

**An Examination of the determinants of entrepreneurship in Thai
high technology start-ups**

**Submitted by
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Abstract

This study advances understanding of the complexity of sustaining growth in high technology-based businesses. The study builds on the conceptual and applied insights on business growth from the entrepreneurship literatures to develop a model. The model is developed to investigate the impact of determinants subsumed under the three key-based factors, entrepreneurship, innovation and firm growth dynamics on the firms' innovative entrepreneurial activities that might lead to enhanced economic growth

This thesis uses both qualitative and quantitative methods to describe the determinants and test the relationships. The quantitative survey collected data from 521 young Thai start-ups. The qualitative study involved interviews with the CEO/owners of seven high-tech firms in Thailand. The quantitative and qualitative evidence from these firms led to a much stronger explanation of the performance of the high-tech sample.

This thesis has significant theoretical and practical implications. From a theoretical viewpoint, this study provides detailed evaluation on the growth determinants from a developing country perspective. The results shown that the young high-technology firms in Thailand were similar to firms that had been examined in the literature with regard to their characteristics, innovation and firm growth dynamics but differed with regard to the utilisation of the key firm based factors subsumed under the three key-based factors, entrepreneurship, innovation and firm growth dynamics.

From a practical viewpoint, these findings indicate that the competitiveness of young technology-based firms can be enhanced by developing critical capabilities to assist the right strategies for better performance.

The thesis provides important new insights into this group of firms in a developing country. The analysis of the empirical and qualitative results showed the role and impacts of the determinants on the firms' sustainable growth and highlighted the importance of the managerial ability to dynamically manipulate these key firm based determinants to sustain growth.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Thailand has achieved remarkable success in economic development over four decades since 1960s and has been upgraded by The World Bank from a lower-middle income economy to an upper-middle income in 2011 (The World Bank, 2011). The Thai economy is expected to grow from 3.1 percent in 2016 to 3.2 percent in 2017, a rapid rise from 2.8 percent in 2015 (The World Bank, 2016).

Thailand has a population of 68.8 million in 2017 and its gross domestic product (GDP) per capita was USD 5,742.3, according to the Global Competitiveness Index 2016-2017 edition released by The World Economic Forum (Schwab, 2016). The Global Innovation Index (2016) ranked the Thai companies' capacity for innovation at 55 out of 128 countries in 2015 and 52 in 2016 based on their innovation measures, environments and their outputs. The Global Entrepreneurship Monitor (2013) reported 46.3 percent of its population engaged in entrepreneurial activities in 2013. Even though Thailand has been upgraded to an upper-middle income country; it has been less successful than the neighbouring countries such as Singapore and Malaysia in retrieving technological capabilities and is at risk of becoming a middle-income economy. Thailand is also under competitive pressure from lower-cost emerging economy such as Viet Nam and the dynamically evolving economies such as India and China. Moreover, Thailand continues to lag behind the four Asian Tigers; Singapore, China, South Korea and Taiwan in technological enhancement. These challenges can be overcome by a putting a stronger emphasis on innovation which is known as the driver of economic growth (OECD, 2013). Wongsintuwised and Jaroonpiphat (2017) said that to increase potential competitiveness and to overcome the middle-income trap, Thailand needs to give more priority to innovation which will drive productivity and prosperity (The World Economic Forum, 2016).

It has been more than ten years since the Thai government committed to positioning the country as a world leader in technology industry through improving infrastructure, creating a hi-tech talent pool and offering a superior business climate for all multinational technology companies (Thailand Board of Investment, 2014). At the same time, the Thai government has been pushing the SME development policy by funding the SME Entrepreneurs to simulate the national economic growth. However, the outcome of this policy has not exactly achieved the objective, less than five percent of the start-ups have contributed towards the achievement of the objective (Intrama, 2014). The theory of financial management states a business heuristic of high risk, and also high return (Bowman, 1980). Hi-tech business is categorized as hi-risk and hi-return, thus the higher risk business such as high technology firms should be a major concern for the country.

Entrepreneurship and innovation have been classified as the critical sources of organizational survival and growth in the national economic evolutions and entrepreneurial activities and technological innovation have been widely recognized as crucial factors for the national economic development in many developed countries. Since Schumpeter's theory of economic development was published, he has earned the reputation as a prophet of innovation (McGraw, 2007), His theory is certainly the first step to originate the theoretical instruments and concepts to approach economic enhancement, as the Schumpeterian system of economic thought appointed a crucial role to entrepreneurship with its indivisible and rooted innovative nature (Croitoru, 2012). The economist, Swedberge affirmed the influence of Schumpeter's entrepreneurship studies: "Of all the theories of entrepreneurship that exist, his theory is still, to my mind, the most fascinating as well as the most promising theory of entrepreneurship that we have" (2007, p. 2). Innovation has had an impact on economic growth in both low income and high-income countries (Bunyasrie, 2010). In addition, it also plays an important role, especially in developing countries (Markusen, 1987) to generate new products and services (Li and Atuahene-Gima, 2002). Innovation at all levels includes individual, group or organization levels which exert significant effects in organizations (Huang and Wang, 2011). This involves a complex process with multiple links between new technology and science, capable producers and buyers (Rothwell, 1991). Businesses can build up

technological capabilities through innovation in the technological frontier to compete with other firms (Dosi, 1982). In summary, the combination of Innovation and entrepreneurship leads to successful businesses (Veeraraghavan, 2009).

Entrepreneurship and innovation are crucial factors in the process of a country's development. They lead to technology creation and mobilisation which enable entrepreneurs to get through the technological frontier in both the developed and developing economies. Therefore, the purpose of this study is to identify the key firm-based factors that are associated with longer term development of the young high technology firms in Thailand. This thesis will determine the extent in which entrepreneurial activities and possible factors constraining or assisting the growth process of innovative start-ups.

1.2 Aim and Objectives of the Study

The overall main aim of this study is to identify the key firm-based factors that are associated with the longer-term growth of young high-technology firms in Thailand.

The aim will be achieved by the following objectives and related research questions stated in Table 1.1.:

1. To examine the core characteristics of hi-technology entrepreneurship.

This objective attempts to identify the core characteristics of hi-technology entrepreneurship classified in term of their entrepreneurial demographics, firm demographics, skills and competencies, product characteristics, Research and Development (R&D), aspect of innovation, competition, market development, internationalisation activities, source of finance, characteristics of growth.

2. To examine the relationship between key predictors of firm growth and young hi-technology firms in Thailand

This objective is to examine which hi-technology start-ups have more innovation and growth development based on the key prediction of core theories of entrepreneurship and innovation process.

3. To examine the role of the innovative inputs in young Thai hi-technology firms
 This objective is to examine how the Thai firms implement and configure the 'innovative inputs' to achieve output.

4. To determine the core firm growth determinants on young Thai hi-technology firms.

This last objective is to examine whether the key firm based factors identified by the literature such as formation mode, size, education and experience, innovativeness and technological advancement of product and process, competition intensity, market development and internationalization activities, and finance, which are expected to be a function in the various dimensions of growth of firm, impact on the Thai firms' long term growth or not.

Table 1.1: Objectives and associated research questions

Research Aim	
To identify the key firm-based factors that might be associated with the longer term growth of young high-technology firms in Thailand	
Objectives	Research Questions
1. To examine the core characteristics of hi-technology entrepreneurship	i. What are the core entrepreneurial characteristics of Thai innovative firms?
2. To examine the relationship between key predictors of firm growth and young hi-technology firms in Thailand	i. What are the relationship between the contingent factors and the types of firm establishment of young Thai hi-technology firms? ii. What are the factors constraining or assisting firm growth of young hi-technology firms?
3. To examine the role of the innovative inputs in young Thai hi-technology firms	i. How do the innovative firms implement the innovation process? ii. How the Thai entrepreneurs configure the innovative inputs to influence outputs in general?

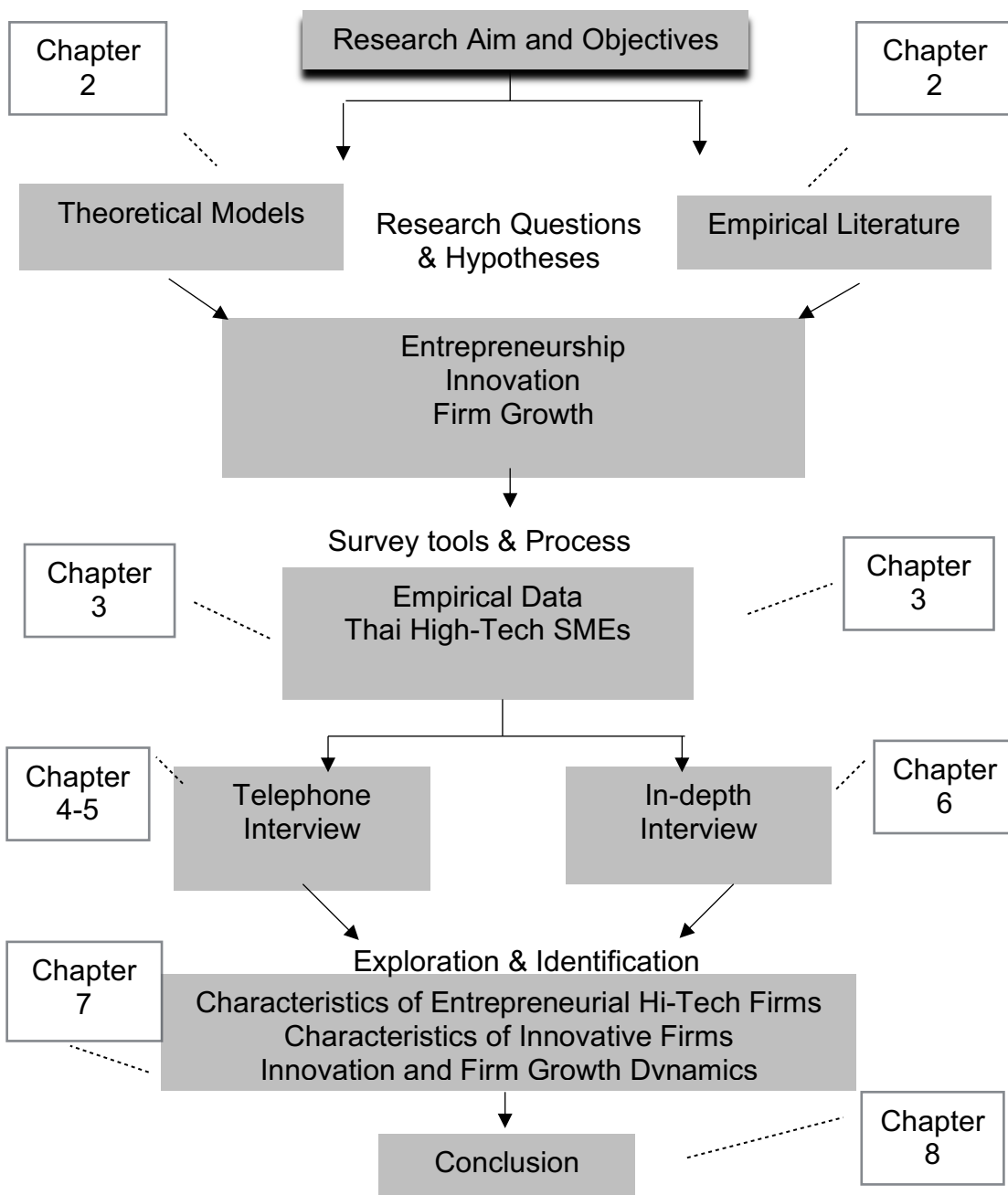
4. To determine the core firm growth determinants on young Thai hi-technology firms.	i. What are the core firm growth deterrents of young Thai hi-technology firms?
--	--

Source: Author

1.3 Structure of the Thesis

This research is organized into 8 chapters (excluding Chapter 1) as illustrated below and a summary of each chapter is presented.

Figure 1.1: Organization of research



Source: Author

Chapter 1 starts by illustrating the background of the research and setting out the research problems relating to entrepreneurship, innovation and growth. It identifies a group of coherent research questions which will be subsequently tested using empirical data from a sample of Thai high-tech SMEs.

Chapter 2 reviews the historical background of research on entrepreneurship, outlines the key models and empirical literature relating to entrepreneurship, innovation and growth, and examines the current empirical literature relevant to the research questions and hypotheses formulated.

Chapter 3 discusses the development of the empirical survey instrument and the process by which the survey sample was selected from the database of hi-technology firms established in Thailand between 2008 and 2012. Then, it moves on to deliberate the methodologies for analysing the survey data and testing the key hypotheses.

Chapter 4 descriptively explores the key characteristics of the firms surveyed by focussing on factors such as Entrepreneurial demographics (education, experience), Firm demographics (age, size, sector, ownership structure, management team), Technology (new/established, R&D inputs, incremental, customisation), Products and services (best-selling product, portfolio, technological content, novelty), Employment and Labour Productivity (human capital, scientific knowledge of total employment, share of full-time, part-time), Customer and competition (number of customers, market size, number and type of competitions, domestic/international market), Financing the firm (debt, internal finance, external finance) and Internationalization (exporting markets, types of countries sell in, number of countries sell in, mode of international sales) that have been extracted from the review of literature.

In addition, the research attempts to identify firm life-cycle effects and explores whether older, more established firms are configured differently than their younger counterparts. Furthermore, the chapter considers whether different types of entrepreneurs and entrepreneurial teams, with different skills, competencies and experiences, create fundamentally different types of businesses and adopt different types of business models.

The aim of Chapter 5 is to explore the relationship between key predictors of firm growth and young hi-technology firms in Thailand. Here, initially, it will focus on the relationships between the types of firm establishment and the contingent factors such as their core characteristics of entrepreneurial and firm demographics, skills and competencies, product/service innovativeness, marketing development, source of finance and factors that constrain firm growth

In Chapters 6 the role of the innovative inputs in young Thai hi-technology firms, how the innovative firms implement the innovation process, and how they configure the innovative inputs to influence outputs in general are examined.

In Chapter 7, after having established how entrepreneurial firms embark on the path that leads from innovation inputs to innovation outputs, the discussion moves to explore impact of core firm growth deterrents on young Thai hi-technology firms such as firm demographic, product/service characteristics, innovation, internationalization, finance, constraining growth process factors, skills shortage within managerial team, and performance indicators subsumed under three main areas; entrepreneurship, innovation, and firm growth dynamics.

The hypothesis in this chapter is firstly, accumulate productive resource, then deliver more innovation outputs that will enable the firm to develop new markets or compete more effectively in existing markets. This is to establish that this entrepreneurship-innovation-growth causal chain will create a self-reinforcing dynamic as demonstrated by previous studies which have often identified a pattern of persistent growth from a small subset of unique and highly entrepreneurial and innovative firms.

Finally, Chapter 8 concludes the discussion by summarizing the key findings from the empirical sections of the thesis in the context of the research questions drawn from the theories identified in the literature review chapter. In doing so the researcher answers the question on which the entrepreneurial activities and possible factors constrain or assist the growth process of the innovative start-ups. This gives clear understanding of how entrepreneurs should operate their business during the initial stage that can create future economic growth in young hi-technology firms in Thailand.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This thesis seeks to identify the key firm-based factors that contribute to the survival and long term development of small and medium size high-technology firms. It will attempt to determine the significance of the entrepreneurial activities and possible factors that constrain or assist the growth process of the firms. As such, the key literature reviewed is concentrated in the areas of entrepreneurship, Innovation, and firm growth within the context of SMEs.

This chapter reviews how different theories in economics, psychology, sociology, anthropology, resource-based, behavioural management, opportunity Identification and innovation process have explained the causal chain of events through which entrepreneurs can deliver more innovation and ultimately higher growth to benefit the national and regional economies. The key predictions of the core theories of entrepreneurship and innovation are synthesised and utilised to formulate testable hypotheses for the empirical testing which encompasses three broad areas, namely, the characteristics of: entrepreneurial, innovative hi-technology firms, innovation and firm growth dynamics presented in Chapters 4-7. As the majority of the existing seminal theories have been developed to explain entrepreneurial and innovation dynamics in Western economies, it is also the intention of this study to verify whether they are relevant to a wider and different context and whether new theories need to be developed to explain the function of these key building blocks that might lead to enhanced economic growth in the developing economies.

This chapter is divided into seven parts. Part I is an introduction. Part II is a brief background of entrepreneurship and innovation, the determinants of innovation and the importance for the firm growth via the examination of the relationships between entrepreneurship and innovation in the formation of new businesses. Part III presents the determinants of high-technology firm. Part IV presents the core theories on high-technology entrepreneurship which will consider the

structure of how economic theories have sought to explain why entrepreneurs exist and why they create firms to exploit new technologies. Part V reviews the empirical studies on the key characteristics of innovative firms to illustrate the innovation process. Part VI presents the entrepreneurship in Thailand in both the economic and innovation areas. The conceptual research framework and the research model are presented in Part VII. The chapter ends with a brief summary.

2.2 Entrepreneurship and Innovation

2.2.1 Research on Entrepreneurship

This section presents a brief introduction to the field of entrepreneurship research. It begins with a short discussion of the origin of the field and of its development over recent years. It then discusses the fragmented and multidisciplinary nature of the research field and the current trend towards greater interdisciplinary.

Currently, the entrepreneurship literature represents a broad and heterogeneous range of approaches and methods. However, this heterogeneity of research approaches has made it difficult to gain a clear overview of the combined, cumulative state of knowledge on entrepreneurship. This is largely because the different disciplines advance distinctly of each other's progress, and knowledge development therefore takes place on multiple, parallel research fronts, with no unifying conceptual framework or research paradigm to guide it (Busenitz et al. 2003; Cooper 2003; Kurathko et al. 2005; Gartner et al. 2006).

Each discipline brings its own valuable and often unique insights and perspectives on entrepreneurship. For example, psychologists have focused on understanding the motives and character traits of actual and potential entrepreneurs, while economists have studied the impact of the economic climate and technological developments on entrepreneurial activity (Grilo and Thurik, 2004).

The field is currently spreading into almost every other social science discipline. However, Mulholland (1994) and Rosa and Bowes (1990) assert that the field

is still dominated by the positivist-functionalists, and that there is an urgent need to open up new perspectives in order to understand what entrepreneurs are and what they do.

Recently, there is a greater move towards interdisciplinary research in the field of entrepreneurship. Minitti and Lévesque (2008) even suggest that a new “mainstream” may be emerging in entrepreneurship research, as the distance between economics and other social sciences is declining, and as cross-disciplinary research (e.g. bridging economics and psychology) becomes more common.

Chepurenko (2015) opines that the field of entrepreneurship research was characterized by spectacular growth, and the set of topics and theoretical concepts used in the literature widened significantly during the first decade of the 21st century. Moreover, other researchers have analysed the achievements in particular areas, such as social entrepreneurship (Dacin et al., 2010), sustainable entrepreneurship (Hall et al., 2010], cross-cultural entrepreneurship research (Engelen et al., 2009), entrepreneurship in emerging economies and developing societies (Naudé, 2010; Kiss et al., 2012), and methods in entrepreneurship research (Short et al., 2010). Now entrepreneurship research seems to be theoretically well supported. Broadly accepted theories exist at the macro, mezzo, and micro levels and are supported by various core scientific domains.

The vast, fragmented and highly multidisciplinary entrepreneurship research makes it's difficult to gain an overview of current knowledge on the determinants, characteristics and effects of entrepreneurial activities (Bull and Willard, 1993; Bruyat and Julien, 2000; Audretsch, 2003; Grilo and Thurik, 2004; Ireland et al. 2005). There is, therefore, a need to synthesize the state of the art knowledge on entrepreneurship so as to contribute to our understanding and provide a sound basis for future research and policymaking on entrepreneurship.

2.2.2 The concept of Entrepreneurship

This section on entrepreneurship will first present an over view of the development of entrepreneurship. Then it will discuss in greater detail what constitutes the foundation of the thesis's perspective on entrepreneurship.

The field of entrepreneurship can be defined, in a very basic manner, as the field that studies entrepreneurs. It examines their activities, characteristics, economic and social effects and the support methods used to facilitate the expression of entrepreneurial activity (Filion, 1997). In general, it studies the why, when and how of opportunity creation, recognition and utilization for providing goods and services through the creation of new firms (start-ups) and within existing firms for both profit and non-profit purposes. Shane and Venkataraman defined 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' (2000, p. 218). In general, entrepreneurship concerns the individual discovery and exploitation of entrepreneurial opportunities through creating new products, new processes, new resources and new markets under risk and uncertain circumstances (Shane and Venkataraman, 2000).

Entrepreneurship is an important vehicle for economic growth (Acs, et al., 2016) in both the developed and developing economies (Audretsch, Keilbach, and Lehmann, 2006; Cala, et al, 2015, 2017; Koellinger and Roy Thurik, 2012; Van Praag and Versloot, 2007; Vivarelli, 2012). It plays an important role in wealth and job creation (Cornelius, et al. 2006; Dvouletý, 2017). Entrepreneurship is the crucial driver to business success (Covin and Slevin, 1986; Harms and Ehrmann, 2003) and generates economic development (OECD,2003). In addition, it is also considered as an outcome of the balancing of opportunity, risk and reward (Alam and Hossan, 2003). In general, entrepreneurship concerns the individual discovery and exploitation of entrepreneurial opportunities through creating new products, new processes, new resources and new markets under risk and uncertain circumstances (Shane and Venkataraman, 2000).

The lack of a single definition of 'entrepreneurship' is partly due to the differentiated traditions within the field of entrepreneurship research. There exist

a number of schools of thought which view the notion of entrepreneurship from fundamentally different perspectives. Several theories ranging from economic, psychological, sociological, anthropological, opportunity-based, to resource-based which are underpinned by empirical research evidence have been put forward to explain the field of entrepreneurship (Ahmad and Seymour, 2008; Simpeh, 2011). Consequently, there is still yet to exist a commonly accepted definition of entrepreneurship.

Entrepreneurs are the driving force in transforming and renewing economies worldwide, contributing not only to employment but also to economic, social and political stability (McFarlane, 2016).

The concept of the entrepreneur has been around since 1730. Ahmad and Seymour have succinctly synthesised a list of extant definitions found in the literature (Table 2.1).

Table 2.1: Superficial review of extant definitions

Superficial Review	Author (Year)
Entrepreneurs buy at certain prices in the present and sell at uncertain prices in the future. The entrepreneur is a bearer of uncertainty.	Cantillon, 1755/1931
Entrepreneurs are 'pro-jectors'.	Defoe 1887/2001
Entrepreneurs attempt to predict and act upon change within markets. The entrepreneur bears the uncertainty of market dynamics.	Knight 1921,1942
The entrepreneur is the person who maintains immunity from control of rational bureaucratic knowledge.	Weber 1947
The entrepreneur is the innovator who implements change within markets through the carrying out of new combinations. These can take several forms: <ul style="list-style-type: none"> • the introduction of a new good or quality thereof • the introduction of a new method of production • the opening of a new market 	Schumpeter 1934

<ul style="list-style-type: none"> • the conquest of a new source of supply of new materials or parts, and • the carrying out of the new organisation of any industry 	
<p>The entrepreneur is always a speculator. He deals with the uncertain conditions of the future. His success or failure depends on the correctness of his anticipation of uncertain events. If he fails in his understanding of things to come, he is doomed.</p>	<p>Von Mises 1949/1996</p>
<p>The entrepreneur is co-ordinator and arbitrageur.</p>	<p>Walras, 1954</p>
<p>Entrepreneurial activity involves identifying opportunities within the economic system.</p>	<p>Penrose, 1959/1980</p>
<p>The entrepreneur recognises and acts upon profit opportunities, essentially an arbitrageur.</p>	<p>Kirzner 1973</p>
<p>Entrepreneurs take initiative, accept risk of failure and have an internal locus of control.</p> <p>An entrepreneurial activity as an activity with the objective to change the system, by increasing the productivity of the system, decreasing the cost of part of the system, producing accrual of personal wealth and/or producing an increase of social values.</p>	<p>Shapero 1975, 1983</p>
<p>Entrepreneurship is a systematic innovation, which consists in the purposeful and organized search for changes, and it is the systematic analysis of the opportunities such changes might offer for economic and social innovation.</p> <p>An entrepreneur searches for change, responds to it and exploits opportunities. Innovation is a specific tool of an entrepreneur hence an effective entrepreneur converts a source into a resource.</p>	<p>Drucker 1964, 1993 1985</p>

Entrepreneurship is the pursuit of opportunity beyond the resources you currently control.	Stevenson 1983, 1985, 1990
Entrepreneurship is the process of creating something different with value by devoting the necessary time and effort, assuming the accompanying financial, psychic, and social risks, and receiving the resulting rewards of monetary and personal satisfaction.	Hisrich and Peters 1989
The essential act of entrepreneurship is new entry. New entry can be accomplished by entering new or established markets with new or existing goods or services. New entry is the act of launching a new venture, either by a start-up firm, through an existing firm, or via 'internal corporate venturing'.	Lumpkin and Dess, 1996
Entrepreneurship is a multifaceted and heterogeneous activity. Entrepreneurs have multi-task abilities. Entrepreneurs perceive and creates new opportunities, operate under uncertainty and introduce products to the market, decide on location and the form and use of resources, and, finally manage their business and compete with others for a share of the market.	Wennekers and Thurik 1999
The field of entrepreneurship involves the study of sources of opportunities; the processes of discovery, evaluation, and exploitation of opportunities; and the set of individuals who discover, evaluate, and exploit them.	Shane and Venkataraman, 2000
Entrepreneurship is a context dependent social process through which individuals and teams create wealth by bringing together unique packages of resources to exploit marketplace opportunities.	Ireland, Hitt, and Sirmon, 2003
Entrepreneurship is the mind-set and process to create and develop economic activity by blending risk-taking, creativity and/or innovation with sound management, within a new or an existing organization.	Commission of the European Communities, 2003

Source: Author and adapted from Ahmad & Seymour, 2008, p.7

Though many definitions of entrepreneur have been postulated, there is no one widely accepted definition of the term 'entrepreneurship' (Hornaday, 1992; Ucbasaran, Westhead, and Wright, 2001; Watson, 2013). The term has been used to define a wide range of activities such as creation, founding, adapting, and managing a venture.

This research has adopted the definitions proposed by the OECD (Ahmad and Seymour, 2008, p.14) as stated below:

Entrepreneurship is the phenomena associated with entrepreneurial activity.

Entrepreneurial activity is the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets.

Entrepreneurs are those persons (business owners) who seek to generate value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets.

Entrepreneurship is a dynamic process of vision, change, and creation. It requires an entrepreneur to apply energy and passion towards the creation and implementation of new ideas and creative solutions. Essential entrepreneurial processes include the willingness to take calculated risks in terms of time, equity, or career; the ability to formulate an effective venture team; the creative skill to marshal needed resources; and fundamental skill of building solid business plans; and finally, the vision to recognize opportunity where others see chaos, contradiction, and confusion. (Kuratko and Hodgetts, 2004,)

As such, this study posits that entrepreneurship is about identifying and acting upon (enterprising human activity) opportunities that create value (be that economic, cultural or social). Typically, entrepreneurial activities require the leveraging of resources and capabilities through innovation, but the opportunities themselves always relate to the identification of new products, processes or markets.

2.2.3 The concept of Innovation

Schumpeter was an early writer who associated entrepreneurship clearly with innovation. Schumpeter (1928) viewed entrepreneurship as a force of creative destruction. The entrepreneur carries out new combinations, thereby helping render old industries obsolete. Established ways of doing business are destroyed by the creation of new and better ways to do them.

Schumpeter's definition of innovation embodies a characteristic of entrepreneurship that is widely recognized today, namely, innovation, and refers to the 'new combinations' associated with the technical, marketing and organizational aspects.

Innovativeness is the willingness and the capability of entrepreneurs to engage in new idea generalization, experimentation and R&D activities to influence the firm's existing marketing resources, technological resources, skills, knowledge, capabilities, or strategy (Jun and Deschoolmeester, 2003). Other researchers have defined innovation as the exploitation of new markets, new business formation and new sources (Bascavusoglu-Moreau, 2010; Gebreeyesus, 2009; Stam and van Stel, 2011; Voeten, deHaan, and deGroot, 2011). Innovation is associated with the firm's innovative outcome in both quality and quantity of production (Van Praag and Versloot, 2007) and has always inspired new market and technological opportunities (Dodgson, Gann, and Phillips, 2013). Szirmai, Naudé, and Goedhuys (2011) posit that innovation covers not only the development of new products, new processes and new sources of supply, but also the exploitation of new markets and the development of new ways to organize business.

Innovation by entrepreneurs can play an important role in catch-up and growth in a global economy (Szirmai, Naude, and Gedhuys, 2011). Innovation is believed to be a crucial facilitator of financial growth (Simmie and Wood, 2002), and innovations can result in imitations that generate even newer innovations (Segerstrom, 1991), keeping up the tempo in the battle for survival. Thus, innovation is a mechanism that drives business to survive and thrive (Dodgson et al., 2013).

2.2.4 Entrepreneurship and innovation

2.2.4.1 Importance of entrepreneurship and innovation

In the fields of economics and business management, innovation and entrepreneurship are related and the entrepreneur can only be understood in the context of innovation theory (Voeten et al., 2011). In line with the argument of Voeten et al., Alam and Hossain (2003) state that entrepreneurship is a process in which people pursue their opportunities and need fulfilment through innovations. It is a key factor in driving development, especially in small business (Mahemba and Bruijn, 2003) and promoting the success of a business (Hausman, 2005; Rogers, 2004). Schumpeter (1934) equates entrepreneurship with innovation in the business sense, that is, to identify market opportunities and using innovative approaches to exploit them. Entrepreneurs are innovators who take advantage of change by performing the following five different types of innovation, (i) The introduction of a new (or improved) good; (ii) The introduction of a new method of production; (iii) The opening of a new market; (iv) The exploitation of a new source of supply; and (v) The re-engineering/organization of business management processes (Ahmad and Seymour, 2008). Entrepreneurship helps to generate new idea for the economy and create the culture of independence, risk taking and confidence. As a result, the combination of Innovation and entrepreneurship leads to successful businesses and to overall economic growth.

Like all forms of entrepreneurship, innovative entrepreneurship originates from a nexus of individuals and opportunities (Shane 2003). Innovative entrepreneurship is more likely to occur with some sources of opportunities than with others: opportunities that are knowledge-based, technology, or research-driven are strong antecedents of innovative entrepreneurship (Acs et al., 2009). Innovative entrepreneurship is more likely to occur if entrepreneurs possess some socio-economic and personality characteristics such as academic education and technical background (Shane, 2000; Koellinger, 2008). The environmental context and the available of accessible resources from stakeholders, alliances, and networks also influence innovative entrepreneurship. Industrial clusters, for example, facilitate knowledge transfer and knowledge spill overs, can lead to

innovative entrepreneurship. (Eisenhardt and Schoonhoven, 1996; Elfring and Hulsink, 2003).

The context of innovation is a crucial aspect of this research because it is an important component of entrepreneurship. Studies show that both entrepreneurship and innovation are necessary for creating new products and processes that can transform start-ups to become economically sustainable firms (Low and Isserman, 2015). The accumulation of factors of production, i.e., knowledge, human and/or physical capital, cannot alone explain economic development. Innovation and entrepreneurship are needed to transform these inputs in profitable ways (Anderson and Tollison, 1982).

2.2.4.2 New business formation

Start-up entity is established with the intent of profiting financially. Many ventures are founded by one or more individuals with the expectation of the business bringing in a financial gain for all backers. Most business ventures are created based on demand of the market or a lack of supply in the market. Needs of consumers are identified for a product or a service and the entrepreneur and investors will proceed to develop the idea, commercialise the idea, and sell the product or service developed. Broadly, a new venture is a firm that is in its early stages of development and growth and is in the process of bringing its initial products/services to market, forming a customer base, and installing organizational processes and procedures. (Klotz, Hmieleski, Bradley and Busenitz, 2014).

The empirical data reported by The Global Entrepreneurship Monitor (Monitor, 2017) showed that business start-ups across 60 countries in both the developed and developing countries since 1999 were a key driver of economic growth (see Acs, Desai, and Klapper, 2008; Reynolds et al., 2005). The advantage of new business creation is not only to generate employment but also to reduce unemployment rate in both the developed and developing nations (Hart and Oulton, 2001; Thurik, 2003). Even though most entrepreneurial firms are typically small size (Nurmi, 2006) and have low individual market influence (Dickson, Coles, and Lawton Smith, 1997), they have the potential to boost the nation's

wealth and economic growth (Robson et al., 2009; Colombelli, Krafft, and Vivarelli, 2016; Roman et al. 2017), especially the success of small and medium size enterprises (SMEs) are able to create more job and important to drive the growth of economy (Bogenhold et al., 2016). Thus, it is the key of national sustainable, wealth, and reduce the poverty (Monitor, 2018). However, often the SMEs exits within the first year (Munkongsujarit, 2016) and only half of them survive past of five years (Pugsley, Sedlacek, and Sterk, 2018). Nascent entrepreneurs and new entrepreneurs are of significant importance to a country's economy because from the entrepreneurs involved in this phase of entrepreneurial activity are expected job creation but also innovation (Rusu & Roman, 2017).

It is important to understand the diversity and dynamics of new firm formation. There are a number of studies discussing the survival and growth of new firms. Bartelsman, Scarpetta, and Schivardi (2005) found a low level of survival rate amongst new firms. In ten OECD countries approximately 20-40% of young firms failed during the first two years and only 40-50% survived after seven years of operation. Other studies found that over 50% of new firms exit the market within the first five years in the UK and USA and Italy (Johnson, 2005; Reid, 1991, Audretsch, Santarelli, and Vivarelli, 1999). High cost is a main reason small start-ups exit the market in a short time (Lotti and Santarelli, 2004). Interestingly, the rate of entry and exit in developing countries is similar (Bartelsman, Haltiwanger, and Scarpetta, 2004).

While the survival rate of new start-ups is low, they are important to economic growth as a whole (Van Stel, Carree, and Thurik, 2005), and also beneficial to the economic development in developing countries (Drucker, 2013; Kennedy and Kennedy, 1980). As such, it is pertinent to identify the factors that constrain the firms' survival or associate with their growth.

2.3 The determinants of high technology firms

The high technology sector is defined as industry which invests significantly in the activity of science and technology (Butchart, 1987) and hi-technology firm is

an independently owned and the owner hold at least 50% of the company (Tether and Storey, 1998).

The level of innovation, Research and Development (R&D), and labour productivities are related positively (Cohen and Klepper, 1992; Andersson, Johansson, Karlsson and Loof, 2012) and have a positive effect on economic development (Autio, 1997; Drucker, 1987; Griliches, 1998; Roberts, 1991; Schumpeter, 1934; Teece, 1986) because the hi-technology sector enhances the knowledge-intensity and science base of a national economy (Rickne and Jacobsson, 1999) which promotes economic competitive advantage and industrial renewal (Licht and Nerlinger, 1998). New technology-based firm can exploit the technological innovation that associate with the long term promotion of economic performance of the countries, businesses and industries (Cohen, 2010).

Some authors such as Jones-Evans and Westhead, (1996); Storey and Tether, (1998); Tether, (1997) claim that innovative firms have lower failure rates and contribute dramatically to direct and indirect employment creation. Moreover, they drive higher sales, assets and export growth than other firms operating in more traditional industry sectors and achieve overall economic growth.

Nevertheless, Ganotakis and Love (2010) argued that hi-tech firms are important drivers of economic growth but generally face challenges in producing their highly innovative goods to serve national and international markets. Owners may encounter obstacles related to technological advancement and marketing system (Maine and Garnsey, 2006; Saemundsson and Dahlstrand, 2005) and incur a higher initial cost while introducing new products to the market as the innovation takes a long period of time to complete (Oakey, 2003; Saemundsson and Dahlstrand, 2005). Thus, these firms need to launch products to a larger market in order to cover the high cost of R&D, to address the short product life-cycle of hi-tech products, and to rapidly reach the domestic markets in order to be profitable (Saemundsson and Dahlstrand, 2005; Storey and Tether, 1998). As such, the identification of the determinants of high growth firms can help the business to promulgate more efficient production plan.

2.3.1 New Technology based firms

New technology-based firms (NTBFs) have stirred growing interest from governments, industry and researchers, due to their perceived tremendous potential to contribute to economic development and growth. NTBFs have been characterised as entrepreneurial start-ups and spin-offs from technical universities and corporations (Rydehell et al. 2018). The successful commercialization of the NTBFs could help to convert innovative ideas into economic opportunities, generate competitiveness, create employment, and increase productivity (Zapata Huamani et al. 2017). In addition, such firms transform new scientific findings into commercial innovation, thereby strengthening the transfer of technological knowledge into the markets, securing innovation-based economic growth and generating high qualification jobs. These potential effects have led to a broad interest to motivate technology-based founding activities and to provide supporting services aiming at increasing their survival prospects (Ungerer et al. 2017).

The term NTBFs seems to have been derived from the path-breaking report comparing NTBFs in the United States with those in the UK and West Germany produced by the Arthur D. Little group in 1977 (Storey and Tether, 1996). Broadly defined, new technology-based firms (NTBFs) are new technology ventures, commonly small, which have been described as important sources of knowledge-intensive employment and promoters of technological change and innovation in different countries (Saemundsson and Candi, 2017).

NTBFs have characteristics that distinguish them from larger, established firms. Their newness and smallness, the uncertainty of their endeavour and the dynamics of their environment present challenges for their managers in the pursuit of business opportunities (Lynskey, 2016).

The fragility of NTBFs together with recognition of their high potential for innovation have stimulated economic research on the factors that affect their creation, survival and performance. Studies have identified the following factors: financial constraints generated by capital market imperfections; the degree of entrepreneurialism and the individual characteristics of those starting a business;

firms' access to knowledge externalities; local economic and social characteristics; the availability and quality of support infrastructures; and the level of awareness among young people of the potential benefits of creating a venture (Ramaciotti et al., 2016, Ungerer et al., 2017).

Saemundsson and Candi (2017) assert that NTBFs have been primarily preoccupied with the development of the firms' first products or services. Opportunities exploited at founding are likely to be based on the founders' prior technical knowledge. As technology-based firms, they depend and rely on their employees' technical knowledge for the creation, detection, and exploitation of business opportunities. These firms are likely to house a specialized collection of technical knowledge related to their focus of activity and this collection is extended and refined by employees, many of which specialise in research and development (R & D).

Rydehell et al. (2018) and Ramírez-Alesón and Fernández-Olmos (2017) assert that in general during the early phase, NTBFs are resource-scarce and their initial bundles of resources are not sufficient for the firms to create competitive advantages or even to progress from ideas to the commercialization of their technologies. In addition, these firms often lack financial resources and legitimacy. Consequently, in order to be able to develop and commercialize their technologies, including patent activities so that they can compete with other firms, NTBFs need to access resources external to the firms (Löfsten, 2016). Such external resources are R&D equipment and production facilities (tangible resources), and technological know-how and expertise (intangible resources). They opine that new technology-based firms (NTBFs) need to collaborate with external stakeholders and build networks in order to acquire technical expertise and equipment to develop their technologies and innovation performance. Networks can be regarded as vehicles for firms' resource endowments, which are important for NTBFs to conduct business. Through business networks and close localisation with universities and industry intense regions, tangible resources, such as R&D equipment and facilities, which enhance new firms' ability to operate, become more easily accessed (Yu and Lee, 2017).

Besides internal resources, a firm's network resource endowments influence its competitive advantage as business networks can offer firms access to necessary assets and equipment for technology and the development of patents. In particular, in the early stage of firms, business networks and firm localization may provide NTBFs with resources which enhance the ability to develop and produce their technologies, and thus their innovation performance which could further enhance access to resources, such as external financing. The development of innovation capacity through internal research and development (R&D) or through collaborations with external partners could enhance young firms' success in launching new products in the market.

Internationalization is a competitive requirement for growth and gaining market share even in the home markets. NTBFs in emerging economies often have their technological and marketing strategies guided by technology imitation for which they need to build international networks to support their innovative capacity and internationalization. However, a significant number of them fail or do not even try to cross national boundaries. In the emerging economies, three barriers are perceived to be the major obstacles to TNBFs' internationalisation. They are (1) Institutional barriers such as high cost of capital to start international operations, lack of incentives and government support (credit lines, training programs, tax incentives), (2) organizational capabilities barriers such as difficulties in offering products/services that meet the needs of international customers, insufficient or inadequate technological skills to compete on cost and quality, and high production costs relative to competitors in international markets and (3) human resource barriers such as language barriers and human resources being unprepared for international operations (Cahen, et al., 2016).

The establishment and growth of new firms are recognized as imperative because they are a manifestation of entrepreneurship and a source of economic growth. NTBFs have the potential to fundamentally transform the ways in which societies and markets operate. They are crucial to the long term development of an economy and in this sense deserve special attention.

2.3.2 Incubator and accelerator

New technology based firms (NTBFs) exploit emerging technologies for their high growth potential and are differentiated for their contributions to economic growth. Consequently, national and local initiatives to promote the growth and support the survival of NTBFs have been widely implemented. Establishing incubators and accelerators is one such initiative (Hausberg and Korreck, 2018).

Business incubators

Business incubators (BIs) are considered as a vehicle in both the advanced and emerging societies for the promotion of small-medium enterprises (SMEs) (Mahmood et al., 2016). Incubators have become one of the most prominent instruments for facilitating the survival and growth of innovative startups (Ahmad and Ingle 2013; Bergek and Norrman 2008).

The first business incubator was founded in 1959 in Batavia, New York (Brown et al., 2000). From the 1970s onward, business incubators spread worldwide (Albert and Gaynor, 2001). The latest recorded number of incubators around the world is more than 7000 (National Business Incubation Association, 2014). Asia, the largest and mostly developing region with around 50 countries, has more than 2000 BIs. Most of these BIs are operating in the populous countries of Asia such as China and India (Jamil et al., 2015).

Business incubation has undergone a major transformation and constantly added new valuable services. In the first generation, shared and affordable office space as well as resources and facilities contributed to an objective of economic revitalization. The second generation (1991-2000) added a variety of advisory and support services (coaching and training) in addition to networking in order to accelerate learning efficiency (Hackett and Dilts 2004; Theodorakopoulos et al. 2014). The third generation of incubators emerged in the late 1990s and focused on providing the startups with access to networks, with the aim of facilitating access to external resources and providing legitimacy (Bøllingtoft and Ulhøi 2005; Bruneel et al. 2012; Theodorakopoulos et al. 2014), by being affiliated with other partners (Rao et al. 2008).

Accelerator

Accelerator is considered as a new generation incubation model (Goswami et al. 2018; Jackson and Richter 2017; Pauwels et al. 2016; Uhm et al., 2018). The first accelerator, the Y-Combinator, was established around 2005 (Christiansen, 2009; Miller & Bound, 2011; Isabelle, 2013). This industry has grown quickly and in 2015 there were 387 accelerator programs in place, responsible for nurturing more than 8,000 start-ups worldwide, with investments in the order of \$200 million US (Brunet et al., 2016).

