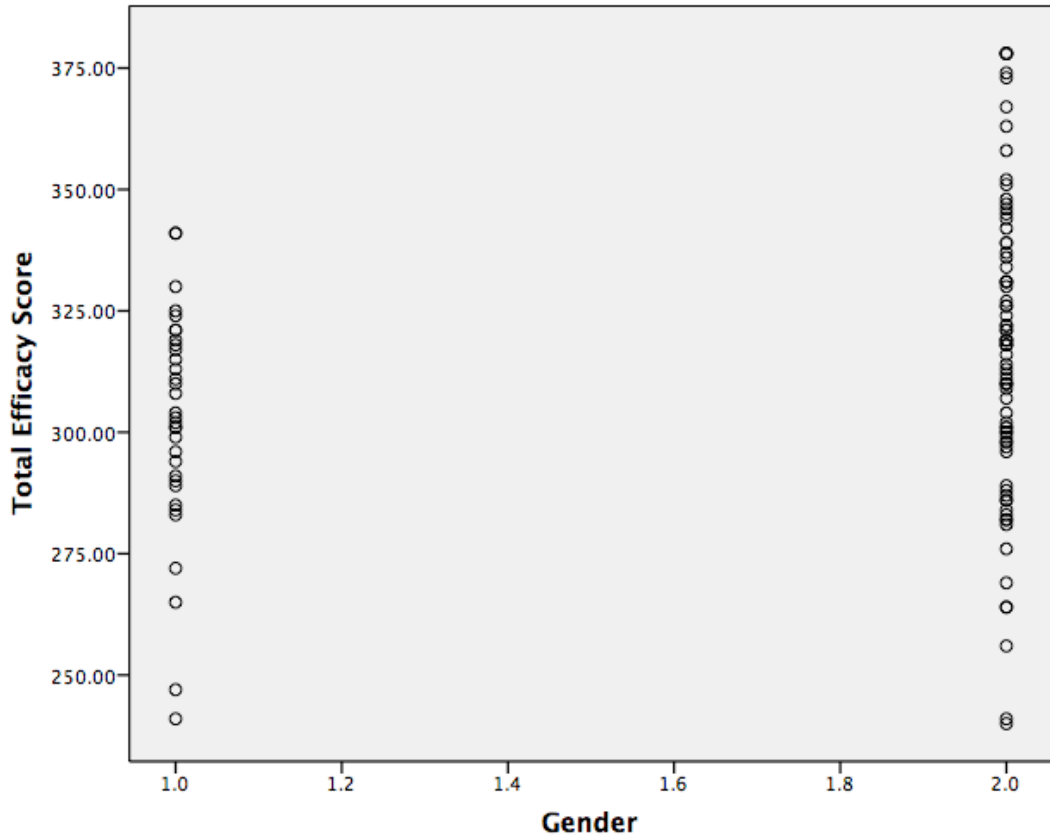
a. R Squared = .053 (Adjusted R Squared = .017)

It should be noted that the significance of Gender (p -value = 0.009) held when Age, Educ_Lev, and Fam_His were dropped. However, this model accounts for only 5.1% of the variability in Total Efficacy and, indeed, there are just two values for Gender.

By being careful to fit models with and without various variables, and since the various tests gave the same results (e.g. significance or non-significance of a variable whether or not other variables were included), it seems reasonable to conclude that multicollinearity is not a problem in GLM 1.

The scatter plot of Total Efficacy versus Gender in Figure 4.10 below shows a large variance in Total Efficacy for the two levels of the input variable. Also notice that there is more variability in the Total Efficacy of males versus females.

Figure 4.10 Scatter plot of Total Efficacy versus Gender



An effort was made to include interaction terms in the model. So, for example, if an interaction exists between Gender and Educ_Lev, this would mean that the effect of Gender on Total Efficacy is not the same at the two levels of education. A model was run with Gender and Educ_Lev along with the interaction between these two factors. This interaction was not significant (p -value = 0.112).

The parameter estimates for the model to predict Total Efficacy from a person's Age, Gender, Educ_Lev, and Fam_His are shown in Table 4.22 below. For Gender, in the column labelled B, one can see that the Total Efficacy of females is expected to be 15.240 lower than that of males, after adjusting for other variables in the model. In fact, after controlling for the effects of other inputs, we are 95% confident that the Total Efficacy of females is between 2.695 and 27.784 lower than it is for males. The fitted model is:

$$Total\ Efficacy = 318.154 - 0.649(Age) - 15.24(Gender) - 3.139(Educ_Lev) - 0.644(Fam_His) + \text{effect of random error.}$$

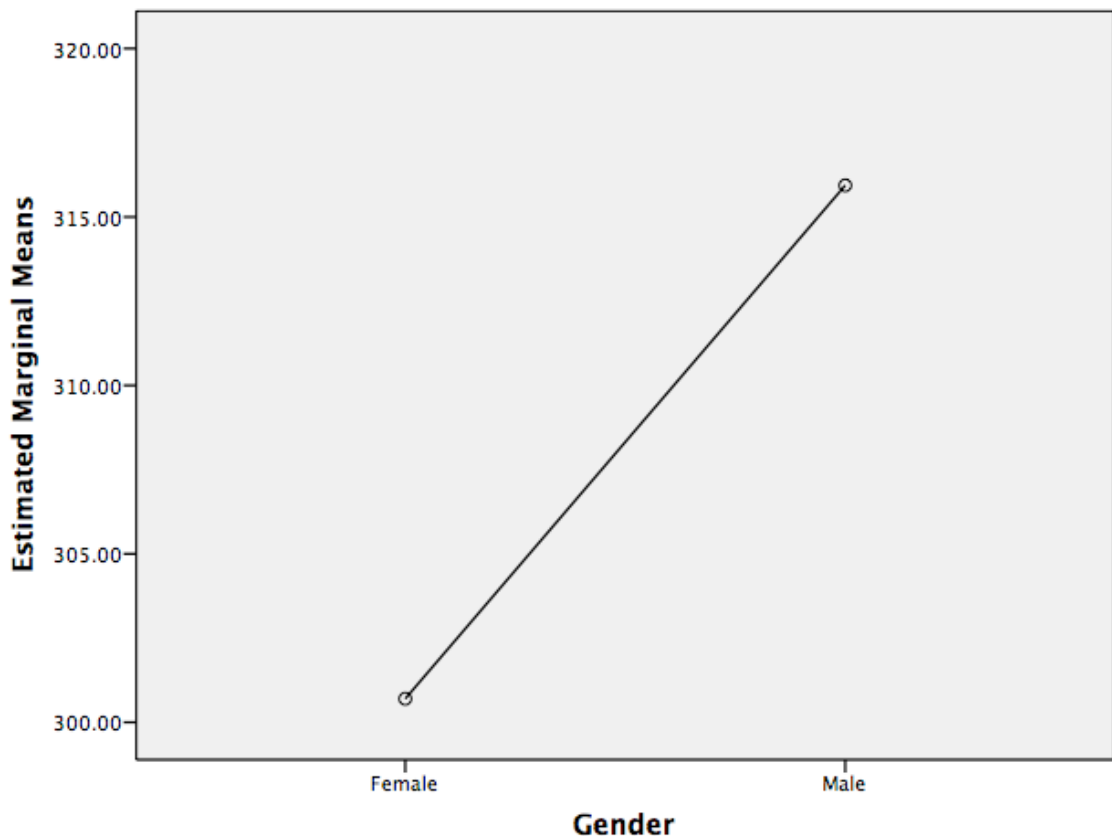
Table 4.22 Parameter estimates (GLM 1)

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	318.154	5.371	59.235	0.000	307.506	328.803	0.971
[Age=1]	-0.649	5.694	-0.114	0.455	-11.938	10.641	0.000
[Age=2]	0 ^a	.	.	.	.	.	.
[Gender=1]	-15.240	6.327	-2.409	0.009	-27.784	-2.695	0.052
[Gender=2]	0 ^a	.	.	.	.	.	.
[Educ_Lev=1]	-3.139	6.724	-0.467	0.321	-16.471	10.193	0.002
[Educ_Lev=2]	0 ^a	.	.	.	.	.	.
[Fam_His=1]	-0.644	5.670	-0.114	0.455	-11.886	10.597	0.000
[Fam_His=2]	0 ^a	.	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

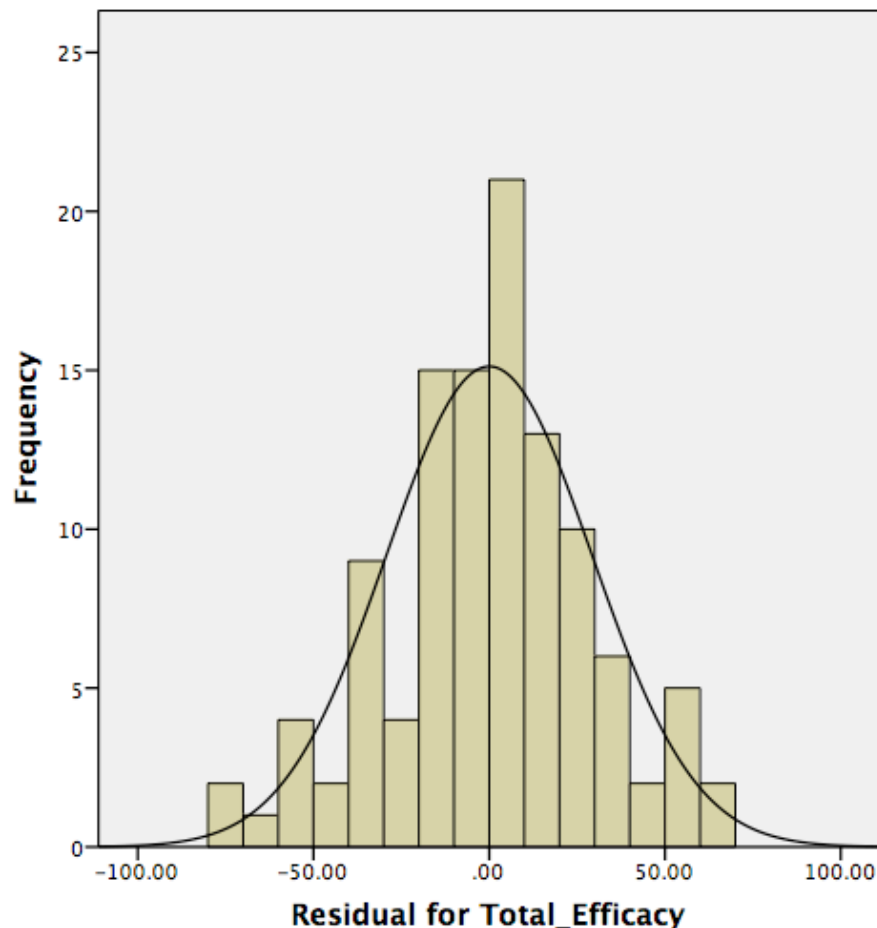
The estimated marginal means of Total Efficacy versus Gender are shown in Figure 4.11 below. It shows how the mean Total Efficacy for females is lower than that of males, after adjusting for other variables in the model.