Accelerators have been described as a form of early stage investment, speeding up processes of venture creation and product launch, and increasing start-up sustainability (Stayton and Mangematin, 2019). Accelerator programs combine previously distinct services or functions: seed investment, value added mentorship and advisement, co-working or colocation with other start-up companies, capital introductions and exposure, network building, the opportunity to pitch to multiple investors, and an increase in leverage in relation to potential VC investors that were each individually costly for an entrepreneur to find and obtain (Hochberg, 2016; Mian et al., 2016; Pauwels et al., 2016). More specifically, accelerator programs are programs of limited-duration—lasting about three months—that help cohorts of startups with the new venture process. In addition to the tangible resources such as office space and equipment, they usually provide a small amount of seed capital in return for equity. They also offer a plethora of networking opportunities, with both peer ventures and mentors, who might be successful entrepreneurs, program graduates, venture capitalists, angel investors, or even corporate executives (Cohen, 2013; Cohen and Hochberg 2014; Hochberg, 2016).

Cohen (2013) has succinctly summarized the characteristics of and differences between incubators and accelerators (Table 2.2).

Table 2.2 Key differences between incubators and accelerators

	Incubators	Accelerator
Duration	1 to 5 years	3 months
Cohorts	No	Yes
Business Model	Rent; non-profit	Investment (can be also non-profit)
Selection	Non-competitive	Competitive, cyclical
Venture Stage	Early, or late	Early
Education	Ad hoc, human resources, legal, etc	Seminars
Mentorship	Minimal, tactical	Intense, by self and others
Venture Location	On site	On site

Adapted from Cohen, 2013, p.20

Successful new technology-based firms (NTBFs) play a critical role in the development of local, regional, and national economies through the creation of jobs and the generation of profits (Kiederich & Kraus, 2009; Löfsten & Lindelöf, 2005) and innovations (Acs and Audretsch, 1992). Grilo and Santos (2015) contend that new start-ups face many factors that may threaten their economic potential, for example, the management capacity and the sales and marketing ability, as their founders often have mainly technological skills and competences.

The modern Incubators provide both tangible resources (such as cash, land, buildings, or equipment) and intangible resources (such as patents, trademarks, copyright, experience, or brand) directly to the startup or enable it to access resources externally through the incubator's networks (Eveleens et al. 2017). In sum, Andries, et al. (2019) propound that the specific challenges that are faced by the technology based start-ups during their development typically could be surmounted by incubators as they provide nurturing, instructive and supportive environments for entrepreneurs during the critical stages of a new business start-up.

2.4 Theoretical underpinnings of the concept of high technology entrepreneurship

There is extensive discussion on the different theories that referred to the hi-technology start-ups. The literature which is most relevant to this thesis' objective, which is to identify the determinants of young hi-technology firms, is derived from various subject disciplines such as economics, psychology, sociology, and anthropology and management (Simpheh, 2011; Sayed and Slimane, 2014). The theoretical core elements, criticisms and implications for technology based start-ups are discussed in the following sections.

2.4.1 The Economic Theories

The economic theories have long been used to present a sophisticated understanding of the economic history and economic development in the area of technological revolution in different economic eras. They explore factors that improve entrepreneurial behaviour in high technology businesses. These theories are customarily said to have deep historical roots in the Classical, Neoclassical and Austrian economic theories.

2.4.1.1 Classical Economic Theory

The Irish banker, Cantillon (1755) introduced the concept of entrepreneurship and uncertainty into commerce, economics, and business. The classical movement followed his model with emphasis on provision of the economic variables such as labour, technology, prices, demand-supply, production, and markets.

The classical theory began in the late seventeenth century lauded the value of specialisation, free trade and competition (Ricardo, 1817; Smith, 1776) and moved to a new level of sophistication during the British industrial revolution. The English classical economist Adam Smith wrote 'The Wealth of Nations' in 1776 (Lalonde, 2010) which has influenced economic and social inquiry by mixing fact and theory and testing one against the other. Later, David Ricardo and others followed the same path (O'Brien, 1975) which has influenced economic thought.

Adam's *Wealth of Nations* began a revolution in economic thinking. It became the pillar of capitalism with significant influence on economic problems solving (Butler, 2007). Smith (1971) claims that there are two basic ideas in *The Wealth of Nations*; self-interest and natural liberty. The philosophy of self-interest is related to motivation and conditions to create wealth, while natural liberty is the system to respond to the needs of the nation and the need for government power to affect economic conditions.

Adam Smith theorized about the domestic system or the monopoly of in-house market. His theory illuminates the drawbacks to manufacturers and traders who rely on exports of their goods and services. By contrast, Ricardo was an internationalist who developed the theory of international trade. He believed that national competitors, tariffs, trade barriers and trade wars were the elements of gradual development of capitalism (Canterberry et al., 2013)

The classical theory movement focused on the role of the entrepreneur in the field of manufacturing and product distribution in the competitive market (Say, 1836) and in the modes of production; land, capital and human industry (Murphy, Liao, and Welsch, 2006).

It could be assumed that the classical economic theory extols the virtues of free trade, specialization, and competition.

2.4.1.2 Neoclassical Economic Theory

The Neoclassical theory started around the end of the nineteenth century. Parker, (2008) Neoclassical theory emphasizes the flexible factors of production whereas Classical theory focuses on the fixed supply of land and that in neoclassical theory, the growth rate of the workforce was exogenously decided and entrepreneurial activity was regarded as the vehicle for resources to be transformed into products and services (Murphy et al., 2006). Simpeh (2011) articulated six criticisms of the neoclassical model. First, the theory disregards the uncommon individual level of entrepreneurial activity. Second, it overlooks the future value of innovation. The third criticism is that it ignores the complexity of a market based system. The fourth is that effective based performance does

not include innovation and un-uniformed outcomes: innovation and entrepreneurial activity are not factored into market competition. The fifth is that all inputs and outputs can't be traced in the market place. The final criticism is the notion that entrepreneurial activity will be devastating to the economic system.

Though the Classical and Neoclassical economic theories are different in the context of human capital, nevertheless both are built as the tools of economic analysis on the market-based strategy in the context of innovation that can be utilized in this thesis.

2.4.1.3 Austrian Market Process

The criticisms of the neoclassical theories brought about a new movement known as the Austrian Market Process (AMP) (Ahuja and Lampert, 2001; Simpeh, 2011). In the past century, Austrian economic theory dominated. There are a number of theorists who contributed to the field of dynamics and economic revolution (Keizer, Tieben, and van Zijp, 1997). This theory sought to explain an innovative behaviour at the start-up stage (Endres and Woods, 2003; 2006).

The AMP model is influenced by Schumpeter (1934) who emphasized entrepreneurship as a vehicle in the market-based systems in which firms create new products to meet trends in the market system.

Kirzner (1973) claims that the AMP was based on three main conceptualisations. Firstly, the arbitraging market affords opportunities for some market actors as others overlook the opportunities or undertake suboptimal activity. The second conceptualisation is the alertness of entrepreneurs to the profit making opportunities which entrepreneurs discover and take advantage of. The third conceptualisation, following the argument of Say (1803) and Schumpeter (1934), is that ownership is distinct from entrepreneurship. In other words, entrepreneurship does not require ownership of resources, an idea that adds to uncertainty and risk (Gartner, 2004; Knight, 1921). Opportunities are considered as very unique and previous activity can't predict the outcomes reliably.

The AMP is not without criticism (Simpeh, 2011). Firstly, market systems are related to antagonist cooperation and are not purely competitive. Secondly, monopolies of resources can hinder entrepreneurship and competition. Thirdly, deception and controls are contributing to the activity of the market system. Fourthly, private and public firms are different. However both sectors can be entrepreneurial. The last criticism is that it is possible for non-market social circumstances to happen without competition. Acs and Audretsch (1988) however rejected the study of Schumpeter which stipulated that economies of scale are needed for innovation.

2.4.2 Psychological Theories

The psychological or personal theory analyses the differences of attitude at the individual level (Alam and Hossan, 2003; Landström, 1999) and emphasizes the use of personal characteristics to define entrepreneurship. Some characteristics of entrepreneurs are that they are more opportunity driven, show a high level of creativity and innovation, and have high-level management skills and business know-how (Rauch and Frese, 2000). Personality traits, locus of control and need for achievement (Simpeh, 2011) are found to be closely related to the success of the entrepreneur (Karugu, 2013). New characteristics such as risk taking, innovativeness and tolerance for ambiguity have found to exert positive and significant influence on entrepreneurial inclination (Mohar, Singh and Kishore, 2007).

The Locus of Control theory (LOC) was introduced by Julian Rotter in the 1950s as a significant factor of personality Simpeh (2011). LOC is the personal perception of the main causes accounting for outcomes in life (Rotter, 1966). The person with internal LOC is able to control their life's events, while individuals with an external LOC attribute external factors such as chance and luck or fate to their life's events. Simpeh (2011) revealed that the success of entrepreneur derives from their own individual abilities and outside support.

The need for achievement theory by McClelland (1961) emphasises the need of humans to succeed, accomplish, excel or achieve. There is a relationship between entrepreneurship and achievement motivation (Johnson, 1990).

Achievement motivation might be a factor associated with new venture creation (Shaver and Scott, 1991) because the inner feeling for individual achievement persuades a person to be an entrepreneur (Islam, Islam, and Mamun, 2000) .

2.4.3 Sociological Theories

The sociological model for business focuses on the social context (Simpeh, 2011). The theorist, Reynolds (1991) said that sociological theory consists of social network, the life course stage, ethnic identification and population ecology.

Reynolds examined social networks that focus on building social relationships and bonds. Success should be based on trust than taking advantage of others. The life course stage examines life events and personal characteristics of those who aspired to be an entrepreneur as experience can influence thought and action and may drive people to do something that is more meaningful for their lives. The ethnic identification (Aldrich and Waldinger, 1990; Light and Rosenstein, 1995) asserts that sociological background is the push factor that may determine how far an aspired entrepreneur can go. The last social context, population ecology refers to the environmental factors such as government legislation or politics and policies (Hurley, 1999) , customers, employees and competition which are key factors in the survival of new business ventures.

2.4.4 Anthropological Theories

The anthropological theory introduced by Robert Park in 1982, also called the marginal and tension theory, asserts that the marginal man is doing business because he/she cannot be widely accepted in any society (Alam and Hossan, 2003). This is likely to create more entrepreneurs (Islam et al., 2000) for him/her to live in difference societies. Simpeh (2011) described the theory of anthropology as the study of the origin, development, customs and beliefs of a community and it also urges business to achieve understanding of a complex phenomenon for new venture creation (Lalonde, 2010).

Social and cultural factors have an influence in creating the entrepreneur (Katz, 1991) . Baskerville (2003) claimed that personal ethnicity affects behaviour and

attitude. Culture reflects ethnic, social, economic, ecological and political complexities in individuals (Mitchell et al., 2002). Smith-Hunter et al. (2003) claimed that strong culture beliefs tend to lead to a higher rate of entrepreneurial activity and further influence the entrepreneur and economic performance (Franke, Hofstede, and Bond, 1991). As a result, cultural environments can produce differences in attitude (Baskerville, 2003; Shane, 1993) as well as differences in entrepreneurial behaviour (North, 1990; Shane, 1993, 1994).

The anthropological model states that for a person to successfully start a business, socio-cultural contexts should be considered (Simpeh, 2011) as the diversity and cultural creativity are very important to form new firm venture start-ups (Lee, Florida, and Acs, 2004). The model says that new venture is created by the influence of one's culture. Cultural practices lead to entrepreneurial attitudes such as innovation that also lead to venture creation behaviour.

2.4.5 Resource-Based Theories

Resource based theory (RBT) with its roots in economic theory (Penrose, 1959) is important for business growth and change (Pitelis, 2007) as it highlights the importance of access to resources as a predictor in predicting opportunities for growth of a new firm (Alvarez and Busenitz, 2001). RBT has become one of the dominant approaches used for analysing sustainability of competitive advantage (Barney, 1986; 1991) and in strategic management research (Peteraf, 1993), furthermore it can be used to examine the survive of technological new firms (Geroski et al., 2010).

This theory subsumes the Financial Capital/Liquidity Theory, the Social Capital or Social Network Theory, and *the Human Capital Entrepreneurship Theory* which examine financial, social and human capital (Alldrich, 1999) in the form of experience, knowledge, skills and competencies (Alvarez and Busenitz, 2001), Research and Development (R&D), employee's scientific skills that boost the positive chance on hi-tech start-ups survival (Ugur et.al., 2016, Yang, Bossink and Perverelli, 2017). Financial theory asserts that the man with financial capital is more capable of effectively identifying and exploiting entrepreneurial opportunities and start up the business (Clausen, 2006). Social network theory

stresses the importance of social connections in the opportunity structure (Clausen, 2006). Human capital theory stresses the role of education and experience (Becker, 1975). Education and experience are unevenly distributed through individuals and affect differences in identification and exploitation of opportunities (Ardichvili, Cardozo, and Ray, 2003; Ozgen, 2003; Shane and Venkataraman, 2000; Stevenson and Gumpert, 1985).

2.4.6 Opportunity-based Theories

The opportunity-based theory presents a wide- ranging framework for research on entrepreneurship (Fiet, 2002; Shane, 2000). This model is anchored on two factors; managers' expectation of a future stage of change and growth and their own perceived power and capability to achieve goals (Stevenson and Gumpert, 1985; Stevenson and Jarillo, 2007; Stevenson, Roberts, Grousbeck, and Bhide, 1994).

The theory is rooted in classic entrepreneurship literature (Park, 2005). Identifying and selecting the right opportunities for new ventures are the most significant capabilities of successful entrepreneurs (Stevenson et al., 1994). In addition, Ardichvili et al. (2003) and Ozgen (2003) claim that successful firm creation follows a successful opportunity development process and opportunity recognition. Ardichvili et al. (2003) and Ozgen (2003) further examine the core process of opportunity recognition and development which included personality traits, social networks, entrepreneurial alertness, prior knowledge (Ardichvili et al., 2003; Stevenson and Gumpert, 1985). Shane and Venkataraman (2000) show that information corridors and cognitive properties are the key factors to determine the discovery of opportunities by entrepreneurs. To sum up, the opportunity theory explains how businesses identify and exploit the opportunities created by change (Moreno, 2008) for their future stage of change and growth.

2.4.7 Behavioural Theories

Behavioural theory examines behaviour to see how people act (Robbins and Coulter, 2007). It is important for firm growth and change (Pitelis, 2007). The behavioural theory studies the entrepreneurial actions which are a complex

institutional phenomenon take place in the marketing processes (Bateman and Crant, 1993; Endres and Woods, 2003; Hébert and Link, 1988). In addition they pointed out that behavioural theorists share an interest in heuristics which highlight the role of prior micro-level knowledge at the discovery stage (Endres and Woods, 2003).

Tipu and Arain (2011) claimed that entrepreneurial actions are associated with the behaviour of successful entrepreneurs. Mair (2005) described this theory as encompassing a set of activities performed by entrepreneurs. These include preparing the business plan, competency cognition for start-up planning, overconfidence and representativeness heuristics for managing risk, gaining professional intruder assistance for learning, improving business relationships with suppliers for networking and beneficial credit policies, and engaging owner-related and delaying-payment methods for managing finance.

2.5 Innovation

Innovation is believed to be a crucial facilitator of financial growth (Simmie, 2004). The concept of Innovation in economic activity started at the beginning of the twentieth century or during the neo-classical economic theories period (Domar, 1946; Harrod, 1939) and is considered as a crucial component of entrepreneurship by many scholars such as Schumpeter (1932), Knight (1942), Kirzner (1973) and Schultz (1975). Innovation is one of the crucial competitive advantages of firms (Chapman and Hyland, 2004; Hamel and Prahalad, 1990) and plays a big role in the dynamic business environment (Huang and Wang, 2011). Simmie (2004) argued that innovation is the key driver of competitiveness and productivity.

Hi-technology industry is a key business field associated with and necessary for economic growth activity in the future (Petrauskaite, 2009) because this business type is capable of changing the environment landscape (Mohrman and Glinow, 1986) and innovate always (Shanklin and Ryans, 1984; MacInnis and Helslop, 1990). Innovation based on the strength of research and development (R&D) can create the differentiation and catch up with the latest technology trend of the

competitors (Van and Uyen, 2017). Thus fostering innovation in high technology firms is a challenge for entrepreneurs.

Schumpeter (1934) believed economic change was related to innovation, entrepreneurial activities, and market power. In addition, He asserted that innovation-initiated market power could offer better outcomes than hidden hand and price competition. Schumpeter was also convinced that technological innovation that often produces temporary monopolies which generate irregular profits, will sooner or later be eroded by competitors and imitators. However, these temporary monopolies were essential to bring the incentive necessary for businesses to improve their new products and processes (Pol and Carroll, 2006).

The research into firm and entrepreneur characteristics that are associated with the behaviour and strategy of innovative start-ups has established the importance of firm characteristics for innovation. Firm size, location, organizational form and an entrepreneurial attitude are associated with a firm's innovativeness (Sundbo, Orfila-Sintes, and Sørensen, 2007; Robson, Haugh, and Obeng, 2009). Knowledge management is also associated with innovative behaviour (Sundbo, Orfila-Sintes, and Sørensen, 2007; Palacios, Gil, and Garrigos, 2009). At the individual level, business ownership experience is associated with a higher likelihood of innovative behaviour, as is portfolio entrepreneurship (Robson et al., 2012). Other individual characteristics, such as the education level of the entrepreneur, are also positively related to the extent of innovation (Robson, Haugh, and Obeng, 2009).

The Innovation process

The term 'innovation process' is defined as a chain of stages. It starts with an idea, follow by product development, then the launch of the products/services to market (Cooper and Kleinschmidt, 1995, cited in Aarikka-Stenroos, Jaakkola, Harrison, and Mäkitalo-Keinonen, 2017).

2.6 Determinants of entrepreneurship

This research examines the key characteristics synthesized from the various theories reviewed that have been shown to be associated with the survival and growth of new ventures that enhance economic growth and eventually bring forth national and regional growth (Coviello and Josph, 2012, Aarikka-Stenroos and Lehtimaki, 2014, Nalintippayawong et al.,2018).

The review of the literature has identified a range of determinants of entrepreneurial decisions and success and subsequently they are used in the study. The characteristics that have been selected by this study are entrepreneurial demographics, firm characteristics, skills and competencies, research and development, products characteristics, market development, financing, and internationalisation as summarizing in Table 2.3. The derivation of these determinants from the various theories discussed will be elaborated in greater detail in the following sections.

Table 2.3: Key characteristics underpinning the entrepreneurial Innovative Process

Key Characteristic	Underlying Factor
Entrepreneurial Demographics	Education, Experience, Entrepreneurial founding team
Firm Characteristics	Age, Size, Ownership structure
Skills and Competencies	Scientific knowledge, Business qualification
Research and Development and innovativeness	Incremental or disruptive change, R&D inputs, Customization, New or established
Product/Service Characteristics	Best-selling product/service, Product/service portfolio, Technological content of product/service, Novelty
Market Development	Number of customers, Market size, Number and type of customers, Domestic or international markets, Who is customer, Timing of first international sales

Financial of the firm	Debt, Equity, Personal inputs
Internationalization	Exporting, Export markets, Type of country sell in, Mode of international sales, Use of foreign agents

Source: Binnui (2016, p.37)

2.6.1 Entrepreneurial Demographics

The entrepreneurial demographics is drawn from the study by Knight (1921) and Schumpeter (1934) who focused on the characteristics of the start-ups' founder as they were possibly a driver for the new firms' growth (Gilbert, McDougall and Audretsch, 2006). In this research the demographic factors used to predict growth include education and experience (human capital), and the entrepreneurial founding team. The psychological and opportunity identification theories claim that the entrepreneurs' prior knowledge (Stevenson and Gumpert, 1985) leads to entrepreneurial alertness to business opportunity (Ardichvili et al., 2003), while prior experience influences the entrepreneurial process (Marquis and Tilcsik, 2013; Mathias et al, 2015). They are able to shape the behaviour, attitudes and motivation of entrepreneurs (Higgins, 2005, Mathias et al, 2015) and enable them to have a clear vision of uncertainty (Minniti and Bygrave, 2001) that can allow them to evaluate the opportunities in the new business situation better (Colombo and Grilli, 2005). That is why it is an important driver for entrepreneurial achievement (Stevenson et al., 1994)

According to the resource-based theory (Becker, 1975) the two human capital factors, experience and education, associate with entrepreneurship (Evans and Leighton, 1990). These factors help the entrepreneur to identify and exploit an entrepreneurial opportunity for a new venture (Ardichvili et al., 2003; Ozgen, 2003; Shane and Venkataraman, 2000; Stevenson and Gumpert, 1985) to stimulate the growth of a region (Jacobs, 1961; Lucas, 1998). Specific personal characteristics (Landström, 1999) are found to link to successful entrepreneur (Karugu, 2013).

Several empirical research studies have concluded the importance of entrepreneurial characteristic factors to predict entrepreneurship and business

success. The human capital factor is an important driver for young firms' survival and improving their economic performance (Acs, Armington, and Zhang, 2007; Bates, 1990; Gimeno, et. al., 1997). The empirical research studied a panel of industries across twelve OECD countries found that human capital plays a significant role in productivity growth for countries (Griffith, Redding, and Van Reenen, 2004) in both specific and formal human capitals as they are correlated to the outcome of radical innovation (Marvel and Lumpkin, 2007). Other research stated that human capital fosters entrepreneurship in high-technology firms. For example, Massimo. Colombo and Grilli (2010) claimed that human capital is an important driver for the growth of innovative start-ups. In addition, Lussier (2000), in a comparative research of US and Croatian entrepreneurs found human capital factors such as experience and education are both significant variables for US firms but not for European entrepreneurs in predicting the success and failure of business. Moreno (2008) also used these critical variables to analyse the entrepreneurial opportunity identification of new Spanish ventures. He concluded that both factors were related to the identification and exploitation of opportunities. Kundu and Renko (2005) examined the characteristics of entrepreneurs to explain the export performance of Indian and Finish innovative firms and found that, in general, entrepreneur characteristics such as educational background, technological innovativeness, and strategic orientation of the entrepreneur are to some extent more important in explaining successful export performance.

The founders' experience is typically an indicator of enterprising success (Staniewski, 2016). Their prior experience has a beneficial impact on firm survival, performance and growth (Bürgel et. al., 2000; Lechner and Gudmundsson, 2014; Altinay et al., 2015), for example, industry experience, can raise the entrepreneur's awareness of industrial trends and reduce technological unreliability (Delmar and Shane, 2006). Moreover it can improve the founder's perception of the macroeconomic condition on industrial growth and performance (Mekhail et al., 1997) which is a critical consideration in high technology firms (Cassar, 2014). While, commercial or technical educational background provided more opportunities for UK new innovative firms to receive funds from external finance (Ganotakis, 2010). The same result was found in the survey of Italian young hi-tech entrepreneurs, those with greater prior work experience in

technical areas and university level education in management and economics (Colombo, and Grilli, 2005) had more chances to receive Venture Capital support (Colombo, and Grilli, 2010). Industrial and marketing experiences are also considered important drivers for business success for new innovative industries in the United States (Song, et al.,2008).

Also, in Italian ICT start-ups the higher level of the entrepreneurial founding team's work experience strengthens the firms' survival in the industry (Grilli, 2011). The same trend was found in Norway and Sweden too. Aspelund, Berg-Utby, and Skjevdal (2005) found in their survey that in addition to the founding team's experience, technology radicalness was important for the survival of innovative firms. A study of Israeli new technology firms found that managerial experience of the founder was a significant driver of the success of the business (Chorev and Anderson, 2006).

To sum up, the characteristics of management team expounded by the resource based-view of firm (Barney, 1991; Teece et al., 1997) has a strong effect on business outcomes (Hambrick, 2007). They are the important vehicle to determine business success (Wright et al., 2007; Colombo and Grilli, 2005) and growth of young firms (Birley and Stockley, 2000; Colombelli, 2016) because the characteristics promote the innovativeness and creativity that effects the rate of firm growth (Colombelli, 2016).

2.6.2 Firm characteristics

Several studies have examined the characteristics of new firms (e.g., Stinchcombe, 1965; Carroll, 1984; Brüderl, Preisendörfer, and Ziegler, 1992; Audretsch and Mahmood 1995; Taymaz and Ozler, 2007) such as age, size and ownership structure in relation to the growth of young firms.

Lussier (2000), in her study of US businesses found that age is one factor that influences success and failure prediction. The age of the firm is positively correlated with survival Other studies of firms in Spain (Calvo, 2006), United Kingdom (Dunne and Hughes, 1994), Japan (Yasuda, 2005) and the United States (Evans, 1987a) concluded that the firm's age is a positive indicator of

business survival. In contrast age appears to have a negative impact on growth of firms because old firms grow less than their younger counterparts.

In contrast to Gibrat's law model, the size of new firms is negatively correlated with survival and growth (Audretsch et al., 1999; Evans, 1987a, 1987b; Goddard, Wilson, & Blandon, 2002; Hall, 1988; Hart and Oulton, 1996; Lotti and Santarelli, 2004). The research of Calvo (2006) investigating young Spanish innovative firms found that small firms grew faster than larger ones. There are studies that claim that business growth is typically determined by the size of firms at start-up (Almus and Nerlinger, 1999) and that firm size is significantly linked to better business performance (McMahon, 2001). Many studies found a positive link between size and survival (Agarwal and Audretsch, 2001; Audretsch and Mahmood, 1995; Mata, Portugal, and Guimaraes, 1995). However there are studies that found no correlation between size and firm growth. (see Audretsch, 1995; Wagner, 1992). Meanwhile, Agarwal and Audretsch (2001) found that smaller firms in the US had a lower rate of survival than their larger counterparts and that size and business survival are formed by the technology and the stage of life-cycle of new firms.

Studying the relationship between size, age and entrepreneurial structure, in Germany, Almus and Nerlinger (1999), stated that age, size and technical state allow hi-tech firms to grow faster than non-innovative firms. Audretsch and Mahmood (1995) concluded that size and entrepreneurial structure influence the survival of US manufacturers. Colombo, Delmastro, and Grilli (2004) found in Italian young enterprises, the year of prior experience in the same industry, and managerial and entrepreneurial experience have a positive relationship with firm size and business survival. Firm specific characteristics, such as the degree of human capital, both generic human capital, such as the formal educational degree of the founders, and specific human capital, such as successful entrepreneurship, of the founding entrepreneurs (Astbro and Bernhardt, 2005; Colombo, Delmastro and Grilli, 2004; Colombo and Grilli, 2005), influence the start-up size of new firms

Turning to the link between firm size and innovation behaviour, Sternberg and Arndt (2001) found that firms' characteristics are more important to determine

the innovation behaviour of European firms than other external factors. Internal factors such as firm size influenced the scope and nature of innovation as it correlated strongly with the quantity and quality of R&D, marketing and high number of qualified employees.

The size of start-ups also is related to the level of internationalisation (Bloodgood, Sapienza, and Almeida, 1996; Preece, Miles, and Baetz, 1999; Zahra, Ireland, and Hitt, 2000). Small firms have limited product ranges and maintain a narrow network distribution, face obstruction to enter larger markets, while the larger counterparts gain more advantage to go international due to the ability to offer greater diversity of products (Carroll, 1985). The bigger firms establish more connections (Porac, Thomas, Wilson, Paton, and Kanfer, 1995) to support entry to international markets (Fernhaber, Gilbert, and McDougall, 2014).

Lastly, research in the US on new hi-tech ventures by Song et al. (2008) indicated that the size of the founding team is also a crucial factor for the success of a business. The firms founded by a team grew faster than firms established by a single person because insufficiency of individual know-how could be compensated by other managerial team members' knowledge (Eisenhardt and Schoonhoven, 1990; Reynolds, 1993; Storey, 1994).

2.6.3 Skills and competencies

The other human capital factors including knowledge/skills and competencies are also important characteristics in defining entrepreneurship (Ardichvili, Cardozo and Ray, 2003) and are the vehicle of opportunity to derive a higher level of creativity and innovation (Marvel, Davis and Sproul, 2016).

Human capital such as skills and competencies support the acquisition of new knowledge and assist in the creation of advantage for the start-ups (Bradley, McMullen, Artz and Simiyu, 2012). Many scholars claim that the most important skills of new start-up firms to enhance their performance are managerial and technical/scientific skills (Almus and Nerlinger, 1999; Colombo and Grilli, 2005). In addition, Littunen and Niittykangas (2010) found a significant correlation between the founder's know-how and high growth in young firms during years

one to four in Finland. Geroski et al. (2010) and believe that employees with scientific skills have a positive enhancement to the firms' performance and survival, particularly in the new hi-technology firms (Koch et al, 2013) and technical and engineering skills affect the technical orientation of firms (Storey and Tether, 1996). The study by McKelvie, Wiklund, and Short (2007) on Swedish start-ups firms found that technological and mechanical knowledge of new firms are the greatest conditions for improving the innovative efficiency of firms. The entrepreneurs who are highly educated in sciences and engineering are more capable to learn and implement new technical knowledge (Ohyama, 2007), create more innovative products and services (Boyer and Blazer, 2014) and response quickly to new technology and market changes (Gimmon and Levie, 2010). These have made it more difficult for rivals to imitate them (Autor, 1998). Consequently, the firms that employed highly skilled employees are less likely to exit (Geroski et. al. 2010).

2.6.4 Research and development and innovativeness

Research and Development (R&D) plays a significant role in the transfer of technology and innovations (The World Bank, 2010) and it promotes positive performance and survival particularly in hi-technology start-ups (Esteve-Perez and Manez-Castillejo 2008; Giovannetti et al., 2011; Ugur et al. 2016). There are a number of studies in developed and developing countries examining the effect of R&D and technological industry. Griffith et al. (2004) studied productivity growth in twelve OECD countries and they found that R&D is an important driver for both technological catch-up and innovation by acquiring knowledge through learning-by-doing. R&D showed a correlation with export activity in service firms in West Germany (Vogel and Wagner, 2012) and technological innovativeness is one of the crucial drivers for the success of export performance of Indian and Finish enterprises (Kundu and Renko, 2005). Innovation strategy impacted on innovative enhancement for hi-tech industries in India (Manimala, Jose, and Thomas, 2005). Companies which invest more on R&D can maintain technological leadership (Maidique and Hayes, 1984).

Incremental innovation in R&D encourages strategic development in developing countries. In a study on innovation and entrepreneurship in Ghana using a

multilevel theoretical framework to analyse the different types of innovative activity related to the characteristics of the entrepreneur found that incremental innovation is considerably important for the firm (Robson et al. (2009). Moreover, Maidique and Hayes (1983) stated that the entrepreneur who concentrates on one or two technological polices tend be the most successful and minimize risk.

In conclusion, R&D can be considered as a part of innovation theory as it is linked to new science and technology (Rothwell, 1991) and enhances competitive advantage (Hamel and Prahalad, 1990; Chapman and Hyland, 2004) and market power for a better outcome (Schumpeter, 1934). When the young hi-tech firms use R&D resource efficiently to enhance their innovation capacity, they can provide a helpful framework for industrial survival and be more competitive in the market (Buddelmeyer, Jensen and Webster, (2010). Therefore, the more investment in R&D resources, the higher the firms' survival rate (Dzhumashev, Mishra, and Smyth, (2016).

A number of theoretical arguments suggest a positive link between innovativeness and subsequent survival: In addition to making entry possible, innovativeness enhances firms' market power (Schumpeter, 1934), improve their ability to escape competition (Porter, 1985), reduce their production costs (Cohen and Klepper, 1996a, 1996b), improve dynamic capabilities (Teece et al., 1997), and lead to enhanced absorptive capacity (Zahra and George, 2002). However, another set of theoretical arguments suggest that the link may also be negative: Pursuing innovations leads to riskier, more complicated, and less linear start-up processes (Samuelsson and Davidsson, 2009) and (potentially) to more skewed returns (Scherer and Harhoff, 2000). An innovative startup may face a greater liability of novelty than its non-innovative counterparts (see, e.g., Amason et al., 2006). Other scholars argue that such firms suffer from having few collateralizable assets and long and uncertain payback times (Brown et al., 2012; Minetti, 2011). Therefore, innovative startups have more limited access to external financing, which leads to a greater likelihood of failure (Berger and Udell, 2006). Moreover, entrepreneurs who believe that they are exceptionally innovative may have a particular exit strategy in mind (e.g., DeTienne et al., 2015) and may, as a result, seek to increase the firm's risk profile to achieve the desired exit.

The prevailing view in the empirical literature appears to be that there is a positive association between the innovativeness of firms and their subsequent survival (Arrighetti and Vivarelli, 1999; Audretsch, 1995; Calvo, 2006; Cefis and Marsili, 2005, 2006, 2011, 2012; Colombelli et al., 2013; Helmers and Rogers, 2010; Wagner and Cockburn, 2010). Nevertheless, there is emerging empirical evidence suggesting that these results may be context-dependent and not necessarily applicable to younger firms (Boyer and Blazy, 2014; see also Cader and Leatherman, 2011; Reid and Smith, 2000).

2.6.5 Product characteristics

The various aspects of product characteristics considered in this research are best-selling products, product portfolio and the technological content of products.

Production has been described in the Classical and Neoclassical economic theories and is regarded as the vehicle of changing resources into new product and services (Murphy et al., 2006). Furthermore, the innovation and resource-based theories also propound that product characteristics help the entrepreneur to access resources, predict opportunity for firm growth (Alvarez and Busenitz, 2001) and sustain competitive advantage (Barney, 1986) by producing temporary monopolies (Pol and Carroll, 2006).

The importance of technological product characteristics has been established in many studies (e.g. Bürgel et al., 2000; Beamish et al., 1993; Katsikeas et al., 1997). The technological sophistication of products has probably impacted the growth rate of UK and German hi-tech start-ups (Bürgel et al., 2000). In addition, the initial adoption of technological strategy to integrate production lines with new complementary products (Nambisan, 2002) determine business efficiency in young US software ventures. Research on innovative firms in Russia showed that businesses which produce better technological products and enter the market later, performed the best (Bruton and Rubanik, 2002). However, Kakati (2003) states that product criteria alone does not lead to business success. It is also important to meet the needs of customers and develop multiple resources for strategic success.

2.6.6 Market development

This research focuses on factors such as number of customers, size of market, number and type of customers, and domestic or international markets in the examination of market development.

The sociological theory underpins market development. This theory focuses on the survival of business by considering customers and competition (Reynolds, 1991). The Austrian market process theory also places an important role on the function of the market-based system (Schumpeter, 1934; Simpeh, 2011) and states that it is crucial for firms to create their new products to meet the trends of the market system. The opportunity base theory predicts that firms which exploit existing market knowledge and new technology market knowledge can gain more growth than firms that rely on new market knowledge (Saemundsson and Dahlstrand, 2005).

Gungaphul and Boolaky (2009) in a study of Mauritius island entrepreneurs found that the function of marketing was significant for their business achievement, whereas Song et al., (2008) said the scope of marketing is considered as a crucial driver to the success for US innovative start-ups. The Challenge in marketing management for hi-tech firm is to work in tandem with R&D (Bender, 1986). The firm needs to find a balance between 'technology push' and 'market pull' within the context of innovation planning (Benkenstein and Bloch, 1994, p. 15). Innovative industries require a period of time to work on the technological development to effect competitive advantage to achieve market position (Roberts, 1989). Companies entering the market earlier than rivals need to adopt an oriented-competitive strategy to meet the industry standard as fast as possible because the followers are also raising their level to meet customers' demand. If a company fails in this regard, it will need to cut prices aggressively as there will be a competition taking place in the market system and. (Benkenstein and Bloch, 1994).

2.6.7 Financial Resources

Financing has long been reviewed in economic literature (Giudici and Paleari, 2000; Westhead and Storey, 1997). Resourced-based theory (Aldrich, 1999) and behavioural theories (Tipu and Arain, 2011; Aldrich, 1999) state that financial capital enables entrepreneurs to get more resources to start their own businesses. Financial resources support the growth of start-up firms (Cooper, Gimeno-Gascón, and Woo, 1997; Doutriaux, Simyar, and Administration, 1987). Many new entrepreneurs operate with limited resources (Ebben and Johnson, 2006; Hanlon and Saunders, 2007), the availability of financial resources is one of the main contributors to new firm's achievement (Martin and Justis 1993). Tipu and Arain (2011) highlighted the benefits generated by credit policy, payment method and financial management for owners. A firm with a stronger resource base is more likely to survive (Hanlon and Saunders, 2007).

Much research has recognized the importance of the financial issue for new firms. The mode of financing influences its fundamental contribution to young hi-tech firms (Denis, 2004; Gompers, 1995; Kaplan and Stromberg, 2001; Sahlman, 1990). Young hi-tech firms seem to face serious problems to access external financial sources, especially debt financing (Carpenter and Petersen, 2002; Colombo and Grilli, 2007). Therefore, the capacity to get more resources by the founding team is very important to the competitiveness and growth of firms (Jones et al., 2001; Zahra and George, 2002).

Ganotakis (2010), in his research of UK hi-tech new ventures, claims that financial capital is typically an important factor for business survival and growth. Similarly, for US innovative start-ups, financial resources are typically a crucial driver for business success (Song et al., 2008). In addition, Colombo et al. (2007) found that the competency of Italian young innovative founders affected their ability to access venture capital. Start-ups which have a high quality of human capital, have a better chance to be selected by Venture Capital (VC) investors (Fried and Hisrich, 1994; MacMillan et al., 1986; Shepherd et al., 2000; Tyebjee and Bruno, 1984).

2.6.8 Internationalisation

Internationalisation is defined as “the process of adapting (the) firms’ operations (strategy, resource, etc.) to international environments” (Calof and Beamish, 1995, p.116).

International competition for UK and German firms is significantly high and the frequency of exporting overseas increases over time (Fier, Licht, and Murray, 2001). The study by Coeurderoy, Cowling, Licht, and Murray (2011) on the effect of internationalisation on survival of young innovative firms in the UK and Germany concluded that a good relationship between customer and suppliers produce a higher chance of survival. German start-ups with good supportive networks and founders with a broad network and more social support tend to survive and achieve more growth (Brüderl and Preisendörfer, 1998). Bürgel et al. (2000) which investigated UK and German innovative start-up firms found that entrepreneurs who sell overseas gain greater sales growth than those who sell only in the domestic market. A study on US technology start-ups illustrated that the factors of size, R&D and prior experience raise the capacity of international competitiveness (Fernhaber et al., 2007).

New entrepreneurs that enter international markets earlier are proliferating (Baum et al., 2011). Internationalisation can help the start-ups in the technology sector to have a longer life span in the business market (Koch, 2017). Oviatt and Mcdougall (cited in Autio, 2005) found that Internationalisation brings a business to positive performance in the long run through value creation. Superior product and R&D activities lead to a firm’s success because they help the firm to distinguish itself from rivals when selling abroad (Fryges, 2009). However, research on Chinese enterprises found that entrepreneurs who have prior significantly experience exporting with large networks are less likely to start exporting early because they think internationalisation at the early stage may harm the firm’s development (Naudé and Rossouw, 2010).

Thus, it will add to our knowledge to find out whether the new hi-tech firms, especially those in the developing countries, which embark on internationalization are more probable to survive and grow than those which don’t.

2.7 Entrepreneurship in Thai Hi-Technology firms

The study of Thai hi-technology firms in this research is based on the following reasons.

Innovation by new firms is critical for developing nations. (Szirmai et al., 2011). There are many small firms in the knowledge-intensive sector in Thailand and it is essential to obtain information on the determinants of growth of these companies to further assist the development the sector and government policies. In addition, the statistics are accessible and available for use at a practical level. Chepurenko (2015) argues that our new knowledge on entrepreneurship is mostly derived from analyses of well-functioning and sustainable market economies. Are the approaches, concepts and the results in particular of such a 'Western-centric' theory relevant for other types of environments? In addition, "Entrepreneurship in developing countries is arguably the least studied significant economic and social phenomenon in the world today" (Lingelbach et al., 2005, p. 1). The issue of entrepreneurship in developing economies still remains as an under-researched phenomenon (Naudé, 2008).

2.7.1 Entrepreneurship in Thailand

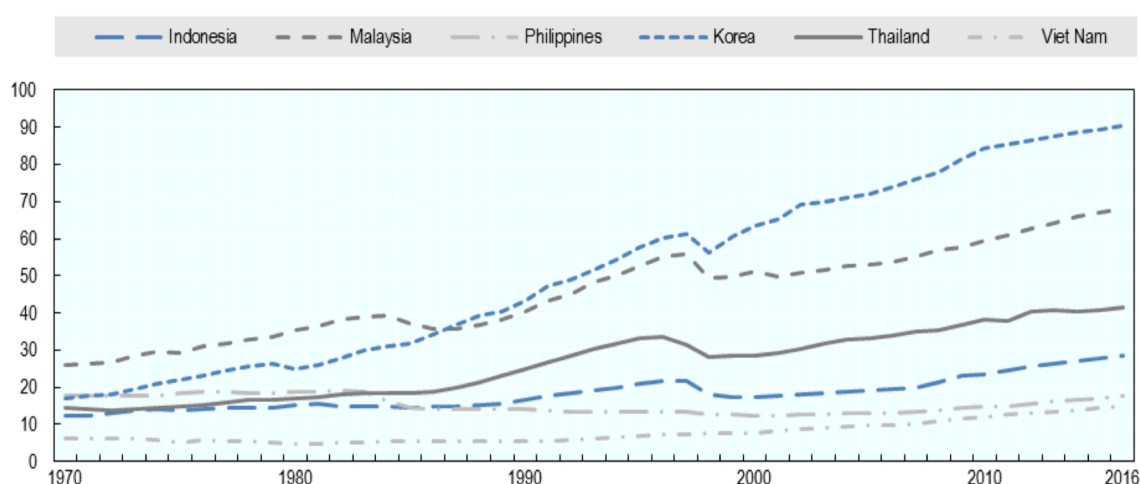
Entrepreneurship and innovation are considered as fundamental for technology creation and mobilization crucial for a country's development process as they are the vehicles driving economic growth. The OECD (2011) provided an entrepreneurship profile of Thailand. According to the OECD survey, Thais have a positive perception of entrepreneurs with 87.5 percent of the participants saying that entrepreneurship is a pleasing career choice and 83.3 percent saying that successful entrepreneurs have a higher level of status. Nevertheless, over 50 percent were apprehensive to start their own business due to fear of failure. (OECD, 2011).

2.7.2 The profile of Thailand economy

According to Global Entrepreneurship Monitor (GEM) Thailand report 2016/17, Thailand contain a population of 67.9 million, with a gross domestic product

(GDP) of USD 5,814.80 per capita in 2017 is ranked as a middle-income country, ranks as the 4th largest economy in Asian Nations (ASEAN) after Singapore, Brunei Darussalam and Malaysia (Guelich, 2018). Thailand has achieved a substantial growth rate in GPA (Koen, et al., 2018). Between the year 1970 and 2016, Thai GDP growth per capita averaged 4.2% per year in purchasing power parity terms, with income per head reaching 42% of the OECD average in 2016 (Figure 2.1)

Figure 2.1: GPA per capita, percentage of OECD average, computed at 2016 PPP USD



Source: Conference Board, (2017)

In figure 2.1, it found that between the year 1970 and 2016, Thai GDP growth per capita averaged 4.2% per year in purchasing power parity terms, with income per head reaching 42% of the OECD average in 2016.

Thailand experienced a marked slowdown in economic growth caused by the Asian financial crisis in 1997/98 with annual growth under 5 percent during the years 1999-2008. However, the Thai GDP growth rose to 2.83 percent in 2015 (The Global Entrepreneurship Monitor, 2017). It recovered from the crisis relying on increasing exports which counted for more than two-thirds of GDP (OECD, 2013) and the overall justification of the ASEAN Economic Community (AEC) is to raise a region with “sustained economic growth, accompanied by lasting peace, security and stability as well as shared prosperity and social progress” (ILO and ADB, 2014, p.1). In 2014 Thailand’s economy expanded only by 0.7 percent, suffered from owing to internal and external constraints that unsecured

growth, even later the economy recovered gradually after the easing of political uncertainty in Thailand, (Bank of Thailand, 2015). However the economy expanded by 2.9 percent in 2015 and then rose to 3.2 percent in 2016, which is underpinned by the private consumption and services exports (The World Bank, 2017). By 2037 Thailand has ambition to become a high-income economy (OECD, 2019).

The Thai economic recovery was sluggish in 2014. Its export stayed weak due to China, Japan and Europe, its major trading partners, weak economic conditions (Bank of Thailand, 2015). Thai exports benefited from the economic recovery in the US and the EU (World Bank, 2014) as the Thai economic growth is dependent on the pace of global recovery. However, after the continued Thai economic recovery since 2015, the economic indicators show that the products export improvement became increasingly broad-based and sustained in 2017 (The World Bank, 2017).

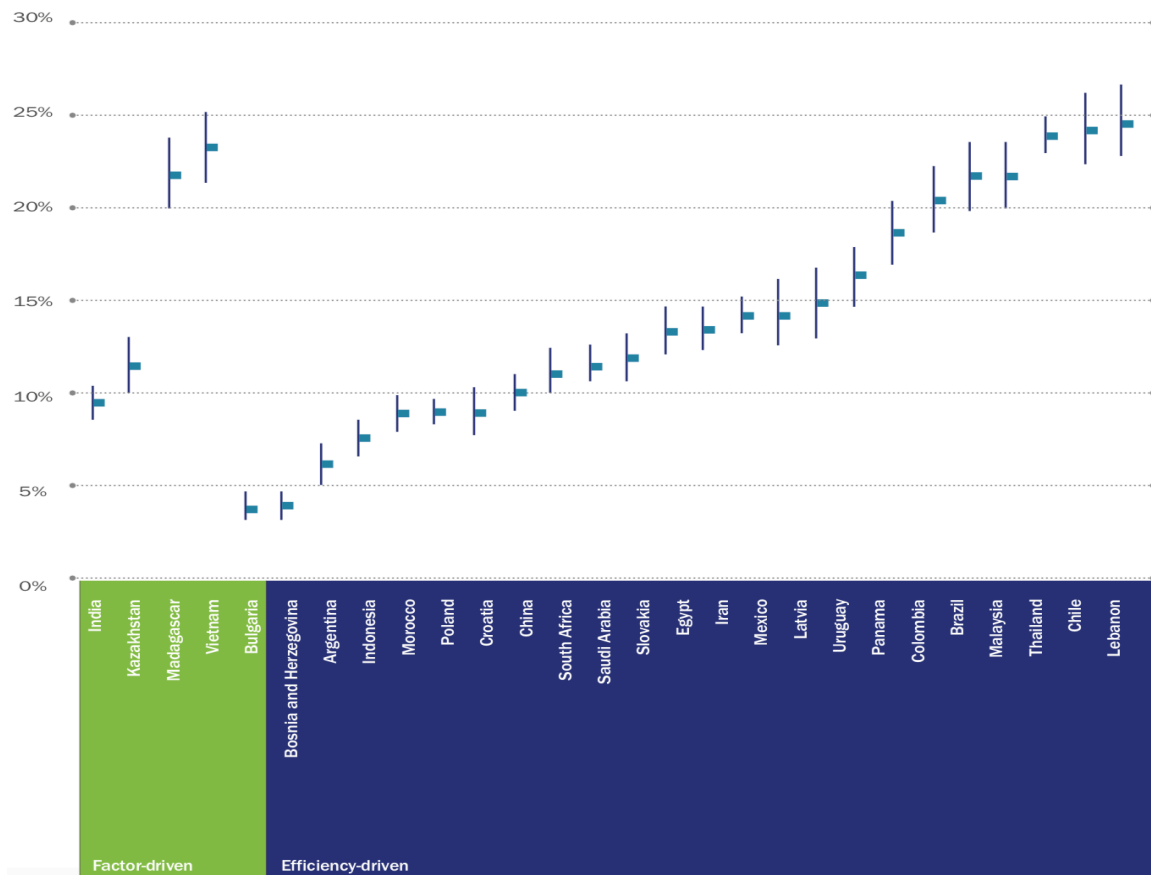
The core business unit in the production and services sectors in Thailand is the Small and Medium-sized Enterprises (SMEs). SMEs are defined as firms with less than 200 employees and fixed capital of less than THB 200 million (USD 6.17 million) (OSMEP, 2012). SMEs represent about 42 percent of Thailand's GDP, mostly in services and manufacturing (Koen, et al. (2018). It constituted 2,736,744 or 99.73 percent of the total number of businesses in Thailand and the majority of the business is small size, accounting for 99.26 percent of the total number enterprises employed 11.8 million people or 80 percent of the labour force. Bangkok had the highest number of SMEs totalling 541,257 or 19.8 percent of all SMEs (OSMEP, 2016). The population of SME's across the region is uneven. Two-fifths of SMEs are located in Bangkok and metropolitan provinces and the number of SMEs in the rest of the country lags way behind (OECD, 2013).

2.7.3 Thailand's profile of innovation

The annual Global Entrepreneurship Monitor (GEM) surveys are the world's largest regular study on entrepreneurship, The GEM 2017/18 in figure 2.1 shows the differences in the Total Entrepreneurial Activity indicator (TEA) rates are lowest among economies in the innovation-driven economies, and highest

among efficiency- driven economies. Thailand has one of the highest group rankings of entrepreneurship in the world as measured by GEM (2018). Its TEA at approximately 24 percent, was the third ranking among 54 countries in 2017, after Lebanon and Chile with approximately 24.50 and 24.50 percent respectively (The Global Entrepreneurship Monitor, 2018) (see figure 2.2).

Figure 2.2: Total early-stage Entrepreneurial Activity (TEA) for 54 economies, grouped by phase of economic development, GEM 2017



Source: GEM survey dataset, The Global Entrepreneurship Monitor (2018, p.34)

Majority of the enterprises in Thailand, 2,989,378 enterprises from the total number of 3,013,722 enterprises, is small business (OSMEP, 2017). They achieve business growth via upgrading and developing technology which enable the production process to produce products with low cost and of better quality (Munkongsujarit, 2018).

In the past, it was found that approximately 56 percent of the respondents introduced similar product as other existing businesses. Fifty four percent did not offer new products and 45 percent did not make any use of novel technology

(table 2.4). Though Innovation is the way to survive and adapt to changing circumstances, Thai companies' capacity for Innovation was ranked 70 out of 144 countries, with the capacity to innovate is weighted at an average of 3.7 point out of 7 as reported in the World economic forum in 2014.

Table 2.4: Novelty of products and services and technology use

	Product new to customers, %			Business offering same product, %			Use of technology, %		
	To all	To some	To none	Many	Few	None	Very latest ¹	New (1-5 yrs)	Not new
Thailand	6.8	39.3	53.9	55.6	34.8	9.6	23.8	31.7	44.5
India	5.6	23.6	70.8	61.4	38.7	0.0	13.4	25.7	60.9
China	13.8	59.2	26.9	82.1	12.8	5.1	8.6	22.7	69.7
Japan	11.9	36.0	52.0	66.1	32.4	1.5	8.7	31.9	59.5
USA	14.5	34.8	50.7	38.7	44.0	17.3	12.9	24.3	62.9

Source: OECD Studies on SMEs and Entrepreneurship in Thailand, OECD (2011, p.35)

Based on the report of the World Bank (2014), Thailand's R&D spending and R&D workers number are the lowest in the region with average growth behind Malaysia and China, later there has been found that Thailand pay insufficient attention into innovation especially Thai SMEs sector that is the reason from lack of creative activity (Charoenrat and Harvie, 2017). However, R&D is always considered an important factor for Thai firms.

2.8 The research conceptual framework

2.8.1 Introduction

Innovation and entrepreneurship not only function as important drivers of the development process of firms which assist national and regional economic growth but also are considered as the fundamentals of technology creation and mobilization use by the entrepreneurs in both the developed and developing economies to access the technology in the world. New firms are more likely to innovate (Audretsch, 1995) and foster regional growth (Reynolds, 1993) due to the entrepreneur's ability to exploit technological innovation and bring sustainable economic performance (Cohen, 2010). Typically, in developing

countries, innovation plays an important role (Markusen, 1987) in the introduction of new products and services to the market by businesses (Li and Atuahene-Gima, 2002). As a result, the innovative process allows the businesses to build up technological capabilities that will allow them to enhance their innovation and consequently innovate better than other firms (Dosi, 1982).

In the past two decades, small knowledge-based, high-technology firms had been crucial for modern economies (Coad et al., 2014) and they have been classified as the vehicles for innovation, wealth creation and growth (Protogerou, Caloghirou, Vonortas, 2017). These small knowledge-based hi-tech firms can make a positive contribution to economies by increasing productivity, creating new markets, and expanding employment opportunities (Cowling, 2006). The research by Almus and Nerlinger (1999) concluded that small and medium size new high-tech enterprises are proliferating.

Despite the various literature on exploratory studies that have been addressed the measurement and achievement of young hi-tech firms, very little research has focused on factors which lead to the survival and growth of small innovative firms and contribute to firms' performance, (Coad et al., 2014).

Therefore, to fill the earlier research gaps, the core theories of entrepreneurship, innovation and firm growth have been used in this thesis to create a conceptual model for investigating three main areas: namely, the characteristics of Entrepreneurial Hi-tech firms, the characteristics of Innovating Firms, Innovation and Firm Growth Dynamics. The goal is to explain the causal chain of events from which entrepreneurs can deliver more innovation and ultimately higher growth for the benefit of the national and regional economies.

This study will also examine to what extent do the theories developed to explain the growth of entrepreneurial and innovative firm growth in developed Western economies explain these relationship in Thailand, and whether new theories need to be developed to explain the firms' key-based characteristics that enhance the growth of economy in developing countries. This research will conclude whether the young innovative firms in Thailand can create a meaningful contribution to the future economic growth potential of the nation.

This research not only adds to existing generic knowledge on entrepreneurship, but also is intended to fill a specific gap in the current literature on the theory of entrepreneurship and innovations and on hi-technology entrepreneurship in the developing countries.

2.8.2 Research theoretical conceptual framework

This study analyses the core theoretical perspectives on high technology entrepreneurship drawn from management and economics literature in three main areas: Entrepreneurship, Innovation and Growth from theories and disciplines including economics, psychology, sociology, and anthropology to synthesise the key innovative entrepreneurial activities as shown in Table 2.5 below.

Table 2.5: Summary of Theoretical Framework

Theory	Main Assumptions	Theoretical Model (Author, Year)	Relevance in Research
<i>The economic theory</i>	To present the understanding of economic development in the area of technological revolution the economic change; innovation, entrepreneurial activities and market power	Classical (Cantillon, 1755, Ricardo, 1817, Smith, 1776) Neoclassical (Parker & John, 1978; Murphy et al, 2006) Austrian Economic theories (Keizer, Tieben & Van Zijp, 1997; Kirzner, 1973) Economic change theory (Schumpeter, 1934)	Neo classical brought about new movement known as Austrian Market Process for criticize market systems, entrepreneurship and completion, and market development Bring businesses to improve their new products and processes into market system

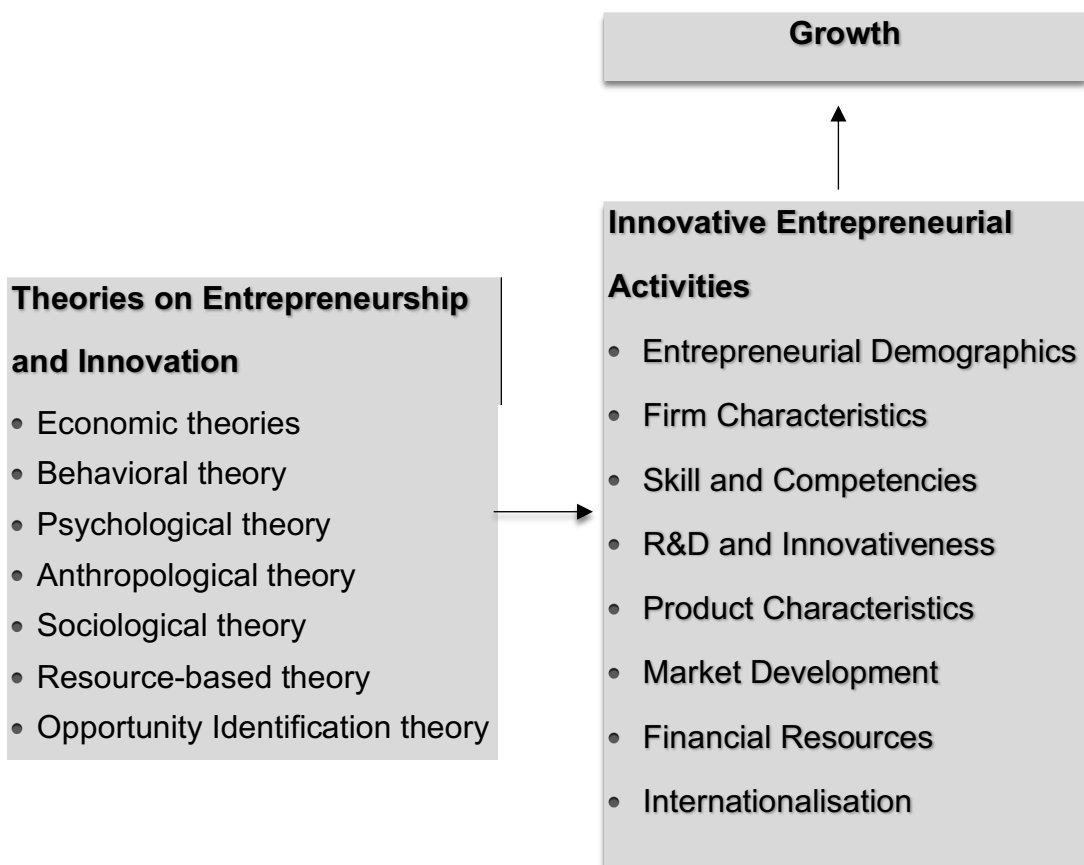
<i>Psychological theory</i>	Personality traits to define entrepreneurship, there are 2 theories; Locus of Control and the need of achievement	Locus of Control (Rotter, 1996) The need of achievement (McClelland, 1961)	Characteristics of entrepreneurs driven by creativity and innovation, and management skills. While the theory of achievement associated with the new venture creation
<i>Anthropological theory</i>	Study of social and cultural contexts	Social and culture contexts (Simeh, 2011)	Cultural environments can produce differences in entrepreneurial behavior
<i>Sociological theory</i>	Study of social network, life course stage, ethnic identification and population ecology for the business	Social theory (Reynolds, 1991)	The impact of factors of government legislation, customers, employees and competition on the survival of entrepreneurs
<i>Resource-based theory</i>	Predict the opportunity identification and the growth of new firms. It is composed of financial, social and human capital	the opportunity identification and the growth of new firms (Alvarez & Busenitz, 2001) financial, social and human capital (Aldrich, 1999)	Human capital (education and experience) and financial exploit entrepreneurial opportunity and business start-up
<i>Opportunity identification theory</i>	Process of opportunity recognition and development includes: entrepreneurial alertness, information asymmetry and prior knowledge, social networks, personality traits and opportunity	Opportunity theory (Ardichvili et al., 2003, Shane, 2000)	Prior knowledge and experience factors are significant capabilities of a successful entrepreneur

<i>Behavioural theory</i>	Examine the people's act and entrepreneurial actions	Personal action (Robbins & Coulter, 2007) Entrepreneurial actions (Bateman & Crant, 1993; Endres & Woods, 2003; Hebert & Link, 1988)	Entrepreneurial action associated with the relationship with suppliers for networking and financial management
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Source: Author

The theoretical conceptual framework is shown in Figure 2.3.

Figure 2.3: Framework of Underpinning Theoretical Foundation



Source: Adapted from Theoretical Framework, Binnui, 2016, p. 35

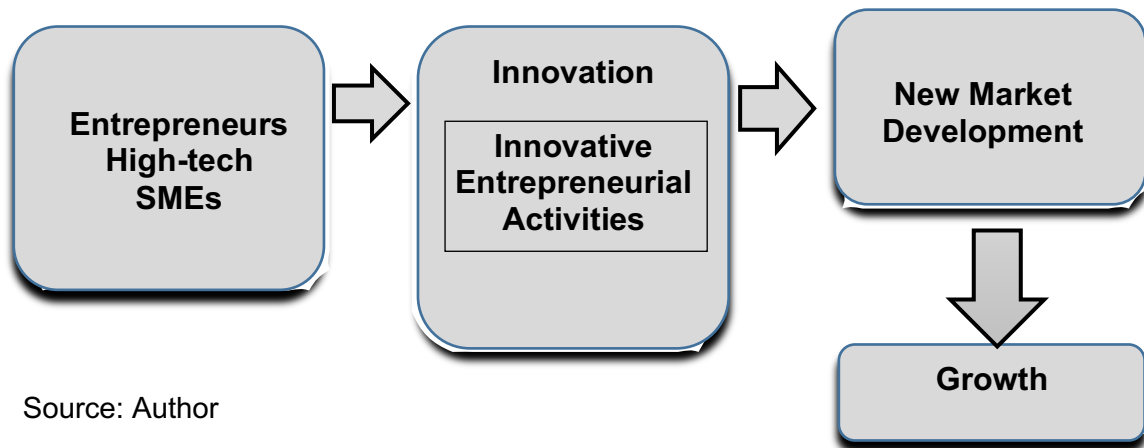
2.8.3 The Research Model

Veeraraghavan (2009) concluded that a combination of innovation and entrepreneurship factors lead to successful businesses. To survive and grow, businesses must adopt entrepreneurial initiatives as part of their strategy and that means implementing a dynamic process that stimulates a continuous flow of ideas and, thereby, provides the potential for an ongoing competitive advantage.

The key innovative entrepreneurial activities are hypothesised to contribute towards firm's growth. The research considers the extent that firm level factors are associated with the longer term growth of young high technology firms. It examines the relationship among different levels and configuration of innovation inputs and innovation outputs in terms of new market development by offering new products / services or delivering existing products/services in innovative ways. The entrepreneur is simultaneously looking back to the resources (and combining them in new and creative ways) and forward to markets (and perceiving new or unmet opportunities). The entrepreneur perceives and recognises a fit between the two, a capability and process referred to as innovating. To be motivated by an opportunity, the entrepreneur has to recognise that the current situation does not represent the best way of doing things and that the status quo does not exhaust all possibilities. The impact of being more innovative, the final link in the causal chain of events, is predicted will lead to superior or enhanced economic growth at the firm level initially and to regional and national growth ultimately.

The model Figure 2.4 illustrates the chains of events that lead high-tech businesses to create economic growth.

Figure 2.4: The Conceptual Model



Source: Author

In summary, this research will contribute to the literature on the characteristics of innovative entrepreneurial activities, and propose a coherent research framework and specific research questions linking innovative entrepreneurial activities and firm’s growth.

2.8.4 Research questions and Hypothesis

The research questions that will be examined and hypotheses that will be tested are as shown in following sections.

Table 2.6: Objectives and associated research questions

Research Aim	
To identify the key firm-based factors that might be associated with the longer term growth of young high-technology firms in Thailand	
Objectives	Research Questions
1. To examine the core entrepreneurial characteristics of hi-technology entrepreneurship	i. What are the core entrepreneurial characteristics of Thai innovative firms?
2. To examine the relationship between key predictors of firm growth	i. What are the relationship between the contingent factors and the types of firm

and young hi-technology firms in Thailand	<p>establishment of young Thai hi-technology firms?</p> <p>ii. What are the factors constraining or assisting firm growth of young hi-technology firms?</p>
3. To examine the role of the innovative inputs in young Thai hi-technology firms.	<p>i. How do Thai innovative firms implement the innovation process?</p> <p>ii. How the Thai entrepreneurs configure the innovative inputs to influence outputs in general?</p>
4. To determine the core firm growth determinants of young Thai hi-technology firms.	<p>i. What are the core firm growth determinants of young Thai hi-technology firms?</p>

Source: Author

The key research hypotheses which are adapted from Anglo-German Foundation study by Bürgel et al. (2001) will examine the relationship among different level of configuration of innovation input (entrepreneurial activities) and innovation output in the context of new market development.

Both quantitative and qualitative analysis are utilised in the analysis as discussed in the methodology chapter.

Research questions subsumed under research objective 1 are as stated below and will be described using descriptive statistics.

Objective 1: To examine the core characteristics of hi-technology entrepreneurship.

Research questions:

- i. What are the relationship between the contingent factors and the types of firm establishment of young Thai hi-technology firms?

Objective 2: To examine the relationship between key predictors of firm growth and young hi-technology firms in Thailand

Research questions:

- i. What are the relationship between the contingent factors and the types of firm establishment of young Thai hi-technology firms?
- ii. What are the factors constraining or assisting firm growth of young hi-technology firms?

To answer the research questions, five general key hypotheses are postulated and tested.

H1: There are significant differences in managerial skills, competencies and experience among young Thai hi-technology firms.

H2: There is a significant difference in product/service innovativeness among young Thai hi-technology firms.

H3: There is a significant difference in market development among young Thai hi-technology firms.

H4: There is a significant difference in source of finance among young Thai hi-technology firms

Objective 3: To examine the role of the innovative inputs in young Thai hi-technology firms.

Research questions:

- i. How do Thai innovative firms implement the innovation process?
- ii. How the Thai entrepreneurs configure the innovative inputs to influence outputs in general?

Objective 4: To determine the core firm growth determinants of young Thai hi-technology firms.

Research question:

- i. What are the core firm growth determinants of young Thai hi-technology firms?

Characteristics of Innovative Entrepreneurs

Hypothesis 1: The type of establishment is related to the firm's start-up size.

Hypothesis 2: The type of establishment is related to human capital as measured by prior work experience, technical and business education qualification, number of owners and prior industry experience.

Hypothesis 3: The type of establishment is related to the firms' international market development.

Hypothesis 4: The type of establishment is related to the nature of product/service.

Hypothesis 5: The type of establishment is related to the intensity of competition.

Hypothesis 6: The type of establishment is related to the firms' innovativeness.

Hypothesis 7: The type of establishment is related to the firms' sales support.

Hypothesis 8: The type of establishment is related to the firms' internationalisation of sale.

Hypothesis 9: The type of establishment is related to the firms' production location.

Hypothesis 10: The type of establishment is related to the firms' sources of corporate finance.

Hypothesis 11: The type of establishment is related to the firms' six skills shortage in the management team.

Hypothesis 12: The type of establishment is related to the firms' Performance distribution and general performance.

Hypothesis 13: The type of establishment is related to the firms' advanced technology, innovation and skills.

Hypothesis 14: The type of establishment is related to investment in new capacity.

2.9 Summary

The key literature for this research is under three main areas: entrepreneurship, Innovation and growth. This chapter reviews the various core theories from disciplines such as economics, psychology, sociology, and anthropology and management to determine the possible firm-based factors underpinning the entrepreneurial activities that constrain or assist the growth of businesses. The firm-based factors synthesised are entrepreneurial demographics, firms

characteristics, skills and competencies, research and development product characteristic, market development, financial of firm and internationalization.

A conceptual framework is developed to explain the causal chain of events through which hi-tech start-ups can deliver more innovation and ultimately higher growth to both the regional and national economies. These core firm-based characteristics are used to formulate testable research hypotheses testing three based areas for innovative firms; characteristics of entrepreneurial hi-tech firms, characteristics of innovative firms and innovation and firm growth dynamics that have been empirically developed to explain entrepreneurial and innovation dynamics in Western economies.

CHAPTER THREE

DATA AND RESEARCH METHODOLOGY

3.1 Introduction

As stated in the first chapter, the aim of the research is to identify the key firm-based factors that are potentially associated with the long term development for hi-tech start-ups. Inputs and outputs of entrepreneurship and innovation will be used to measure business growth. The methodology chapter will first describe the development of the survey instrument and the process of sample selection. Then it will discuss the research methodologies and technique used to gather the data to answer the key hypotheses in this study.

This chapter is organized into nine main sections. It begins with the research design presenting the previous entrepreneurship and innovation research methodologies used to generate the survey research approaches and methods for this study. The underpinning research philosophy is presented in detail and the research choices are discussed to explain the difference of the quantitative and qualitative approach in the mix-methods theory. The design of the survey instruments used in the telephone and face-to-face (in-depth) interviews are described in details. The piloting of survey instruments section is presented to establish the validity and reliability of the questionnaires. The background of data sources and sampling procedure are then presented in details. Then the variety of data analysis methods; descriptive analysis, bivariate analysis and multivariate analysis is discussed in the analysis of the data section. Finally, the related ethical issues are presented in the last section.

3.2 Research Design

A research design presents the basic direction for carrying out a research by providing the relevant information that is most efficiently and effectively analysis the research questions and hypotheses (Hair et al., 2015). Hair (2015) presented three distinct research designs, namely, descriptive, casual and exploratory designs. This study will utilize all the three designs. Firstly, the descriptive

analysis is used to investigate the research questions 1 to 4 of objective 1 (Chapter 4). It provides information on the contingent factors that examine the core characteristics of young hi-tech firms and their establishment. The causal research (Saunders et al., 2009), will test whether the independent variables are responsible for the changes in the dependent variables (Emory and Cooper, 1991) in objectives 2 and 4 which are presented in chapter 5 and 7 respectively. While the exploratory research will seek to examine objective 3 through in-depth interviews and try to identify the perception of young hi-tech firms in Thailand (Chapter 6). Both the quantitative and qualitative approaches are used in this study because data collection will involve the use of a large scale survey and in-depth research.

The following review of previous research is used as the basis to create the research tools and formulate the methods in this study.

Previous Hi-technology entrepreneurship research methodologies

There is abundant evidence showing various methods are used to conduct research in the area of entrepreneurship, innovation and firm growth within the context of Small and Medium Enterprises (Chapter 2). The review of the relevant literature has discovered a big number of studies on hi-technology entrepreneurship utilizing different tools to analyse the research results collected (Table 3.1).

Table 3.1: Previous hi-tech entrepreneurship research

Authors	Reference	Method/ Tools	Sample
Cowling, M.	Small Business Economics, 2001 Vol.22. Page 1-9	Ordinary Least Squares (OLS) and 2SLS econometric models	1991-1993 UK independent unquoted firms
Burgel, O., Murray, G., Fier, A. and Licht, G.,	ZEW Discussion paper, 2000, no. 01-51	Event history analysis models	British and German start-up

			companies in hi-tech industries
Chaplin, H.	High Technology Small Firms Conference, 2009	Descriptive statistics of the mode of internationalization	2008 UK Internationalizing firms
Vogel, A. and Wagner, J.	CEIS, 2012	Panel data models	2003-2006 West German business service firms
Kundu, S. and Renko, M.	Advances in Entrepreneurship Firm Emergence and Growth, 2005. Vol. 8. Pages 43-84	A long-linear specification	Indian Software industries in 1998-1999 and Finland in 2004
McKelvie, A., Wiklund, J. and Short, C.J.,	Advance in Entrepreneurship Firm Emergence and Growth, 2007. Vol.10. Pages 159-185	The Absorptive Capacity Process for New Ventures Model	1995-2003 Swedish new innovative firms
Ganotakis, P.	New Technology Based Firms in the New Millennium, 2010. Vol.8, Pages 69-88	The Econometric Model	2005 UK New technology based firms
Becker, S. and Hvide, H.	IZA DP. 7146, 2013	Panel Study of Income Dynamics (PSID) and Survey of Consumer Finance (SCF)	1999 – 2007 entrepreneurs incorporated in Norway, the founder deaths before 2009

		Exogenously timed entrepreneur deaths	
Marvel, M. and Lumpkin, G.T.	Entrepreneurship theory and practice, 2007. Pages 807-828	Hierarchical multiple regression	US founders of technology based ventures who were affiliated with university incubators
Manimala, j.M., Jose, P.D., and Thomas R.K.	Journal compilation, 2005. Vol.14. Pages 413-424	Hypothesized Model of Organizational Design for High Impact Innovations. (Qualitative method.)	Large Innovative enterprises in India
Hayton, C.J.	R&D Management, 2005. Vol.35, Pages 137-155	Hierarchical regression analysis of innovation and venturing model. (three dimensional framework of IC includes, human capital , intellectual property and reputational capital)	1994-1998 US High technology new ventures (HTNVs)

Naude, W. and Rossouw, S.	Journal of International Entrepreneurship, 2010. Vol. 8, Pages 87-111	Heckman two-step estimator	Chinese international new firms
Gungaphul, M. and Boolaky, M.	Journal of Chinese Entrepreneurship, 2009. Vol.1, Pages 209-226	Market orientation scale	Successful enterprises in Mauritius
Mainela, T., Pernu, E. and Puhakka, V.	Journal of Small Business and Enterprise Development, 2011. Vol. 18, Pages 430-456	The process levels of international new venture development framework	2004-2007 new Hi-tech enterprises
Littunen, H. and Nittykangas, H.	Journal of Small Business and Enterprise Development, 2010. Vol.17, Pages 8-31	Factors affecting firms' growth framework	1990-1997 Finnish enterprises
Marvel, R.M., and Droege, S.	Journal of Small Business and Enterprise Development, 2010. Vol.17, Pages 32-44	Tacit knowledge framework	Midwestern USA young technology entrepreneurs
Grilli, L.	International Small Business Journal, 2011. Vol. 29, Pages 626-647	Econometric models	1995-2000 Italian ICT new ventures
Messersmith G.J. and Wales J.W.	International Small Business Journal, 2013. Vol. 31, Pages 115-136	The predicted model and the hypothesized model.	2006-2007 US Young high technology companies

Coeurderoy, R. Cowling, M., Licht, G. and Murray, G.	International Small Business Journal, 2012, Vol. 30, Pages 472- 492	Econometric model of survival	1997, 2003 German and UK young high-tech firms
Agarwal, R. and Audretsch, D.	Journal of Industrial Economics, 2001. Vol.49, Pages 21–43	Life table analysis and the Cox proportional hazards regression	Thomas register of American Manufacturers
Amario J, Ruiz D, and Amario E.	Journal of Small Business Management, 2008. Vol.46, Pages 485– 511	Measurement and structural model	2003 Spanish SMEs in foreign markets
Audretsch, D., and Mahmood, T.	Review of Economics and Statistics, 1995 Vol.77, Pages 97– 103.	The framework of a hazard duration estimation model	US manufacturers
Autio, E.	Journal of International Business Studies, 2005. Vol.36, Pages 9–19	The PTI and the INV model	Theoretical implications, Oviatt and Mcdougall article
Blankenburg, H. Eriksson K., and Johanson J.	Journal of International Business Studies, 1996. Vol. 27, Pages 1033–1053.	LISREL model	International enterprises
Bruderl, J., and Preisendorfer, P.	Small Business Economics, 1998. Vol. 10, Pages 213– 225.	OLS -regressions models	1990 German New business firms

Song, K Podoyntsina, H Van Der Bij, JIM Halman	Journal of product innovation management, 2008, Vol.25,Pages 7-27	Meta-analysis	New Technology Venture, United States, 1991- 2000
Bürgel, Fier, Licht, & Murray	ZEW Discussion paper no.01-51, 2000.	Standard OLS and Probit model/ Mail survey	New hi-tech firms, United Kingdom and German, 1987-1996

Source: Author

The review clearly indicates that both the quantitative and qualitative approaches are utilized to gather data.

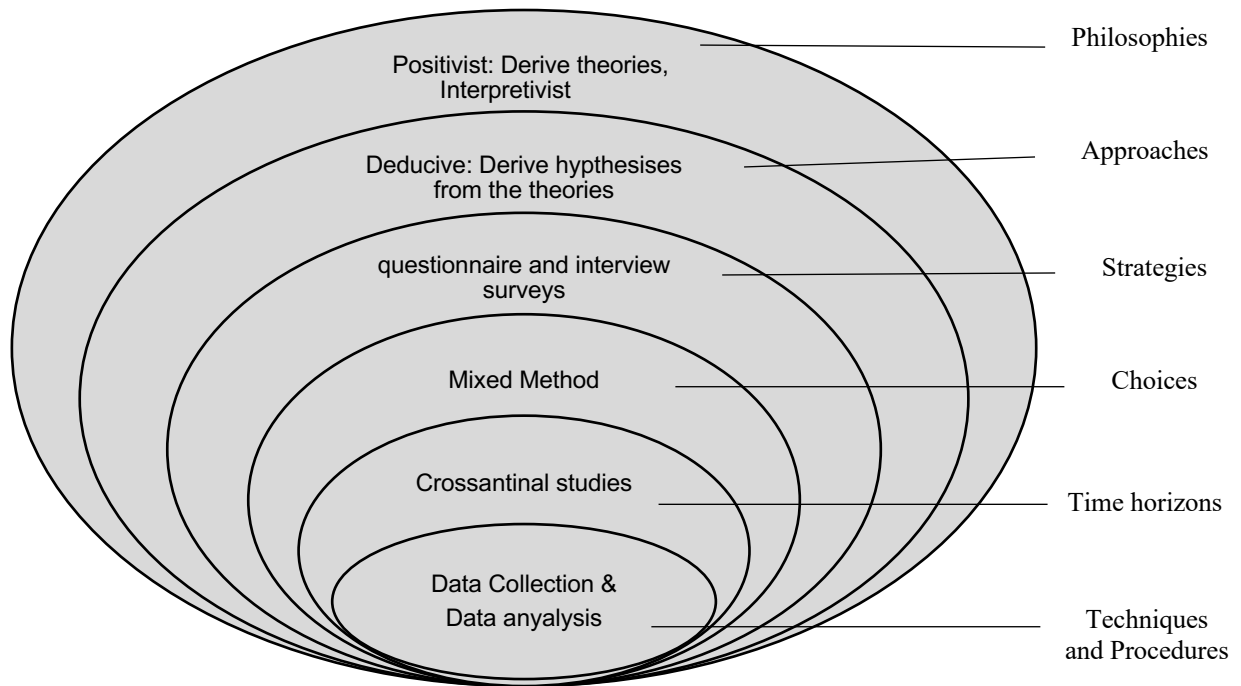
3.3 Research Approaches and Methods

Johnston (2017) ascertain that business and management researchers need to be aware of the philosophical commitments that are made through the choice of research strategy, since this has significant impact on how the research is conducted and understood

The research onion model formulated by Saunders, Lewis, and Thornhill (2009) has been adapted by the current research to formulate the research approach for investigating the particular research objectives (see Figure 3.1). The research onion provides an effective progression through which a research methodology can be designed. Its usefulness lies in its adaptability for almost any type of research methodology and can be used in a variety of contexts (Bryman and 2011; Bell, Bryman and Harley, 2018). The research onion describes the stages through which the researcher must pass when formulating an effective methodology. The sequential methods suggested by Saunders et al. (2009) is used to develop the research process. The model is divided into six stages. The outer most layer presents the various research philosophies. The second layer addresses the main research approaches which will lead to the third layer that examines the research strategies. At the fifth stage, the different choices of

research methods are illustrated. Finally, the researcher moves to the last stage comprises data collection and analysis.

Figure 3.1: Research Onion Diagram



Source: Adapted from the Research Onion theory, Saunders et al, 2009, p.108

3.4 Research philosophy underpinning Approaches and Methods

Business and management researchers have to be aware of the philosophical influence on the choice of research strategy. It has a significant impact both in what we do and how we understand what we are interested (Johnson, 2017). Easterby-Smith, Thorpe, and Jackson (2012, p. 17) have posited three arguments to support their assertion that research philosophy is the most important element of methodology and it sets in motion the journey through the research process. Firstly, it clarifies and formulates the designs and structure of the research, leading to its techniques for collecting and interpreting the data, Secondly, it guides researchers to make the correct and most suitable methodological decisions, indicating the benefits and limitations of each aspect of the process and thirdly, it helps researchers generate new ideas in relation to research design and adapt existing knowledge in accordance to the subject being investigated. Consequently, whoever fails to think about the underlying

philosophy for their research may seriously affect the quality of research outcome,

Moreover, the point of philosophical assumption is also important for the researcher who study organizations, which helping researchers to judge the reliability of the research outcomes (Johnson and Duberley, 2000).

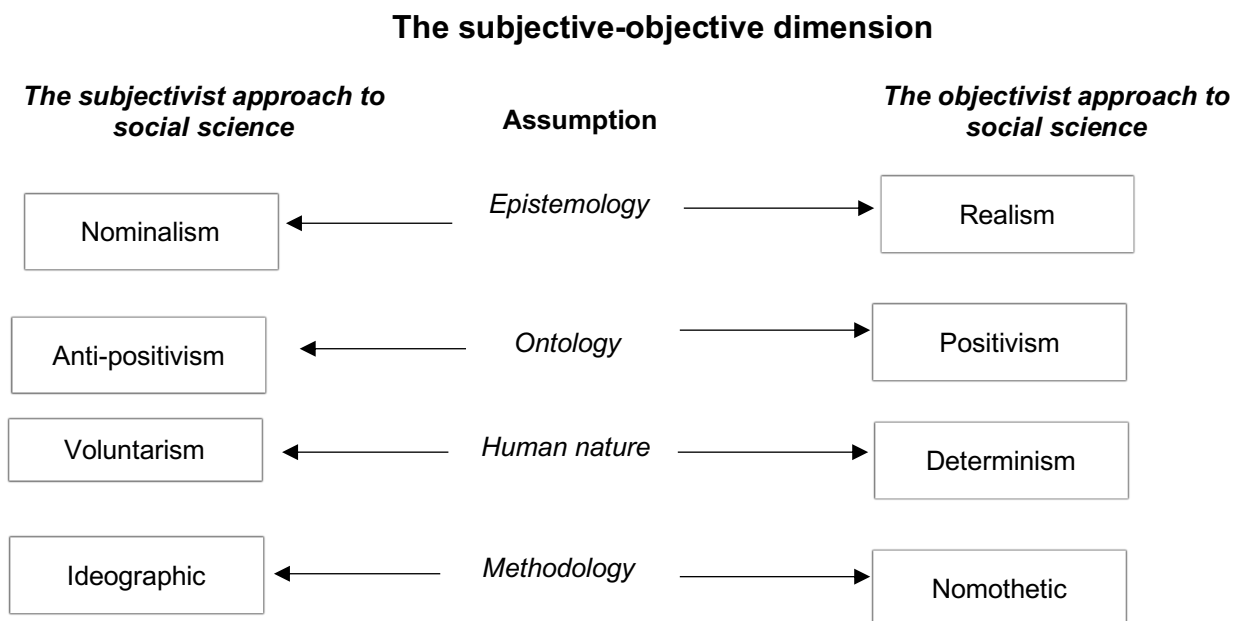
The scope of Epistemological, Ontological, and methodological assumptions are briefly explained below;

- **Epistemological assumption:** “What is the nature of the relationship between the knower or would be knower and what can be know?” (Guba and Lincoln, 1994, p. 108). It is about the question on the understanding of the real world, searching for regularity and causal correlations between positivist elements (Kulatunga, Amaratunga, and Haigh, 2007) as “the world is essentially relativistic an can only be understood from the point of view of the individuals who are directly involved in the activities which are to be studies” (Burrell and Morgan, 1979, p. 5). While, Campbell and Wasco (2000) stated that epistemology is interweaved with ontology,
- **Ontological assumption:** Guba and Lincoln (1994, p. 108) addresses the question on ontology by asking “what is the form and nature of reality and therefore, what is there that can be known about it?”. The primary ontological decision point for researchers is to accept or reject the notion that there is a single, objective, real world (Campbell and Wasco, 2000).
- **Methodological assumption:** Methodology is the strategy or plan of action which lies behind the choice and use of particular methods (Crotty, 1998. p. 3). Thus, methodology is concerned with why, what, from where, when and how data is collected and analysed. Guba and Lincon (1994, p. 108) explain that methodology asks the question: how can the inquirer go about finding out whatever they believe can be known?

Whilst Sexton (2003), as well as Guba and Lincoln (1994), suggested that the contrasting issues on philosophies found in the literature are determined by the different views on the assumptions of ontology, epistemology and axiological.

Morgan and Burrell (1979) have developed a framework using the subjective-objective dimension approach (Figure 3.2) to categorize the philosophical assumption into four critical areas, namely, ontology, epistemology, human nature, and research methodology which are relevant to the understanding of social science.

Figure 3.2: A Scheme for analysing assumptions about the Nature of Social Science



Source: Burrell and Morgan, 1979, p. 3

Burrell and Morgan (1979) explain that the extreme positions on each of the four strands are reflected in the two major intellectual traditions which have dominated social science over the last two hundred years. “The first of these is usually described as ‘sociological positivism’. It treats the social world as if it is the natural world, adopting a ‘realist’ approach to ontology. This is backed up by a ‘positivist’ epistemology, relatively ‘deterministic’ views of human nature and the use of ‘nomothetic’ methodologies (p.3). The second intellectual tradition, according to them is “that of ‘German idealism’, stands in complete opposite to this. It is essentially ‘nominalist’ in its approach to social reality which stresses the essentially subjective nature of human affairs, denying the utility and relevance of the models and methods of natural sciences to studies in this realm. It is ‘anti-positivist’ in epistemology, ‘voluntarist’ with regard to human nature and it favours ideographic methods as a foundation for social analysis (p.3).” They posit that the

objective and subjective extremes of their model are demarcated by Sociological positivism and German idealism.

Research philosophies can differ on the goals of research and on the best way that might be used to achieve these goals (Goddard and Melville, 2004). The possible structure of choices can guide researcher to collect and analyse data to create valid findings (Saunders et al., 2009). The primary philosophical underpinning of this research is derived from Sociological Positivism.

The researcher's ontological position, based on the analysis above, is that of positivism. Positivism assumes that reality exists independently of the thing being studied. In practice this means that the meaning of phenomena is consistent between subjects (Newman, Benz and Ridenour, 1998). Miller Strang and Miller (2010) claimed that knowledge without a positivism basis is invalid and unclear. The nomothetic methodical approach bases research upon systematic protocol and technique and focuses on testing hypotheses (Burrell and Morgan, 2017). To generate a research strategy to collect these data for this study, existing theories are utilized to develop hypotheses. These hypotheses will be tested and confirmed, in whole or part, or refuted, leading to the further development of theory which may then be tested by further research.

3.5 Research method Choices

This topic is typically refer to the research style that using in collecting and analysing the research data. Both the quantitative and qualitative methods are selected to be used in this research. Since the methods have their own benefits and limitations, they are examined and explained below:

3.5.1 Quantitative Versus Qualitative methods

Bryman (2004, p.19) has listed the differences between qualitative and quantitative research strategies (Table 3.2).