Figure 4. 11 Marginal means of Total Efficacy versus Gender



The reader will recall that GLM depends on underlying assumptions about the shape of the distribution generating the data points. In this regard, from the histogram of the residuals shown in Figure 4.12 below, it is pleasing to see that the distribution of the residuals is approximately normal.

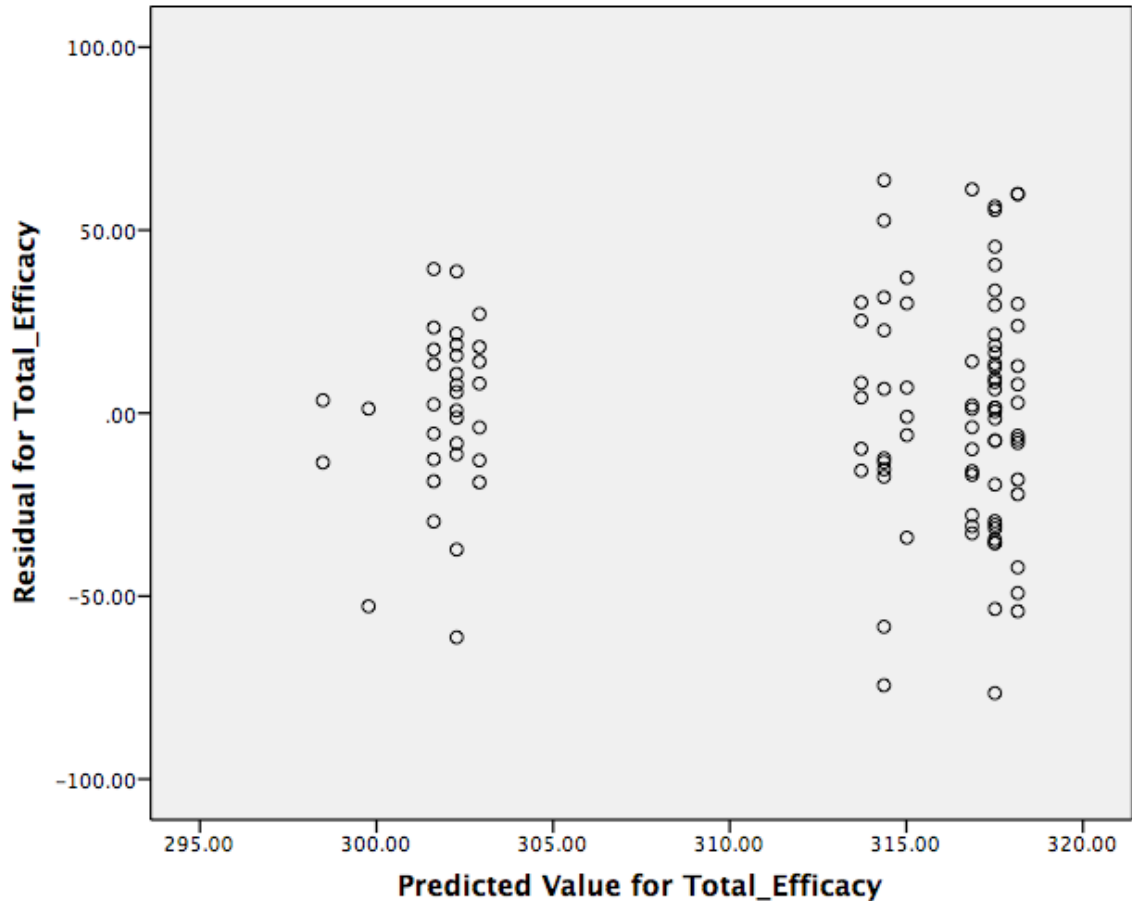
Figure 4.12 Histogram of the residuals (GLM 1)



Notes: Mean = 2.08E-14. Std. Dev. = 29.281. N = 111.

In addition, from the scatter plot of the residuals versus the predicted values for Total Efficacy shown in Figure 4.13 below, it is pleasing to note that the plot of the residuals versus the fitted values shows no violation of the model's other assumptions. Indeed, in the underlying model relating Total Efficacy to Age, Gender, Educ_Lev and Fam_His, there is no evidence of heterogeneity of variances of the response at the various level combinations of the four factors, or evidence against the assumption of linearity.

Figure 4.13 Plot of the residuals versus the fitted values (GLM 1)



To sum up, in a model that attempted to predict entrepreneurs' Total Efficacy from Age, Gender, Educ_Lev and Fam_His, only Gender appears to have an effect (p -value = 0.009). The distribution of the residuals and the plot of the residuals versus the fitted values give more confidence that this inferences is correct.

However, while the analysis may be justified, the knowledge GLM 1 provides does not answer the question of whether the population mean Total Efficacy of entrepreneurs is higher than that of non-entrepreneurs. In order to address this question another GLM was run on the two sample groups.

GLM 2

Here, for the GLM to be run on the sample of entrepreneurs and non-entrepreneurs ($N = 203$), the goal is to model Total Efficacy as a function of

Entrepreneurial Status (ES), Age, Gender, Education Level (Educ_Lev), and Family History of Self-Employment (Fam_His).

We begin by introducing the descriptive statistics for Total Efficacy versus ES—non-entrepreneurs (1) and entrepreneurs (2)—in Table 4.23 below:

Table 4.23 Descriptive statistics: Total Efficacy versus ES

Variable	ES	N	Mean	Std. Dev.
Total Efficacy	1	92	269.55	35.30
	2	111	312.23	30.09

One goal of GLM 2 will be to see if the observed difference in Total Efficacy versus ES is statistically significant, after adjusting for other variables in the model: Age, Gender, Educ_Lev, and Fam_His.

One could include interactions between the five factors, yet it was decided not to do this because the number of level combinations here already *is* 32. So, the prediction equation is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon$$

and the model may be written as

$$\textit{Total Efficacy} = \textit{constant} + \textit{effect of ES} + \textit{effect of Age} + \textit{effect of Gender} + \textit{effect of Educ_Lev} + \textit{effect of Fam_His} + \textit{effect of random error}.$$

The results of this analysis are presented below.

First, the significance of Levene's test is provided in Table 4.24 over. Since the significance value of the test, 0.073, is greater than 0.05, there is no reason to think that the equal variances assumption is violated.

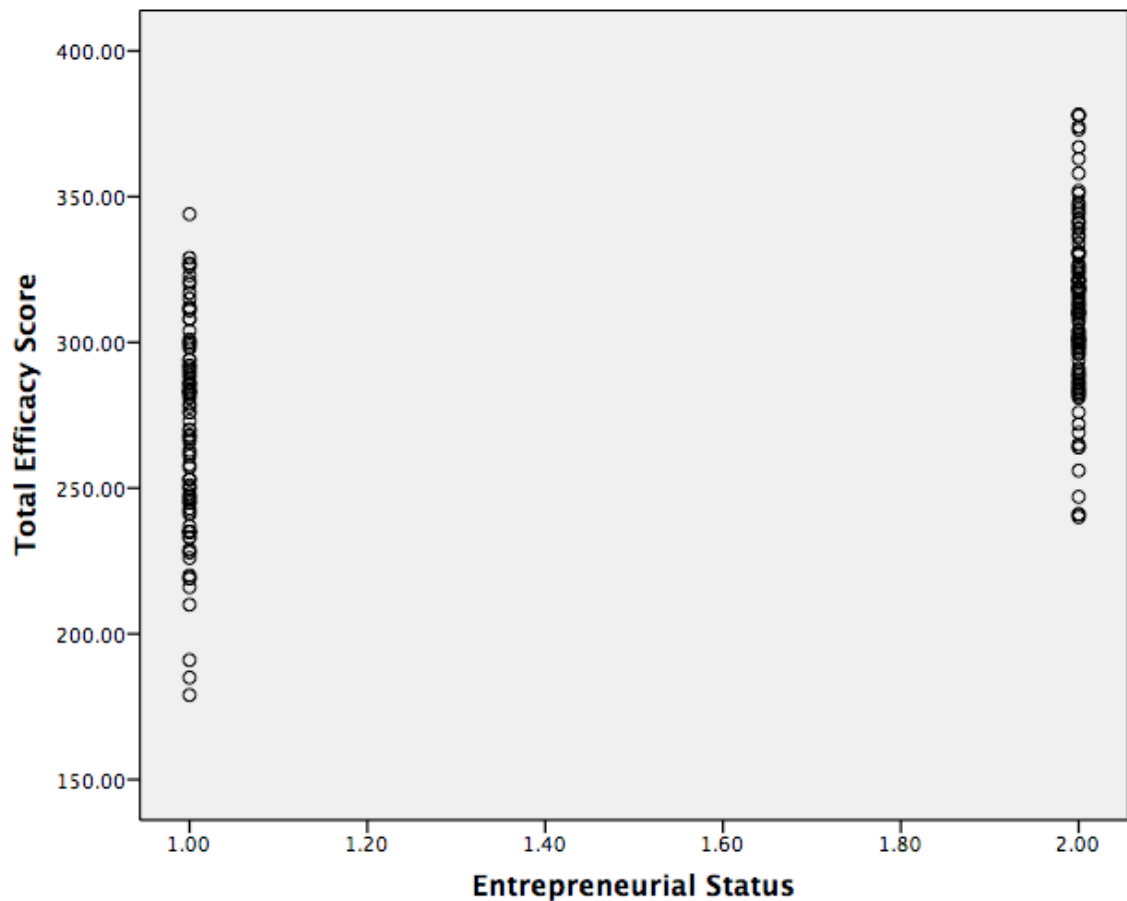
Table 4.24 Levene's test of equality of error variances (GLM 2)