Table 3.2: Quantitative versus Qualitative strategies

Orientations	Quantitative	Qualitative
<ul style="list-style-type: none"> • Principle orientation to the role of theory in relation to research • Epistemological orientation • Ontological orientation 	<ul style="list-style-type: none"> • Inductive; generation of theory • Interpretivism • Subjectivism/Constructivism 	<ul style="list-style-type: none"> • Deductive; testing of theory • Positivism • Objectivism

Source: Adapted from Bryman, 2007

Davies (2007) has highlighted some significant difference between the methods (Table 3.3).

Table 3.3: Quantitative versus Qualitative methods

Quantitative Research	Qualitative research
<ul style="list-style-type: none"> • Produces statistical data • Where random probability samples are used, survey estimates can be defined within specified bounds of precision • Can measure the extent, prevalence, size and strength of observed characteristics, differences, relationships and associations • Can determine the importance of factors influencing outcomes • Uses standardised procedures and questions, enabling the reproducibility of results 	<ul style="list-style-type: none"> • Flexible • Enables the exploration of the meanings of concepts and events • Produces valid data as issues as explored in sufficient depth to provide clear understanding • Enables the study of motivations and patterns of association between factors • Provides a detailed understanding of how individuals interact with their environment, cope with change, etc.

Source: Davies 2007, p.9

In this study, both the quantitative and qualitative research approaches are applied.

3.5.2 Mixed-methods

During 1970s and 1980s, the argument of methodological differences between the quantitative and qualitative paradigms recognized their fundamental incompatibility. Hence, the mixed method approach has an ‘edge’ in capitalizing on the strengths of each paradigm and to offset their weaknesses (Symonds and Gorard, 2008). ‘The use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone’ (Creswell and Clark, 2007, p. 5). Mix-method in social sciences (Symonds and Gorard, 2008) refers to “the class of research where I mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (Johnson and Onwuegbuzie, 2004, p. 17). The description of the strengths and weakness of mix-method are presented in Table 3.4.

Table 3.4: Strengths and Weakness of Mixed Research Method

Strengths	Weaknesses
<ul style="list-style-type: none"> • Words, pictures, and narrative can be used to add meaning to numbers. • Numbers can be used to add precision to words, pictures, and narrative. • Can provide quantitative and qualitative research strengths (i.e., see strengths listed in Tables 3 and 4). • Researcher can generate and test a grounded theory. • Can answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach. 	<ul style="list-style-type: none"> • Can be difficult for a single researcher to carry out both qualitative and quantitative research, especially if two or more approaches are expected to be used concurrently; it may require a research team. • Researcher has to learn about multiple methods and approaches and understand how to mix them appropriately. • Methodological purists contend that one should always work within either a qualitative or a quantitative paradigm. • More expensive. • More time consuming.

<ul style="list-style-type: none"> • A researcher can use the strengths of an additional method to overcome the weaknesses in another method by using both in a research study. • Can provide stronger evidence for a conclusion through convergence and corroboration of findings. • Can add insights and understanding that might be missed when only a single method is used. • Can be used to increase the generalizability of the results. • Qualitative and quantitative research used together produce more complete knowledge necessary to inform theory and practice. 	<ul style="list-style-type: none"> • Some of the details of mixed research remain to be worked out fully by research methodologists (e.g., problems of paradigm mixing, how to qualitatively analyse quantitative data, how to interpret conflicting results).
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Source: Johnson and Onwuegbuzie, 2004, p.21

The quantitative procedures will allow the researcher to collect data to verify the formulated hypotheses. Park (2005) argue that the qualitative study can reveal new insights into complex interactive process of opportunity recognition of the innovative start-ups within hi-technology industry. As a results, the mixed method is selected as the data collection method for this study as it will allow the researcher to collect the relevant data needed to triangulate the findings in order to examine the hypotheses formulated for testing.

- **The Explanatory sequential design**

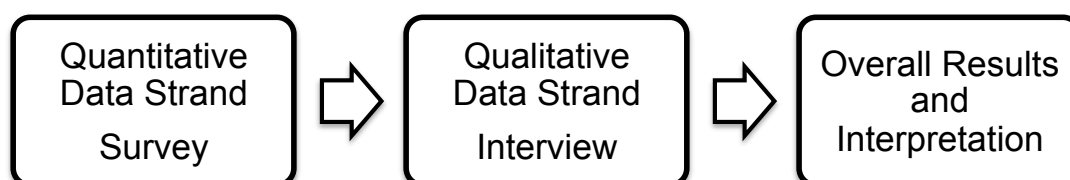
To match the research’s purpose, the explanatory sequential design is used in this research to address the research questions. This design starts with the collection and analysis of quantitative data which subsequently forms the basis for the qualitative data collection and analysis (see Figure 3.3).

Having justified the application of the 'Explanatory Sequential Model' and taken into account the data collection methods available, the methods of the quantitative and qualitative strands were selected. Taking into account the purpose and aims of this study, a questionnaire survey is selected to collect the quantitative data and in-depth semi-structured interviews are used to collect the qualitative data. The survey approach is selected as it is considered the most appropriate way to explore the nature of the Thai hi-tech start-ups initially before the qualitative data collection could be completed. The questionnaire survey is also deemed the most suitable method as a sample could be drawn from a wide range of SMEs in one fixed time period. Surveys are generally classified as a deductive research method (Gill and Johnson, 2002).

The interview method is selected for the qualitative data collection. In-depth interviews have been described as a suitable method of data collection after an initial search of the subject matter has been completed (Creswell, 2017). This qualitative data approach offers a more elaborate and detailed account of the intricacies of the conduct in high-tech SMEs. Where the first strand explores the topic, the interviews, as part of the second strand, provides a richer explanation of the phenomenon.

The design that has been adopted to complete this research investigation is illustrated below (Figure 3.3).

Figure 3.3: Explanatory Sequential Model



Source: adapted from Creswell and Clark, 2011, p.69

3.6 Design of the data collection instruments and the collection process

The hypotheses of this research have been developed using the deductive approach for the reason that the logical process can originate specific instances

based on a general assumption (Zikmund, Babin, Carr, and Griffin, 2013). The inductive approach test the existing theoretical perspective by using qualitative procedures (Yin, 2009).

3.6.1 Design of the instruments

3.6.1.1 Questionnaire Design

The quantitative questionnaire has been developed based on the Anglo-German Foundation research questions (Bürgel, et al., 2001) which was grounded on exiting literature in the field of entrepreneurship, innovation and growth dynamics. The design and structure of the questionnaire were planned and managed in order to create the desired response rate and to collect precise information from the participants (Bryman and Bell, 2011).

The questionnaire is divided into 6 parts with a total of 47 questions (Appendix 1-2). Part I asks about the General Characteristics of respondents; firms, ownership and governance such as founding background, number of employees, educational degree both in technical/scientific and business and previous industry experience. Part II comprises of questions on Product Characteristics, including bestselling product/service, timing of first sold, primarily product development, product/service based, type of customer based, competition intensity, innovativeness description, the core technologies, timing of launching similar product/service by competitors, sales support activities. Part III covers International Activities; current international sales status, mode of selling overseas, physically producing product location. In Part IV, the participants are asked to indicate their source of funded for their business activities. Part V examines Factor Constraining Growth; firstly the participant will indicate which factor examines the constraints of their business development and the six factors of the shortage of skills within the management team. Then the various factors of business performance attribution and their general performance, the level of their advance technology and position with comparing to the technology against others, rate of innovation and their current position, rate of availability of skills, level of investment and their current position are covered. Lastly, Part VI contains questions based on their Research and Development (R&D) activities and rating

of their innovation situation, including their future plan. The design of questions was discussed with the supervisor and pre-tested with case studies. The sample questionnaire can be found in Appendix 1 and 2.

3.6.1.2 Interview Design

To gather collaborating data about the hi-tech start-ups, qualitative interviews were conducted with seven relevant representatives selected from the hi-technology start-ups established in Thailand. The interview method was selected because of its relevance to of the research context which aims to find meaningful contribution to the future economic growth potential of Thailand. Semi-structured interviews were used to gather the research data to make sure that all interview representatives are asked the same questions, to ensure that it is coherence and provide some rooms for the interviewer to adjust the interview flow to ask further in-depth questions (Koch, 2017) that is useful to gather relevant information for this research.

The interviewer used semi-structure interviews by using the same question structure used in the telephone survey. The interview aimed to identify the main factors in depth to explore the key defining characteristics of the respondents in the context of innovation. The research themes examined during the interview include; entrepreneurial characteristics, skill competencies, the technological strategy both research and development (R&D) and innovation strategy, product development, the extent of market development and international business activities, financial of business, and possible factors assisting or constraining the growth of firms.

The interview was conducted during two survey periods. The first group of five respondents were interviewed during the period March to May 2015, and the second interview of two entrepreneurs was carried out in January 2016.

The respondents were persons in management or higher positions of the hi-tech firms. All respondents were selected from the participants who registered in Thailand Innovation Boot Camp. All those who are in the technology businesses involved in Technology and Business Promotion, and involved in the area of IP,

Law, Finance, Marketing, etc. of the hi-tech businesses. The reason to select the sample from the group of innovative firms registered in the Thailand Innovation Boot Camp is because this boot camp is a high-energy, intensive effort which delved deep into the challenge of innovation and was facilitated by a group of Thailand Innovation Fellows. It is supported by a number of like-minded organizations, including the Science, Technology, and Innovation Policy Office, The Thailand Business Incubator and Science Park Association, the Science Park Promotion Agency, the Regional Science Parks Network, as well as a number of universities in Thailand.

3.6.2 Data collection process

Both primary and secondary data are used to test the hypotheses of this study. Primary data is 'data gathered and assembled specifically for the research project at hand', while secondary data is 'data that have been previously collected for some project other than the one at hand' (Zikmund, Babin, Carr, and Griffin, 2013, p. 63).

Before starting the research survey, various relevant sources of secondary data were considered (Bradley, 2013). The sources for secondary data in this research include both official sources and commercial data providers such as academic articles, books and other documents related to entrepreneurship, innovation and economic growth in high-technology based firms. The questionnaire questions examined Human capital, Products and Services, Technology and Innovation, Customer and Competition, Finances of the firm, Internationalization factors. However, the study is particularly interested to identify the extent to which Thai young hi-technology firms engaged in innovation process activities. Therefore, it is important to identify a source of data with broad and wide coverage of innovative firms. There are various industry directories databases. However, it is not possible to identify directories for all innovative firms using the earlier definition of Butchart (1987). Therefore, using the data from industry directories was not chosen. Rather, the data from credit rating agencies are used. Using credit rating data is popular and proliferating in research on new firms (McDougall, 1989). The key benefit in the use of credit rating data is that they offer a similar official data sources which are not covered by the public sources.

The data collection started from August 2013 and lasted till January 2016. This fieldwork took 20 months to complete. The process comprised 2 phases. The questionnaire survey by telephone was carried out in Phase 1 and the face-to-face interview was carried out in Phase 2.

Phase 1: Questionnaire survey

The first questionnaire survey was carried out from August 2013 to June 2014. 108 usable responses were collected out of the 1231 respondents contacted. As the number of usable responses was too small, a second questionnaire survey was conducted from July 2014 to June 2015. 413 usable questionnaires were obtained from 779 firms surveyed.

Phase 2: Face-to-face interviews

The first interview was conducted during March-May 2015. 15 firms were interviewed. However, unfortunately none of firm interviewed was will to sign the consent form. As a result, the second interview was conducted from June 2015 to January 2016. 12 firms that were selected for the interview had completed the interview process successfully.

A summary of the process is shown in Table 3.5.

Table 3.5 Data collection process

Phase 1: The 1st telephone survey (August 2013-June 2014)				
Source of data	Number of firms identified	Number of firms participated	Number of usable questionnaire	Remarks
Department of Business Development, Thailand	2,219	1,231	108	Out-of-date phone number, Closed-down, Refused.
Phase 1: The 2nd telephone survey (July 2014-February 2015)				
Private company/ Credit rating agencies	1,356	779	413	
Phase 2: The 1st face-to-face interview (March-May 2015)				

From usable questionnaire collected	15	0	0	Consent refused
Phase 2: The 2nd face-to-face interview (June 2015-January 2016)				
STI ¹ , Thai BISPA ² , SPA ³ and Regional Science Parks Network	70	12	7	

Source: Author

Time horizons: cross-sectional study

The researcher choose cross sectional research to measure variables in a short time period, so these measurement is viewed as contemporaneous (Baltes, Reese, and Nesselroade, 1988). Cross-sectional offers a ‘snapshot’ of a particular phenomenon in a specific timeframe. Saunders et al (2011) contend that cross-sectional research often adopts a quantitative method to collect data usually through a survey. Easterby-Smith et al. (2012) opine that cross-sectional designs generally belong to positivist positions. Collis and Hussey (2009:77) argue that cross-sectional studies are designed to obtain research data in different contexts, but over the same period of time. Even the cross-sectional survey has a number of limitations (Burgel, 2000), for example the difficulty in selecting a sample, which is large enough to be representative of the population, how to isolate the phenomena under study from all other factors that could influence the correlation, and cross-sectional studies do not explain why a correlation exists; only that it does or does not exist (Collis and Hussey, 2009). However, cross-sectional survey can create the prevalent phenomenon as it can examine the different high-tech national innovative start-ups simultaneously.

Despite higher cost and time consuming, gathering the data through telephone surveys and case study interviews enriches the findings of this research.

¹ The Science, Technology and Innovation Policy Office (STI)

² The Thailand Business Incubator and Science Park Association (ThaiBISPA)

³ The Science Parke Promotion Agency (SPA)

3.6.3 Research Surveys

Questionnaire survey is the most commonly use method for collecting primary data. It is a technique for gathering data from samples by using questionnaire (Zikmund, Babin, Carr, and Griffin, 2013). This research utilizes the mixed-method approach whereby questionnaire and semi-structure surveys are chosen from the available tools such as telephone, mail, and face-to-face interview procedures to collect data. The rationale behind decision to choose the telephone and face-to-face interview surveys to collect the empirical data is elaborated in the sections below.

3.6.3.1 Telephone survey

Technological advancements have made telephone interview survey particularly more feasible and more reliable, increasing more popular for use in survey research. Literally everyone has telephone. Telephone surveys are not only particularly cost-efficiency and but also increase the speed of data collection (Frey and Oishi, 1995). In telephone survey, respondents show a greater positive answers to questions than online (Christian, Dillman, and Smyth, 2008; Dillman and Christian, 2005; Dillman et al., 2009) and it has a higher response rates (Frey and Oishi, 1995). According to the research by Groves and Kahn (1979) on national telephone interview survey, it has been found that 39.4% of respondents prefer the survey conducted by telephone, 28.1% by mail and 22.7% by face-to-face.

The framework of the administrative procedure

The framework of administrative procedure for the telephone survey implementation adapted from Frey and Oishi (1995, p. 8) is as follows:

- 1) Number of interviewers needed and intensity of training required to meet sampling requirements
- 2) Type and amount of supervision needed based on questionnaire complexity and interview mode
- 3) Other personnel need (clerks, data entry personal, statistical experts) to handle data volume

- 4) Facilities needed to house operations, including office equipment and storage space
- 5) Amounts of suppliers to stock (paper, pens, notepads, etc.)

Composition of the research team members:

- 1) Two part-time interviewers
- 2) One part-time supervisor to stand by during interviews and do quality check on completed surveys
- 3) One part-time assistant to search for new telephone numbers of former fellows by calling the fellows' former institutions, searching databases for recent publications (these list the author's affiliation), and using other location strategies. This duty may also be carried out by interviewers to keep personnel to a minimum.
- 4) One or two calling stations, depending on whether both interviewers will be phoning at the same time
- 5) One part-time data enterer

In addressing the problem associated with outdated addresses and phone numbers, the researcher used the private company or credit rating agency as resources to search for the phone number and the current operating status of businesses.

3.6.3.2 Face-to-face interviews

Face-to-face surveys require a single interview with each respondent and do not usually demand that the date and time of the interview be fixed (Casley and Lury, 1987). Face-to-face interview is more helpful to gather valid and reliable data (Kahn and Cannell, 1957). Hox and De Leeuw (1994) found that face-to-face interview had the highest percentage of research question completion rate, 70.3%, while telephone survey and mail survey were at 67.2% and 61.3% respectively.

Interviews have an advantage in terms of fewer limitations on the types and length of questioning and in ability to use visual aids. The location to conduct interview is at the workplace of person interviewed Morgan (1993). Although, personal interviews are expensive but it is much valuable because the researcher

can utilize visual devices and postscript the interview with observation so that the researcher can explore all interesting points for further information and investigation easily within the limit of the research framework.

3.7 The Pilot Studies

The pilot study is a small scale trial run in preparation of the main study, as it is a critical step to develop an effective survey instrument (Fink and Litwin, 1995), It can collect data to serve as a guide for the larger study (Zikmund, Babin, Carr, and Griffin, 2013).

In addition, checking words and sentence in questions, checking the research team members' understanding of instructions and the way to interview respondents, checking the time used for each interview and most importantly, checking the reliability and validity of the results. The pilot was primarily conducted in order to reconfirm the necessity for the research and to test the individual questions and overall validity of the survey.

The key step to develop an effective survey instrument is doing a pilot testing (Fink and Litwin, 1995). Pilot testing will help to polish the questionnaire and to eradicate the cause of confusion and misconception of the survey and subsequently, the participants could answer the investigative questions easily (Saunders and Lewis, 2012). Answering the questionnaire more consistently would improve the reliability of the instrument. Respondents should be able to answer in consistent manner, if not, the scale could be unreliable (Hair, 2007). Oppenheim (1992) recommended a balance between the number of questions to provide great data and the number of questions for respondents are able to answer without incomplete or untruthful responses. By piloting the survey, it will be able to identify the exact time for the respondents to complete all questions. Saunders and Lewis, (2012:452) suggested using the pilot to find out whether:

- 1) There are any questions for which visual aids should have been provided;
- 2) They have difficulty in finding their way through the questionnaire;
- 3) They are recording answers correctly.

Saunders et al (2012:451) also remarked that ‘without a trial run, you have no way of knowing whether your questionnaire will succeed’. To conclude, a pilot study enables the researcher to refine the questions, evaluate their validity, ensure that the data collected matches the research questions and assist in developing the final version of the survey (Collis and Hussey, 2009).

The piloting was conducted between September-October 2013, two months prior to the conduct of the main survey. Thirty young high-tech firms were surveyed using both telephone interview and face-to-face interview. In total, seven questionnaires were fully completed, while twenty-three organizations were not willing to provide some information. As a result, the average response rate was about 23%. On answering time, the interviewer needed about 25-30 minutes to complete all questions. As such, the length of interview was considered as appropriate and did not require shortening.

The, pilot testing did not add much important information into the current study. As a result of the pilot testing, a few changes to the questions were made.

Figure 3.4: Question 3 in demographics of firm section used in pilot

Has your firm experienced any of these events?		Yes	No	Don't know	If Yes, what year?
A	A merger with a larger firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
B	A merger with a similar sized firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C	Acquisition of another firm in your industry sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
D	Acquisition of another firm outside your core industry sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
E	A management buy-out or management buy-in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
F	A change of ownership	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
G	A change of management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	refuse <input type="checkbox"/>				

Source: Author

Figure 3.5: Question 3 in demographics of firm section used in main survey

Was your company founded as:

	Yes	No	Don't know	If Yes, what year?
A merger with a larger firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A merger with a similar sized firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Acquisition of another firm in your industry sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Acquisition of another firm outside your core industry sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A management buy-out or management buy-in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A change of ownership	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A change of management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Independent new firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
refuse				<input type="checkbox"/>

Source: Author

There are two amendments in Question 3. Firstly, question wording has been changed from 'have your experienced any of these events?' to 'Was your company founded as:' (Figure 3.4) and adding choice H. 'Independent new firm' in the multiple answers (Figure 3.5).

Figure 3.6: The Question 24 in Internationalization section used in pilot and main survey

Do you currently have any international sales?

- Yes
- No
- don't know
- refuse
-

Source: Author

Figure 3.7: The Question 25 in Internationalization section used in main survey

If no to Q24, Please indicate the year, when your company expect to sell abroad.

	<input type="text"/>
don't know	<input type="checkbox"/>
refuse	<input type="checkbox"/>

Source: Author

Question 25 has been added to 'Please indicate the year when your company expect to sell abroad'

When checking the responses to Question 24 'Do you currently have any international sales?' The interviewer found that some of participants had never sold abroad and didn't any experience to international sell. The question 25 'If NO, please indicate the year when your company expect to sell abroad' needed to be added to the questionnaire to gather the data on internationalization.

3.8 Sampling Procedure

The stratified sampling is used to select the sample. Stratified random sampling is a method of sampling that involves the division of a population into smaller groups known as strata. In stratified random sampling, or stratification, the strata are formed based on members' shared attributes or characteristics. Random samples are then selected from each stratum. (Zikmund, Babin, Carr, and Griffin, 2013, p. 71)

The population is divided into subgroups or strata by categorized high technology firms using the criteria established by Butchart (1987), which translate into NACE Rev.1 code (Chapter 2).

In the stratified sampling process, subsample of hi-tech firms is drawn within each stratum utilizing simple random sampling. The advantage of using a stratified sample, it is more a productive sample than taken on the regular random sampling. Random sampling error will diminish with the use of stratified sampling

because each group is interiorly homogenous and reflect the population (William et al, 2013).

3.8.1 Sample size

A definition of the term 'hi-technology' is important for identifying young high technology firms, but unfortunately, the review shows that the definition of hi-tech firm is still unclear. In addition, the Thailand Standard Industrial Classification: TSIC 2008 has no standard definition of technology based firms and the details of the Thai innovative start-ups which are impacting on the nation economic growth are general in nature.

This thesis defines the high-technology sectors based on the definition employed by the Organization for Economic Co-operation and Development (OECD) for the technology sector based on the classification which includes the manufacturing and service sectors in the NACR Rev. 2 (2006). The criteria used are the 'ratio of Research and Development (R&D) or R&D expenditure to sales' and 'the share of employees working in R&D'. These hi-tech firms have higher R&D expenditure and employ more qualified scientists and engineers than other sectors (refer to table 3.6).

Table 3.6: The definition of high technology sector

Aggregated Industries Used	Short description according to NACR Rev. 2
R&D Intensive Service Industries	Telecommunication, Computer Programming and Software Services, Data processing, Misc, Computer Services, R&D in Natural Sciences and Engineering
ICT-Hardware	Office Equipment; Computers and other Information Processing Equipment; Television and Radio Transmitters and Apparatus for Line Telephony and Line Telegraphy; Television and Radio Receivers, Sound or Video Recording and Reproducing Apparatus

Engineering Industries	Electronic Instruments and Appliances for Measuring, Checking (except Industrial Process Control); Electronic Industrial Process Control Equipment; Optical Instruments; Photographic Equipment
Health and Life Sciences	Pharmaceutical Products and Preparations; Medical and Surgical Equipment and Orthopaedic Appliances
Other High-tech Manufacturing	Plastics and Synthetic Rubber in Primary Form; Electric Motors, Generators and Transformers; Electricity Distribution and Control Apparatus; Electronic Valves, Tubes and other Components; Aircraft and Spacecraft Manufacturing

Source: Eurostat (2008)

The above definitions describe the hi-technology industry as one with high expenditure on research and development (R&D), shorten technology and product life cycle (PLC) and strong international competition.

Eurostat (2008). NACE Rev. 2. Luxembourg: Office for Official Publications of the European Communities.

The Thai Small and Medium-sized Enterprises (SME)

The Thai ministry of Industry established the definition of Small and Medium-sized Enterprises (SME) on 11 September 2002. The definition is based on the number of employee and fixed capital. An enterprise is categorised as an SME, if it has less than 200 employees and fixed capital less than THB 200 million, excluding land and properties. SMEs in Thailand are grouped in three sectors, namely Production, Service and Trading.

Table 3.7: The Definition of SMEs in the Thai Industry

Type	Small Enterprise	Medium Enterprise
Manufacturing Industry	Enterprise which corresponds to any of the following; with employees of up to 50 or with assets of up to 50 million baht.	Enterprise which corresponds to any of the following; with 51 – 200 employees or with assets of no less than 50 million baht and up to 200 million baht.
Wholesale Industry	Enterprise which corresponds to any of the following; with employees of up to 25 or with assets of up to 50 million baht.	Enterprise which corresponds to any of the following; with 26 – 200 employees or with assets of no less than 50 million baht and up to 100 million baht.
Retailing Industry	Enterprise which corresponds to any of the following; with employees of up to 15 or with assets of up to 30 million baht.	Enterprise which corresponds to any of the following; with 16 – 150 employees or with assets of no less than 30 million baht and up to 60 million baht.
Service Industry	Enterprise which corresponds to any of the following; with employees of up to 50 or with assets of up to 50 million baht.	Enterprise which corresponds to any of the following; with 51 – 200 employees or with assets of no less than 50 million baht and up to 200 million baht.

Source: The Office Small and Medium Enterprise Development Policies in Thailand (OSMEP, 2012, p.161)

The official definition for SMEs is not used by the financial institutions in Thailand. Each financial institution in Thailand is permitted to use its own definition of SMEs, which typically bases on criteria such as sales less than THB 400-500 million and/or credit line less than THB 200 million. Thus, data presented in Thailand’s profile does not reflect the above national definition.

The selection of Thai technology firms to be use in this thesis is based on a combination of high-technology firm characteristics (Table 3.6) and the industrial standard of SMEs in Thailand (Table 3.7) from both the manufacturing and service sectors. They are the founders/managers from 2,000 innovative firms in

Thailand. And the seven cases of innovative companies selected from the original name list of respondents who were registered with STI, Thai BISPA, SPA, and the Regional Science Parks Network. The details of the sample are described in 3.8.2.

3.8.2 Sample selection

The survey was conducted in Thailand from 2013 to 2016 using a sample of hi-tech SMEs as the small start-ups are more likely to exhibit a greater percentage of innovation (Audretsch, 1995). The SMEs were established between 2007-2012 in the manufacturing and services industries sectors. The sample was drawn from the commercial registration database of the Department of Business Development, the Ministry of Commerce of Thailand.

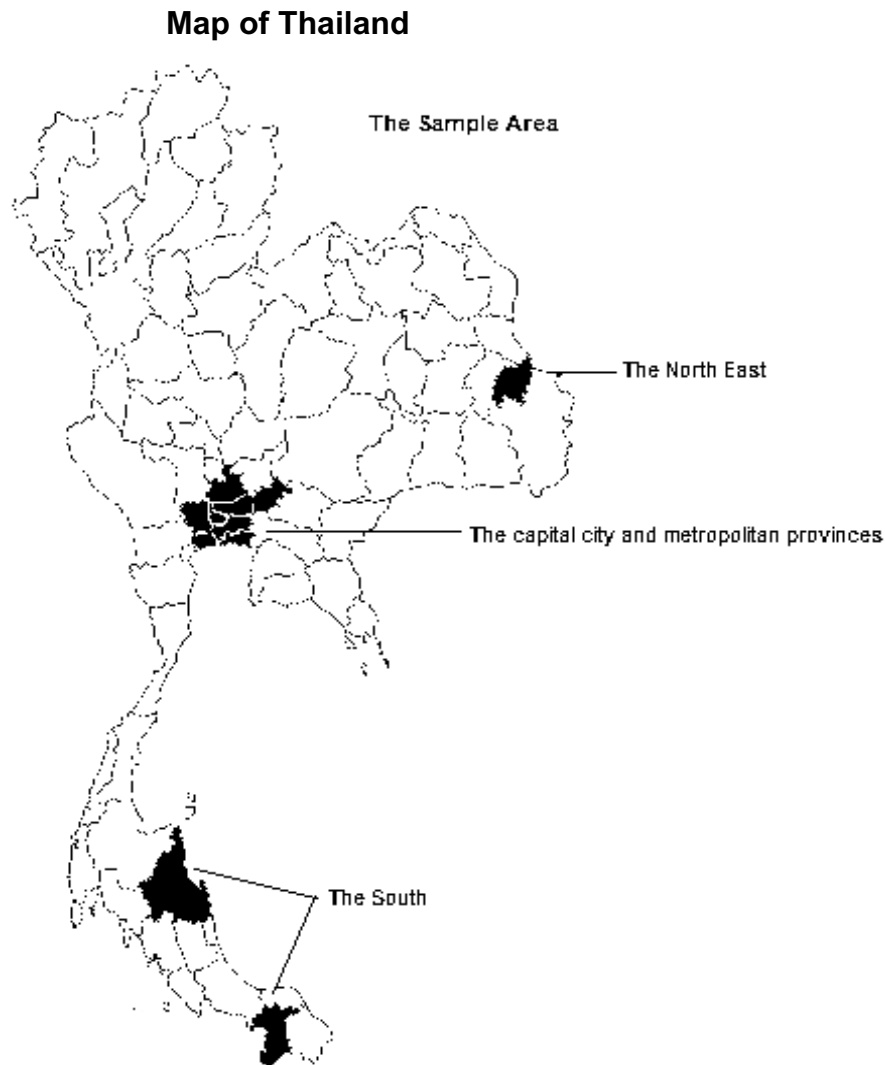
The sample size of 2,000 firms obtained from Bangkok, the capital city and the metropolitan provinces classified by size, age and sector was drawn from the sample database Thailand Standard Industrial Classification: TSIC - 2009, was obtained from the Office of the Central Company and Partnership Registration, Department of Business Development.

The respondents participated in the in-depth interview were involved in technology businesses and in IP, Law, Finance, Marketing, etc. of the hi-tech businesses. The detailed breakdown of the participating SMEs will be presented in Chapter 4.

3.8.3 Sampling area

The Thai SMEs selected for the study came from the areas (in black); the capital area and metropolitan provinces, the north east and the south as shown in Figure 3.8

Figure 3.8: The geographical locations of samples selected



Source: adapted figure from www.google.co.th

3.9 Data Analysis

The main objective of the statistical analysis is to examine the core characteristics of hi-technology entrepreneurship, the relationship between key predictors of firm growth and young hi-technology firms in Thailand, and the core firm growth determinants of young Thai hi-technology firms. The univariate, bivariate and multivariate analytical procedures are used to analyse the data collected in this research. The univariate descriptive procedure is used to describe the data collected to provide a profile of the characteristics of the respondents. Hypotheses on how firm based contingent factors are related to type of establishment are tested using the bivariate correlation analysis and the multivariate regression analysis.

3.9.1 Univariate descriptive analysis

The descriptive analysis of the 521 usable questionnaires collected from the 2,000 young hi-technology firms in Thailand using telephone survey provides the basic descriptive statistics profiling the respondents used in the discussion of the results. The Kernel density was used to estimate and explore the distribution of the different variables (Tapia and Thompson, 1987).

3.9.2 Bivariate analysis

The bivariate analysis is an associating technique that can determine if there is a systematic and consistent relationship between two or more variables (Hair et al., 2015) which is necessary toward the demonstration of the present of relationship between variables (Kent, 2001). The strength of correlation measurement is ranges from -1 to +1. A value of '+1' representing a perfect positive correlation. It means the two variables are perfectly correlated, that is if the value of one variable increases, the value of the other variable will also increase by the same degree. On another way, a value of '-1' represents a perfect negative correlation which means if one variable's value increases, the other will decrease by a similar degree. While a value of '0' means there is no relationship between the variables and they are absolutely independent (Saunders et al., 2009). Correlational values of 0.1, 0.3 and 0.5 are considered as small, medium and large respectively (Miles, and Shevlin, 2005), this discussion assumes you are using correlation analysis is that the case.

3.9.3 Multivariate analysis

Multivariate regression analysis is a statistical technique that explored the association between a single dependent variable and number of independent variables (Hair et al., 1998). The use of multivariate regression analysis could minimize the possibility of overstating the overall explanatory power of a group of independent variables which could occur if using a series of bivariate analysis (Patton and Zelenka, 1997). Moreover, this technique is a very commonly used statistical method in the social sciences (Long, 1997).

In this study, the multiple regression analysis is used to test the various dimension of business development, 1) characteristics innovation entrepreneurs, 2) product characteristics and innovation, 3) new market development, and 4) firm growth dynamics to measure the extent these factors constraining or assisting the growth process of firms, the multivariate analysis is hypothesized an identical variable for these four dimensions. The multivariate regression analysis quantifies the individual variables that impact on performance and helps to assess the relationship between the various variables and to control the scope of complexion variables in data, which may influence the outcomes.

Multiple regression analysis or the regression model assumes that the dependent variable is continuous and has been measured for all cases in the sample. Long (1977) stated that the dependent variables can be in several forms such as binary, nominal, ordinal, censored and count variables. The binary logit and probit⁴ models are suitable for use when attempting to model a dichotomous dependent variable, e.g. yes/no, agree/disagree, like/dislike, etc. (Amemiya, 1981; Greene, 1997).

Logistic regression is the appropriate regression analysis to conduct when the dependent variable is dichotomous (binary). Like all regression analyses, the logistic regression is a predictive analysis. Logistic regression is used to describe data and to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables (Armitage and Berry, 1994) and becomes the standard method of analysis over the last decade (Hosmer, Lemeshow, and Sturdivant, 2013). This typical analysis is chosen because it is designed for use with categorical dependent variables. While the ordinal logistic regression model (ORM) is a natural extension of the binary outcomes model which builds around latent regression the same way or manner like the binary logit and probit (Liao, 1994). The result of logistic regression analysis is an important statistic that can determine the robustness of the model and the significance of the independent variables as measure by:

- Model fitting analysis

⁴ Probit and Logit models are appropriate when attempting to model a dichotomous dependent variable, e.g. yes/no, agree/disagree, like/dislike, etc. and are widely used in the binary logistic regression analysis. They produce similar outcomes even if the parameter coefficients are not directly comparable. (Amemiya, 1981; Greene, 1997)

- The coefficient of determination R^2
- The logistic regression coefficients

In a multiple regression analysis, the main effect is represented by the R squared (R^2) value. The significance of the R squared value generated will be used to verify the acceptance or rejection of the hypotheses. The individual coefficient will be used to provide supplementary information on the independent variables used when necessary.

Saunders et al. (2009) stated that it is highly unusual to obtain perfect association in the business/management research, thus it is very important to create the acceptable level of significant statistic to support or reject (not support) each hypothesis. Hence, in this research, the classification of the significant value of probability is as follows:

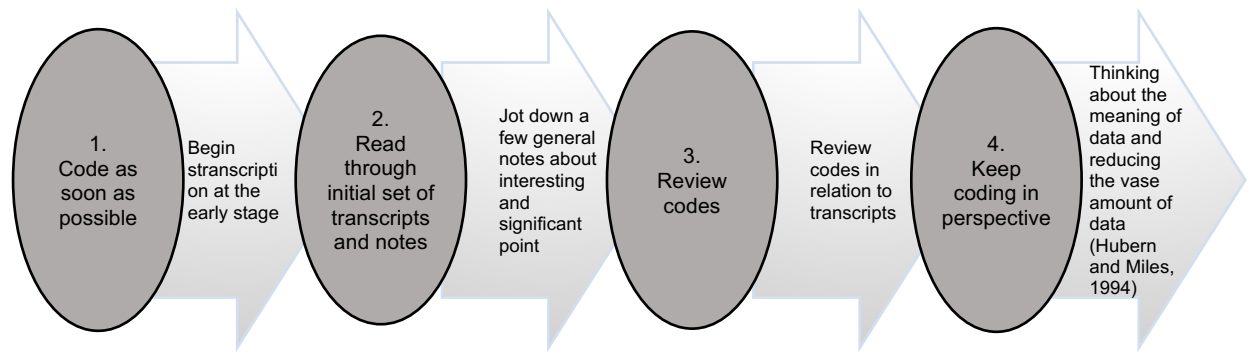
****	Significant at $p < 0.001$
***	Significant at $p < 0.01$
**	Significant at $p < 0.05$
*	Significant at $p < 0.10$

Hair et al., (2007) identify the acceptable level of significant value at $p < 0.05$. It is the significant value employed in this study.

3.9.4 Qualitative data analysis

The data derived from the in-depth interview was analysed in order to answer the research questions of this study. The interviews were recorded using devices such as audio recorder and tablet and shorted-note to minimize unexpected missing information. The recording was transcribed and coded for further analysis. Coding is the most common form of qualitative data analysis (Bryman and Bell, 2015). It is used to explore the concepts of technological strategy of high technology start-ups, the international business activities and the factors constraining the growth of business. The coding steps applied in this research is shown in figure 3.9.

Figure 3.9: The steps in coding



Source: Adapted from the steps and consideration in coding by Bryman and Bell, 2015

3.10 Ethical Issues

The researcher would like to quote the text from Blumberg, et al. (2014, p.134) that ‘the ethics are norms or standards of behaviour that guide moral choices about our behaviour and our relationships with others... the goal of ethics in research is to ensure that no one is harmed or suffers adverse consequences from research activities’.

Generally, ethical issues involve confidentiality, security, data protection, voluntary participation and the participant’s awareness of the study’s purposes and reporting procedure.

The Ethical issues of concern in this research are that the research is conducted in satisfactory and ethical way to produce accurate of information (McGivern, 2003), that the field of study is ethically acceptable (Behi and Nolan, 1995) and that to ensure the respondents are not subjected to discomfort or loss their privacy and confidentiality (Blumberg, Cooper and Schindler, 2014).

Thus, to safeguard against the infringement of the participants’ rights, Blumberg et.al (2014, p.114) provide us the basic ethical guidelines for conducting a research.

- explain the benefits of the study
- explain the participant’s rights and protection
- obtain informed consent

The ethical guidelines of the University of Exeter requires the securing of informed consent. This consent form states that the participants provide their

information voluntarily and have the right to withdraw from the research at any time. It is important that the ethical report is submitted and approved by the Business School Ethics Representative before starting the data collection process. The consent form provides six options for the participants to conform with all requirements (Appendix 3).

During the data collecting process, firstly, the interviewer begins by introducing her name, university and explains the purpose of the study and the benefits of this research. This information is also presented in the consent form. The interviewer describes the main purpose of this study that is to try to seek the key firm-based factor that may be associated with longer development of technology-based firms to the participants

“...regarding the main purpose that I inform you earlier, I will ask the details about the technological strategy of your company, the extent of international business activities and the possible factors constraining or assisting the growth process of the company”.

To conclude this section, the chapter highlights the research design and methodology utilize to answer the research questions, objectives and testing the hypotheses of this research. This chapter describes the development of research instruments, the sample selection process and the method to analyse the contingency data and interview protocol collected. Finally, it describes the procedure taken to ensure that the research meets the ethical requirements expected.

CHAPTER FOUR

DESCRIPTIVE ANALYSIS OF COMPANY CHARACTERISTICS

4.1 Introduction

The key purpose of chapter four is to provide a general description of the core characteristics of the firms surveyed and to answer the research question subsumed under the first research objective, 'To examine the core characteristics of hi-technology entrepreneurship' (Table 4.1).

Table 4.1: Research questions subsumed under research objective 1

Objectives	Research Questions
1. To examine the core entrepreneurial characteristics of hi-technology entrepreneurship	i. What are the core entrepreneurial characteristics of Thai hi-technology firms?

Source: Author

A total of 521 start-ups were selected from the survey. Altogether there are eight categories of firms by type of establishment. The distribution of the start-ups by type of establishment is presented in Table 4.2

Table 4.2 Frequency distribution of types of start-ups based on establishment

Types of establishment	Number of observations
merger with a similar sized firm	138
merger with a larger firm	136
Independently established firm	93
acquisition of another firm in your industry sector	33
acquisition of another firm outside your core industry sector	25
management buy-out or management buy-in	22
change of ownership	24

change of management	26
----------------------	----

Source: Author

Of the eight types of establishment, three types of establishments which are (1) firms established by merging with large firm, (2) firms established by merging with similar firm, and (3) firms established independently, 367 in total, accounted for about 70% of the total number of firms participated in the survey. The remaining six types of establishments, 154 in total, accounted for 27% of the firms surveyed. As these six types of establishments are too small in number to be statistically practical for use individually in the analysis, they are combined to form the 'other' establishment type. Though the 'other' type is part of the analysis, it will be excluded in the discussion because it is not possible to attribute meaningfully the implications derived from the analysis to this group as it is consisted of six distinctly different types of firms.

After the discussion of response rate, the chapter will present the descriptive analysis of the core characteristics systematically in their respective order in the questionnaire.

4.2 Response Rate

4.2.1 First questionnaire survey

A total of 2,219 small and medium enterprises (SMEs) in the hi-technology sector selected based on the information obtained from the Department of Business Development in Thailand was contacted by telephone. After validating the contact information, 1,231 firms were selected to participate in the telephone survey conducted from August 2013 to June 2014. To encourage all participants to complete all the questions, they were assured that their participation was anonymous. Within the ten month period, a number of follow-up actions were undertaken to boost questionnaire completion rate. However, only 108 (8.77%) of the questionnaires were completed and can be used in the research. Some reasons accounting the low response rate are the information from the government data base is not up-to-date with regard to telephone numbers,

operating status and addresses, participants' refusal to give some information that is sensitive to their organizations, and a number of start-ups closed down before and during the survey.

4.2.2 Second questionnaire survey

A second telephone survey was conducted to secure more participating firms during July 2014 - February 2015. In this period of seven months, 1,356 firms were contacted and 779 firms participated. 413 from the 779 companies, about half (53.01%), participated completed the questionnaire.

At the end of the questionnaire survey, a total of 521 usable questionnaires were collected. Therefore, the net usable questionnaires accounted for 14.57% (521/3575) of the total number of firms initially selected and 25.92% (521/2010) of the firms participated in the survey. Table 4.3 summarizes the response rate of the survey.

Table 4.3: Summary of questionnaire survey response rate

	Number	Percent (%)
Total number of samples selected initially	3575	100.00
Total number of firms participated	2010	56.22
Attrition:	(1489)	
Had ceased operation and ineligible	(489)	-
Refused to participate in survey	(673)	-
Did not complete the questionnaires	(327)	-
Usable responses	521	14.57

Source: Author

According to Neuman (2007), unsearchable persons should not be included in the total number in the sample. Despite the huge percentage of unusable firms, the response rate in this survey is better than the typical expected telephone survey response rate of 9% (Keeter et al., 2017).

4.3 Description of Core Characteristics

The descriptive statistics illustrating the aspects of firm ownership, governance, general firm demographics and general patterns in their evolution from inception to now are presented in this chapter.

The aspects were analysed based on four main categories, namely 1) Ownership, governance and firm demographics, 2) Product characteristics and innovation, 3) Market development and internationalization, 4) Source of finance. Then the chapter ends with a summary of each of the factors presented.

Traditional economic theories on firm focus on the separation of ownership and control in large firms (Alchian and Demsetz, 1972). In contrast, entrepreneurial theories on the firm often focus on the single entrepreneur as an innovator (Kuratko and Hodgetts, 2001; Schumpeter, 1932) and/or risk-taker (Knight, 1921). As such, little consensus has been achieved either within or across disciplines, particularly with respect to how firms are formed and what governance structures they adopt, especially in the early stages of their existence. Is it true that there is a natural tendency for ownership and effective control of firms to be separated? Or is it the case that new firms are typically the legal manifestation of a single entrepreneur or innovator? In addition, we generally know much about the total size of firms at start-up stage and through their growth and development, but very little about the hierarchical structure of employment within firms and the nature of human capital at various hierarchical levels within the firms. Technical aspects of human capital are particularly important in a technological context and more broadly in relation to innovative capacity and capabilities.

The aim of the descriptive data presented in the following sections is to identify the core characteristics of entrepreneurial demographics, firm demographics, skills and competencies of Thai innovative firms by exploring:

- The (in)dependent nature and modes of firm foundation
- Start-up size distributions
- Human capital and general employment
- Ownership teams and ownership change

- Managerial teams and human capital

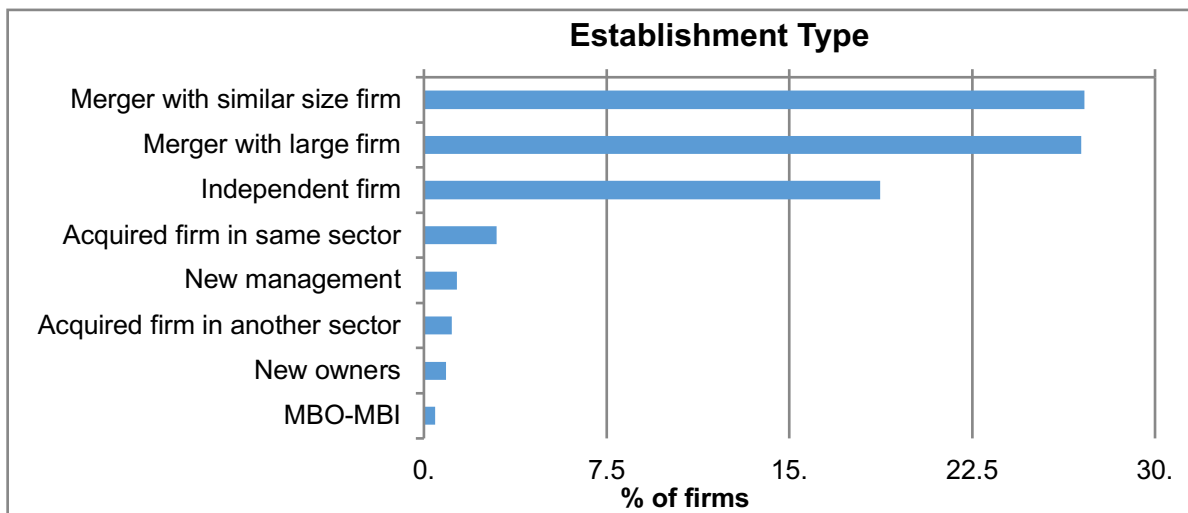
4.4 Ownership, Governance and Firm Demographics

In this section, the nature of the firm at its establishment is examined. Specifically, the examination focuses on establishment type, number of employees and employment preference, ownership and governance,

4.4.1 Company Establishment Characteristics

The respondents were asked about their company’s establishment. The data relating to the nature of the firms’ establishment is presented in Figure 4.1.

Figure 4.1: Nature of company establishment type



Source: Author

The most common mode of founding of a new firm was through a merger with similar sized firm (27.11%), follow by merger with larger firm (26.98%) and independently founded firms (18.71%). New firms formed from acquisitions, either within or outside of the firm’s sector, were relatively uncommon. This was also found to be the case for new firms established via in-firm ownership and management changes.

4.4.2 Employment

Table 4.4 shows the average employment size of firms in the overall employment distribution in percentiles.

Table 4.4: Distribution of average start-up employment

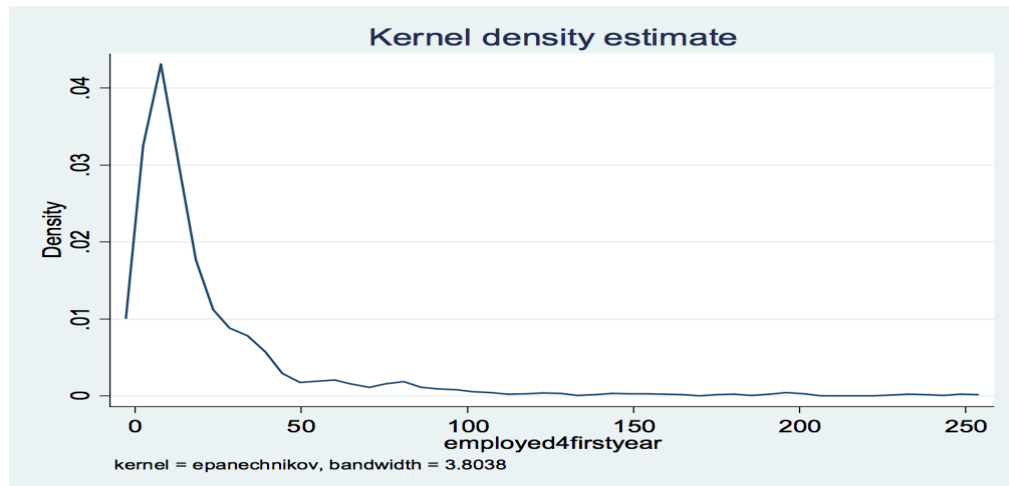
Distribution percentile	Actual start-up employment
5pc	2
10pc	3
25pc	6
50pc	11
75pc	25
90pc	52
95pc	80

Source: Author

The firms in the lowest quartile (25%) of the distribution have six or less employees at establishment which is categorised as the micro business. The firm at the 50 percentile has in average 11 employees. At the 75 percentile, the average number of employees is 25, and at the 90 percentile it is 52. The top 10% in the distribution has an average of 80 employees which may be classified as a medium-sized start-up and is highly unusual.

The overall distribution of start-up employment size, shown using the kernel density estimates (Figure 4.2), shows that majority of the firms began at a relatively small scale with fewer than 25 employees in the first year of establishment. The long tail to the right hand side of the distribution indicates that much larger start-ups with a number of 80 or more employees, the classification cut-off point for medium-sized firm, is scarce in the distribution.

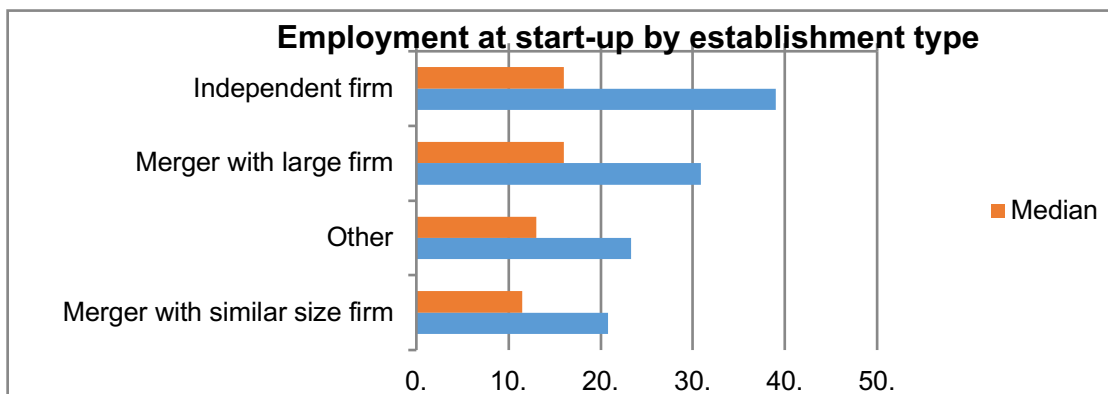
Figure 4.2: Kernel density estimates of the distribution of start-up employment



Source: Author

The number of employees employed at start-up by type of establishment is presented in Figure 4.3. The median and mean are calculated for each type of establishment,

Figure 4.3: Employment at start-up by type of establishment



Source: Author

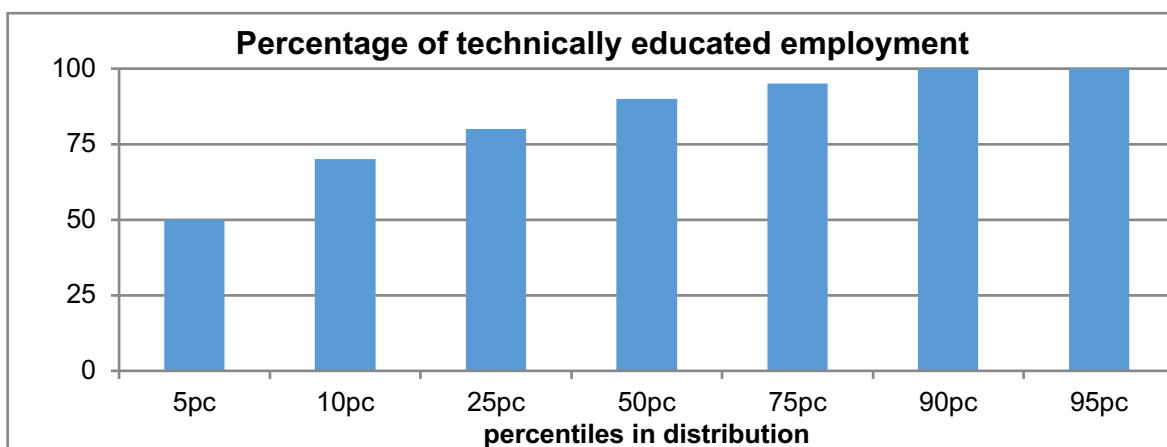
Note: The Other category comprises all other types of establishment with small number

The results show that the independent start-ups had the highest average employment size whereas firms that were founded through a merger of two similar size firms had the lowest average employment at start-up. When the mean and medium employments for each establishment are compared, the employment at start-up for the independently established firms varied much more than the other types of establishments. The mean employment value was more

than two times of its median employment value. Whereas for the other establishment types, the mean value was about twice that of the median value.

Figure 4.4 presents the distribution of employees who have technical education in the total employment in percentiles.

Figure 4.4: Percentage of Technically educated employees in total employment



Source: Author

The pertinent point observed in the distribution is that the overall percentage of technically educated employees in the total employment was high for all businesses. Firms in the lowest quartile (25%) which were in the micro organization category had a percentage from 50 to 80 percent. The firms in the 50 percentile had about 90 percent. Then, at the 75th percentile the percentage reached 95 percent. Lastly, firms at the 90th and 95th percentiles had 100 percent technically educated employees.

To further examine the employment preference, the employment of each type of establishment was analysed. Table 4.5 presents the data for employment of technically educated employees by type of business establishment.

Table 4.5: Share of technically educated employees in total employment by establishment type

Establishment type	% share of technically educated employment
Merger with large firm	88.58

Merger with similar sized firm	89.87
Independent	81.35
Other	86.25

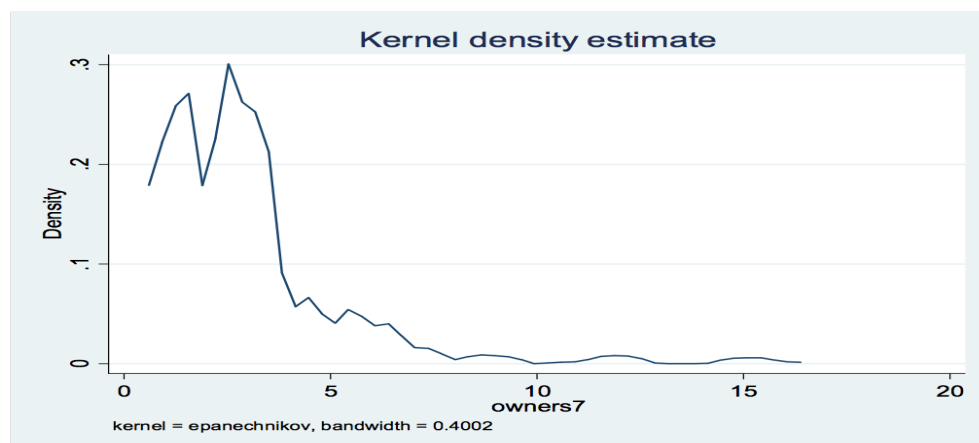
Source: Author

All firms had a very high percentage of technically educated employment at the start-up period irrespective of type of establishment. More than 80% of their employees had technical education. Overall, the difference in percentage between the establishments was relatively small.

4.4.3 Ownership

As a whole, the kernel density estimate (Figure 4.5) shows that a typical start-up has fewer than five owners although a small minority may have up to sixteen owners. The median number of owners is three and the average number of owners is 2.93. This suggests that ownership is closely held amongst a small group of people.

Figure 4.5: Number of estimated owners



Source: Author

The various current number of owners based on establishment types are compared. The results are as presented in Table 4.6.

Table 4.6: Current number of firm owners by establishment type

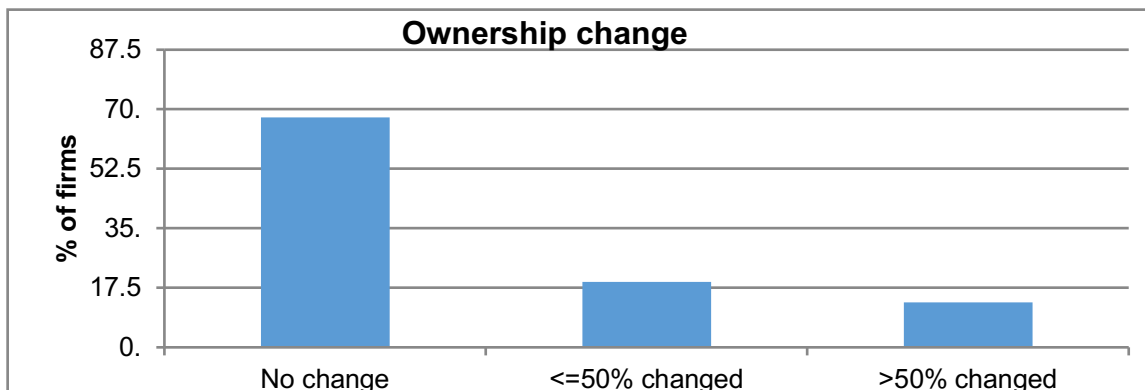
Establishment type	Current Number of firm owners
Merger with large firm	3.79
Merger with similar sized firm	2.99
Independent	2.99
Other	3.27

Source: Author

The average number of owners for the firms that merged with large firm had the highest number of owners with of 3.79. Firms who merged with similar size firm and independently established businesses had almost similar number of owners at 2.99. The average number of owners for other type of establishment was 3.27. The size of the management team did not vary by establishment type despite the fact that they had different number of employees.

Figure 4.6 shows the data on changes in the founding team since start-up.

Figure 4.6: Change of ownership since start-up



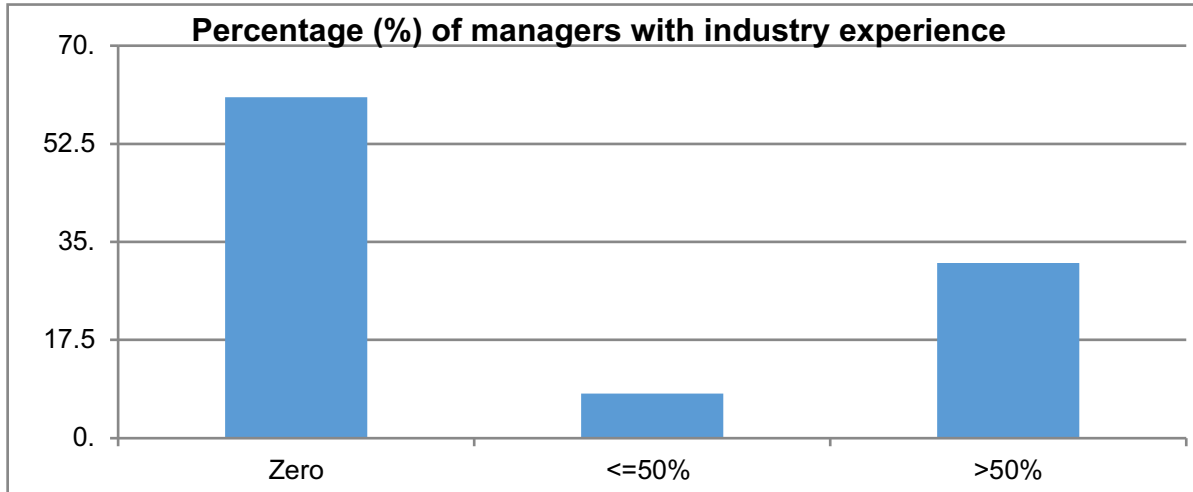
Source: Author

The results show that the original ownership of about 67.6 percent of the firms had no change.

4.4.4 Governance

The characteristics of the managers of the firms are examined to shed light on governance. Interestingly, as shown in Figure 4.7, the proportion of current managers without previous industry experience was relatively high. About two-third (60.8%) of the managers did not have previous industry experience.

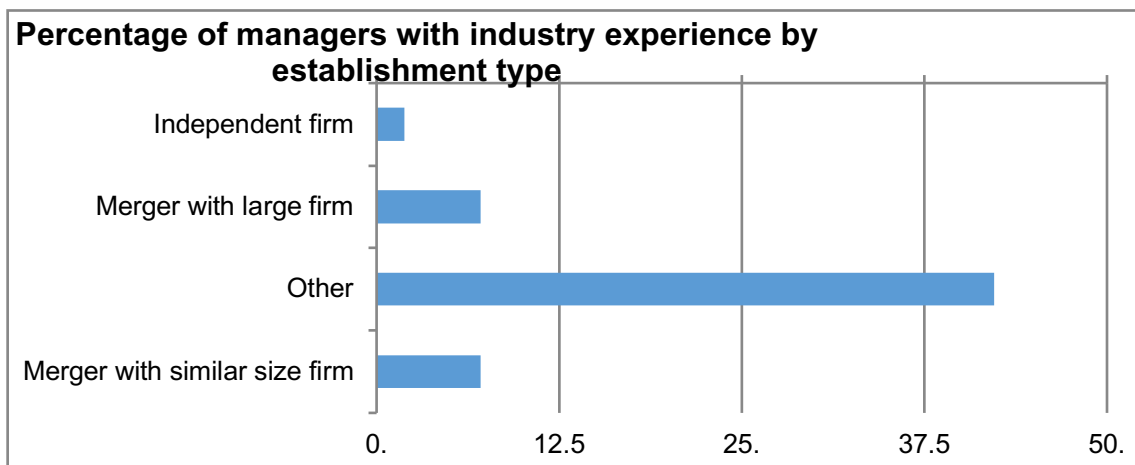
Figure 4.7: Percentage of managers with industry experience



Source: Author

The distribution of the industry background experience of managers based on establishment types is presented in Figure 4.8

Figure 4.8: Percentage of managers with industry experience by establishment type



Source: Author

Figure 4.8 reveals that in general, the percentages of the managers with industry experience of the three major types of establishments, the merger with large firm, merger with similar size firm and independently established firms were low.

Table 4.7 shows the overall percentage of managers with a qualification in business based on the size of the firms' employment. In general, the percentage of managers with business qualification was high in all the firms. Interestingly, even the micro firms (those in the lower 25%) had relatively high percentage of managers with business education. For those firms in the 50 and above employment percentile, 100 percent of their managers had business qualification.

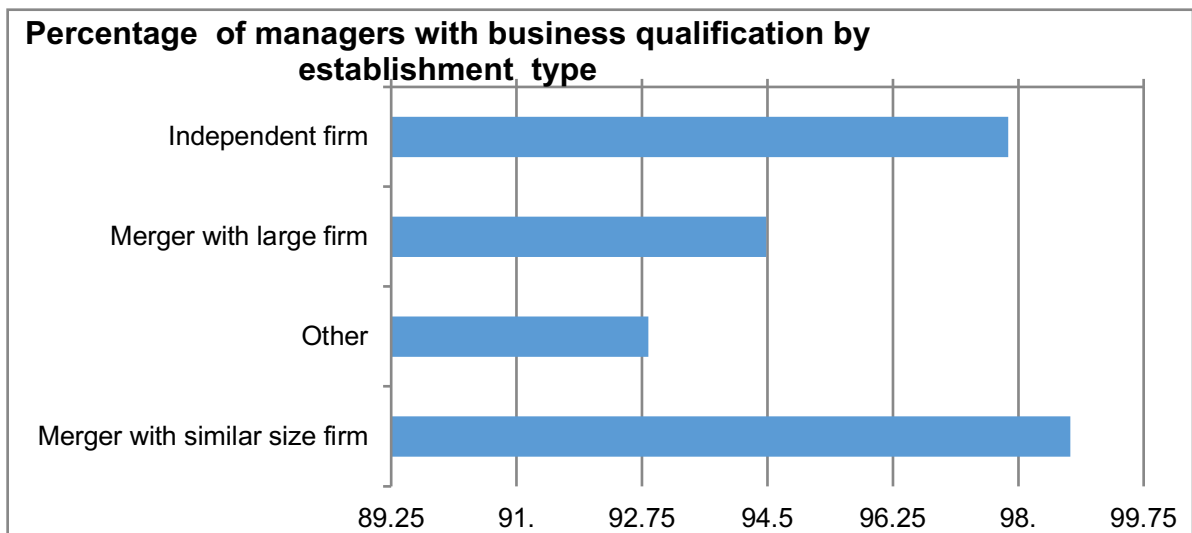
Table 4.7: Percentage of managers with business qualification

Employment percentile	% with business qualification
5pc	40
10pc	75
25pc	99
50pc	100
75pc	100
90pc	100
95pc	100

Source: Author

The educational qualification of the managers was further analysed based on establishment type. The results are presented in Figure 4.9.

Figure 4.9: Percentage of managers with a business qualification by establishment type



Source: Author

In general, more than 90 percent of the managers employed by all types of establishment had a business qualification.

4.5 Product characteristics and Innovation

Product characteristics have long been discussed in economic theories as they are regarded as the vehicle on which resources changed into new products and services (Murphy et al., 2006). Product characteristics are also linked to theory of innovation and resource-based view (RBV) as they help the entrepreneur to access resources to forecast the opportunity identification and firm growth (Alvarez and Busenitz, 2001). They also sustain competitive advantage (Barney, 1986).

Thus, the aim of this section is to inspect the core characteristics of product, R&D, and aspect of innovation of innovative firms by examining:

- The bestselling products or services of the firm
- Timing to offer the bestselling products or services
- Development of products or services for the international market
- The nature of products or services
- Group of customer base
- The innovative aspect of products or services

4.5.1 Firms' best-selling product or service

The firms' best best-selling product or service is examined to ascertain its importance. As shown in Table 4.8, the average percentage of the total sales accounted for by the firms' best-selling product or service was as high as 93.80%. This shows the high dependency of most firms on a single best-selling product or service line. It is observed that even the firms in the 5th percentile of the distribution have a high reliance on a single core product or service which accounted for about 70% of the total sales. Half of the firms were completely reliant on a single product or service.

Table 4.8: Percentage of best-selling product or service (% of total sales)

Best-selling product or service percentile	% share of total sales
5pc	70
10pc	80
25pc	90
50pc	100
75pc	100
90pc	100
95pc	100

Source: Author

Table 4.9 below shows the data relating to how long the firms took to offer their best-selling product or service to the market after having been established.

Table 4.9: Time took from formation to offer bestselling product or service

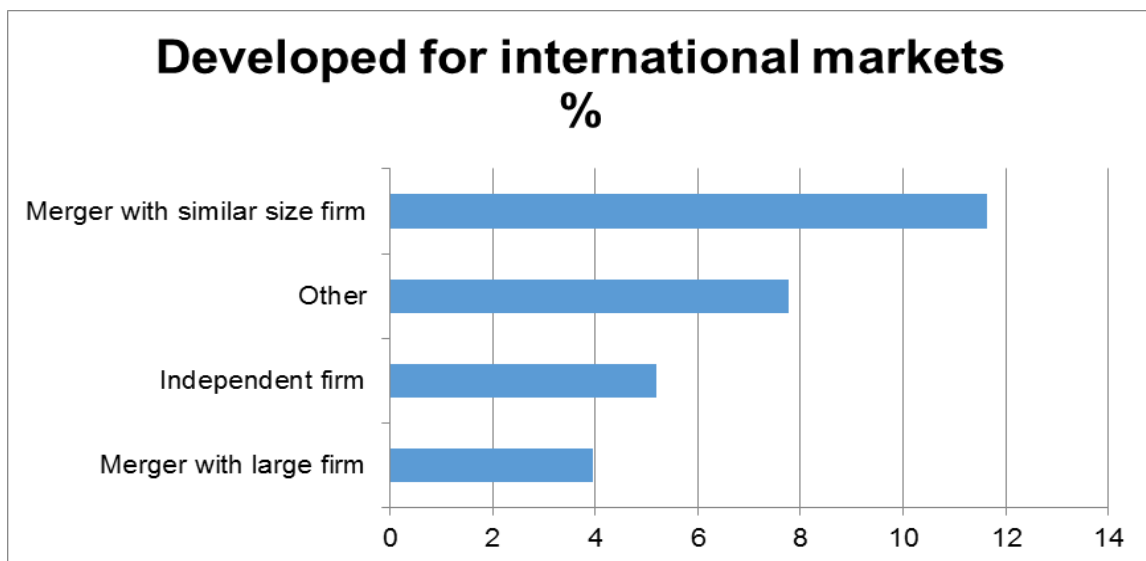
Time (Years)	% of firms
0	88.92
1	5.42
2	4.25
3	1.18
4	0.24

Source: Author

The results show that 88.92% of the firms marketed their best-selling product or service at the point of start-up. Only about 10% of the firms developed best-selling products or services one or two years after start-up.

Figure 4.10 shows the percentages of firms which produced for the international market by establishment type.

Figure 4.10: Firm developed product or service primarily for international markets by establishment type (% of total firms)

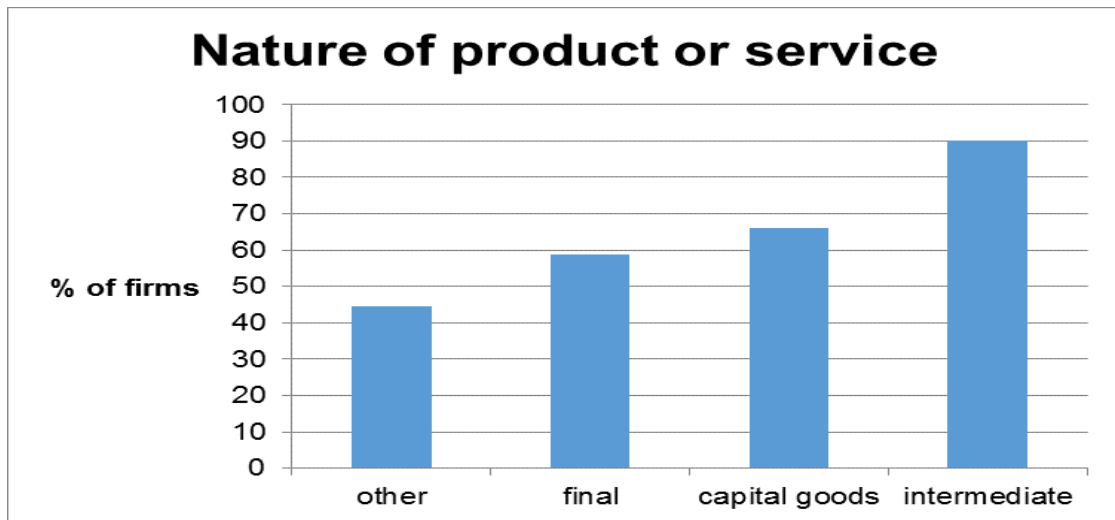


Source: Author

Generally, the percentage of products/service developed for the international market was rather small. The total percentage for the different establishments varied from 4 to about 12 percent. The firms that formed by merging with similar size firm had the largest percentage, whereas those that merged with larger firms had the smallest percentage offering products/services developed for the international market. The results suggest that most of the firms, irrespective of different establishment type, started by focusing on producing for the domestic market.

Figure 4.11 illustrates the nature of product or service offered by the firms.

Figure 4.11: Nature of product or service

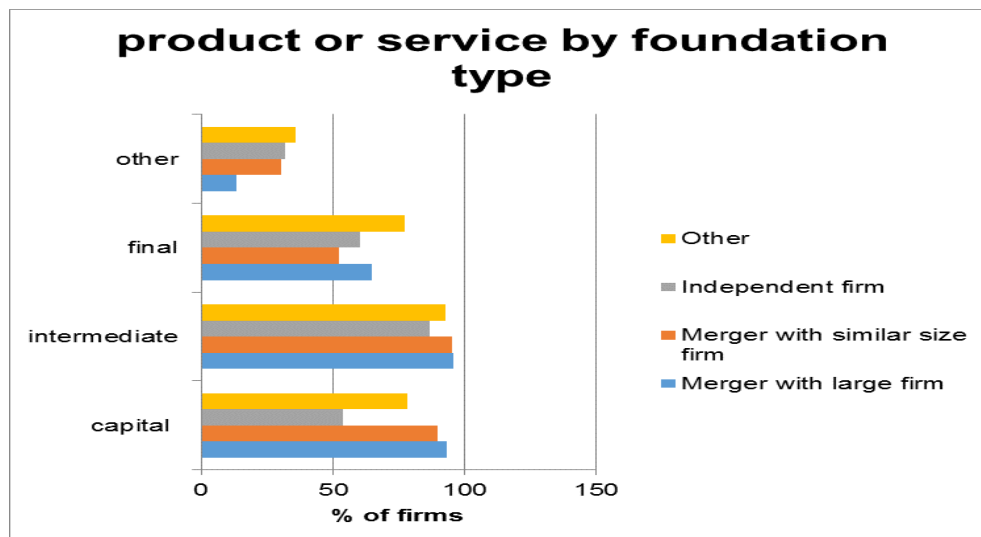


Source: Author

More than 90% of the firms offered products or services of the intermediate type. 66% and 58.72% of the firms offered product and service classified as capital goods and final goods respectively.

The exact nature of the product or service offered by the different types of establishment is presented in Figure 4.12.

Figure 4.12: Product/Service by establishment type



Source: Author

In general, the firms, irrespective of establishment type, produced more intermediate goods than other types of goods. Comparing the three types of establishment, higher percentage of firms that formed by merging with larger firms producing intermediate, final and capital goods.

Table 4.10 shows the average percentage of firms based on customer group

Table 4.10: Customer Base

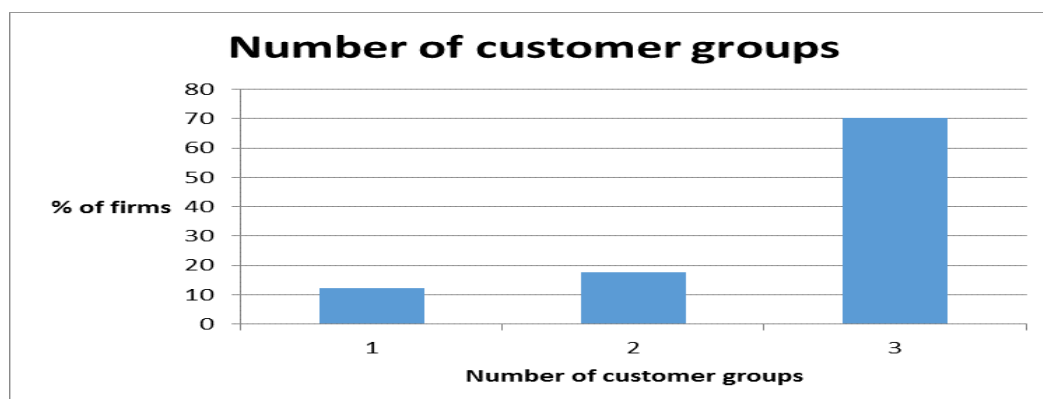
Customer	% of firms
Business	95.00
Consumer	83.46
Government	77.69

Source: Author

Comparatively, the business group customer base was the most important group of customer to the firms. However, the high percentages indicate that all three customer groups were important customers for the start-ups to sell their products or services.

The overall number of groups of customers of the firms is shown in Figure 4.13.

Figure 4.13: Number of customer groups



Source: Author.

The results shown in Figure 4.13 are in line with that presented in Figure 4.12. 70.19 percent of the firms had three customer groups while 17.69 percent of start-ups had two customer groups and 12.12 percent had one customer group.

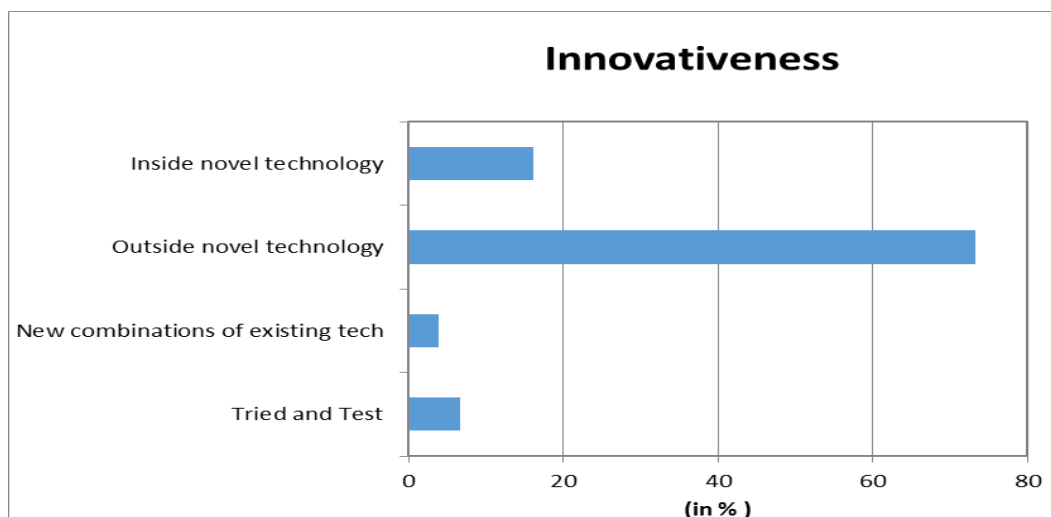
4.5.2 The innovative aspect of products or services

The technologies used to produce the firms' products or services are presented in Figure 4.13. The technology choices adopted by the start-up firms examined to determine the degree of innovation of the products/services are:

- Incorporates 'tried and tested' combinations of existing technology
- Incorporates new combinations of existing technology
- Incorporates novel technology that has been developed elsewhere
- Incorporates novel technology that had to be developed specifically for this product by the company

Almost three quarters (73.21 percent) of the firms used outside novel technology or technology from third parties to produce their own product or service. The use of internal novel technology accounted for just 16.18 percent while the use of existing 'tried and tested' technology was about 6 percent. Finally, the least adopted method used by the young hi-tech firms was by combining exiting technology or technology developed internally in a new way which accounted for only four percent.

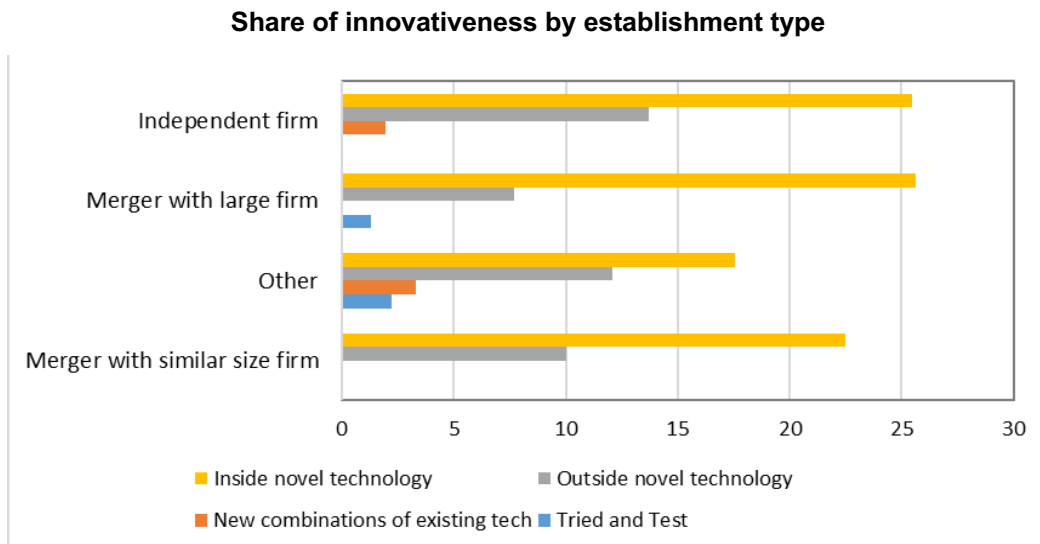
Figure 4.14: Innovativeness



Source: Author

The way the different types of firms used technology, a manifestation of the degree of innovativeness of their technology use, was presented in Figure 4.15.

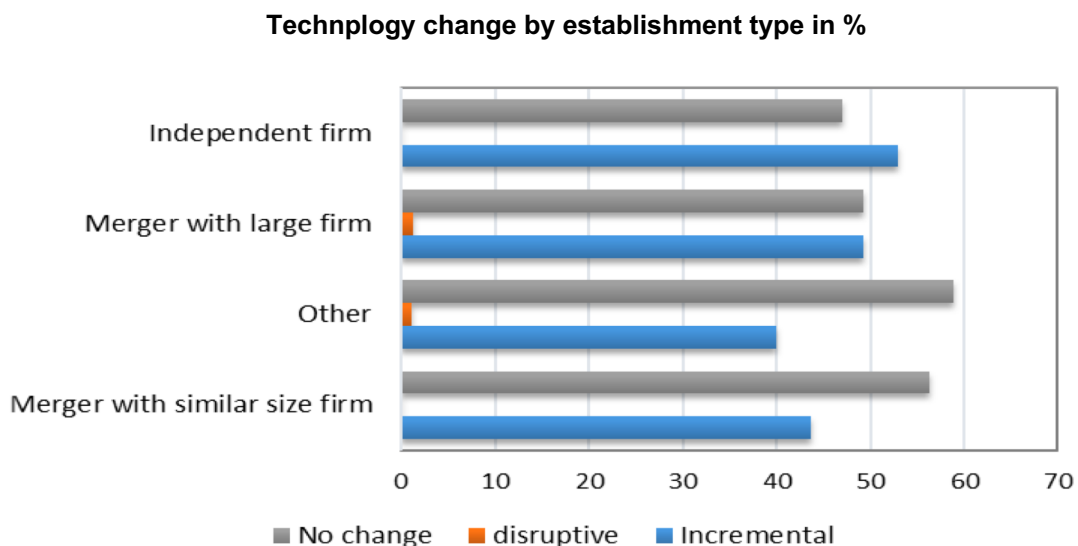
Figure 4.15: The share of innovativeness by establishment type



Source: Author

The results indicate that the use of inside novel technology is the predominant choice of all types of firms. In addition, all the firms also used outside technology. The use of tried and tested technology and the use of new combination of existing technology were marginal.

Figure 4.16: Technology change by establishment type



Source: Author

As can be seen in Figure 4.16 above, 56% of the firms that merged with similar size firms had no technological changes in producing their product/service. The rest of them (44%) carried out incremental change. The second establishment type, merger with larger firm, 49% of them invested in incremental change, while

49% had no change on core technology embodied in the production of their product/service. Only about 2% of this type of firms used disruptive technology. For the independent new firm, 53% of them practised incremental change in their core technology, while the rest (47%) of them had no change in manufacturing the technology. For firms in the independent category, 53% of retained their technology, while 47% practiced incremental change in technology. Only firms that merged with larger firms used the disruptive change to develop new technology to produce their product/service.

Firms that change their technology incrementally and firms that retained their technology were found in all types of establishment. Incremental change in technology was more preferred than disruptive change. The use of disruptive change was very minimal and was only found in firms that formed by merging with larger firms.

4.6 Market development and Internationalisation

The descriptive data presented in this section will illustrate the following:

- The intensity of competition
- Timing of the competitor launching a product or service
- Type of sales support
- International sales
- Production/service location

The descriptive results will address the examination of the core characteristics of competition, market development and internationalization activities of innovative firms.

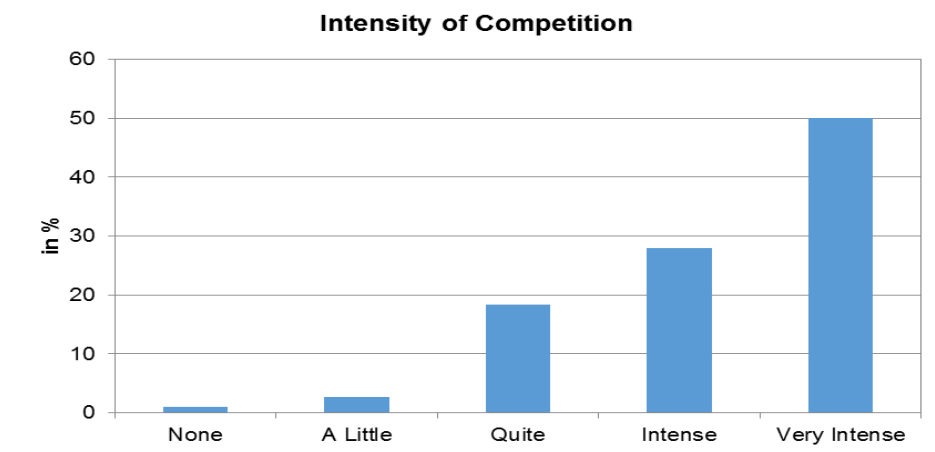
4.6.1 The intensity of competition

The intensity of competition that the start-ups encountered in the market is examined. A five point Likert scale ranging from none to very intense competition was used to measure competition. The results are as shown in Figure 4.16.

Competition was faced by majority of the firms. Half of the respondents indicated that competition was very intense and about one fourth of the firms engaged in

intense competition. Finally, only about four percent of the firms claimed to face little or have no intense competition.

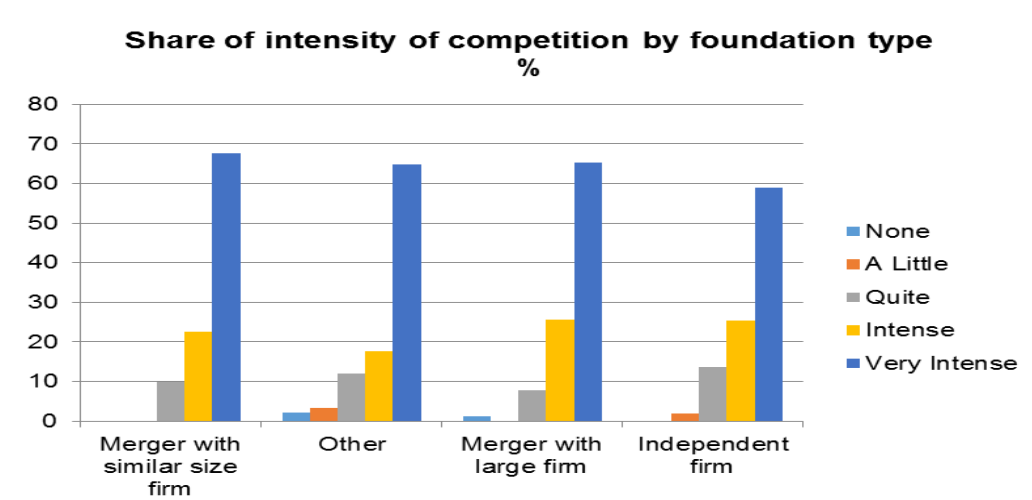
Figure 4.17: The intensity of competition



Source: Author

The Intensity of competition by establishment type is shown in Figure 4.18. The data shows that all types of establishments faced competition. More than half of the firms from each type of establishment faced very intense competition. The firms that merged with similar firms had the highest percentage (67.50%) of 'very intense competition'.