F	df1	df2	Sig.
1.474	27	175	0.073

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

However, as one might expect, greater variability was observed in the Total Efficacy of non-entrepreneurs. In this regard, the scatter plot of Total Efficacy versus ES in Figure 4.14 below shows a large variance in Total Efficacy for the two levels of ES: non-entrepreneur (1) and entrepreneur (2). Accordingly, one must be mindful to adjust for this in the GLM if required.

Figure 4.14 Scatter plot of Total Efficacy versus ES



From the Tests of Between-Subjects Effects provided in Table 4.25 below, one can see that in a model to predict Total Efficacy from Entrepreneurial Status (ES), Age, Gender, Educ_Lev and Fam_His, only Ent_Status (ES) seems to have an effect (p -value = 0.000+). The partial eta squared value of 0.213 tells us that ES explains 21.3% of the variability in Total Efficacy.

Table 4.25 Tests of between-subjects effects (GLM 2)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	93298.964 ^a	5	18659.793	17.399	0.000	0.306
Intercept	12923730.140	1	12923730.14	12050.273	0.000	0.984
Ent_Status (ES)	57133.109	1	57133.109	53.272	0.000	0.213
Age	0.916	1	0.916	0.001	0.489	0.000
Gender	1651.634	1	1651.634	1.54	0.108	0.008
Educ_Lev	0.003	1	0.003	0	0.500	0.000
Fam_His	34.095	1	34.095	0.032	0.430	0.000
Error	211279.430	197	1072.484			
Total	17718450.000	203				
Corrected Total	304578.394	202				

a. R Squared = .306 (Adjusted R Squared = .289)

It should be noted that the significance of ES (p-value = 0.000+) held when Age, Gender, Educ_Lev and Fam_His were dropped, and this model accounts for 30.1% of the variability in the response. When ES was omitted from the model, then: (a) Gender had a significant effect on Total Efficacy (p-value = 0.000+) with a partial eta squared value of 0.074, and (b) Age had a significant effect on the response (p-value = 0.008) with a partial eta squared value of 0.029. In other words, ES affects Total Efficacy whether or not the other inputs are included in the model.

By fitting models with and without certain factors, and since the various tests gave the same results (e.g. significance or non-significance of a factor whether or not other factors were included), it seems reasonable to conclude that multicollinearity is not a problem in GLM 2.

The parameter estimates for the model to predict Total Efficacy from an individual's ES, Age, Gender, Educ_Lev, and Fam_His are shown in Table 4.26 below. For ES, one can see that the Total Efficacy of non-entrepreneurs is expected to be 40.028 lower than the predicted value for entrepreneurs (i.e. 314.587), after adjusting for other variables in the model. In fact, after controlling for the effects of other inputs, we are 95% confident that the Total Efficacy of non-entrepreneurs is between 29.213 and 50.844 lower than it is for entrepreneurs.

Table 4.26 Parameter estimates (GLM 2)

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	314.587	5.055	62.235	0.000	304.618	324.555	0.952
[ES=1]	-40.028	5.484	-7.299	0.000	-50.844	-29.213	0.213
[ES=2]	0 ^a	.	.	.	.	.	.
[Age=1]	-0.152	5.210	-0.029	0.489	-10.426	10.122	0.000
[Age=2]	0 ^a	.	.	.	.	.	.
[Gender=1]	-6.292	5.070	-1.241	0.108	-16.290	3.707	0.008
[Gender=2]	0 ^a	.	.	.	.	.	.
[Educ_Lev=1]	0.009	5.140	0.002	0.500	-10.127	10.146	0.000
[Educ_Lev=2]	0 ^a	.	.	.	.	.	.
[Fam_His=1]	-0.831	4.659	-0.178	0.430	-10.018	8.356	0.000
[Fam_His=2]	0 ^a	.	.	.	.	.	.

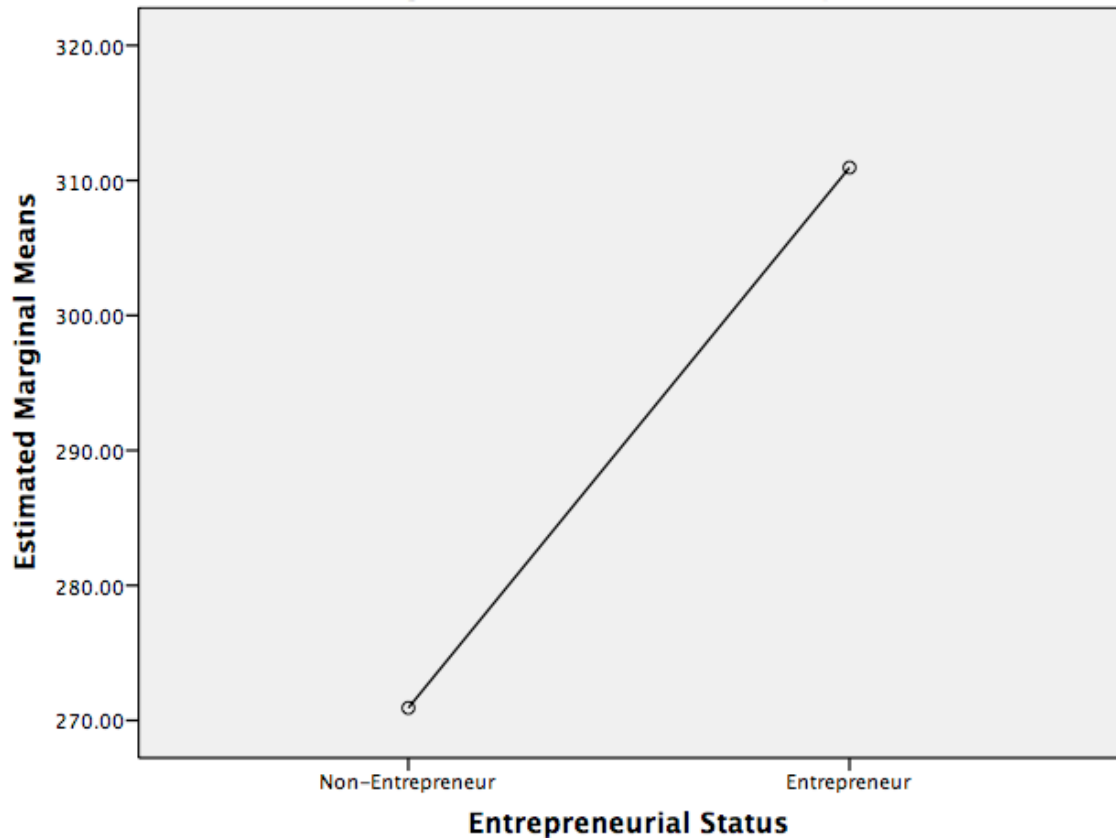
a. This parameter is set to zero because it is redundant.

The fitted model is:

$$Total\ Efficacy = 314.587 - 40.028(ES) - 0.152(Age) - 6.292(Gender) + 0.009(Educ_Lev) - 0.831(Fam_His) + \text{effect of random error.}$$

The estimated marginal means of Total Efficacy versus ES are shown in Figure 4.15 below. It shows how the mean Total Efficacy for non-entrepreneurs is lower than that of entrepreneurs, after adjusting for other variables in the model.

Figure 4.15 Marginal means of Total Efficacy versus ES

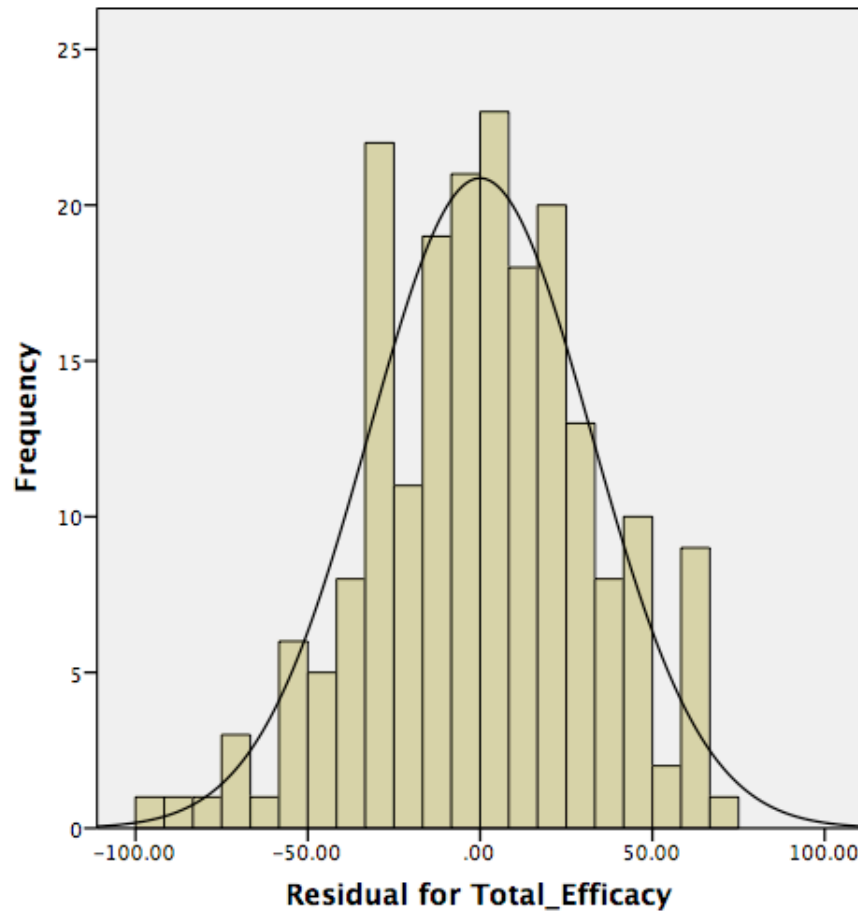


A GLM analysis of Total Efficacy on Entrepreneurial Status (ES), Age, Gender, Education Level, and Family History of Self-employment showed evidence that ES predicts Total Efficacy. In fact, in the data, entrepreneurs had a significantly higher mean Total Efficacy than non-entrepreneurs (p -value = 0.000+). None of the other variables in the model were useful in predicting Total Efficacy. In fact, after controlling for the effects of other variables that might affect the response, there is no evidence of an effect of:

- Age on Total Efficacy (p -value = 0.489)
- Gender on Total Efficacy (p -value = 0.108)
- Education Level on Total Efficacy (p -value = 0.500)
- Family History of Self-employment on Total Efficacy (p -value = 0.430)

From the histogram of the residuals shown in Figure 4.16 below, it is pleasing to note that the distribution of the residuals is approximately normal.

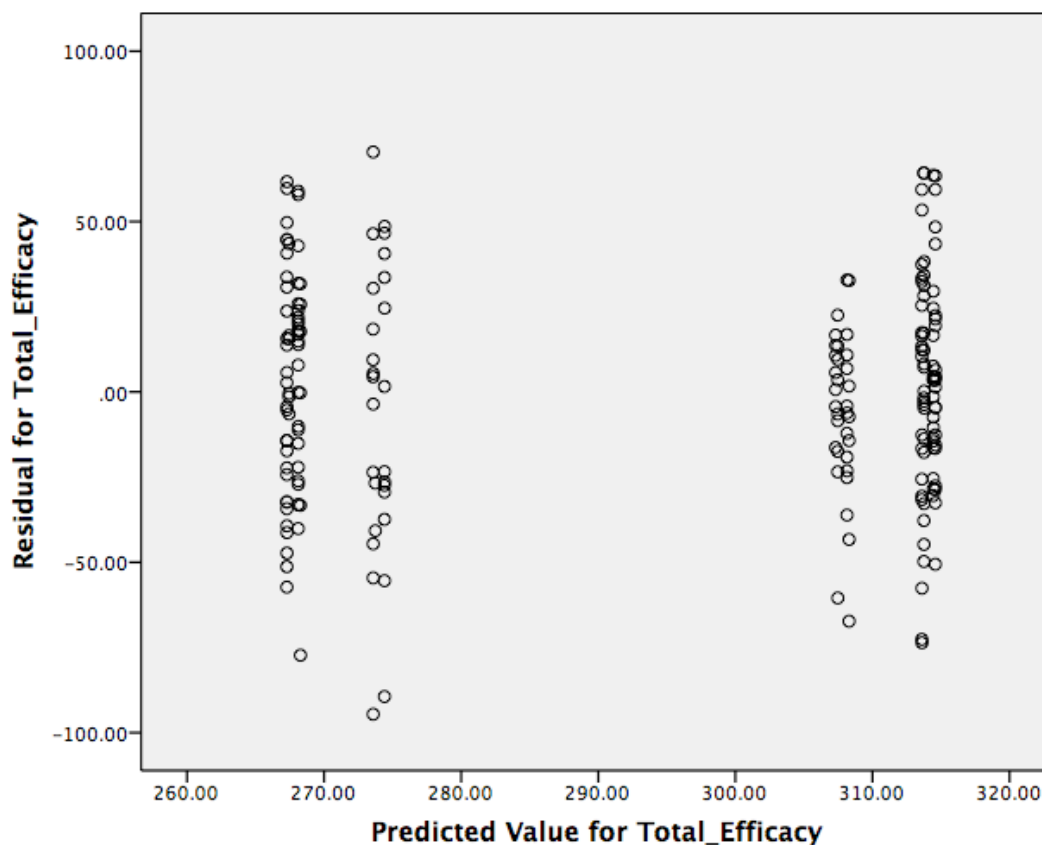
Figure 4.16 Histogram of the residuals (GLM 2)



Notes: Mean = $-2.39E-14$. Std. Dev. = 32.341. N = 203.

From the scatter plot of the residuals versus the predicted values of the response (see Figure 4.17 below), it is pleasing to see that the plot of the residuals versus the fitted values shows no violation of the model's other assumptions. Indeed, in the underlying model relating Total Efficacy to Entrepreneurial Status (ES), Age, Gender, Educ_Lev and Fam_His, there is no evidence of heterogeneity of variances of Total Efficacy at the various level combinations of the five factors, or evidence against the assumption of linearity.

Figure 4.17 Plot of the residuals versus the fitted values (GLM 2)



From the Central Limit Theorem, we also know that no matter what distribution the respective populations have, since the sample size is large ($N = 203$), the distribution of the sample means are approximately normal.

To sum up, the results of GLM 2 seem justified.

4.7 Conclusion

This chapter presented and interpreted the results of the statistical analysis.

First, only Likert scale items were used in the analysis and 16 such variables (the so-called efficacy variables) were created by calculating a composite score (i.e. sum) from 6 or more Likert-type items. By reference to the two-dimensional scheme of business model activities (see Figure 3.3), it was already pointed out that entrepreneurial self-efficacy (ESE) is defined in the 54 underlying Likert-type items and, for instance,

- in terms of the 6 element 'know-how' dimension, the quantitative variable "Identify" is a sum of 9 Likert-type items along its own row, while
- in terms of the 9 element 'know-what' dimension, the quantitative variable "Customer Segments" is a sum of 6 Likert-type items along its own column.

Likewise, it was also pointed out how the variable "Total Efficacy" is created by summing respondents' scores on the 54 Likert-type items so as to provide a quantitative measure to represent ESE for hypothesis testing.

Second, in terms of data summarisation, a portion of the data set was presented and explained, descriptive statistics were provided for respondents' scores on the 16 efficacy variables, and graphical summaries (e.g. radar charts) were used to visually display some descriptive statistics on these data:

- The mean total score of entrepreneurs was higher than that of non-entrepreneurs for each of the summative variables. For example, the mean Total Efficacy score of entrepreneurs (n = 111) was 312.23, while the comparable score for non-entrepreneurs (n = 92) was lower at 269.55;
- There was less variability measured on each of the 16 efficacy variables in the entrepreneur data when compared to the variability observed on these variables in the non-entrepreneur data.

Third, in terms of internal consistency reliability, entrepreneurs' scores on the 16 efficacy variables showed good reliability evidence. For example, their scores on Total Efficacy had a Cronbach's Alpha value of 0.96 and, in fact, their scores on the 6 'know-how' variables (e.g. Identify) and on the 9 'know-what' variables (e.g. Customer Segments) each had Cronbach alphas of at least 0.78.

Fourth, in terms of using principal components analysis (PCA) to reduce the number of variables on each of ESE's two underlying dimensions, namely its *content* ('know-what') and *process* ('know-how') dimensions, it was found that the number of variables in the entrepreneur data could be reduced to a smaller number of principal components without loss of much information:

- Content dimension of ESE—the 9 ‘know-what’ variables (e.g. Customer Segments) could be replaced by 2 principal components, namely *Operations* and *Marketing*, for which the sum of the variance of these 2 variables explained 66.71% of the variance on the original 9 variables;
- Process dimension of ESE—the variation in the 6 ‘know-how’ variables (e.g. Identify) could be described by the sum of the 6 variables, and this mathematical variable, which was called *Total Efficacy*, accounted for 82.98% of the total variance of the data on the original 6 variables.

Fifth, the results of statistical hypothesis testing suggest that, after adjusting for the effects of other variables (e.g. Age), in the Irish population of entrepreneurs and non-entrepreneurs from which the data were obtained:

- the likelihood of a person being an entrepreneur increases with her Total Efficacy score (p -value = 0.000+), and
- the population mean Total Efficacy score of entrepreneurs is higher than that of non-entrepreneurs (p -value = 0.000+).

Aside: The p -value is used to determine whether or not the results are statistically significant. Typically the p -value is compared to α (often set at 0.05, which gives a confidence level of 95%) so as to decide whether one should reject the null hypothesis (H_0). The decision rule is:

- if the p -value is $\leq \alpha$, then one rejects H_0 , or
- if the p -value is $> \alpha$, then one fails to reject H_0 .

So, having set α at 5%, the results are statistically significant. They suggest that (with a confidence level of 95%) one can reject both $H_0^{(1)}$ and $H_0^{(2)}$:

- $H_0^{(1)}$, the likelihood of a person being an entrepreneur is not associated with her Total Efficacy score, and
- $H_0^{(2)}$, there is no difference between the population mean Total Efficacy score of entrepreneurs and that of non-entrepreneurs.

The next chapter explains the meaning of these findings.