Figure 4.18: The intensity of competition by establishment type

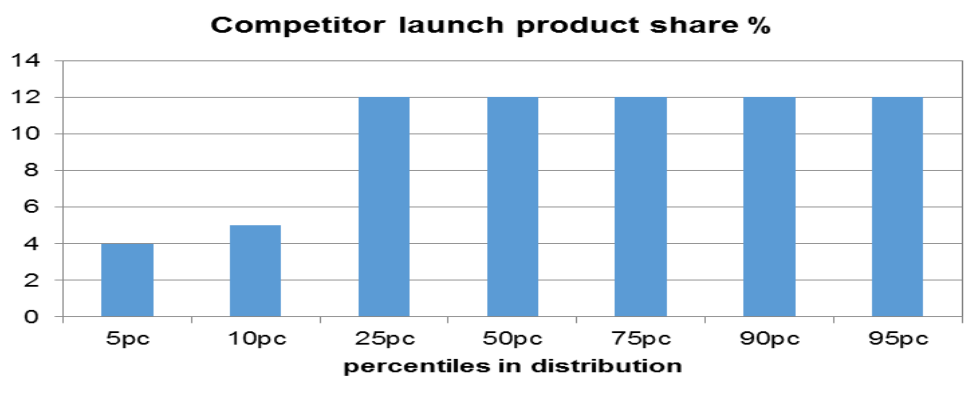


Source: Author

4.6.2 Timing of competitor launching competing product or service

A useful starting point for the analysis of competition is to look at the rate or probability of having a competitor launching a similar product or service with similar or superior performance. Figure 4.18 shows that during the first five years of the existence of the firms in the survey sample. About 15% of them faced launching of competitive products in less than five months after the launch of their product or service. However, almost 100 percent of the firms faced the launch of competitive product or service by other firms within 12 months after the launch of their products or service. This suggest that facing competition is a norm for all the firms surveyed.

Figure 4.19: The percentage of timing of competitive product launched



Source: Author

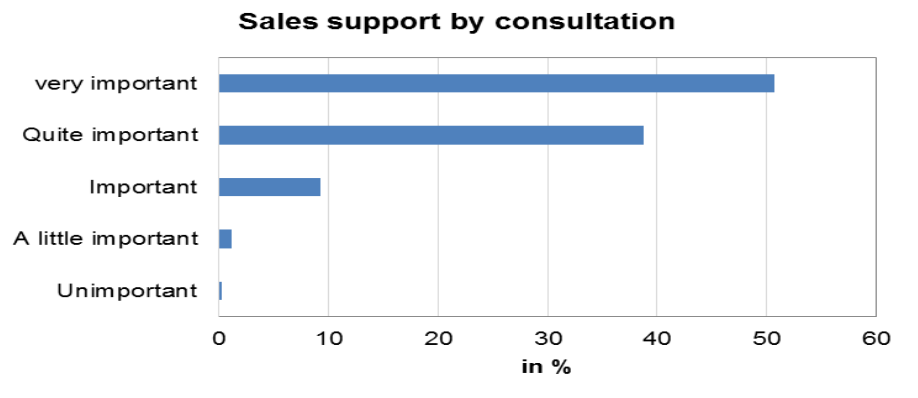
4.6.3 Type of sales support

In order to sell a product or service successfully, a number of different sales support activities need to be provided by a firm. The comparative importance of the following sales efforts that are typically employed are examined one by one in this section.

- 1) Technical consultation prior to sale
- 2) Individual client customization
- 3) Specific configuration or system requirements
- 4) Complex or time consuming installation
- 5) Regular maintenance and upgrade
- 6) Specialized training required for front-line and sales personnel

4.6.3.1 Technical consultation prior to sale

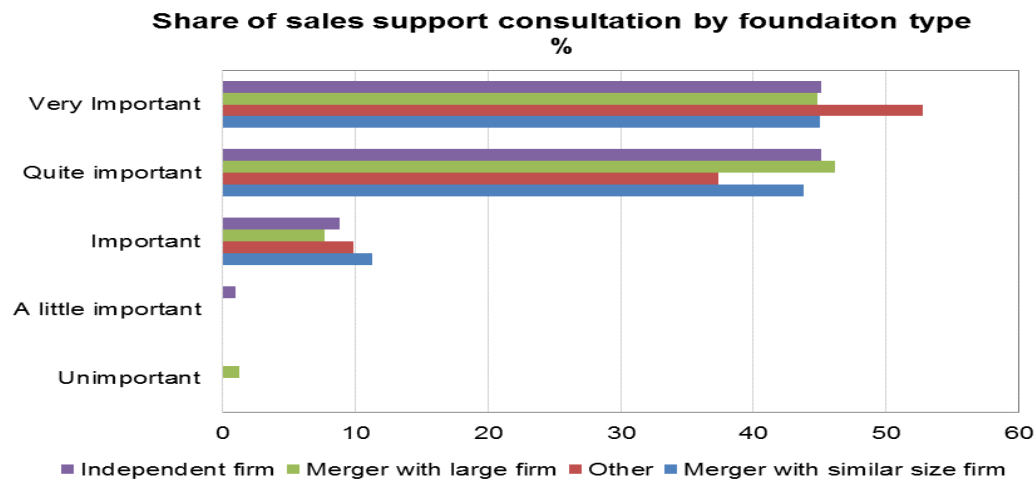
Figure 4.20: Sales support consultation



Source: Author

Providing sales support consultation was considered as important by more than 95% of the firms with about 52% saying that it was very important.

Figure 4.21: The percentage of sales support consultation by establishment type

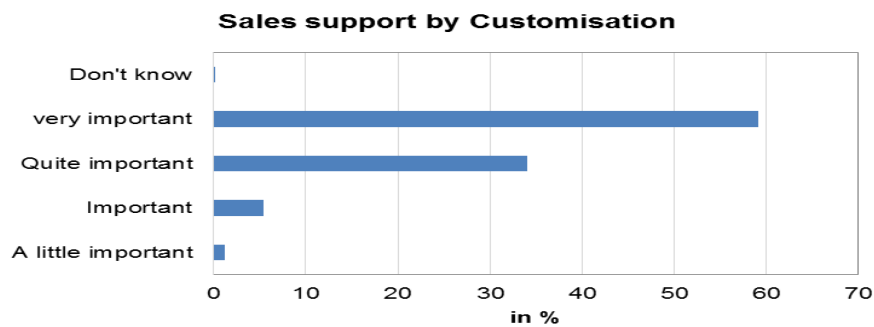


Source: Author

The number of firms by establishment type agreed that this support service was important was fairly similar.

4.6.3.2 Individual client customization

Figure 4.22: Importance of Customisation support

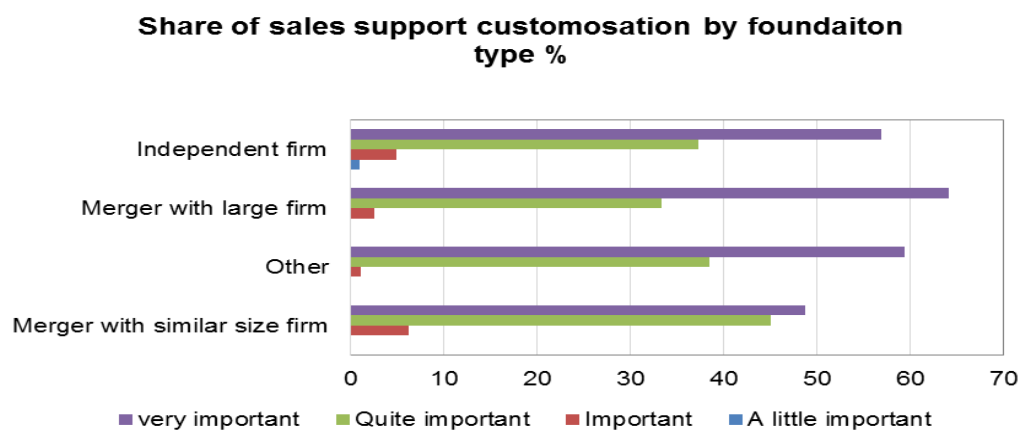


Source: Author

Figure 4.22 shows that more than 95% of the firms considered customisation support as important. Of this, about 59% of the firms said that individual client customization support was very important to them.

The opinion about customisation support across establishment types is presented in Figure 4.23.

Figure 4.23: The importance of sales support consultation by establishment type



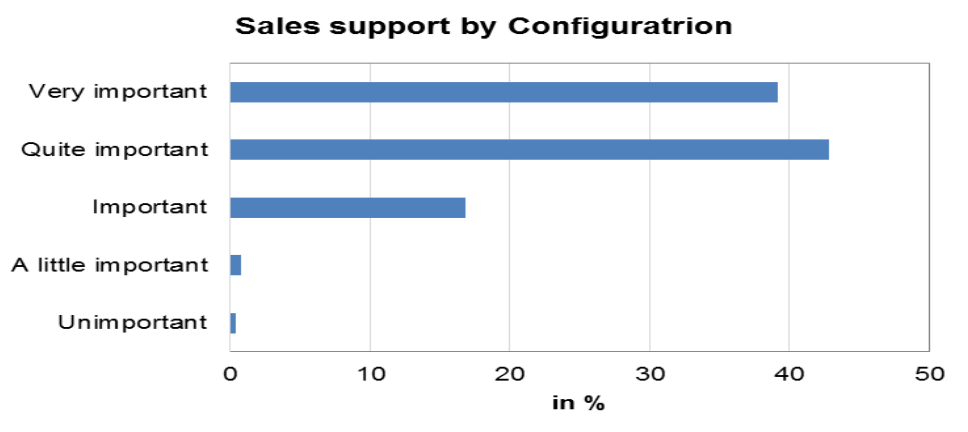
Source: Author

All firm types considered customization activity as very important for their business. Companies that merged with a large firm had the highest percentage of individual customization for their clients (64.1%), followed by independent firms (56.86%) and firms that merged with similar firms (48.75%).

4.6.3.3 Specific configuration or system requirements

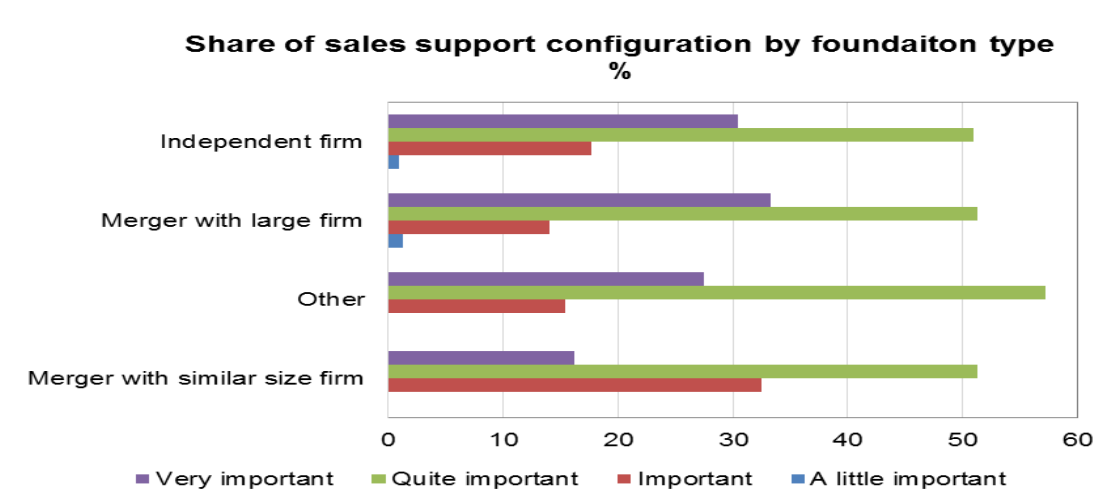
Specific configuration requirements were considered as important by more 95% of the start-ups (Figure 4.24). 39.86% of the firms considered specific system configuration requirement activity as very important.

Figure 4.24: The sales support by configuration



Source: Author

Figure 4.25: The percentage of the importance of sales support configuration by establishment type



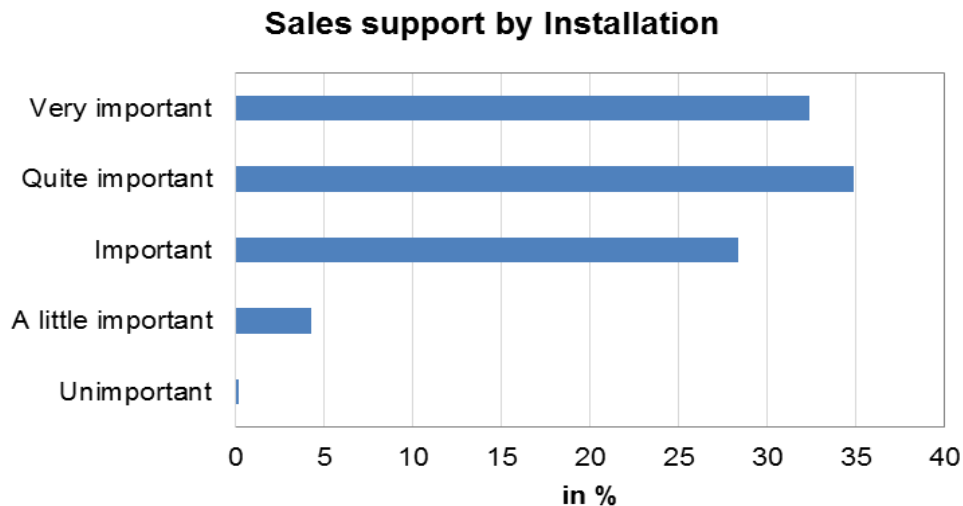
Source: Author

In general, as can be seen in Figure 4.25, configuration sales support was considered as important similarly by all establishment types.

4.6.3.4 Complex or time consuming installation

As can be seen in Figure 4.26 more than 96% of respondents found this installation support important even though it was time-consuming.

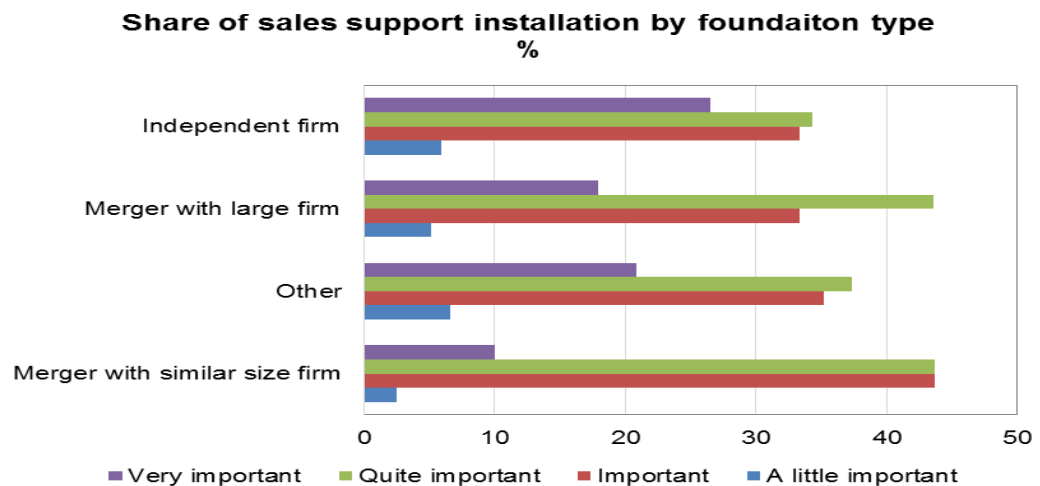
Figure 4.26: The importance of installation sales support



Source: Author

As is shown in Figure 4.27, firms of all establishment types displayed very similar position about the importance of this support activity.

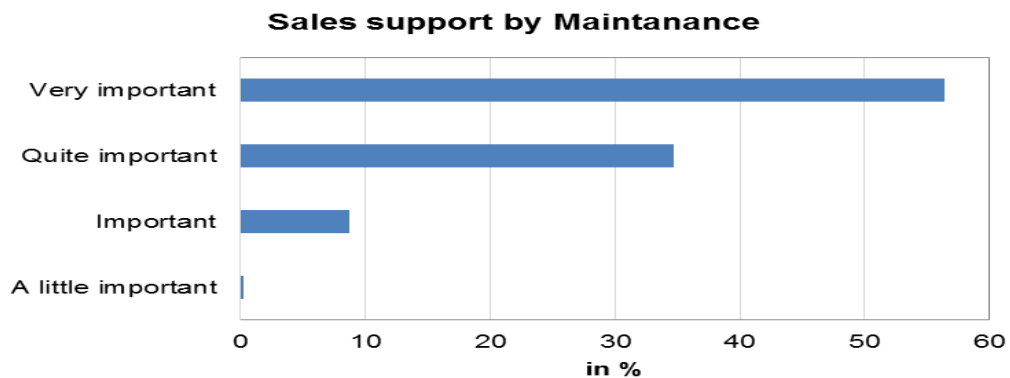
Figure 4.27: The percentage of the importance of installation sales support by establishment type



Source: Author

4.6.3.5 Regular maintenance and upgrade

Figure 4.28: Importance of Maintenance Sales support

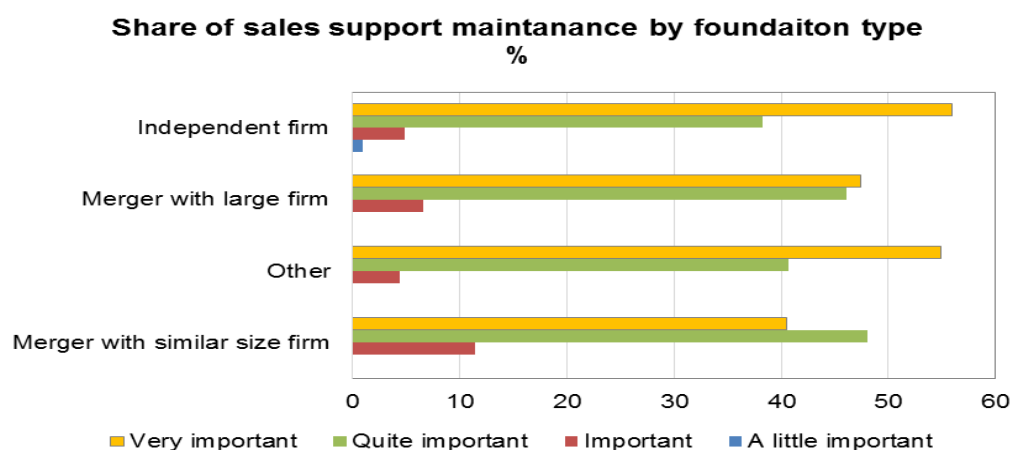


Source: Author

Figure 4.28 shows that all firms considered the regular maintenance and upgrade support important with 56.4% considered it as very important. It can be concluded that regular maintenance and upgrades are relevant and necessary for hi-tech start-ups because of the key characteristics of their product and service.

More than 90% of the firms from all types of establishments regarded this activity as important (Figure 4.29).

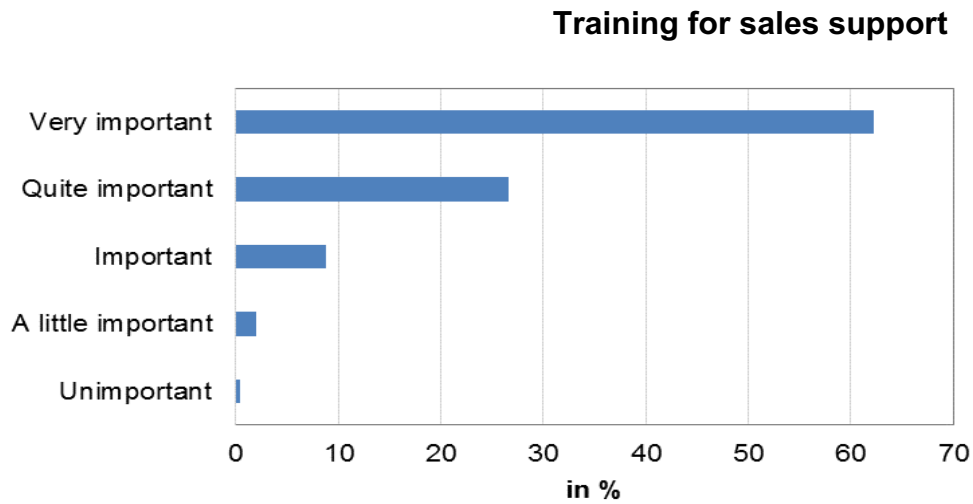
Figure 4.29: The percentage of the importance of maintenance sales support by establishment type



Source: Author

4.6.3.6 Specialized training required for front-line and sales personnel

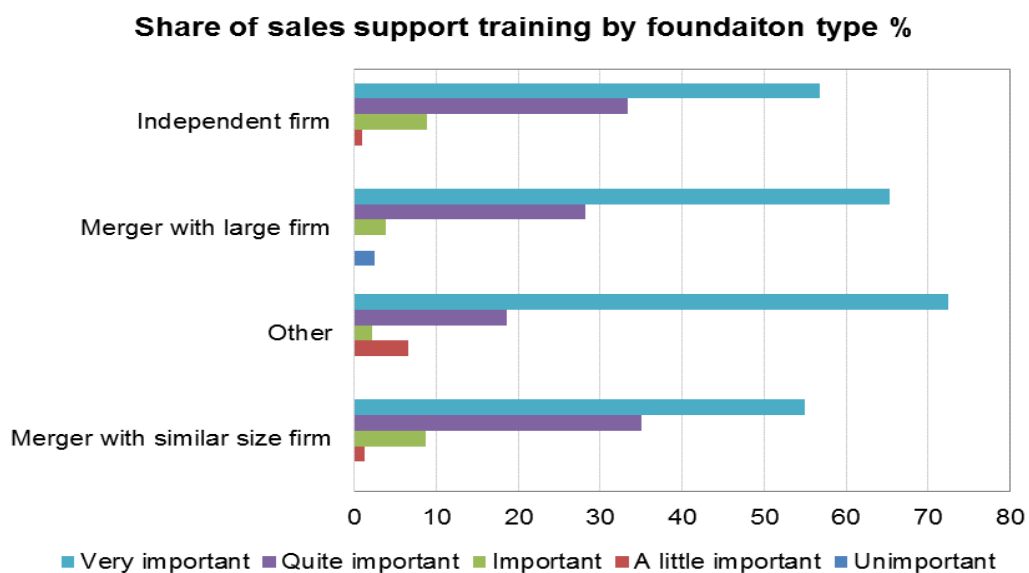
Figure 4.30: Importance of training for sales support personnel



Source: Author

The results presented in Figure 4.30 indicated that training activity was considered a highly relevant and necessary sales support by the majority of hi-tech firms.

Figure 4.31: The percentage of the importance of training sales support by establishment type.



Source: Author

Figure 4.31 shows that in line with all previously discussed sales support activities, majority of the firms from all establishment types regarded this activity as important.

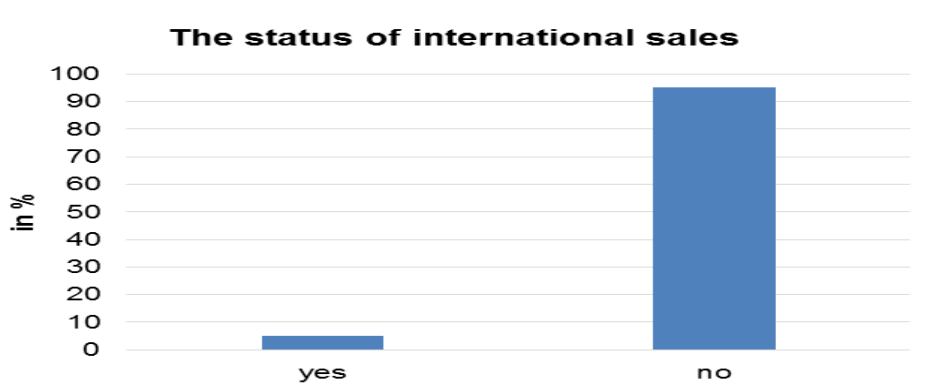
In general, the descriptive data presented in this section suggested that all the typical sales support activities were regarded as important by the hi-tech start-ups.

4.6.4 Internationalization

One of the main objectives of this study is to determine an estimation of the extent to which Thai innovative start-ups are engaged in international activities. Respondents were asked about their international business activities. The questions refer to the whole range of products or services including the location both domestically and overseas where their goods and services are physically produced.

Figure 4.32 gives an overview of the international sales status of Thai start-ups. About 5% out of the total firms engaged in sales abroad. These results provide evidence that the engaging in international sales activities was not very prevalent among the Thai innovative start-ups in the early stage. The findings suggest that majority of the Thai hi-tech new firms were not ready to engage in international sales activities initially.

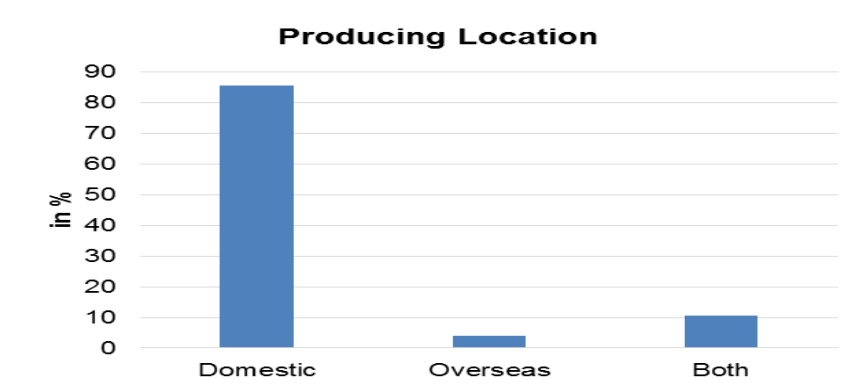
Figure 4.32: The status of international sales



Source: Author

Figure 4.33 shows that a sizable proportion of young hi-tech firms produced their company's products or services in Thailand. About 4% of Thai start-ups produced their products/services in foreign countries. By contrast, 85.43% of firms produced domestically. 10.58% of them manufactured in both domestic and international locations.

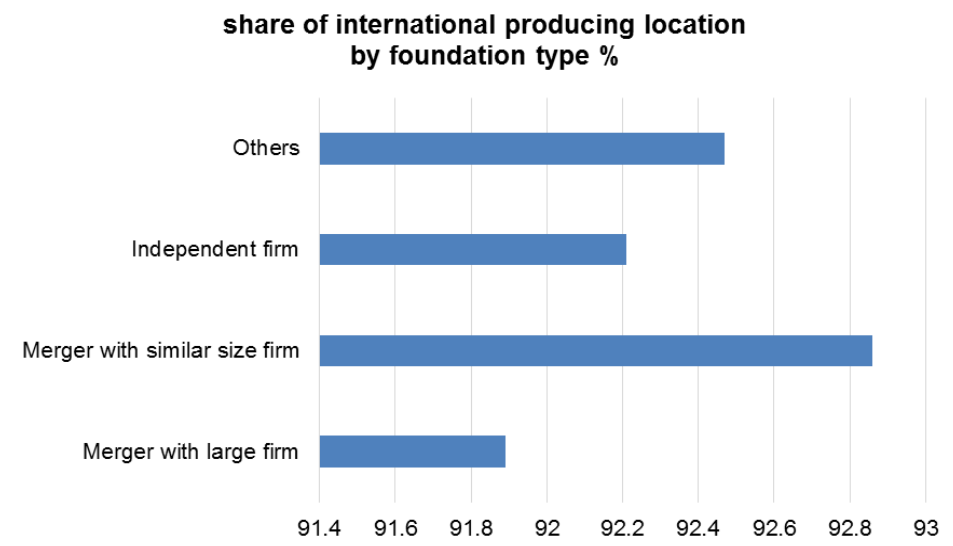
Figure 4.33: The percentage of producing location



Source: Author

The Bar chart (Figure 4.34) shows minor differences in international production location by establishment type. The percentages ranged from 91.2 to 93%. 92.86% of the firms that merged with similar sized reported international production. Independent firms and firms that merged with large firms showed a percentage of 92.21% and 91.89% respectively.

Figure 4.34: The percentage of international production by establishment type



Source: Author

4.7 Sources of Finance

The aim of this section is to investigate how Thai start-ups manage their business funding activities. This section explores the following significant issues:

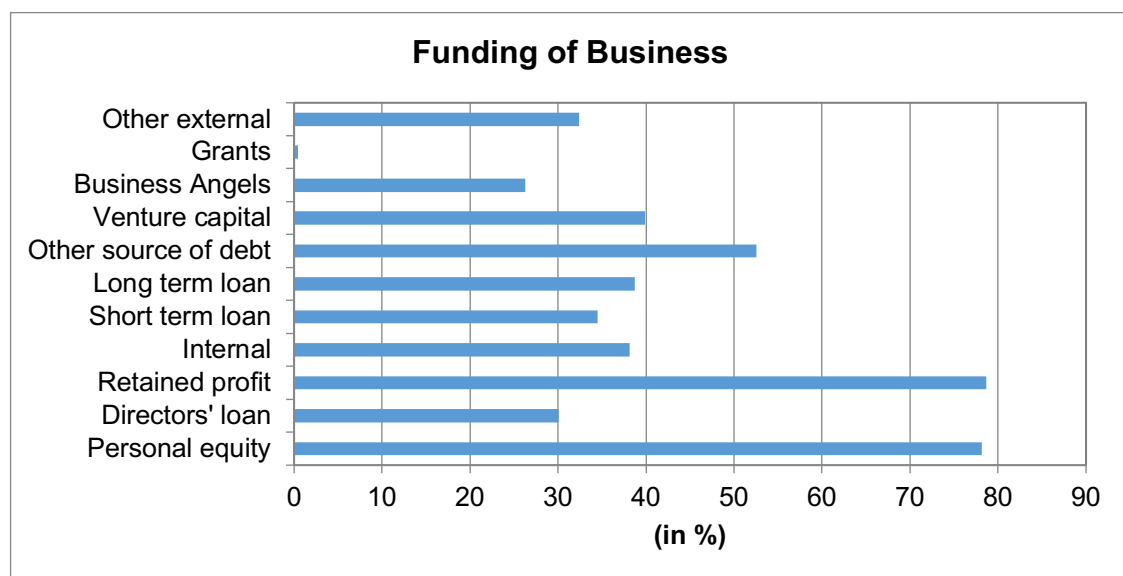
- Funding of business
- The share of business funding from different sources

The descriptive results presented in this section will illustrate the characteristics of the source of finance of innovative firms.

4.7.1 Sources of business funding

The participants indicated how they funded their business activities. As shown in Figure 4.35, there are several sources of business funding. The financing of hi-tech start-ups came from both internal and external finance sources. However, personal equity and retained profits were more widely used in funding the business (78.15 and 78.70 percent respectively).

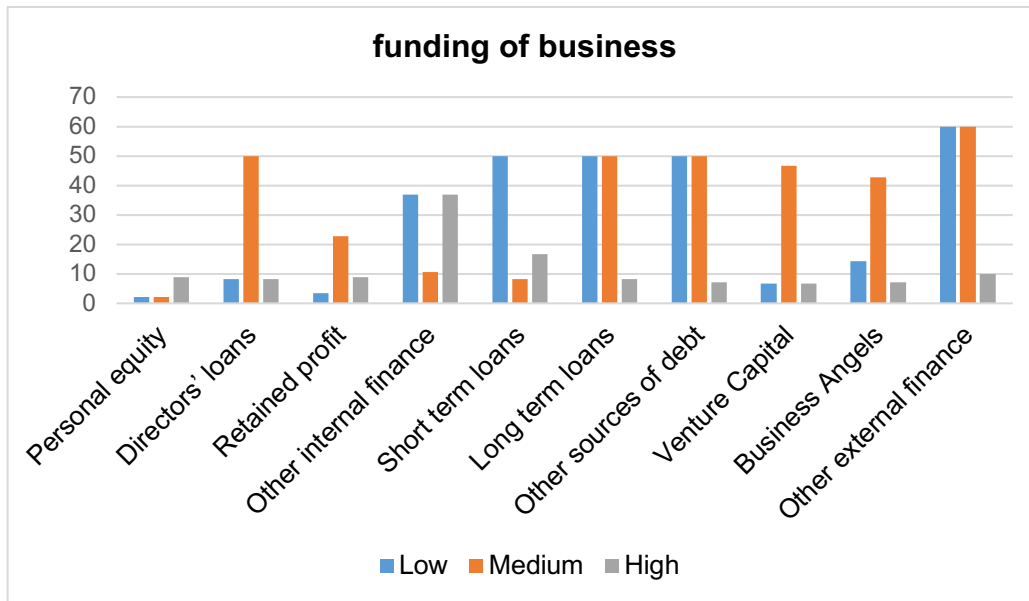
Figure 4.35: Funding of Business



Source: Author

4.7.2 preferred source for funding business

Figure 4.36: Preferred source of business funding



Source: Author

Figure 4.36 shows the three levels of preferences for business funding sources. As the first preference (High), the start-ups were more likely to use other internal finance followed by personal equity. The second preferential choice (Medium) were directors' loans, retained profits, venture capital and Business angels. Lastly, the least preferred source of funding (low) for hi-tech start-ups was short term loan. While long bank loans, other sources of debt and other sources of debts were equally by the firms as low and medium preference for their funding.

Summary

1. Ownership, Governance and firm demographics

This section analysed empirically the key aspects relating to how the start-ups began their lives (establishment types) and how they configured their ownership structures. It also considered how firms structured themselves in a hierarchical sense from the ownership team, management and down to core employees. Particular attention was given to the examination of the skills and competencies of the people working at all levels within the firm and the nature of formal and informal human capital available to the firm.

Modes of firm establishment and governance

In respect of establishment types, less than one in five new firms could be considered as independent, de novo start-ups. In fact, overwhelming majority of the new technology start-ups in Thailand were formed through mergers and acquisitions amongst existing firms. The typical technology firm had between three to four owners, although the ownership team members could be 16 at the extreme. 68% of the firms had not change in their ownership team since their initial formation. Of those that did undergo an ownership change, in the majority of cases the overall control remained with the founding owners (less than 50% of total shares were sold).

Initial firm size

In terms of initial employment at start-up, the results show that the median employment number at start-up stage was 11 which is classified as above the micro firm cut-off point of 9 employees but within the small firm class size range (10-49 employees). A particularly interesting feature of the start-up size across the different start-up establishment types is that independent start-ups were on average significantly bigger than start-ups arising from merger between or acquisition of existing firms.

Human capital

Thai technological start-ups had a very high concentration of technically educated employment with more than 80% of the total workforce having a higher level technical qualification. In contrast, more than six in ten managers had no industry specific experience. The lack of industry specific experience was particularly evident in the independent start-ups. However, virtually all managers had a business qualification. This suggests that at the managerial level general nature human capital is the dominant form rather than specific human capital.

2. Product characteristics and Innovation

In this section, the importance of the bestselling product or service to a firm's success and how long after establishment it took before offering their best-selling products or services to the market were empirically explored. It also investigated how firms of different establishment types configured different market strategies based on the product or service developed.

The bestselling products or services of the firm

The share of total sales for the bestselling product or service was considerably high (93.80%). Half of all the innovative firms surveyed were reliant on a single core product or service which was unaffected by the nature of establishment. There was no correlation between firm size and bestselling product or service.

Timing of offering the bestselling products or services

In majority (90%) of the cases, the firms offered their bestselling product or service at the start-up stage. Few firms developed their product or service at later as indicated by the significant negative correlation between the bestselling product or service and the length of time to produce.

Development of products or services for the international market

The Thai innovative start-ups of different establishment types had different marketing strategies based on product or service development, however, the findings show that the higher percentage (11.63%) of merger with similar sized firms developed their products/services for international market.

The nature of products or services

Most of the hi-tech firms produced intermediate type of product. Firms that merged with larger and similar firms mostly produced intermediate type products followed by capital and final goods respectively. Independent firms were more likely to produce final goods than other types.

Customer base Group

The three types of customer groups, businesses, government and customer based groups, were important to all the firms. Majority (70.2%) of the firms had all three types of customers. More firms had the business customer group followed by the consumers group and lastly, the government group.

The innovative aspect of product or service

Outside novel technology was used by about three fourth of the firms to produce their own product or service. This suggests that the firms were lacking in technology innovation.

To sum up, the data presented so far in this section suggest that most of the firms had already developed 'best-selling' products or service on formation. Most of the products or services were of the intermediate type. Most of the firms depended on a single product or service line. Though business customers were the most important to most firms, all three types of customer groups (business, consumer, government) were important customers for the start-ups to sell their products or services.

3. Market development and internationalization

This section empirically explored how start-ups view the intensity of competition, how they describe the innovativeness of their products and services and core technologies embedded in their products and services. Furthermore, it investigated the estimated time for a competitor to launch a product or service. The chapter also addressed different sales support activities used to enhance business performance.

The intensity of competition

In term of competition intensity in the market, half of the firms claimed that competition was strongly intense and more than one fourth of them engaged in intense competition.

Timing of competitor launching their competing products or services

The direct measure of competition for start-ups is the time period used by competitors to launch their substitute product. The results indicate that competitors offered their competitive product/service or offered a lower price product into the market within one year.

Type of sales support

The descriptive data presented in this section suggested that all the typical sales support activities such as,

- 1) Technical consultation prior to sales
- 2) Individual client customization
- 3) Specific configuration or system requirements
- 4) Complex or time consuming installation
- 5) Regular maintenance and upgrade
- 6) Specialized training required for front-line and sales personnel

were regarded as very important by the hi-tech start-ups.

Internationalisation activities

Launching international sales was a much less prevalent phenomenon among the Thai hi-tech start-ups during the establishment stage. They mainly competed in the domestic market rather than engaged in international sales activities. During the early stage, Thai start-ups also mainly produced their products/services within the country.

4. Source of finance

Funding of business

Internal finance sources, personal equity and retained profits, were more widely used in funding the business. Personal equity was generally used to start the business and retained profits were used later after the business had generated income/revenue.

The share of different sources in business funding

Important sources of finance were mostly internal finance and short bank loans.

CHAPTER FIVE

ANALYSIS OF RELATIONSHIPS BETWEEN TYPES OF ESTABLISHMENT AND CONTINGENT FACTORS

5.1 Introduction

This chapter describes the analysis of data and follows by a discussion of the research results related to the research objective 'To examine the relationship between key predictors of firm growth and young hi-technology firms in Thailand' and the research questions, 'What are the relationships between the contingent factors and the types of firm establishment of young Thai hi-technology firms?' and 'What are the factors constraining or assisting firm growth of young hi-technology firms?'

The data were analysed to identify, describe and explore the relationships between the types of firm establishment and the contingent factors such as their core skills and competencies, product/service innovativeness, marketing development, source of finance and factors that constrain firm growth. The contingency variables used in this study include those most commonly identified in the contingency theory literature, which comprises the economics of innovation and management theories. Contingency innovation and entrepreneurship theories proposes a theoretical perspective that emphasises how the contingent factors such as innovation and entrepreneurship of business activities affect the growth process of firms.

5.2 The correlation between type of firm establishment and contingent factors

The correlation analysis conducted seeks to examine how the differently established innovative firms differ from each other in terms of their core entrepreneurial characteristics and firm demographics, skills and competencies, product/service innovativeness, marketing development and factors that constrain firm growth to test five key hypotheses. Only three types of establishments are used in the analysis, which are firms established by merging

with large firm (ML), firms established by merging with similar firm (MS), and firms established independently (IN) as they accounted for about 73% of the total number of established firms. The other types of establishments are too small in number to be practical for use in the analysis (refer to Table 5.1 and Figure 4.1 in Chapter 4).

Table 5.1 Frequency distribution of types of establishment and classification

Types of establishment	Number of observations	Percentage (%)	Ownership classification
Q3-a: merger with a larger firm	136	27.4	Type 1
Q3-b: merger with a similar sized firm	138	27.8	Type 2
Q3-c: acquisition of another firm in your industry sector	33	6.6	Type 4
Q3-d: acquisition of another firm outside your core industry sector	25	5.1	Type 4
Q3-e: a management buy-out or management buy-in	22	4.4	Type 4
Q3-f: a change of ownership	24	4.8	Type 4
Q3-g: a change of management	26	5.2	Type 4
Q3-h: Independently established firm	93	18.7	Type 3

Source: Author

Nature of the data used in the analysis

Correlation analysis can determine whether there is a consistent relationship between two or more variables (Hair et.al, 2007) and it is necessary as a pre-condition toward demonstration of an association between variables (Kent, 2001). The hypotheses postulating the significant relationship between type of establishment and contingent factors will be tested using correlation analysis or bivariate association.

In order to determine the appropriate analytical test to be used, the nature of data should be examined first as different data category requires the use of different analytical test (Cooper and Emory, 1995).

The classification of types of data that is used to test the five key hypotheses is summarised in Table 5.2.