CHAPTER FIVE: Discussion and Conclusions

5.1 Introduction

This thesis developed a conceptual framework so as to study the factors that may lead to being an entrepreneur, and that distinguish entrepreneurs from non-entrepreneurs. To do so, it drew on existing theoretical and empirical studies in the area of the entrepreneurial process. Chapter 2 presented a review of this literature, which identified the need for a generic, yet distinct, conceptual framework that both describes *how* entrepreneurial action occurs and predicts *who* does it. This chapter noted that linking the “business model” to entrepreneurial thought and action is an important direction for research on entrepreneurship and, in this regard, it was pointed out that “entrepreneurial self-efficacy” (ESE) could potentially be used to link the business model to the entrepreneur’s decision to create a *firm* and or a *market*. In Chapter 3, the research process used to develop and initially validate a conceptual framework of entrepreneurial thought and action was presented. This framework described the distinctive role of the business model in the decision to act entrepreneurially (or not), and hypotheses were generated to test the accuracy of this description in the area of firm creation vis-à-vis ESE. This chapter also outlined the process of scale development that was used to provide an empirical estimate of ESE (*belief in one’s capabilities to perform a set of business model activities involved in firm creation*) for hypothesis testing and, in terms of the variables used to define ESE, a classification scheme of business model activities was developed in order to guide the construction of 54 efficacy items. A survey containing these and other items was conducted to collect data at a point in time. Chapter 4 presented the results of the statistical analysis in which the psychometric properties of respondents’ ESE scores were evaluated. Entrepreneurs’ ESE scores showed good reliability evidence and, in terms of hypothesis testing and after controlling for the effects of other variables, the quantitative variable “Total Efficacy” showed good validity evidence vis-à-vis “Entrepreneurial Status” (ES; *being an entrepreneur or not being an entrepreneur, and defined as creating a firm or not, respectively*), and vice versa. By way of discussion, the current chapter explains the meaning of the study’s findings to the reader. First, it states the study’s major empirical findings. Second, the chapter discusses the meaning and importance of the results. Third, it relates the findings to previous research on ESE. Fourth, the chapter considers alternative explanations of the

results. Fifth, it outlines the study's contributions. Sixth, the chapter acknowledges the study's limitations. It concludes by making suggestions for future research.

5.2 Empirical Findings

After adjusting for the effects of other variables (e.g. Age and Gender), the results of statistical hypothesis testing on data obtained from *entrepreneurs* (defined as having created a firm) and *non-entrepreneurs* (defined as not having created a firm) suggest that "entrepreneurial self-efficacy" (ESE), as measured by the variable "Total Efficacy" (which is a sum of 54 variable), is a factor that may lead to a person being an entrepreneur, and showed evidence that entrepreneurs had higher ESE than non-entrepreneurs. The results are statistically significant.

5.3 Meaning and Importance

The results mean that the ESE measure gains, at least, some validity from its success in predicting the likelihood of a person being an entrepreneur (as measured by the existence of a firm), and its ability to distinguish those who have created firms (i.e. entrepreneurs) from those who have not (i.e. non-entrepreneurs).

These findings are important because a key goal of this research was to create a valid measure of ESE, and the results suggest that the ESE measure has good predictive and discriminant power in the area of firm creation. The fact that real-world entrepreneurs and non-entrepreneurs, not students, were used to validate the measure is important if one considers the following caveat:

"Entrepreneurs clearly are the most knowledgeable sources of information about their own venture creation intentions and activities; student samples are insufficient and inappropriate proxies." (Shook et al., 2003: 393)

Indeed, in a world of research where any new firm is a gestalt of variables from several dimensions (e.g. environment, person, and process) and any new firm is inherently difficult to describe completely (Gartner, 1985), the demonstrated validity of the ESE measure may be of interest to researchers who address the broad question of “why do some people but not others become entrepreneurs?”

However, while the initial validity evidence for the ESE measure is pleasing, it is important to note that these results are exploratory (not confirmatory). In any case, for psychological assessment in general and self-efficacy assessment in particular, it is well known that validity is not a static property and validation is not a one-off process (Bandura, 2006; Messick, 1995):

“Construct validation is an ongoing process in which both the validity of the postulated causal structure in the conceptual scheme and the self-efficacy measures are being assessed.” (Bandura, 2006: 319)

Indeed, after Hofer & Bygrave (1992), the primary purpose of this empirical research was not to test hypotheses, but to test the conceptual framework of entrepreneurial thought and action in the real world. In this regard, the results are important because they provide empirical (albeit tentative) support for the postulated causal role of the business model in firm creation vis-à-vis ESE.

Although more research will be required, the results are also important as they suggest that the two-dimensional classification scheme (or knowledge structure) used to guide the construction of the ESE measure may be a particular mechanism that embodies the so-called entrepreneurial method. In this regard, to the extent that specific mechanisms that give shape to the entrepreneurial method signify “specific learnable and teachable techniques” (Sarasvathy & Venkataraman, 2011: 129), it was already pointed out that social cognitive theory provides a theory of learning and change that specifies how knowledge structures can be developed in the classroom (Bandura, 2012).

Also, the results answer a call for more empirical work on the business model in entrepreneurship (e.g. Trimi & Berbegal-Mirabent, 2012). By testing the conceptual framework in this way, this research has laid the foundations for

future research on the business model as a bridge between entrepreneurial thought and firm creation.

Although this study seems to be the first of its kind to have used ESE to link the business model to firm creation, other scholars have developed and validated ESE measures before (Chen et al., 1998; De Noble et al., 1999; McGee et al., 2009). The next section relates this study's findings to those studies.

5.4 Related Studies

Chapter 2 introduced three scale development studies each of which constructed and initially validated an ESE measure: the Chen-scale, the DeNoble-scale and the McGee-scale. All three studies used a non-randomised, cross-sectional research design to validate their measures with samples of students, although Chen et al. (1998) also sampled firm founders in their pioneering work on ESE.

This study's findings replicate the results of a scale development study conducted by Chen et al. (1998). In fact, the ESE measures in both studies showed similar psychometric properties: e.g. scores on Total ESE in the Chen et al. study had a Cronbach's Alpha value of 0.89, while the comparable measure of internal consistency for Total Efficacy in this study had a value of 0.96. Indeed, their ESE measure not only predicted the likelihood of a person being an entrepreneur, but also distinguished those who had created firms from those who had not.

However, while both studies share a common criteria (e.g. firm versus no firm), the entrepreneurs surveyed by Chen et al. (1998) and this research may not be entirely compatible. For example, while the entrepreneurs in the Chen et al. study operated in firms where the average number of employees was 135, the modal size of entrepreneurs' firms in this study was less than 10 employees. While firm size may or may not be a key determinant of a person's ESE, the fact that this study's findings are in agreement with those of Chen et al. (1998) serves to strengthen the importance of this study's results, and vice versa.

Entrepreneurship involves activities of broad scope, and ESE is an activity specific construct. So, valid ESE measures need a good conceptual scheme to understand the activities of entrepreneurs. In this regard, the Chen-scale was developed using five factors (innovation, marketing, risk-taking, financial control and management). However, unlike the ESE measure developed by McGee et al. (2009) and, indeed, the one developed herein, Chen et al. (1998) did not define entrepreneurial activities within a firm creation process model. Although McGee et al. (2009) did define their activities within such a model (search, plan, marshal and implement), neither they nor Chen et al. (1998), or indeed other developers of ESE measures (De Noble et al., 1999), have considered the business model in their conceptual schemes.

So, to advance the scope of ESE assessment and, of course, to test the conceptual framework of thought and action, this ESE measure was developed using a “business model” lens. In something of a departure from the three aforementioned studies, but in line with the guidelines for constructing self-efficacy scales (Bandura, 2006) and the idea that statements of activities typically involve a content as well as a process element (Krathwohl, 2002, a two-dimensional classification scheme was used to understand the activities involved in firm creation:

- the content (“know-what”) dimension had 9 elements: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure (Österwalder & Pigneur, 2009);
- the process (“know-how”) dimension was designed as a hierarchy of cognitive complexity, and it had 6 elements that ranged from less to more cognitively complex: identify, select, plan, implement, evaluate, and create (Alvarez & Barney, 2007; Baron & Henry, 2010; Krathwohl, 2002).

Indeed, by adding a cognitive process dimension to the content provided by the business model canvas (BMC; Österwalder & Pigneur, 2009), this classification scheme helps to make capabilities a first-order theme in the BMC and it may be a step towards the content and process view that business model scholars have called for (e.g. Zott et al., 2011). Also, this knowledge structure or cognitive map

may help future researchers to explore how entrepreneurs think (Brännback & Carsrud, 2009) and act (Bird et al., 2012) when they create firms.

In any case, the classification scheme allowed the business model concept and the ESE construct to hang together conceptually and the process dimension introduced a gradation of challenge as required in efficacy measurement. It was used to construct 54 (new) variables so as to define ESE. By construction, this structure revealed 9 ‘know-what’ or column sum variables (e.g. Customer Segments) and 6 ‘know-how’ or row sum variables (e.g. Total Identify). In this regard, it was pleasing to find that entrepreneurs’ scores on these summative variables were highly intercorrelated, which suggests that they measure different aspects of ESE, that is, when compared with the existing measures.

In terms of evaluating entrepreneurs’ efficacy scores via the two-dimensional classification scheme of 54 business model activities, it was pleasing to find that the 9 ‘know-what’ variables (e.g. Customer Segments) from the BMC (Österwalder & Pigneur, 2009) could be reduced to two independent variables, which seem to measure different aspects of creating firms: namely “operations” and “marketing”. This finding helps to verify the multifaceted structure of entrepreneurial capability beliefs, and it introduces a new factor (operations) to broaden the scope of ESE assessment in research on firm creation. This finding seems to be inline with empirical evidence provided by Gatewood et al. (1995): activities that focus on setting up business operations (e.g. producing the product/service) are important in the area of firm creation.

On the other hand, it was already noted that one principal component emerged to explain a majority of the variance on the original 6 ‘know-how’ variables (e.g. Identify). This is not surprising when one considers that their scores on the variables “evaluate” and “create” were both 51.14 (see Table 4.4). So, while Krathwohl (2002) believes that the cognitive processes associated with ‘evaluate’ are less cognitively complex than the ones associated with ‘create’, cognitive complexity (as it was operationalised in this study) does not appear to identify major individual differences within the entrepreneur category. In other words, this finding suggests that the cognitive process dimension of the classification scheme of business model activities is unidimensional as opposed

to multidimensional. Although it is possible that some entrepreneurs may have been answering by rote, this finding is interesting because cognitive complexity has been explained as the capacity to construe idea, objects and people in a multidimensional way (Benet-Martinez et al., 2006).

To sum up, the results of this study provide initial support for the classification scheme of business model activities used to guide the construction of the ESE measure. And, to the extent that entrepreneurship involves activities of broad scope, empirically linking the set of 54 business model activities to firm creation broadens the scope of ESE assessment in research on entrepreneurs.

5.5 Alternative Explanations

Chapter 2 pointed out that the behaviour of the entrepreneur is difficult to explain, predict, and control (e.g. Bird et al., 2012) because it is influenced by at least two broad factors, individual and environmental ones (Reynolds, 2014), and the interactive effects of these two factors (Shook et al., 2003). In this regard, after Bandura (2008), researchers in search of the entrepreneurial personality sometimes use the partially bidirectional model of human action to understand the factors (e.g. general self-efficacy) involved in firm creation. In this view, one is either born (predisposed) to be an entrepreneur or she is not.

Aside: Although this thesis did not focus specifically on personality dimensions (e.g. general self-efficacy or GSE) or environmental factors (e.g. national values) as a source of entrepreneurial action, the research did attempt to hold one important environmental-level variable constant by gathering data from entrepreneurs and non-entrepreneurs based in Ireland.

In Chapter 2 it was also noted that some have introduced behaviour as a third interacting determinant in order to understand human action (Bandura, 2008) and, indeed, entrepreneurial action (Chen et al., 1998). In the so-called model of triadic determination, not only do people interact with their environment to create firms but also the behaviour of the entrepreneur influences her and her

environment as well. This idea fits well with research on entrepreneurship because, as noted earlier from Bygrave & Hofer (1991), the creation of a firm involves changing the environment from one state (that without the firm) to another (that with the firm). In this view, although they do respond to situations and there may be some genetic hardwiring that manifests itself via personality traits (e.g. general self-efficacy or GSE), people do exert some influence over their actions and entrepreneurs are made as well as born.

In any case, since entrepreneurial behaviour is codetermined by at least two broad factors operating interactively, the behaviour of the entrepreneur is not understood well enough to provide an exact description: entrepreneurs and their behaviours are not homogenous (Gartner, 1985; Shaver & Renko, 2015). This makes it difficult for researchers of entrepreneurship to hold all important variables constant in their studies, so there is always some level of uncertainty to the inferences they draw about the effect of one variable (e.g. certain entrepreneurial traits and or cognitions) on another (e.g. firm versus no firm). So, because variables other than ESE could have accounted for the observed effect of the individual on firm creation, some alternative, individual-level explanations of the findings are considered below.

Chapter 2 highlighted that traits such as generalised self-efficacy (GSE; Rauch & Frese, 2007) and the Big Five personality system (Costa & McCrae, 1992) loom large in research on the entrepreneur (e.g. Zhao & Seibert, 2006). Indeed, the Big Five traits are so central to research on human thought and action across areas of activity that Bandura stated provocatively, “The Big Five traits are the entire theory.” (2012: 40) and, in research on the entrepreneur, Brandstätter (2011: 229) noted: “it should be standard, actually a matter of routine, to include in any entrepreneurship study on individual differences short, but sufficiently reliable and valid measures of the Big Five.” So, while research suggests that the effect sizes on firms and their performance are moderate at best, it seems that personality dimensions could potentially have provided an alternative explanation of the findings. However, personality traits (e.g. GSE or conscientiousness) were not controlled for in this research on the entrepreneur.

On the other hand, items from the Big Five tend to be divorced from situational realities: e.g. “I try to perform all the tasks *assigned* to me conscientiously”. This item is cast in general terms. It leaves one asking what specifically is being measured (what tasks, what domains) and or what situation sets the scene for measurement (home, work). Indeed, while conscientiousness is commonly reported as a characteristics of entrepreneurs, how does an entrepreneur interpret the above item in a situation where “tasks are no longer assigned but done voluntarily” (Bird et al., 2012: 891). Notwithstanding this matter of validity for using this particular trait item in research on entrepreneurs and because this research was interested to better understand how people think about the activities of entrepreneurs, it was decided not to include a Big Five scale or subscale (e.g. conscientiousness). Still, it is important to reiterate that trait dimensions not controlled for in this study could potentially have accounted for this study’s findings.

It was noted in Chapter 2 that, whereas trait researchers study who the entrepreneur is, cognitive researchers study how the entrepreneur thinks and scholars have suggested that activity-specific measures, such as ESE, merit more research (Krueger, 2007; Mauer et al., 2009; Sánchez et al., 2011; Vecchio, 2003). So, this research answers that call to action by using a business model lens to understand the activities of entrepreneurs. However, Chapter 2 also pointed out that there are other cognitive mechanisms, such as intentions and attitudes (Krueger, 2007), that this study could have used to bridge between the individual and firm creation. However, while some of these mechanisms may have accounted for the relationship observed between ESE and firm creation, such variables were not controlled for in this study.

Of course, not least because of the costs involved and the time demand it would place on subjects, researchers of entrepreneurship typically cannot control for each and every factor (e.g. individual and environmental ones) in their studies of the entrepreneur. Indeed, to borrow from Bandura (1997), it would have required a Herculean effort to assess the direct and interactive effects of every possible factor at once. Such an approach would fly in the face of parsimony, especially when this exploratory study only wanted to gain an understanding of

how one segment of the conceptual framework of the entrepreneurial method, i.e. the business model, operated in the real world.

To sum up, although future researchers might like to collect data on other variables (individual-level and environmental-level ones) and they might also like to use other theoretical constructs to operationalise the business model and, indeed, other segments of the conceptual framework, this study's findings seem to have justified the idea to link the business model to entrepreneurial thought and action vis-à-vis ESE.

“The factors posited by sociocognitive theories have been shown to possess explanatory, predictive and operative value. Such achievements are not realizable with fictions.” (Bandura, 1996: 324)

5.6 Contributions

The discussion thus far has concerned itself mostly with the results of null hypothesis testing, although it was pointed out that the ultimate purpose of testing hypotheses about entrepreneurs and non-entrepreneurs in relation to their Total Efficacy scores was to validate the conceptual framework of entrepreneurial thought and action on which the hypotheses were based. This section considers the contributions made by the research beyond the decision to reject or not to reject the null.

“Theory is about the connections among phenomena, a story about why acts, events, structure and thoughts occur... a good theory explains, predicts, and delights.” (Sutton & Staw, 1995: 378)

Conceptual Framework

To the extent that the essence of the research process in entrepreneurship is to develop ever more accurate conceptual “maps” that not only predict but also describe different phenomena (e.g. firms and or markets) in the real world (Hofer & Bygrave, 1992), a primary contribution of this research involves the

generic, yet distinct, “conceptual framework” of entrepreneurial thought and action that was developed and initially validated in the thesis.

More specifically, the conceptual framework describes the distinctive role of the business model in creating new firms and new markets, and a basic flowcharting methodology was used to visually represent the postulated causal structure. Then, while drawing on propositions from social cognitive theory, entrepreneurial self-efficacy (ESE) was proposed as the transformational mechanism by which a person moves from her business model to entrepreneurial action, and hypotheses were generated to test the accuracy of the flowchart’s description in the area of firm creation.

So, while using a business model lens, the essence of this contribution is that it provides a conceptual framework that describes how entrepreneurial action occurs and, by way of ESE, can be used to predict those who tend to create new firms. In this way, the research conceptually links the business model to the entrepreneurial method and lays the foundations for empirically testing the efficacy of this description in other areas of entrepreneurial activity.

The conceptual framework is an important contribution not least because Trimi & Berbegal-Mirabent (2012) have emphasised the need for more empirical research on the business model in the field of entrepreneurship, but also since it has been argued that research on business model provides an opportunity to unlock the mystery of the entrepreneurial process (George & Bock, 2011).

Theoretical Lens(es)

In terms of initially testing the conceptual framework of entrepreneurial thought and action, as outlined above, the results seem to provide initial support for the accuracy of the framework's description and predictions in the area of firm creation vis-à-vis ESE.

Although more research is needed to better understand the role of the business model in the entrepreneurial method, the theory based ESE scale seems to provide a psychometrically sound tool for future research on those who create firms. As others have noted that the full potential of self-efficacy in

entrepreneurship remains to be realised (e.g. Sánchez et al., 2011), this research makes an important contribution to knowledge by extending the scope of ESE assessment in research on entrepreneurs.

On the other hand, while the study's findings provide support for using the self-efficacy portion of social cognitive theory (e.g. Bandura, 2001) to understand the role of the business model in entrepreneurial decision and action, it is likely that the conceptual framework will be of interest to scholars of entrepreneurship who uses other theoretical lenses, such as entrepreneurial attitudes and intentions, to frame the problem of why some people but not others become entrepreneurs.

The ESE Measure

Based on this study's findings, researchers now have a new ESE measure that predicts the likelihood of a person being an entrepreneur, and distinguishes those who create firms from those who do not.

This psychometrically sound tool can be used by future researchers to harvest the potential benefits of ESE in entrepreneurship research, practice and education. Considering the evidence for the influence of ESE as a predictor of entrepreneurial status (ES), its inclusion in future research is likely to improve the amount of variance explained in entrepreneurial decision and action, and to enhance the precision of extant models of entrepreneurial process.