Table 5.2: A summary of the classification of the type of data for the independent and dependent variables under four key hypotheses

Variable	Explanation	Type of Data	Measurement
Independent			
ML	Merger with large firm (Type 1)	Categorical	Coding variable (yes=1, no=2)
MS	Merger with similar firm (Type 2)	Categorical	Coding variable (yes=1, no=2)
IN	Independently established firm (Type 3)	Categorical	Coding variable (yes=1, no=2)
Dependent			
Tech Ed	Technical/Scientific education	Categorical	Coding variable (yes=1, no=2, don't know=3, refuse=99)
Biz Qual	Business Qualification	Categorical	Coding variable (yes=1, no=2, don't know=3, refuse=99)
Pri Ind Ep	Prior Industry experience	Categorical	Coding variable (yes=1, no=2, don't know=3, refuse=99)
Dev Domestic Mkt	Developed for domestic market	Categorical	Coding variable (yes=1, no=2, don't know=3)
Dev SA	Developed intended to sell abroad	Categorical	Coding variable (yes=1, no=2, don't know=3)
PP	Primary product/service	Categorical	Coding variable (yes=1, no=2, don't know=3)
ImP	Intermediate product/service	Categorical	Coding variable (yes=1, no=2, don't know=3)
FD	Final product/service	Categorical	Coding variable (yes=1, no=2, don't know=3)
ICompi TH Mkt	Intensity of competition in Thailand market	Ordinal	5 point Likert scale
Incr/Disr Chg	The core technologies embodied in product/service with	Categorical	Coding variable (yes=1, no=2, don't know=3, refuse=99)

	incremental or disruptive change		
Sel Spt Act: Tech Cnst	Sales support activities: technical consultation prior to sales	Ordinal	5 point Likert scale
Sel Spt Act: Indv Cust	Sales support activities: individual client customization	Ordinal	5 point Likert scale
Sel Spt Act: SCfg	Sales support activities: specific configuration or system requirement		5 point Likert scale
Sel Spt Act: TCons Instl	Sales support activities: complex or time- consuming installation	Ordinal	5 point Likert scale
Sel Spt Act: Maint	Sales support activities: regular maintenance and upgrade	Ordinal	5 point Likert scale
Sel Spt Act: Tng SelPer	Sales support activities: Specialized training required for front-line and sales personnel	Ordinal	5 point Likert scale
Int Sel	International sales	Categorical	Coding variable (yes=1, no=2, don't know=3, refuse=99)
Phys Prod Co	Physically produce company's products/service only in Thailand, only overseas or both in Thailand and overseas Only domestic production Only overseas production Both Thai and overseas production	Categorical	Coding variable (yes=1, no=2)
Crstr Gwth Proc	Factor constrained the growth process of company: Availability of finance Availability of skilled employees Availability of experienced management Access to sales channels Access to commercial or market information Red tape or official regulations	Ordinal	5 point Likert scale

Cstr Shtg Skil	Constrained by the shortage of skills within the management team: Marketing Sales and distribution Financial management Organization and general management Production, Manufacturing and Logistics Research and Development	Ordinal	5 point Likert scale
Biz Perf	Business performance attribution factors: Developing international markets Developing new products/service Investment in human capital Access to skilled staff Collaboration with other businesses Collaboration with other organizations (eg. universities) Innovation Ease of accessing investment	Ordinal	5 point Likert scale
PE	Personal equity	Categorical	Coding variable (yes=1, no=2)
Dir Loan	Directors' loans		
Rtnd P	Retained profit		
Oth Int Fin	Other internal finance		
S Loan	Short term loans		
L loan	Long term loans		
Oth So Dbt	Other sources of debt		
VC	Venture capital		
BA	Business Angles		
Grnt	Grants		
GP	Firm's general performance over the years against the rest of the industry	Ordinal	5 point Likert scale
Cur Pos	Firm's current position with regard to the industry level of technology and against the rest of your industry	Ordinal	5 point Likert scale
ROI	The rate of innovation in the company and the	Ordinal	5 point Likert scale

	current position relative to the current rate of innovation		
RO Skil	The rate of availability of skills for company	Ordinal	5 point Likert scale
Inv NCap	The level of investment in new capacity in company and the current position relative to the industry benchmark on investment in new capacity	Ordinal	5 point Likert scale

Source: Author

As shown in Table 5.2, the dependent variables are categorical (dichotomous) data which Yes=1 and No=0, while the independent variables are either categorical or ordinal data. Since there is a mix of categorical and ordinal data, a non-parametric statistical test will be used to test the nature of relationship between variables (Bryman and Cramer, 2004). Kendall's tau was chosen as the analytical method to test hypotheses in this research because it is commonly used in studies examining relationship between categorical or ordinal data ((Scapens & Sales, (1985), Abdel-Maksoud et al., (2005), Hutaibat, (2005)). A disadvantage of using Kendall's tau is that it usually returns smaller values than Spearman's rho correlation.

Botch (2001) classifies the Kendall's tau coefficient as following:

- Less than + / - 0.10 = very small/weak correlation
- + / - 0.10 to 0.19 = small/weak correlation
- + / - 0.20 to 0.29 = moderate correlation
- More than + / - 0.29 = strong correlation

Saunders et al. (2009) argued that it is very unusual to obtain a perfect correlation in business/management research. As such, a pre-detrained probability level is used to consider whether the obtained coefficient of correlation supports or rejects (not support) the hypothesis. The significant probability level used in this research is the $p < 0.05$ level, a probability level that is an acceptable level of significance for correlation and most commonly used in statistical analysis (Hair et al., 2007).

To answer the research question 1, four general key hypotheses are postulated and tested.

H1: There are significant differences in managerial skills, competencies and experience among young Thai hi-technology firms.

H2: There is a significant difference in product/service innovativeness among young Thai hi-technology firms.

H3: There is a significant difference in market development among young Thai hi-technology firms.

H4: There is a significant difference in source of finance among young Thai hi-technology firms

To answer the research question 2, a general hypothesis is postulated and tested.

H1: New Thai high-tech firms have the same factors constraining or assisting firm growth.

The testing of these five hypotheses is discussed one by one in the following sections.

5.3 Human entrepreneurial capital

The correlational analysis presented in this section is conducted to examine how innovative firms differ in terms of skills and competencies. The general hypothesis tested is as shown below.

H₁: There are significant differences in management skills, competencies and experience among young Thai hi-technology firms.

The following three sub-hypotheses (H_{1-a} - H_{1-c}) were developed to guide the analysis.

- **H_{1-a}** : There is a significant positive relationship between type of establishment and technical/scientific education.

- **H_{1-b}** : There is a significant positive relationship between type of establishment and formal business qualifications.
- **H_{1-c}** : There is a significant positive relationship between type of establishment and prior industry specific experience outside their firms.

Table 5.3: Kendall's tau correlation coefficient for the relationship between establishment type and human capital

Var.	Hypothesis	Kendall's tau correlation Coefficient		
		ML (Type 1)	MS (Type 2)	IN (Type 3)
Tech Ed	H_{1-a}	-	0.0823*	-0.0831*
Biz Qaul	H_{1-b}	-	-	-
Pri Ind Xp	H_{1-c}	0.1477*	0.1110*	-0.1357*

Note:

- * significant at $p < 0.05$ level
- ML - Merger with large firm (Type 1), MS - Merger with similar firm (Type 2), IN - Independently established firm (Type 3)

Tech Ed – Technical education, Biz Qaul – Business qualification, Pri Ind Xp - Prior Industry experience

Source: Author

The results presented in Table 5.3 show that not all the three sub-hypotheses linking the type of firm establishment and human capital were supported. Positive correlation, negative correlation and no correlation between the variables were observed in the analysis results.

The significant positive relationships were:

- between merger with large firm (ML) and prior industry specific experience outside their firms (Pri Ind Xp)
- between the merger with similar sized firm (MS) and technical education(Tech Ed) and prior industry specific experience outside their firms (Pri Ind Xp).

The significant negative relationships were:

- between independent firm (IN) and technical education and prior industry specific experience outside their firms (Pri Ind Xp)

It is interesting to observe that there was no significant relationship between the management team of the different types of start-up and business qualification.

Since positive correlation, negative correlation and no correlation between the variables were observed, the three sub-hypotheses positing positive link between type of firm establishment and human capital were not supported.

Significant positive and negative correlations were only observed between two of three variables; technical education and prior industry experience, and type of firm establishments. As such, the general hypothesis 1 which states that there are significant differences in management skills, competencies and experience among young Thai hi-technology firms was partially supported.

5.4 Product/service characteristics

Data on product/service characteristics was obtained to be used to meet the second objective of the study: to examine how innovative firms differ in terms of their core characteristics of product, R&D and aspect of innovation.

The hypothesis formulated for testing is:

H₂: There is a significant difference in product/service innovativeness among young Thai hi-technology firms.

Three sub-hypotheses (H_{2-a} to H_{2-c}) are formulated to guide the analysis of the relationships for young hi-tech firm in Thailand.

- H_{2-a} : There is a significant positive relationship between type of establishment and product/service intended for sale abroad.
- H_{2-b} : There is a significant positive relationship between type of establishment and the nature of product/service.
- H_{2-c} : There is a significant positive relationship between type of establishment and intensity of competition.

Table 5.4: Kendall's tau correlation coefficients for relationship between establishment type and product/service characteristics

Var.	Hypothesis	Kendall's tau correlation Coefficient		
		ML (Type 1)	MS (Type 2)	IN (Type 3)
Dev Sel Abrd	H _{2-a}	-	-	-
Prim P	H _{2-b}	-0.0461*	-0.0877*	0.1457*
Im P	-	-	-0.0327*	0.0338*
FP	-	-	-	-
Intc TH	H _{2-c}	-	-	-

Note:

- * there is a significant correlation at $p < 0.05$
- ML - Merger with large firm (Type 1), MS - Merger with similar firm (Type 2), IN - Independently established firm (Type 3)
- Dev Sel Abrd - Developed intended to sell abroad, Prim P - Primary product/service, Im P - Intermediate product/service, FP - Final product/service, Intc TH - Intensity of competition in Thailand market

Source: Author

The results obtained indicated that there was a significant relationship between type of firm establishment and the nature of product/service at the $p < 0.05$ level.

There was a weak, negative correlation between both types of merger firms and primary goods produced to sell in the market, whereas there was a very small, positive correlation between the independent firm and primary goods produced. The findings illustrated that there was a very small negative correlation between the merger with similar size firm and intermediate goods, while there was a weak positive association between the independent firm and intermediate goods production.

The results in Table 5.4 showed that there was no observable relationship between all start-up establishment types and selling product/services abroad, producing final product/service, and intensity of competition that they encountered in the Thai market.

The three sub-hypotheses positing positive link between establishment type of firm and product/service characteristics were not supported. Since positive correlation, negative correlation and no correlation between the variables were observed in the analysis results, the general hypothesis 2 was partially supported.

5.5 New market development

The test of association analysis seeks to examine how innovative firms differ in terms of their core characteristics of competition, market development and internationalization.

The general hypothesis formulated for testing is:

H₃: There is a significant difference in market development among young Thai hi-technology firms.

The following four sub-hypotheses (H_{3-a} to H_{3-d}) were developed to guide the analysis.

- H_{3-a} : There is a significant and positive relationship between type of establishment and the timing of competitor to present the similar product
- H_{3-b} : There is a significant and positive relationship between type of establishment and the key support activities
- H_{3-c} : There is a significant and positive relationship between type of establishment and international sales
- H_{3-d} : There is a significant and positive relationship between type of establishment and production location

Table 5.5: Kendall's tau correlation coefficient for the relationship between establishment type and market development

Var.	Hypothesis	Kendall's tau correlation Coefficient		
		ML (Type 1)	MS (Type 2)	IN (Type 3)
Cpt LS	H _{3-a}	-	-	-
Sel Spt Act: Tech C	H _{3-b}	-	-	-

Sel Spt Act: Ind Cust		-0.0556*	-	-
Sel Spt Act: SCfg		-	-	0.0646*
Sel Spt Act: TCons Instl		-	-	-
Sel Spt Act: Maint		-	-	-
Sel Spt Act: Tng Sel Per			0.0561*	
Int Sel	H_{3-c}	0.0697*	-	-0.1425*
Phys Prod Co	H_{3-d}	0.0555*	-	-

Note:

- * significant correlation at the $p < 0.05$ level
- ML - Merger with large firm (Type 1), MS - Merger with similar firm (Type 2), IN - Independently established firm (Type 3)
- Cpt LS – Competitors launching service,
- Sel Spt Act: Tech Consul Pri - Sales support activities: technical consultation prior to sales,
Sel Spt Act: Ind Cust- Sales support activities: individual client customization,
Sel Spt Act: SCfg- Sales support activities: specific configuration or system requirement,
Sel Spt Act: TCons Instl- Sales support activities: complex or time-consuming installation,
Sel Spt Act: Maint- Sales support activities: regular maintenance and upgrade,
Sel Spt Act: Tng Sel Per- Sales support activities: Specialized training required for front-line and sales personnel,
- Int Sel - International sales,
- Phys Prod Co - Physically produce company's products/service only in Thailand, only overseas, or both in Thailand and overseas

Source: Author

As can be seen in Table 5.5, all the sub-hypotheses postulated are testing the relationship between the establishment type and market development.

Firstly, the data reported that there was no significant correlation between start-ups establishment type and the estimated time for a competitor to launch similar product with superior performance or launching product with similar performance at a lower price (H3-a).

The second hypothesis (H3-b) tests the correlation between different establishment types and support activities needed to sell a product or service successfully. It is clear that there was no significant relationship between the establishment types and the three support activities namely; technical consultation, time consuming installation and regular maintenance. Positive correlations were found between the other support activities and establishment types: individual customisation, specific configuration and specialised training for sales personnel.

Firms that merged with larger firm (ML) had a weak, negative significant correlation with individual client customization and specific configuration/system requirements and a positive correlation with international sales and locations where products are produced. The independently established firms (IN) had a positive correlation with Sales support activities: specific configuration or system requirement and a negative correlation with international sales. Whereas only the firms that merged with similar size firm (MS) had a weak, positive correlation with Sales support activities: Specialized training required for front-line and sales personnel.

Hypothesis 3-c tested the relationship between type of establishment and international sales. The results obtained showed that firms that merged with larger firm had a positive correlation and independent firms had a negative relationship with international sales.

The last hypothesis (H3-d) tested the relationship between type of establishment and location where the firm's product/service was physically produce in (domestic, abroad, both locations). Only the firms that merge with larger firm had a small, positive correlation with the production location.

The four sub-hypotheses positing positive link between establishment type of firm and new market development were not supported. As positive correlation, negative correlation and no correlation between the variables were observed in the analysis results, the general hypothesis 4 was partially supported.

5.6 Sources of Finance

Financial capital has been recognised as the important factor for new firms (Ganotakis, 2010). To examine of how innovative start-ups differ in terms of source of cooperate finance, the test of correlational analysis has been created.

The general hypothesis formulated for testing is:

H4: There is a significant difference in source of finance among young Thai hi-technology firms

Table 5.6: Kendall's tau correlation coefficient test results for the relationship between foundation type and Source of finance

Var.	Hypothesis	Kendall's tau correlation Coefficient		
		ML (Type 1)	MS (Type 2)	IN (Type 3)
PE	H ₄	0.0057*	-	0.0003*
Dir Loan		0.0001*	-	0.0001*
Rtnd P		0.0074*	-	0.0001*
Oth Int Fin		0.0001*	-	0.0001*
S Loan		0.0001*	0.0369*	0.0001*
L Loan		0.0002*	-	0.0004*
Oth Debt		0.0029*	-	0.0256*
VC		0.0001*	0.0074*	0.0001*
BA		0.0004*	-	0.0006*
Grnt		0.0009*	-	0.0001*
Oth Ext Fin		0.0002*	0.0327*	0.0001*

Note:

- * significant correlation at the $p < 0.05$ level
- ML - Merger with large firm (Type 1), MS - Merger with similar firm (Type 2), IN - Independently established firm (Type 3)
- SOFin – Source of Finance:
 - PE - Personal equity
 - Dir Loan - Directors' loans
 - Rtnd P - Retained profit

Oth Int Fin - Other internal finance

S Loan - Short term loans

L Loan- Long term loans

Oth Debt - Other sources of debt

VC - Venture capital

BA - Business Angles

Grnt - Grants

Oth Ext Fin - Other external finance

Source: Author

As can be seen in Table 5.6, the results showed that there was some correlation between establishment type and source of finance. The data reported that both the merger with large firms and independently established firms showed strong positive correlation with all financial types. While the merger with similar firm size had a positive significant correlation with only short term loan, venture capital and other external finance.

Thus, Hypothesis 4 was partially supported.

In summary, the correlational analysis has indicated that human entrepreneurial capital, product/service innovativeness, new market development, and sources of finance were partially correlated with young Thai hi-technology firms.

5.7 The probable factors constraining or assisting the growth process of firms

New high-tech firms in Thailand can make a meaningful contribution to the future economic growth potential of the country as they grow and develop.

5.7.1 Growth factors and barriers to growth

This section looks at the factors that probably will assist or constrain the growth rate of the Thai innovative start-up firms since establishment were examined in detail. The respondents were asked to determine what they feel about the various

factors that might constrain the growth of their companies using a Likert Scale with a range from no constraints (1) to very important constraints (5).

The aspects:

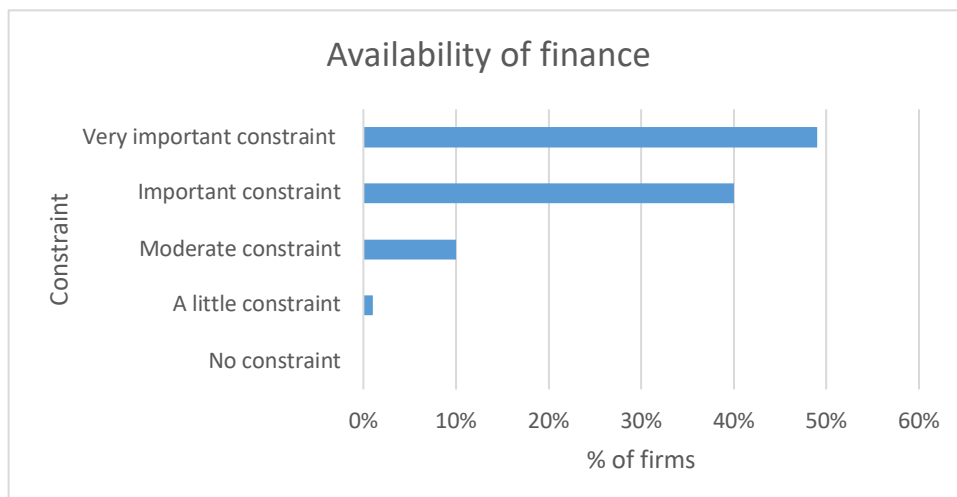
- The factors that could constrain growth: availability of finance, skilled staff, experienced management, access to sales channels and red tape.
- The skills within the management team
- Performance attribution and general management
- The rate of technological innovation in the company
- The level of advanced technology and new capacity investment in the business

were examined to address the core characteristics of the growth assisting factors and barriers to growth of the innovative firms.

5.7.1.1 The factors that constrain business growth

The results display in Figure 5.1 show that most respondents believed financial availability was an important constraint to growth. Almost 40% of the firms indicated that the availability of finance was an important constraint factor, while almost 49% believed that it was a very important barrier to growth.

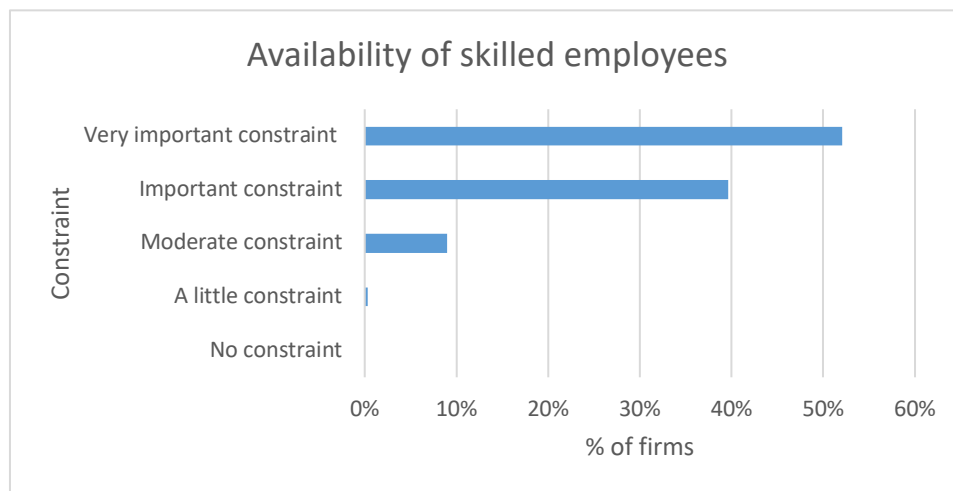
Figure 5.1: Availability of finance



Source: Author

With regard to the availability of skilled staff (Figure 5.2), more than half of innovative start-ups (52.03%) reported that the availability of skilled employees was a very important barrier to the growth of their businesses. 38.66 % of them indicated that the availability of skilled staff was an important constraint to the company's growth.

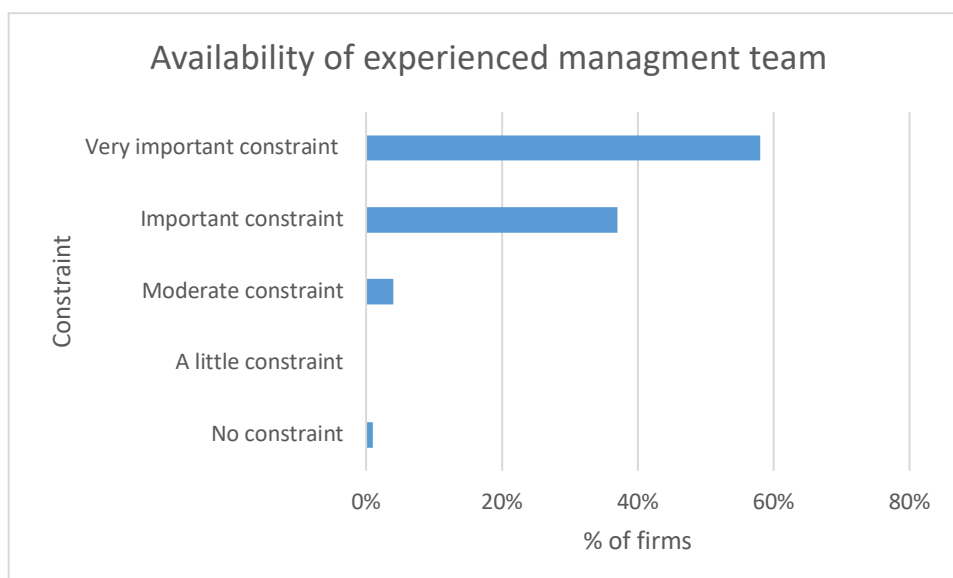
Figure 5.2: Availability of skilled employees



Source: Author

Figure 5.3 shows that 58% of the firms admitted that the lack of experienced management was a very important constraint to growth. Only a mere 1% reported that a lack of experienced management was not a constraint.

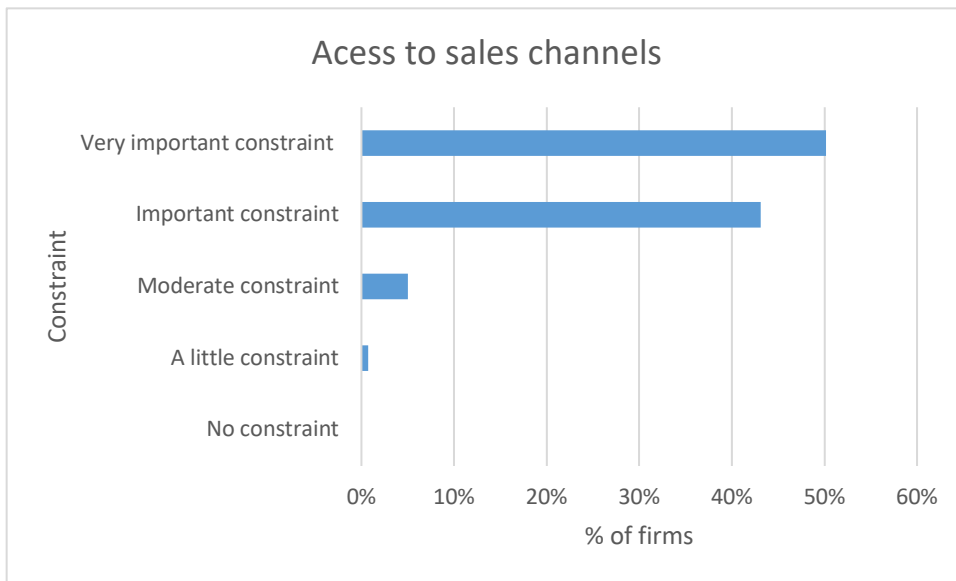
Figure 5.3: Availability of experienced management team



Source: Author

The factor, access to sales channel, was examined next. The results are presented in Figure 5.4 below.

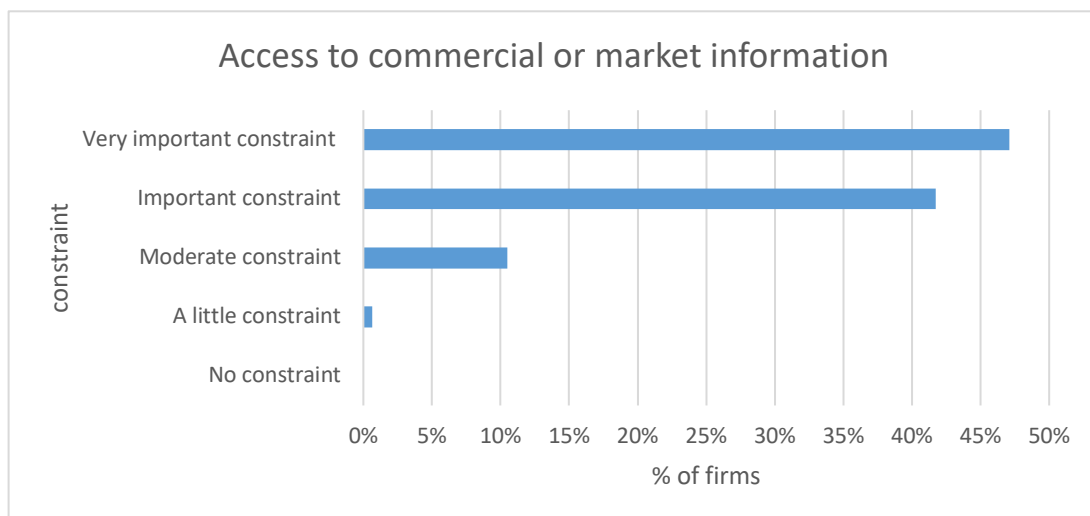
Figure 5.4: Access to sales channels



Source: Author

Accessibility to sales channels was considered 93.21% of the firms as an important constraint to growth. While almost 50% of the firms regarded it as a very important constraint.

Figure 5.5: Access to commercial or market information

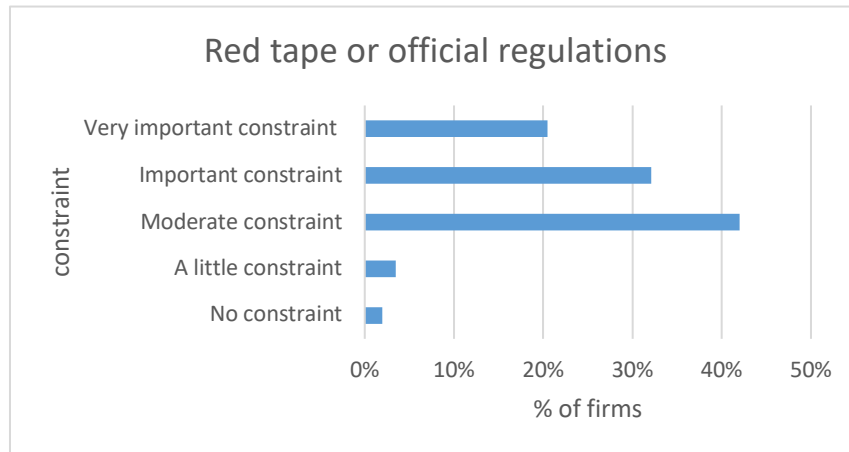


Source: Author

Access to commercial or market information was considered as an important constraint to growth by 41.75% and very important constraint by 47.09% of the firms.

Finally, the factor, red tape or official regulations, was investigated. The results are presented in Figure 5.6.

Figure 5.6: Red tape or official regulations

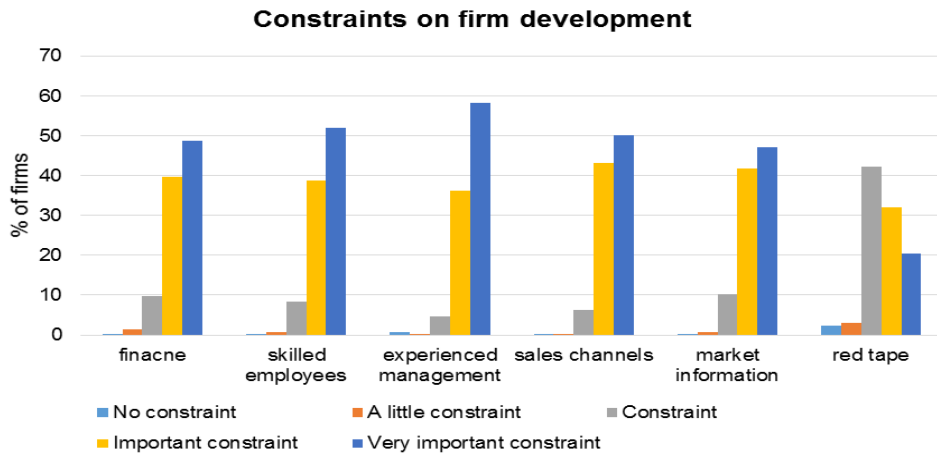


Source: Author

It is interesting to observe that the about 42% of the firms in the high-tech industry found red tape and regulations was a moderate constraint to growth. 32.07% and 20.45% of the firms found them to be important and very important constraints respectively.

Figure 5.7 summarises the percentages of the firms that considered the respective factors as constraint to growth.

Figure 5.7: Percentage of firm constraining growth factors

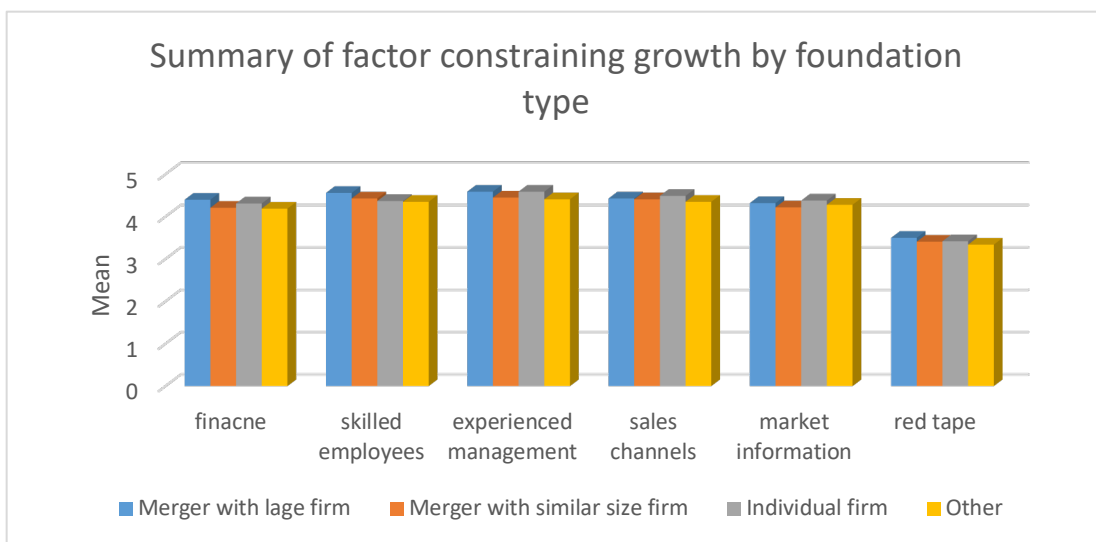


Source: Author

The overall key indication of the results is that all the factors examined were considered as constraints to growth. The most serious constraint was experienced management followed by skilled staff and access to sales channels. The least serious constraint was red tape.

Figure 5.8 shows the average (mean) response of the different establishment type of young innovative firms towards the possible constraining factors. Overall, all the factors examined were considered as constraints by all the establishment types. Experienced management was considered to be the greatest constraining factor and red tape as the least constraining factor by all types of establishment.

Figure 5.8: The summary of constraining growth by establishment type

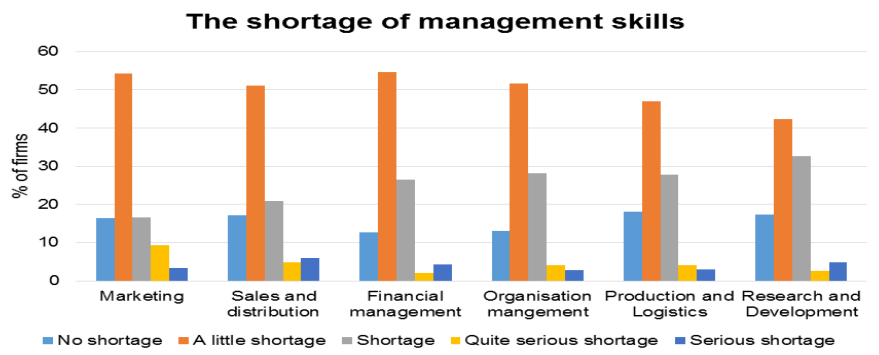


Source: Author

5.7.1.2 The skills possessed by the management team

To further explore the impact of the management team on growth, in the survey the firms were asked how a shortage of particular skills (marketing skills, sales and distribution, financial management, organisation and general management, production, manufacturing and logistics, research and development) within the management team affected growth, using a Likert Scale of a range from strongly disagree (1) to strongly agree (5). The participants were asked to rate the level of skill shortages in marketing, sales, financial and organization management, production, and R&D on a five point Likert scale ranging from no shortage (1) to a serious shortage (5). The percentage of firms experiencing serious constraint in these skills was summarily presented in Figure 5.9 and in Table 5.7.

Figure 5.9: Summary of shortage of skills within the management team



Source: Author

Table 5.7: Shortages of Management Skills

Skill	% of firms with serious shortage
Marketing	12.71
Sales and distribution	10.89
Organisation management	7.04
Production	7.13
R&D	7.6
Financial management	6.21

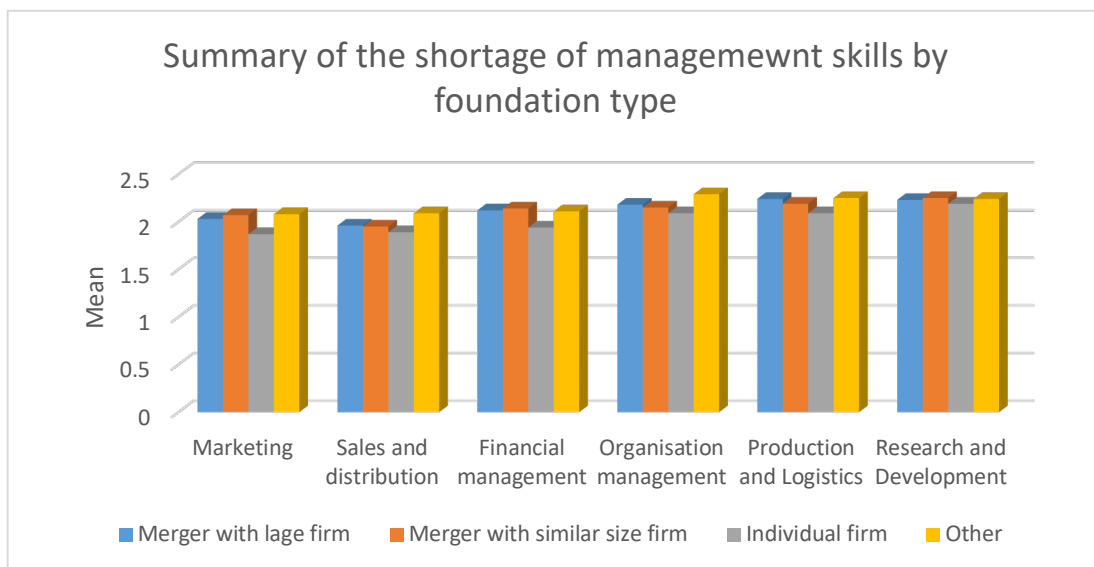
Note: * combined weighted results: 4 (quite serious) and 5 (serious)

Source: Author

Overall, more than 80% of the firms faced shortage in all the management skills (Figure 5.9). However, at the start-up period only about 7-12 percent of the firm experienced serious shortage in all the management skills (Table 5.7).

The shortage of management skills faced by the various types of establishment is presented summarily in Figure 5.10.

Figure 5.10: The summary of the shortage in various skills by establishment type



Source: Author

The level of skill shortages in marketing, sales, financial and organization management, production, and R&D was rated on a five point Likert scale ranging from no shortage (1) to a serious shortage (5). The mean for each skill shortage for each type of establishment was computed for comparison. The means obtained were higher than 1.5. The results presented in Figure 5.10 reveal that all establishment types experienced shortages in the management skills examined.

Although all the start-ups encountered barriers in growing their businesses, the serious constraints to business development faced by the Thai hi-tech start-ups were (1) access to sales channels, (2) availability of experienced management and (3) availability of finance respectively. Red tape or official regulations were the least serious as a barrier to growth. With regard to skills shortage within

management team, the management team was lacking the most in marketing and sales skills.

5.7.2 Factors assisting growth and constraining development of the firms

An in-depth face-to-face interviews with seven entrepreneurs of hi-tech firms to further examine the possible factors assisting or constraining the growth of firms. The responses are presented below.

The interview questions focused on the attribution of the companies' performance in developing international markets and new product/service, investing in human capital, accessing skilled staff, collaborating with other companies or other organisations, promoting technical innovation, and accessing investment.

Software company (B1)

- **Availability of finance and skilled employees:** Money is most important for paying company employees' wages, however, currently, finance is not a constraint factor to the business. The company is always concerned about the skill of temporary staff and subcontractors, and thus, employed only appropriately skilled labour. The nature of the business is program development, so technological skill is very important to all the staff. Moreover, after the product has been delivered and installed/set up for customer, then the after-sale service is a necessary duty which should not be ignored. The company will be ready all the time to serve the customer and to make sure the software/programme is always working smoothly.
- **Access to sales channels:** the company is not very concerned about sales channels. However, they think getting the true marketing information will probably get more customers because it will be able to develop product to meet the potential customer's requirements.
- **Official regulations:** Currently, the company faces the problem with disbursement from customers in the public sector due to the

complicated rules of financial requisition. The problem is caused by the difference in product order and certified checking. The details of product development and installation instruction of the software programme is often not the same as the purchase of order (POR) paper.

- **Marketing Skills:** The owner has some marketing knowledge but lacks sales and distribution skills as he is a science graduate. "...If talking about financial management skills, I think I am happy with it because I work alone. I can manage it by myself and do things one by one with my appropriate IT skills" (B1, Cstr Shtg Skil). The problem is he does not have enough knowledge on accounting, so he is not able to work perfectly alone. He said it is a constraint to run the business. Thus he thinks taking a training programme is important to improve his organisation management skills which will increase product yield and future annual production.
- **Investment in Human capital:** As an IT consultant and developer, developing new product is a regular task. The owner is the only full-time staff and manages all projects himself, including dedicating task to subsidiaries. However, he thinks he needs money to invest in human resources. He believes that human capital investment is the most important.
- **Access to skilled staff:** The founder believes that skilled staff is an important factor for business development. He hires temporally staff, and he thinks the temporally staff is not necessary be graduate in science but they should have skills in programming. The staff ratio of 70:30 (science: business) is fine.
- **Collaboration with other businesses and organisations:** the founder said collaborating with partner can help the business to have a strong competitive power in the current market. He agreed both domestic and foreign partners are important. Moreover, it offers better chance to get new customers. Recently, the company did a collaborative project with a government university by providing student internship for 4 months. In return, the company gets support from the I-san software-park (the university IT unit) and the Bispa department to support new entrepreneurship creation.

- **Current position of technology level against others** With regard to the company's current level of *advanced technology* as compared to the rest of their industry, the owner claims that his company is compatible with the industry as reflected by the high demand from customers,

Frozen food industry (B2)

- **Available of finance:** The owner thinks it is very important for production development and expansion. The company needs to invest in new factory to increase production lines in the near future.
- **Available of skilled employees:** It is very important to employ skilled staff with experience. The skill availability is very high overall, except in innovation skill which the owner thinks they need to learn more.
- **Available of Experienced management:** It is quite important for management team members to have experience.
- **Access to sales channels:** It is very important for launching products into new markets. Attending food industry exhibition is a must because the company can contact the dealers directly to be the company's distributor in the future.
- **Access to commercial information:** the company accesses market information via internet, network connection, and public organisations such as TRF (The Thailand Research Fund). TRF can also help the firm to improve its product through R&D activity. Nevertheless, the owner said sometimes it is very difficult to enter new markets, so it is important to get more support from the public sector such as the Department of Export Promotion (DEP) for getting market information.
- **Official regulations:** It is quite important to be knowledgeable about regulations. Public regulations can be classified as advantage and disadvantage, for example, AEC campaign by the government can bring more competition problems because other AEC country members can imitate the product. However, they think getting information from the public sector is quite problematic

because the company does not know which country that they can export to and how to contact the relevant sectors for information.

- **Skills within the management team:** The owner thinks his management team has the necessary skills and has a lot of experience in the food industry. Even though the owner does not have a degree in finance, he had the opportunity to attend financial course such as cash flow module. The owner said that the only knowledge that he does not have enough is logistics. He believes that it is very important for him to attend a course as soon as possible because it can help him to manage the business cost better. Recently, the company received support from public organisations on R&D, for example, TRF helped them to do a research on how to improve the product quality so that the firm can create new product later and Mahidol University (public university) help them to improve their academic knowledge.
- **Human capital investment:** It is quite important. If the company employs unqualified staff, it could become a managing cost.
- **Innovation:** The owner of the company claims that developing new product, international marketing, cooperation with others, and innovations are all very important. The company complies with all quality standards for *new products development* and is always doing research. Moreover, the management team often takes time to visit customers to get feedback from them. The company has never received any complaints from them. Currently, the company is creating new product for the existing market and plan to expand the target group in the near future. The company plans to replace manpower by using new machine in all assembly lines because it is faster, increases product yield and reduces the cost of manufacturing,
- **Current position of technology level against others:** The company needs to go for more innovation in raw material preparation because the competitors have more advanced machines to produce their products,

Skincare and cosmetic manufacturer (**B3**) and Skincare and cosmetic trader (**B4**): For both, skilled staff is the most important factor followed by finance and experience of management team.

- **Availability of Finance (B3: Manufacturer):** Money is quite important to investment in machinery and raw materials.
- **Availability of skilled staff:** R&D knowledge is very important because R&D is the heart of manufacturing (**B3**), while salesperson's marketing skills are the key factor for business success (**B4**).
- **Available of experienced management:** The founders of both companies do not have experience in the skincare and cosmetic business but they have experience in other businesses and they graduated in the field related to the business of their firms (**B3** Manufacturer: engineering degree and **B4** Trader: marketing degree).
- **Skill of management team (B4: Trader):** The owner's marketing skill, organisation management and R&D are just average (3 of 5). The company is talking staff who already have enough skills to run the business. Firstly, the owner alone cannot take care of all aspects of the business. This is an obstacle to launch their products into new market. Secondly, the owner thinks if they want to increase the market segment, R&D skill is important for them and they need to gain more R&D experience for producing product with better quality.
- **The factors that affect company's performance:**
First, they need to look for new international markets because currently, the domestic market for skincare products is becoming "saturated", but the sale of cosmetics is still growing so this is the time for the company to engage in re-engineering to develop new product. The *investment of human capital* is also needed. The staff needs training in areas such as accounting and warehouse management. They both think organisation management skills can help to ensure the company staff works as a teamwork.

Second, collaboration has a direct influence on business. For example, **B3**, as an OEM manufacturer, needs to work together with other skincare products traders because the company does not have the skills to sell the skincare and cosmetic goods, but the traders can sell

the product efficiency and this will broaden the customer base. Another example is collaborating with the public sector such as the National Science and Technology Development Agency (NSTDA) can provide research grants for the firm to gain technology advancement to secure trade patent. Previously, the company only worked with business matching organisation which focused only on marketing development. Last but not least, attending business camp is very important for the firm to make connection with other industries.

With regard to technological innovation, currently, the company is cooperating with Mae Fah Luang University, a public university. The university supports R&D activity such as the using local rice to produce skincare and cosmetic products. Customers need the best product quality, so finding the selling point for the product is very important to attract clients, for example, soap is not only for cleaning the body but also for whitening the skin and removing spots.

Lastly, *financial investment* is important but not as significant as manpower and innovative idea because the company does not need to invest in all parts of manufacturing. Innovating through existing technology is much more practical and without accruing new investment.