The study's findings suggest that (tentatively at least) the new ESE scale provides potential and practicing entrepreneurs with a reliable and valid tool for assessing their entrepreneurial capability beliefs for a set of business model activities empirically linked with firm creation. The tool allows potential and practicing entrepreneurs to develop a sense of their perceived strengths (to be leveraged) and perceived weaknesses (to be developed).

Indeed, because the results suggest that a person higher in ESE is more likely to be an entrepreneur and, as others have shown (e.g. Zhao et al., 2005), ESE can be developed through learning efforts (e.g. mastery experience and role modelling), the new measure may provide other stakeholders (e.g. educators

and policymakers) with a theory based way to unlock entrepreneurial capabilities through training and education.

Furthermore, after Townsend et al. (2010), the results of this study may aid in the development of remedial strategies to enhance entrepreneurial decision-making in the start-up process. In addition, as pointed out by Chen et al. (1998), ESE can be employed to explain entrepreneurial avoidance in certain communities, groups and individuals. However, additional testing of the new ESE scale with more reliable and larger samples will be required before moving to remedial strategies.

The detailed account of the process used to develop the ESE measure (given in Chapter 3) may be of interest to future researchers. For instance, those who use the measure and gather data on other variables (e.g. market creation) that measure the activities of an entrepreneur might like to repeat the statistical analysis detailed in Chapter 4. Future scale developers might also like to use the classification scheme of business model activities to operationalise the ESE construct in new and improved ways, and then repeat the full process of scale development in Ireland and also in other countries.

Classification Scheme

The classification scheme of business model activities used to establish the construct boundaries and internal structure of ESE is another noteworthy contribution. It may provide future researchers with a point of departure in their efforts to develop ever more precise concepts of the business model.

By adding a process or 'know-how' dimension to the Business Model Canvas (BMC; Österwalder & Pigneur, 2009), it creates a more precise concept of the business model as called for by Zott et al. (2011). Indeed, as called for by Moroz & Hindle (2012), by emphasising the "how" as well as the "what" of business model activity, the classification scheme considers the practical aspects of entrepreneurial action. Although, it should be noted that future researchers might like to add or subtract elements on either dimension of the classification scheme.

This two-dimensional taxonomy table (i.e. 'know-what' and 'know-how') may be of interest to researchers of business models in general (e.g. in eCommerce, technology and innovation management, and/or strategy) and entrepreneurship in particular (e.g. researchers of entrepreneurial action, cognitions, events, processes, and/or tasks).

For example, since it was noted in Chapter 2 that cognitive mapping is a relatively new area in research on entrepreneurship (Brännback & Carsrud, 2009), the classification scheme may provide scholars of entrepreneurial cognition with a tool to explore how entrepreneurs think at deeper levels.

Likewise, it may be of benefit to those who study what entrepreneurs do when they create new firms (e.g. Bird et al., 2012). Indeed, it is hoped that this contribution will be of interest to researchers of business models in general and the entrepreneur's business model in particular.

5.7 Limitations

All studies come with limitations, and this survey research is no exception.

In particular, as is the case with similar cross-sectional designs (e.g. Chen et al., 1998), it is not clear whether Total Efficacy is the cause or the effect of being an entrepreneur. Since firm creation is viewed herein as a good proxy for being an entrepreneur, it could be argued that Total Efficacy is the cause, reasoning that a person with higher Total Efficacy is more likely to create a firm.

On the other hand, it could be advanced that the experience of creating a firm is the cause, reasoning that a person who creates a firm will develop higher Total Efficacy from that action. Indeed, guided by the assumption of triadic codetermination, one can make either argument. In entrepreneurship, this assumption holds that entrepreneurial thinking and action is a product of the interplay of individual factors (e.g. ESE), behavioural events (e.g. creating a firm) and environmental factors.

Thus, it is important to note that the tests used in this exploratory study do not prove cause and effect. Rather, they merely suggest where future researchers should look for causality. In empirical terms, although the conceptual framework of entrepreneurial thought and action shows that entrepreneurship is a journey that takes place over time, firm creation was viewed as an act that occurs at a point in time and entrepreneurs were treated as in a state of *being*: she has created a firm. Because this cross-sectional view does not reflect the fact that firm creation is a process of creating, a longitudinal research design will be necessary to determine if Total Efficacy is a variable that influences the likelihood of a person *becoming* an entrepreneur (i.e. by creating a firm).

Some other limitations of this research pertain to (a) the operational definition of entrepreneurs and non-entrepreneurs, (b) the convenience sampling approach employed, and (c) how the classification scheme of business model activities was used to generate the efficacy items.

- First, the definition used to operationalise entrepreneurship, that is, entrepreneurs create firms (Gartner, 1988), is relatively narrow in that it does not distinguish between large firms and small organisations. On the other hand, not only has it been labelled the operational definition for the field (Shane, 2012) but also it provides an absolute view of entrepreneurship: firm versus no firm (Hisrich et al., 2007). Indeed, Gartner's operational definition is quite common in research on entrepreneurial cognition where the focus is on capturing cognitive mechanisms of the entrepreneur (Brännback & Carsrud, 2009).
- Second, the fact that an Irish, convenience sample was used may have implications for the generalisability of the results. However, because of the challenges in obtaining sampling frames for random samples in the social sciences, purposeful sampling approaches are commonly used in cognitive psychology in general (Chow, 2002) and in research on entrepreneurs' cognition in particular (Seawright et al., 2013).
- Third, not only is the business model canvas (Österwalder & Pigneur, 2009) a relative (as opposed to absolute) description of what firms do, but also the way in which the classification scheme of business model activities was operationalised is not absolute. Although this process was

informed by entrepreneurship texts and literature as well as practicing entrepreneurs, it is possible that future researchers might operationalise the classification scheme in new and improved ways. Indeed, it was already pointed out that future researchers may decide to add or subtract elements from either the content dimension ('know-what') or the process dimension('know-how') of the classification scheme.

It is important to reiterate that only one aspect of the conceptual framework of entrepreneurial thought and action was tested vis-à-vis ESE in this exploratory study. For instance, since it focussed on the role of the business model in the area of firm creation, this research did not explore the influence of the business model on other known activities of entrepreneurs (e.g. using market mechanisms to pursue opportunities). In addition, it was already pointed out that ESE is a major determinant of entrepreneurial intentions (Krueger & Day, 2010), so future researchers might like to assess the relationship between the Total Efficacy scores of nascent entrepreneurs and their scores on known measures of entrepreneurial intent at various stages of the journey by which they intentionally create firms (or move to termination).

“If the theoretical model is a useful guide for research, by definition, all the relationships in the model have not been tested. If all links have been empirically verified, the model is ready for the classroom and is of little value in the laboratory.” (Whetten, 1989: 491)

Thus, after Whetten (1989), not all the relationships in the conceptual framework have been tested. Since all its links have not been empirically verified, the conceptual framework is not ready for the classroom. Rather, for now, it merely provides a useful guide for future research.

5.8 Future Research

The empirical findings from this exploratory study provide initial support for a relationship between “entrepreneurial self-efficacy” (ESE; *beliefs in one’s capabilities to perform a set of business model activities involved in firm*

creation) and “entrepreneurial status” (ES; being an entrepreneur or not being an entrepreneur, and defined as creating a firm or not, respectively). Although the results provide initial support for the view of entrepreneurial thought and action outlined in the conceptual framework, more research is required on the conceptual framework and the ESE measure developed to initially validate it.

Future researchers might like to explore if the findings can become more pronounced on new “Irish” data, obtained using more reliable and larger samples of entrepreneurs and non-entrepreneurs. Likewise, it would be interesting to see how the new ESE scale performs not only in other national contexts, but also in less individualistic cultures. For example, future researchers might like to use the new ESE scale with probability-based samples of entrepreneurs and non-entrepreneurs obtained in the United States of America, which like Ireland is thought to have a more individualistic culture, and in the People’s Republic of China, which is thought to have a more collectivist culture. In this way, as well as helping to see if the findings from this study are generalisable to other populations, it would be possible to evaluate whether or not the ESE scale is cross-culturally consistent.

It was already pointed out that the results of this study do not prove that Total Efficacy is a variable that influences the likelihood of a person creating a firm, and that a longitudinal research design would be required to explore whether this aspect of ESE is a causal factor in firm creation. Accordingly, further research is suggested to better understand the development of ESE in the Irish population and, indeed, other populations. For example, a longitudinal research design to examine the Total Efficacy scores of a sample of nascent entrepreneurs (individuals who are involved in creating a firm) at multiple time frames on their *journey* to actually creating a firm, or not, could provide a more textured understanding of ESE in relation to the entrepreneurial method. In this regard, as already pointed out, future researchers might like to explore how Total Efficacy influences firm creation by its influence on known measures of entrepreneurial intentions.

When the results of the three main ESE scale development studies and the findings from this study are considered together, it seems that the four

measures appear to capture different aspects of ESE. It would be interesting to see whether or not the different scales produce convergent results say, for example, to predict the likelihood of a person creating a firm. Indeed, since they measure the same criterion (firm versus no firm), a validity study to rigorously compare the Chen et al. (1998) scale and the ESE measure developed herein may be of interest to researchers who study the entrepreneur with a cognitive lens. It seems fair to say, as other scholars have previously noted (e.g. Krueger & Day, 2010; Mauer et al., 2009; Sánchez et al., 2011), that the full potential of ESE remains to be realised in research on firm creation.

The statistical part of this thesis used firm creation as synonymous with being an entrepreneur. It is not unusual as a first step to focus on venture creation as a way to mark the entrepreneur, since firm creation is at the centre of entrepreneurship (Shook et al., 2003). But, as emphasised in the conceptual part of the thesis, researchers seem to have moved beyond the relatively narrow “create-a-firm” definition of entrepreneurship. Indeed, the conceptual framework of the entrepreneurial method highlights that the act of becoming an entrepreneur may be observed via new firms or new markets. In terms of the latter mode of entrepreneurial action, entrepreneurs have a number of market mechanisms at their disposal, such as selling, licensing or franchising their ideas (e.g. new products, processes, or business models) to other individuals and/or firms.

In light of the above, while using the new ESE scale, future researchers who obtain data on other variables that measure the activities of entrepreneurs can easily repeat the statistical analysis performed herein by replacing the variable ES (new firm versus no new firm) by any other variable that marks the activity of an entrepreneur (e.g. new market versus no new market), and conduct statistical analyses similar to that outlined in this thesis (e.g. binary logistic regression). Of course future researchers are free to use other procedures to model the data they gather on the efficacy variables. For example,

“Structural Equation Modelling (SEM) is a second-generation multivariate data analysis method that is often used in marketing research because it

can test theoretically supported linear and additive causal models” (Wong, 2013: 1)

One benefit of SEM is that it allows one to do many regressions simultaneously, which can be used to relate the underlying factors. This benefit seems salient here not least because of the two-dimensional conceptual scheme used to operationalise ESE, but also because independent variables (namely ‘operations’ and ‘marketing’) were identified from applying variable reduction techniques to the 9 ‘know-what’ variables that were derived from the business model canvas.

Finally, to the extent that perception and action are key activities in entrepreneurship and that these activities occur both inside and outside existing firms (Shane & Venkataraman, 2000), the conceptual framework of entrepreneurial thought and action may be of interest to researchers who study corporate entrepreneurs. Indeed, as efficacy beliefs operate at the group level via collective efficacy (Bandura, 1997), future researchers might like to study corporate and or team entrepreneurs by using collective entrepreneurial efficacy beliefs to test the link between the business model and entrepreneurial action at the group level of analysis.

APPENDICES

Appendix 1 (A.1): The Two Expert Panels

(i) Panel of Academic Experts

	Expert 1	Expert 2
Position	Lecturer Above The Bar	Senior Lecturer
Gender	Female	Male
Discipline	Industrial Engineering	Psychology
Education	PhD, MBS, BBS	PhD, MPhil, MSc, BA
NOFC*	2	3

* NOFC: number of firms created

(ii) Panel of Experienced Entrepreneurs

	1	2	3	4	5
Gender	Male	Male	Male	Female	Male
Education	MBA	BCom	BSc	MSc	BA
Sector	Manufacturing	Transportation	Food	Insurance	Technology
NOFC*	3	2	2	3	3
Firm Size**	220	14	23	7	9
Firm Age***	13	4	6	5	4

* NOFC: number of firms created (including current firm)

** Number of employees in current firm

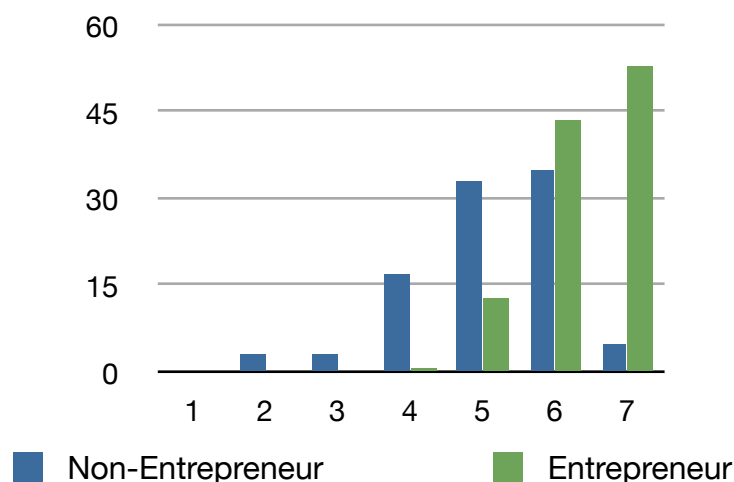
*** Age of current firm in years

Appendix 2 (A.2): Descriptive statistics on two Likert-type items

For illustration purposes only, it is worth spending a moment on how respondents used the 7-point measurement format to score two Likert-type items, and also to see if the gradation of challenge (i.e. level of cognitive complexity) built into these variables helped to identify patterned differences in efficacy beliefs within and across groups. In this regard, a histogram (or bar chart) can be used to visualise the frequency distribution of the data collected on these variables, where the height of each bar shows the frequency of data points for that bar and the horizontal axis shows 7 bars for the 7 points.

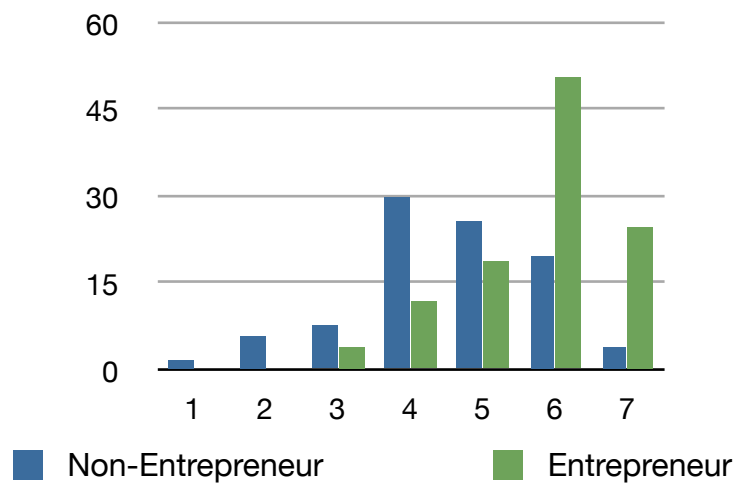
In terms of Customer Segment variables, for instance, the reader will recall that the efficacy item a_1 , “*I can identify potential customers*”, was designed to be cognitively less complex than the item f_1 , “*I can create enough customers for a viable business*”. For a_1 , Figure 1 below shows the frequency for each of the 7 response points used to score this ordinal variable. For non-entrepreneurs ($n = 96$), one can see that their scores on a_1 are distributed over 6 of the 7 response points. For entrepreneurs ($n = 111$), their responses on this item are also distributed over a good part of the scales range, although their frequencies on this item show less variability than that of non-entrepreneurs. In addition, for a_1 , one can see that the modal response point for non-entrepreneurs is 6 (agree), while the modal response point for entrepreneurs is 7 (strongly agree). However, it is not clear from Figure 1 if this difference is statistically significant.

Figure 1 Frequencies of response points used to score the Likert-type item a_1



Similarly, for f_1 , Figure 2 below shows how often each of the 7 response points were used by subjects to score this ordinal variable which, as already pointed out, was designed to be cognitively more complex than item a_1 . For non-entrepreneurs, one can see that responses on f_1 are distributed over the full range of response points. For entrepreneurs, the reader can see how responses on this item are distributed over 6 of the 7 response points. Thus, both groups used a greater range of response points to score f_1 , the more cognitively complex item. In addition, for f_1 , one can see that the modal response point for non-entrepreneurs is 4 (neutral), while the modal response point for entrepreneurs is 6 (agree). Thus, since the sample modes are consistently lower on f_1 than they are on a_1 , the level of cognitive complexity built into these items helps to show differences between and within groups, although it is not clear if these differences are statistically significant.

Figure 2 Frequencies of response points used to score the Likert-type item f_1



When the histograms (barcharts) in Figure 1 and Figure 2 are viewed together, it is pleasing to see that the 7-point scale used to score a_1 and f_1 not only appears to reveal patterned difference in efficacy beliefs between and within groups, but also seems to provide a sensitive measure at both levels of cognitive complexity. However, as scale developers are usually only interested in the composite scores that capture the latent variable (e.g. Total Efficacy), only Likert scale (as opposed to Likert-type) items were used in the analysis.

Appendix 3 (A.3): Assumptions in the General Linear Model (GLM)

The general linear model has the form

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_{p-1} + \varepsilon \quad (1)$$

where Y is the random response (predictand), the $X_i, i=1,2,\dots,p-1$ are either quantitative input variables or indicator variables for qualitative input variables (each qualitative input that has c classes has associated with it $c-1$ indicator variables) having associated with it input or carrier variables, and ε denotes random error. **(In the discussion below, the Y may be Total Efficacy)**

Some assumptions commonly employed are:

(A1) [Non-random X s] The n values of X_1, X_2, \dots, X_{p-1} used in the study are controlled by the experimenter.

(A2) [Linearity of the model] The above linear model holds; i.e. the mean value $E(Y | X_1, \dots, X_{p-1})$ is indeed *linearly* related to the input variables X_1, X_2, \dots, X_{p-1} .

(A3) [Homogeneity of variances] At each setting (X_1, X_2, \dots, X_k) , the response Y has variance σ^2 that does not depend on the setting $(X_1, X_2, \dots, X_{p-1})$. Thus the variance of the response is assumed to be the same at each setting $(X_1, X_2, \dots, X_{p-1})$ used in the study.

(A4) [Normality of the errors] At each setting $(X_1, X_2, \dots, X_{p-1})$, the response Y has a normal distribution.

(A5) [Independence of the errors] At the different settings $(X_{i1}, X_{i2}, \dots, X_{ip-1}), i=1,2,\dots,n$ {where n is the sample size}, the response Y_i has a normal distribution. [By (1), this is equivalent to saying that each ε_i has a normal distribution.]

The assumptions (A2)–(A5) are often summarised as

The Y_i are independent $N(\beta_0 + \sum_{j=1}^k \beta_j X_{ij}, \sigma^2)$ variables, $i=1,2,\dots,n$.

Under certain conditions (e.g. the Berkson model), (A1) is not so serious, and it is often possible to simply make inferences conditional on the values of the input variables actually used in the study. The other assumptions (and some more below) are crucial where interest centres on inferences rather than descriptive or exploratory studies.

(A6) We also assume little multicollinearity.

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