- **Advanced technology:** Compare with competitors, the owner of **B3** thinks the company is a little below them as it is a new manufacturer in this industry sector.
- **R&D activities:** The company (**B3**) used to spend about 50% of total sales revenue for R&D activities, now it has increased to 70% because they have a variety of requisitions as the number of customers has grown. In the next one or two years, the owner thinks that their business will be much more proliferating after the R&D staff gains more experience and the setting up of a proper R&D department.

Engineering industry (**B5**)

The different factors that may assist or constrain business growth and business development are discussed:

- **Financial availability:** The owner thinks that money is the first consideration for business development. If the company plans to start new business, they should have their own equity and apply for bank loan in the ratio of 60:40.
- **Skilled-staff availability:** All business members are skilled-staff due to the nature of the company's product. It is very important to have skilled-staff with specific qualification. The staff should be graduate in engineering, especially in metallurgical engineering. The company needs staff who has technical skills related to metallurgy.
- **Availability of experienced management:** All management team members have much engineering experiences. The experienced management team is very important for hi-technology business because the team will be able to use the engineering knowledge to support the growth of the business.
- **Official regulations constraint:** The owner does not think regulations are a constraining factor for business growth. However, they stated that the business tax is too high, so they try to look for grants from the Board of Investment of Thailand (BOI). Getting grant from BOI is a way to ask for business tax reduction. However, the problem is that it is too complicated to apply for tax reduction.
- **Marketing skill:** The management team members lack marketing skill as they are all engineering graduates. They think one of the crucial factors of business survival is marketing. The interviewee mentioned that if the management team has sufficient marketing skills, the company will have a better chance to grow faster.
- **Developing new products:** Improving the product is very important for the company. They think they can comply with all requirements and can develop product with the best performance without imitating other companies.

“...We cannot say that we do not have rivals. Other companies also produce aluminium die casting machine but they do not have our company's special technique for producing aluminium liquid” (B5, Biz Perf).

The owner gives an example to illustrate their production process. To produce candle, the producer needs a melting pot to boil paraffin wax and

then pour into mould of the desired shape. The way to improve product worthiness is to add colour and scent or change the design.

- **Innovation:** They are always improving and try out their product in different industry conditions. It is very important to add more value to the product in order to have better return for the company.
- **Collaboration with others:** The factory works with a partner. Even though they have technological innovativeness for developing aluminium product, they do not have all the knowhow such as Programmable Logic Controller (PLC) system and Geometric and Micro-controller systems. Thus they need a specialist partner to help create these systems. Lastly, attending the business training course with other industries is another way to help them to run the business better.
- **Availability of Finance:** Money is important for running innovation activity. The company needs to improve product innovativeness all the time, otherwise they cannot compete with rivals. Getting financial support from the public sector is not easy and there is a long queue. They always review the policy and strategies. The respondent mentioned that the company needs to change the current plan when there is a change in Government. It has negative impact because one of the financial sources is from the public sector. Moreover, the sources for financial support in Thailand are not as many as in developed countries.

“...Let me show an example, in developed nations, if we have new idea to produce advanced technology devices, we can easily ask for funds from Venture Capital (VC) or business angles. Here in Thailand, we have the capability to create new innovative ideas but do not have access to finance or it is very slow to get it.” (B5, Inv NCap)

- **General performance:** The company started as a new enterprise creation (NEC) supported by a Thai government university (Prince of Songkhla University). The university supported them in the start-up of the business in the form of capital investment, place and other facilities. Initially the company was located within the university and now they have their own factory in order to cater to bigger customer demands. Currently they are constructing a factory in another location located in the outskirts which is much bigger than the current one. The main reason to build the new

factory is to fulfil bigger customer requirements. However, they have no plan to employ more staff because they have enough capacity to handle all tasks.

- **Level of advance technology:** because the heart of producing product is production process and their think their product is unique. They strongly believed that their technology is more advance and no one can imitate their product. Thus they are not afraid of others 'copying' their products because the internal mechanism is different, moreover they have the patent for doing semi-solid aluminium.
- **Level of innovation and availability of skills:** The owner thinks the company is highly innovative and they are in front of others in the industry. However, the company still need to work together with the customer to match the customer's requisition because the technological advancement is changing all the time.

“...I think nothing is perfect in the first day, doing R&D drawn upon our availability skills is necessary for making better product to meet customer requirement” (B5, ROI).

The company carries out **R&D activity** regularly. It is very important for the business because the product trend is changing all the time and also need to adjust to individual customer's requirement.

- **Level of investment in new capacity:** The Company has a very high level of investment. The owner said that the company is young and it is growing. As demand increases, investing in new capacities is necessary to support the increased production activities. They need to invest more in property, human capital and other resources. The company uses some amount of the current retained earnings to invest in asset and cover other fixed-cost expenses.

Baby product manufacturer (B6)

- **Marketing and General management skills:** The management team has both science and business management skills. They always apply the primary philosophy of the company, 'everything is possible but nothing is easy', to meet business requirement. The respondent stated that 'marketing orientation' strategy is always important for the running of the business.

- **Access to market information:** The company owner said the factor that influences business growth is Brand loyalty. Both good brand image and excellent product quality are the heart of our success. The marketing functions must always response to customers' needs and find ways to solve their problems. "How to do it" is a difficult question, but if the company knows the market and customer well and has all the essential market information, then the company can do it better.
- **Developing new product:** It plans to change the product design and packaging every six months while maintaining the same functional operation. This new product pattern and design is planned for two years in advance. New product would be produced when the company knows of exact customer's need obtained from market survey. For example, after the company has found that babies always bite the mother's nipple while feeding in a market survey, they created a new product line called 'mother care' producing mother shield or nipple protector shield. Another item is disposable baby bottle "ideal for travel". It is a ready to use bottle with does not need washing and sterilising.
- **Innovation:** The innovation of baby product is very important in order to produce super-premium products that conform to world class standard.
- **General performance:** The philosophy of the company is, "courageousness, proficiency and sufficiency" with emphasis on "dare to invest and brave to face the risk". For example, the company was brave to establish a new factory in another province and to recruit new management members to support the new project and to support the larger volume of purchasing orders. The new factory is currently under construction using new innovative structures and the European architectural style with environmental conservation capability.

Medicinal skin food producer (B7)

- **Available of finance:** It is very important for the business because the owner always comes out with new idea, but unfortunately they do not have enough retained profit and have to rely on bank loan which is the best alternative.
- **Available of skilled employees:** It is important to have good efficient staff but some of their skilled employees are going to resign from the company

soon. The company needs to save money, so it cannot employ new skilled staff to replace those who have resigned or planning to quit from the company. Using the existing employees is the only way out.

- **Available of experience management:** This is a critical constraint for the company as it is young and the variety of products is related to science and technology but the owner is not a graduate in science.

“...even with some courses in business management, it is still not easy to manage the business because the product is very specific and special. Moreover, the company does not have a management team to support the firm management” (B7, Cstr Shtg Skil).

The company mostly depend on the consultant to manage the business. Without a management team, the owner plans to take care of the main department such as R&D and to use the current staff by rotating them among the different departments under his control.

- **Access to sales channels:** Sales channels are important for the distribution of products. Currently, the company sells the products themselves because the company needs to make sure that the trader or distributor has enough product knowledge and able to explain to customers personally and clearly. So they think attending exhibition is the best way for them. The company has attended about 18 exhibitions, however the interviewee noted that this channel is not very successful.
- **Access to commercial information:** To have enough market information is very important. The company concentrates on “product orientation” so accessing commercial information is vital to business development. The company uses consultants to help the owner for creating marketing plan and searching for market information, but the consultants are to resign from the company soon.
- **Developing new product:** The owner planned to launch 13 products in one year at the start-up stage. He has many ideas to come out with the new products. The owner has limited skill in R&D and a serious shortage of knowledge in the production process. He delegates the task to the consultant to do research and produce the product under his observation. To fill the vacuum left by the resignation of the consultant team, the founder plan to train their existing staff on how to produce the product in-

house because they do not have the budget to send their staff to train outside.

- **Investment in human capital:** There are plenty of products in the first year so they think it is very difficult to invest in human capital without enough retained profit.
- **Collaboration with other organisations:** The consultant has many connections such as the university which is willing to help them on research. However, the respondent stated that the company is going to face the situation of lacking skilled-staff especially in the R&D unit, so it is very difficult to plan cooperation with outsiders.
- **Ease of accessing investment:** To access the public grant is not difficult for the company as their consultant has good connection with many public organizations which can finance the investment in the new product production,
- **General performance:** The performance level of the company is well below the rest of the industry. The level of its advanced technology is quite satisfactory, but can produce only small amount of products.

The results obtained from the survey and interview suggested development of growth of the firms was probably constrained by factors such as finance, skilled employees, management experience, sales channels and distribution, commercial information, official regulations, organisation management, R&D, production and logistics, and shortage of skills within the management team.

Correlational analysis between the factors that constrain growth and type of firm establishment.

A correlational analysis was conducted to further examine how the differently established innovative firms differ in terms of their characteristics of growth and barriers to growth.

The results are presented in the following sections.

The general hypothesis formulated for testing the correlation is:

H₁: Young Thai high-tech firms have the same factors constraining or assisting firm growth.

Eight sub-hypotheses (H_{1-a} to H_{1-h}) were developed to guide the analysis for Thai hi-tech star-ups.

- H_{1-a} : There is a significant positive relationship between type of establishment and the factor constraining growth process
- H_{1-b} : There is a significant positive relationship between type of establishment and the shortage of skills within the management team
- H_{1-c} : There is a significant positive relationship between type of establishment and performance attribution of firms
- H_{1-d} : There is a significant positive relationship between type of establishment and general performance against the rest of the industry
- H_{1-e} : There is a significant positive relationship between type of establishment and current position with regard to the industry level of technology against the rest of the industry
- H_{1-f} : There is a significant positive relationship between type of establishment and the current position relative to the current rate of innovation
- H_{1-g} : There is a significant positive relationship between type of establishment and the rate availability of firms' skills
- H_{1-h} : There is a significant positive relationship between type of establishment and the current position relative to the industry benchmark on investment in new capacity

Table 5.8: Kendall's tau correlation coefficient for the relationship between establishment type and constraining growth factors

Var.	Hypothesis	Kendall's tau correlate Coefficient		
		ML (Type 1)	MS (Type 2)	IN (Type 3)
Fin	H _{5-a}	0.0814*	-	-0.0676*
Skil EE		0.0846*	-	-
Xp Mgt		0.0610*	-	-
Sel Ch		-	-	-
Mkt Info		-0.0668*		
OReg		-	-	-

Mkt	H5-b	-	-	-0.0548*
Sel		-	-	-
Fin Mgt		-	-	-
GM		-	-	-
Prod/Log		-	-	-
R&D		-	-	-
Dev IMkt	H5-c	-	-	-
Dev NP		-	-0.0623*	-
Inv HC		-	-	-
Skil Staf		-	-	-
Collabo w/Biz		-	-	-
Collabo w/Org		-	-	-
I		-	-	-
Eas Inv		-	-	-
GP	H5-d	-	-	-
Lvl Tech	H5-e	-	-	-0.0581*
Lvl Tech Oth		-	-	-0.0629*
ROI	H5-f	-	-	-0.0759*
CPos		-	-	-0.0828*
RSkil	H5-g	-	-	-0.0722*
Acces Skil		-	-	-0.0797*
Inv NCap	H5-h	0.0694*	-	-
Berk Inv NCap		0.0673*	-	-

Note: * means there is a significant correlation at the $p < 0.05$ level

Note: ML - Merger with large firm (Type 1), MS - Merger with similar firm (Type 2),
IN - Independently established firm (Type 3)

Note: Cstr Gwth Proc - Factor constrained the growth process of company:

Fin -Availability of finance

Skil EE -Availability of skilled employees

Xp Mgt - Availability of experienced management

Sel Ch - Access to sales channels

Mkt Info - Access to commercial or market information

OReg - Red tape or official regulation

Cstr Shtg Skil - Constrained by the shortage of skills within the management team:

Mkt - Marketing

Sel - Sales and distribution

Fin Mgt - Financial management

GM - Organization and general management

Prod/Log - Production, Manufacturing and Logistics

R&D - Research and Development

Biz Perf - Business performance attribution factors:

Dev IMkt - Developing international markets

Dev NP - Developing new products/service

Inv HC - Investment in human capital

Skil Staf - Access to skilled staff

Collabo w/Biz - Collaboration with other businesses

Collabo w/Org - Collaboration with other organizations (eg. universities)

I - Innovation

Eas Inv - Ease of accessing investment

GP - Firm's general performance

Lvl Tech - Level of Technology

Lvl Tech Oth - Level of Technology against other

ROI - The rate of innovation

CPos - Current Position

R Skill - Rate of availability of skills

Acces Skil - Access to skills

Inv NCap- The level of investment in new capacity

Berk Inv NCap - the industry benchmark on investment in new capacity

Source: Author

Hypothesis (H_{1-a}) examines the correlation between the type of establishment and the six factors that may constraint the growth of firm. Both small but significant positive and negative relationships were found. Firms formed by merging with larger firms had positive correlation with 'Availability of finance (Fin)', 'Availability of skilled employees (Skil EE)', and 'Availability of experienced management (Xp Mgt)'. but a negative correlation with 'Access to commercial or market information (Mkt Info)'. Whereas, independently formed firms had a negative correlation with 'Availability of finance (Fin). This affirms the findings

of earlier studies (e.g. Volery et al., 1997; Kouriloff, 2000; Choo and Wong, 2006) that said that independent firms generally lack access to financial sources.

Hypothesis H_{1-b} examines the correlation between the shortage of skills within the management team in developing of company and type of establishment of the firms. Of the six skills examined, only the shortage of marketing skills had a small significant negative correlation with independently established firms. The other five skills, namely, sales and distribution, financial management, organization management, production and R&D had no correlation with all establishment types.

Hypothesis (H_{1-c}) postulating a positive correlation between type of firms and performance attribution over the start-up period. Only the firms formed by merging with similar size firm had a negative correlation with 'Developing new products/service (Dev NP)'.

The correlation analysis testing hypothesis H_{1-e} 'There is a significant positive relationship between type of establishment and current position with regard to the industry level of technology against the rest of the industry' and hypothesis H_{1-f} 'There is a significant positive relationship between type of establishment and the current position relative to the current rate of innovation' indicated that only the independently formed firms had a negative correlation with the factors tested.

The test of correlation between type of firms and two factors, availability of skills and access to skills (H_{1-g}) showed that the independently established firm had a significant negative correlation with the availability and access to skills factors. This suggests that they were lacking in skills and aces to skills.

The results of the test of the hypothesis (H_{1-h}) 'There is a significant positive relationship between type of establishment and the current position relative to the industry benchmark on investment in new capacity' showed that only firms that merged with larger firm (ML) had a significant positive correlation with the level of investment in new capacity and with the industry benchmark on investment in new capacity.

Since positive correlation, negative correlation and no correlation were observed in the analysis, general hypothesis was partially supported. The different types of establishment might have indicated that they faced similar constraints, but they were found to face different constraints and in a significant manner.

Regression analysis on impact of the factors that constrain growth on type of firm establishment.

This section presents the results of the regression analysis on the impact of the factors that constrain growth on type of firm establishment.

Hypothesis: The type of establishment is related to the firms' constraining growth factors.

Models 1-6; Relationships between types of establishment and factors constraining growth

Table 5.9A: Models to test relationships between ownership and governance of young hi-tech firms and growth factors

	Model 1		Model 2		Model 3	
Model Type	Ordered Probit		Ordered Probit		Ordered Probit	
	Constraining Growth: Finance		Constraining Growth: Skilled Employee		Constraining Growth: Experienced Management	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	-.381348	0.055*	-.301346	0.090*	-.306524	0.091*
Independent	-0.231290	0.269	-.408257	0.034**	.0241402	0.904
Other	-0.102616	0.737	-.522680	0.073*	-.660594	0.027**

Constant					
R2	0.0092		0.0133		0.0193
Significance	0.2717		0.1093		0.0449**
N obs	222		287		287

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Table 5.9B: Models to test relationships between ownership and governance of young hi-tech firms and growth factors

	Model 4		Model 5		Model 6	
Model Type	Ordered Probit		Ordered Probit		Ordered Probit	
	Constraining Growth: Sales Channels		Constraining Growth: Market Information		Constraining Growth: Red Tape	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	-0.147301	0.393	-0.119110	0.489	-0.305872	0.075*
Independent	.0023564	0.990	-0.117259	0.535	-0.019658	0.917
Other	-0.088391	0.762	-0.369526	0.184	.0973691	0.735
Constant						
R2	0.0022		0.0035		0.0097	
Significance	0.7975		0.6077		0.1787	
N obs	293		263		279	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Models 1-6 examined the six factors that might constrain the growth of young hi-tech start-up. The regression results show that only the factor ‘experienced management’ was significantly associated with type of establishment.

Therefore, the hypothesis was only partially supported.

5.8 Summary

Relationships between the contingent factors and type of establishment

The results of the testing of the four general hypotheses on the relationships between the contingent factors and type of establishment are summarily presented in the tables below.

H1: There are significant differences in managerial skills, competencies and experience among young Thai hi-technology firms.

Table 5.10: Statistically significant relationship between human capital variables and the firm’s establishment type

Variable	Hypothesis		
	Type 1 (ML)	Type 2 (MS)	Type 3 (IN)
Human capital			
Technical/Scientific education	0	*	*
Business Qualification	0	0	0
Prior Industry experience	*	*	*

Note: Type 1 (ML) – merger with large firm, Type 2 (MS) – merger with similar firm, Type 3 (IN) – independently established

Note: * significant and 0 not significant at the $p < 0.05$ level

Source: Author

H2: There is a significant difference in product/service innovativeness among young Thai hi-technology firms.

Table 5.11: Statistically significant relationship between product characteristic variables and the firm's establishment type

Variable	Hypothesis		
	Type 1 (ML)	Type 2 (MS)	Type 3 (IN)
Product characteristics			
Developed intended to sell abroad	0	0	0
Primary product/service	*	*	*
Intermediate product/service	0	*	*
Final product/service	0	0	0
Intensity of competition in Thailand market	0	0	0

Note: Type 1 (ML) – merger with large firm, Type 2 (MS) – merger with similar firm, Type 3 (IN) – independently established

Note: * = significant, 0 = not significant at the $p < 0.05$ level

Source: Author

H3: There is a significant difference in market development among young Thai hi-technology firms.

Table 5.12: Statistically significant relationship between new market development variables and the firm's establishment type

Variable	Hypothesis		
	Type 1 (ML)	Type 2 (MS)	Type 3 (IN)
New market development			
the timing of competitor to present the similar product	0	0	0
Sales support activities: technical consultation prior to sales	0	0	0
Sales support activities: individual client customization	*	0	0
Sales support activities: specific configuration or system requirement	*	0	*
Sales support activities: complex or time-consuming installation	0	0	0
Sales support activities: regular maintenance and upgrade	0	0	0
Sales support activities: Specialized training required for front-line and sales personnel	0	*	0
International sales	*	0	*

Physically produce company's products/service overseas	*	0	0
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Note: Type 1 (ML) – merger with large firm, Type 2 (MS) – merger with similar firm, Type 3 (IN) – independently established

Note: * = significant, 0 = not significant at the $p < 0.05$ level

Source: Author

H4: There is a significant difference in source of finance among young Thai hi-technology firms

Table 5.13: Statistically significant relationship between source of finance variables and the firm's establishment type

Variable	Type 1	Type 2	Type 3
	(ML)	(MS)	(IN)
Source of finance			
Personal equity	*	0	*
Directors' loans	*	0	*
Retained profit	*	0	*
Other internal finance	*	0	*
Short term loans	*	*	*
Long term loans	*	0	*
Other sources of debt	*	0	*
Venture capital	*	*	*
Business Angles	*	0	*
Grants	*	0	*
Other external finance	*	*	*

Source: Author

It is hypothesised that the type of firm establishment will have significant positive correlation with the contingent factors used in the analysis. Many significant positive relationships were found, however, interestingly, many non-significant relationships were observed too. Many of the contingent factors used in the

analysis did not have significant correlation with any of the types of establishment. In general, there was a difference in the pattern of how the different types of establishment correlated with the different contingent factors. In conclusion, since significant positive correlations were found in the results in the testing of the four general hypotheses postulated to examine the key predators, therefore, all four hypotheses were partially confirmed.

The factors assisting growth or constraining growth development of firms

The crucial six factors that may constrain the growth of the business were **availability of finance, skilled employees, management experience, access to sales channels and distribution, commercial information and official regulations.**

- Finance/money is very important for the company if they want to invest in materials/equipment or to expand the business and human capital. Skilled employees are crucial. Without them it is very difficult to run the business efficiently resulting in waste of time and money. Sales channels and commercial information are important for the new start-up. The respondents need the public sector to support them by providing market information, including the way to expand to the international markets. Information about regulations in AEC countries is still lacking and they still fear the introduction of similar products by international competitors.
- Companies reliant on high technology and science need a more educated management team and equipped with accounting/finance/logistics skills.
- To venture into international markets and develop new products/services to generate better financial returns, the companies need human capital investment, access to skilled staff, collaboration with other companies or organisations, innovation, and access to investment. Firms need to innovate to reduce costs, develop new products and processes, have value-add products, and create more efficient machinery. Another important factor is collaboration with other businesses or public organisations because these partners can help them to expand their market. The partners can provide critical

information such as market information, production information, and competitor information. They can also enhance the start-ups' skills and knowledge.

The impact of the constraints on the young high-tech firms varied from firm to firm. The firm strategically reacted to the constraints faced to maximise output and to compete in the market.

CHAPTER SIX

RESULTS OF INTERVIEWS WITH THAI HI-TECHNOLOGY ENTREPRENEURS

6.1 Introduction

This chapter discusses the results obtained from the in-depth face-to-face interviews with seven entrepreneurs of hi-tech firms. The discussion in this chapter is used to attain research objective 3 and answer the related research questions of the study as stated in Table 6.1.

Table 6.1: Research questions subsumed under research objective 3

Objectives	Research Questions
To examine the role of the innovative inputs in young Thai hi-technology firms	i. How do Thai innovative firms implement the innovation process? ii. How the Thai entrepreneurs configure the innovative inputs to influence outputs in general?

Source: Author

The interviews were conducted in two stages. The first group comprised 5 entrepreneurs from 5 different firms in the manufacturing and services sectors were interviewed during March to May 2015. The interviews with the second group of two manufacturing management teams were carried out in January 2016. The face-to-face interview has more validity and reliability for gathering in-depth data (Kahn and Cannell, 1957) and there is almost zero chance of non-response from the participants because of the direct interaction between the interviewers and the interviewees, and interview allows both sides to exchange information (Surbhi, 2016)

The face to face interviews aimed to provide an in-depth review of the role of the main factors, namely, entrepreneurial characteristics, skill competencies, research and development (R&D) and innovation, product development, market development and international business activities, financial of business and the

growth of firms. This interview explored how innovative entrepreneurs establish and broaden their innovation inputs, accumulate productive resources and how to deliver more innovation outputs that enable the firm to develop new markets or compete more effectively in existing markets.

The interviews were conducted to identify the perception of the entrepreneurs in Thai Hi-tech firms regarding the various innovative inputs. Their perceptions are very important to the overall Thai high technology start-ups as they will help to determine the appropriate key based factors that can assist the young hi-tech firms in the long term run. Verbatim transcripts were obtained from the interview recordings. The data from the interview were then analysed using the thematic analysis.

The semi-structured interview format, employing the same questionnaire used in the telephone survey that had been undertaken in the first phase of the data collection process, was used to gather the information. The interview can help the researcher to get in-depth information needed. As mentioned earlier, the research themes examined in the interview included entrepreneurial characteristics, skill competencies, technological strategy in research and development (R&D) and innovation strategy, product development, the extent of market development and international business activities, and finance of business and possible factors assisting or constraining the growth of firms.

The coding of the data used in the qualitative analysis is as shown in Table 6.2 below.

Table 6.2: Coding of Data

Coding Data	Explanation
B1	Software industry
B2	Frozen Food Industry
B3	Skincare and Cosmetics manufacturers
B4	Skincare and Cosmetics Trader
B5	Engineering Industry
B6	Baby Products

B7	Medicinal skin food products
ML	Merger with large firm
MS	Merger with similar firm
IN	Independently established firm
Tech Ed	Technical/Scientific education
Biz Qual	Business Qualification
Pri Ind Xp	Prior Industry experience
Dev Domestic Mkt	Developed for domestic market
Dev SA	Developed intended to sell abroad
PP	Best Selling Product
Pri P	Primary product/service
Typ Cust	Type of Customer
IAct	Innovation activities
InCT	Intensity of competition
Incr/Disr Chg	The core technologies embodied in product/service with incremental or disruptive change
Sel Spt Act	Sales support activities
Intl Sel	International sales
Phys Prod Co	Physically produce company's products/service
SF	Source of Finance
Cstr Gwth Proc	Factor constrained the growth process of company
Cstr Shtg Skil	Constrained by the shortage of skills within the management team
Biz Perf	Business performance attribution
GP	Firm's general performance over the years against the rest of the industry
CurPos	Firm's current position with regard to the industry level of technology and against the rest of your industry

ROI	The rate of innovation in the company and the current position relative to the current rate of innovation
ROSkil	The rate of availability of skills for company
InvNCAP	The level of investment in new capacity in company and the current position relative to the industry benchmark on investment in new capacity

Source: Author

Note: * means there is a significant correlation at the $p < 0.05$ level

Note: B1 - Software industry, B2 - Frozen Food Industry, B3 - Skincare and Cosmetics manufacturers, B4 - Skincare and Cosmetics Trader, B5 - Engineering Industry, B6 - Baby Products, B7 - Medicinal skin food products

Note: ML - Merger with large firm (Type 1), MS - Merger with similar firm (Type 2), IN - Independently established firm (Type 3)

Note: Tech Ed - Technical/Scientific education

Biz Qual - Business Qualification

Pri Ind Xp - Prior Industry experience

Typ Cust - Type of Customer

IAct - Innovation activities

InCT - Intensity of competition

Incr/Disr Chg - The core technologies embodied in product/service with incremental or disruptive change

Sel Spt Act - Sales support activities

Intl Sel - International sales

Phys Prod Co - Physically produce company's products/service

SF - Source of Finance

Cstr Gwth Proc - Factor constrained the growth process of company

Cstr Shtg Skil - Constrained by the shortage of skills within the management team

Biz Perf - Business performance attribution

GP - Firm's general performance over the years against the rest of the industry

CurPos - Firm's current position with regard to the industry level of technology and against the rest of your industry

ROI - The rate of innovation in the company and the current position relative to the current rate of innovation

ROSkil - The rate of availability of skills for company

InvNCAP - The level of investment in new capacity in company and the current position relative to the industry benchmark on investment in new capacity

6.2 Profile of the Interviewee's Characteristics

The research sample was taken from the Innovation Boot Camp which is facilitated by a group of Thailand Innovation Fellows. It is supported by a number of like-minded organizations such as the Science, Technology, and Innovation Policy Office (STI), the Thailand Business Incubator and Science Park Association (Thai BISPA), the Science Park Promotion Agency (SPA), and the Regional Science Parks Network, as well as a number of universities in Thailand. The respondents were persons holding executive or higher positions, including the founders of the young hi-tech firms interviewed. All the respondents were selected from the participants who registered for the Thailand Innovation Boot Camp organised in collaboration with the Technology and Business Promotion, to ensure that all participants met the purposive sampling requirements stated in chapter 3. The participants currently worked in different areas of the technology industry sector, for example, IP, Law, Finance, Marketing, Research and Development (R&D).

The companies selected to participate in the interview are summarised in Table 6.3 below:

Table 6.3: Profile of the participants

No.	Type of Business	Position	Type of Foundation	Type of organisational sector
B1	Software industry	Owner	Merger with a larger size firm	Product and Service Industry
B2	(Frozen) Food Industry	Owner	Merger with a larger size firm	Manufacturing Industry
B3	Skincare and Cosmetics manufacturers	Owner	Merger with a similar size firm	Manufacturing Industry
B4	Skincare and Cosmetics Trader	Owner	Merger with a similar size firm	Service Industry Manufacturing Industry

B5	Engineering Industry	Share Holder and Factory Manager	Independent New Firm	Manufacturing Industry
B6	Baby Products	Business Developer	Independent New Firm	Manufacturing Industry
B7	Medicinal skin food products	The member of Board of Directors (BOD)	Independent New Firm	Manufacturing Industry

Source: Author

To answer the research questions stated in Table 6.1, the interview results and discussion are presented in 6 sections:

- 1) Entrepreneurial characteristics and skill competencies
- 2) Product/service development
- 3) R&D and innovation activities
- 4) Market strategy and international business activities
- 5) Financial aspects of business management

6.3 Entrepreneurial characteristics and skill competencies

The face-to-face interviews further evaluate the key characteristics and firm structure via skills and competencies of management and employees examined by the telephone survey conducted earlier which have been discussed in Chapter 4.

6.3.1 Ownership background

The seven respondents (B1-B7) could be classified as an elite group of founders and management team members from the main-stream hi-tech industries in Thailand, namely, software industry (B1), frozen food industry (B2), skincare and

cosmetics manufacturers (B3), skincare and cosmetics traders (B4), engineering industry (B5), baby products (B6), and medicinal skin food products (B7).

The presentation of the interview results is divided into two sections. The first section comprises new hi-tech firms that are individual start-ups (B5, B6, and B7). The second section comprises a group of start-ups registered as new independent firms after merging with similar or larger firms (B1, B2, B3, and B4).

The characteristics of the first group of *independent new firms* (B5, B6 and B7):

B5: This engineering company with three management team members including the founder and 12 full-time staff is regarded as a new firm. The company was founded as a manufacturing firm to supply products to the metallurgy industry. The founder is highly skilled in producing materials engineering products and is currently a senior academic staff member in a university engineering faculty.

B6: This baby products manufacturer began with 28 personnel, including the owner and foreign shareholders. It increased to 120 persons with the same owner and management team. The company has foreign shareholders from Europe who are responsible for the architectural and engineering aspects because the products are sold abroad and must conform to world class quality standards under their philosophy of “courageousness, proficiency and sufficiency” (B6, IN)

B7: This medicinal skin food company is one of the 4 companies operated by the same owner. This business group produced 13 types of product in all. The founder started his business as a trader of construction materials, and then expanded the business to include the manufacturing of chemical materials for polymer products before venturing to other different types of businesses. The medicinal skin food products are the latest product produced by the business group. In this research, we only focus on the medicinal skin food company as it is a de novo.

The characteristics of the second group of firms which were founded as independent new firms after having merged with a larger or similar size firms (B1, B2, B3, and B4):

B1: The owner is in charge of 10 part-time staff members. There are no full-time employees or manager because the founder is confident to run the business by himself as he had prior work experience in top level management in an IT company for 8 years. He also receives support from the IT manufacturer who is currently a partner and the owner of the software licence. The company focuses on the development of web applications and software.

B2: The company is registered as a limited company with 20 employees. It was initially managed like a family business. The entrepreneurial knowledge and experience were passed on from father to son and from generation to generation. The father, the former founder, started the business many years ago. The son founded an independent new firm and merged with the father's business and changed from selling domestically to fully selling abroad with new technology and innovation enhancement as an Original Equipment Manufacturer (OEM). Currently the father is a member of the Board of Director (BoD).

B3: This manufacturer of skincare and cosmetics products was founded as an OEM business. The firm supplies the purchase requirements from traders and distributors within Thailand and later merged with a Thai trader to expand to sell abroad.

B4: The owner of this skincare and cosmetics company started the business on her own. However, she recognized the big challenges from market competition, so she decided to form a partnership with her brother's OEM factory, but registered the company separately. The company focuses mainly on the service sector, trader and distributor and engages in marketing and advertising channels both in Thailand and overseas.

To sum up, three of the seven companies are fully de novo establishments. The remainder are registered as independent new firms after merging with a similar or larger firm.

6.3.2 Educational qualifications

6.3.2.1 Technical education

The interviewees also shared their perceptions on the importance of technical/scientific educational qualifications in the operation of their businesses. The opinions of some of the respondents from the two groupings are presented below.

B1: The company provides web applications and software development. The owner stated that the part-time staff and sub-contractors must possess at least a scientific qualification since they are in the technological industry and technical knowledge is necessary for the company's operation:

“... even I do not have any full-time staff except myself but I think I have enough experience to organise and run the business on my own because I have graduated in science and technology which is important for this type of business. All my part-time staff and sub-contractors graduated in Information and Technology (IT) or Science and Technology. Moreover, I was in the top management in IT company before. The important point is I have the full support on software appliances from the IT company partner and that help me a lot on running the business without any problems.” (B1, Tech Ed)

B2: In the interview the founder noted that one of the most important factors for running the business is the technical knowledge of the company's staff. He said that “...our technological machineries are not classified as having a very high technology standard but if we talk about technical knowledge on food creation within our factory, 90% of the employees meet these requirements with their higher technical skills. All these staff are very important to fulfil our business needs. I think it is more important than investing in very high technology appliances since we could produce the products which meet our customers' requirements. It is more than enough for me now.” (B2, Tech Ed)

B3: The founder started his business with only two of the 15 employees graduated in science. He thought it was not enough for running the business because the technical staff can help to improve and create the range of products. After he changed the assembly line to become a full OEM industry, he doubled

the number of employees who graduated in science and technology to fulfil the business needs.

“... from my experience as the owner of the business and graduated in science and technology, I think scientific or technical knowledge is very important for our production process. We focus on the tried and tested process to produce skincare product and making our products more attractive to customers. So, the staff with the scientific background can help business to improve the product especially by contributing to the production formula and packaging design. It means they are important not only in the laboratory room but also in the marketing site too.” (B3, Tech Ed)

B5: The management of this engineering company also agreed that staff with scientific skills is very important for them as their key product is used in innovative manufacturing.

“.... Now we have 12 staff members working with us, 8 of them with qualification in scientific education, the remaining staff graduated in accounting. As I told you earlier our products are supposed to supply to the technological industrial sectors so the staff must have a degree in engineering or the relevant field for working in the Production and R&D sectors.” (B5, Tech Ed)

B6: The management of the baby products manufacturers also strongly agreed that the important key staff should have degree in science education. He provided the information indicating that both the owner of the Thai factory and the foreign shareholders specialised in technological knowledge. For example, the owner of the company in Thailand graduated in polymer science and has direct knowledge of the company's products, while the foreign shareholders graduated in science/engineering.

B7: The interviewee who is a member of the company's Board of Director pointed out that the staff in research and development is very important for the company so they all should have degree in science and technology and the R&D staff graduated in sciences. The owner has a degree in Law and doesn't have a technical qualification.

In conclusion, six of the seven manufacturers agreed that the staff should have a technical or scientific qualification and be employed as full-time staff. Even B4, primarily a skin and cosmetic trader in the service sector, which does not have staff with technical or science qualification in the marketing office, employed a person trained in science to be in charge of research and development (R & D) to ensure that all products of the company complied with world class standard. This shows that scientific and technological knowledge is very important to the hi-tech start-ups even it is in the service sector.

6.3.2.2 Business qualification of manager/owner

The interviews sought to identify whether the manager or owner had business qualification or management knowledge.

Four of the seven founders or management team members (B2, B3, B4 and B6) have a degree in business.

B2: The owner has bachelor and master's degrees in business administration. He confirmed that it is important for the owners to have a qualification in the management field for running their own business and linking to the marketing channel.

B3: One of the management team members has a degree in business. He is the key man running the business. This is necessary because he can advise the owner and help to organise the business. The owner has a degree in engineering and a master's degree in science, but lack knowledge in business management.

B4: The founder graduated with a social science degree with a major in marketing. He mentioned that business management knowledge is always helping the company to create good marketing plan for selling product through various marketing channels.

B6: It is a requirement for the management team to have business qualification, as it is very important for efficient organisational management.

The three remaining company management members (B1, B5, and B7) who did not graduate in business administration have taken specialized business courses and also gained business management skills from their working experience.

B1: The owner graduated in computer engineering. However, he insists that business management knowledge is very important for his business.

“.... It is necessary to take few courses on management skills. I took few business management courses at the Thai Incubation Centre for new entrepreneurs and attended a long term course with K-SME (Kasikorn Bank Campaign) for about 4 months. Even it is not at the degree level, just a professional certification, this knowledge helps me a lot in running my own business better.” (B1, Biz Qual)

B5: All of the management team members graduated in material engineering, including the founder. However, the owner is a university professor so he has high business administration skills. The Interviewee said that business knowledge is important for presenting product to customer both at exhibition event and agent meeting.

B7: He and the owner of the medicinal skin food products company have no degree in business. However, he has taken some management courses and the company employs a temporary consultant who has knowledge in the marketing field.

The opinions gathered indicate that business management knowledge is very important for all hi-technology firms, even though some new firms do not have their own full-time manager who graduated with a business degree. They compensate for this by taking management courses and employing temporary staff to organize the business operation.

6.3.3 Industry experience of manager/owner

The interview showed that all the seven participated companies have persons who had prior industry experience, however there are different perceptions of their own industrial experience.

The owner and management team members of five companies, namely, software company (B1), skincare and cosmetics trader (B4), engineering industry (B5), baby product manufacturer (B6) and medicinal skin food products (B7) have previous industry experience either outside or within the same industrial sector.

“...as I mentioned to you earlier, I have 8 year experiences in IT firm before establishing my own company. I think the persons who want to start their own business they should have enough specific knowledge in the same industrial sector” (B1, Pri Ind Xp)

The owner and all management team members of Engineering business (B5) have relevant prior experience. One of the management team members noted that the top management should have experience before starting-up their own business and he believed that this is particularly important for a business in the engineering sector. All the management team members of baby product manufacturer (B6) from Thai and foreign countries had earlier experience related to the polymer products industries.

Whereas, two company owners, the skincare and cosmetics trader (B4) and the medicinal skin food products manufacturer (B7), have previous experience in a different business sector.

B4: The owner had experience in a different industrial sector before setting up her own business. She said “...I am quite new to this marketing business. I started this business because the current market trend of skincare is proliferating. Even I have a degree in social sciences, I can apply my previous experience and my own knowledge through ‘learning by doing’ technique and always keep trying and testing my own products. I think it is not a big problem for the young entrepreneur like me to run the business on my own.” (B4, Pri Ind Xp)

B7: The owner has significant prior business experience but is not relevant to the current industrial sector. Therefore, the company employs a temporary consultancy team to support the business both in the production and management fields. Due to the fact that the owner did not have any experience and knowledge in science and technology, the company decided to hire outsiders to do all researching and developing of their products. He insists that this is the best way to run the business.

To sum up, it can be seen that the companies, particularly those involved with innovative products/services are concerned about their prior industrial

experience within their management team especially during the start-up period. Whether the experience is related to the current businesses or not is not the important point; it is whether they can utilise their previous experiences with confidently to start a new business.

The two company owners in this research who do not have any previous experiences are the frozen food industry (B2) and the skincare and cosmetics firm (B3):

B2: Even though the founder of the business doesn't have any experience to run the business, he has been learning business management skills from his father through the "learning by doing" technique.

".... My father has his own business many years ago even his business is kind of family business, he has a great experience in the food industry sector. He is very good in finding new customer connection, so it is my inspiration to practice and learn from him for improving my knowledge" (B2, Pri Ind Xp)

B3: The owner doesn't have any experience on producing skincare and cosmetic products. After graduating from university he was taught all the necessary knowledge by his sister who has her own business in the same industrial sector, and she became the business partner when he started to produce the products.

"....my sister run her own business as a trader and she also becomes my business partner to help me to start the business. I have learnt a lot from her experience and currently, I have my own factory to produce products which can response to her purchasing order, and now I have many customers to deal with" (B3, Pri Ind Xp)

In short, the current owner or management team of five industries have previous industry experience, while the other two have no prior experience. However, both these owners have learned business management skills from their family members who are doing business in the same industry. To all of them, prior experience is important for starting the business and the owners with no experience would rely on other management team members to support the running of the business.

6.4 Product/service development

The respondents interviewed were asked to share their perspectives on the improvement of product/service.

6.4.1 Best-selling product/service

B1: The firm's best-selling product is a web application builder. Each application is designed to suit the customer's needs. The company provides all the necessary software and website development. More than 70% of the total turnover is from the information communication technology (ICT) provided to customers in both the private and public sectors. The interviewee claimed that the present customers are very satisfied with the **after-sale services** provided, which ensures that all their installed application software are continually monitored and maintained. This is the reason why they continue buying the product and asking for services from the company.

B2: All products of this frozen food industry are sold abroad. The bestselling food product is glutinous rice steamed in banana leaf with banana or taro inside. It accounts for almost 100% of the annual turnover. A market survey revealed that customers are satisfied with the product because it is not too oily (one of the ingredients used is vegetable oil), has no preservatives, and the texture and taste remain the same after heating in a microwave oven. The company is committed to using only the best ingredients. The owner is confident sustaining the differentiation of the product via good practice in the *R&D process*; 1) creative wrapping techniques 2) attractive packaging to attract customers, 3) superior taste and 4) a full-flavoured food. In addition, they conform to the Food and Drug Administration Standards. The founder of the business thinks that market research is important to ensure that the company knows how to maintain the best product quality and offers the right product with high quality standard to foreign customers.

B4: The best-selling product is a skincare product which accounts for 80% of the total share of sales. This is due to its: 1) luxury image 2) high product quality and 3) good marketing plan. The owner claimed that the customers can feel

changes when putting the product on their skin and the company uses on-line advertisement to save advertisement cost and the Internet to get quick responses from customers to generate higher sale volume.

B5: There is only one product being sold in the market, so 100% of sales come from this product. The major *function of the product* is to improve the quality of aluminium liquid before being used in the die casting process. It is a medium size machine used in the engineering and hi-technology industries. The customers are happy with the good *after-sale service*. The company's technical team is sent to the customer's firms every fortnight. The team keeps a record of the machinery operation and does maintenance if needed. Moreover, they are able to do *market survey* at the same time. In the case of a new customer, the company will send the engineering team to set-up the machine and train the company's personnel until they can use the machine and ensure it works perfectly.

B6: The best-selling products are baby pacifiers and teethingers. The company classifies the products as a super-premium products. They have different product and packaging designs. The interviewee said *the differentiation technique* is one of the important strategies for the business success. For instance, there were only five types of teethingers at first launching, but recently they have increased to 30 product types. The manufacturing process, from design to production, is based on their own *innovative invention* to conform to the *world quality standards*.

".... to secure repeat order from customer is not easy, so our strategy for *branding* is not only on beautiful packaging presentation, but also on the best product quality as an English proverb says that 'Beauty without grace is a violet without smell'. Thus, the world class quality standards is our best measurement for our product with regard to chemical testing, certification by medical doctor and pharmacist and zero defect production." (B6, Sel Spt Act)

B7: The company has two production lines manufacturing medicinal skin food products, namely, Chong cao (*Ophiocordyceps sinensis*) and Lingzhi mushroom (*Ganoderma lucidum*). The best-selling product is the Chong cao. It is a Chinese traditional medicine. The product is a fully innovative type of product.

Chang cao is the best-selling product but it has not met the company's sales target. The company hired marketing specialist to guide the marketing staff in the selling of the product. The interviewee mentioned that even after attended 18 exhibitions and events, the sales volumes of the products both in the national and international markets still have not met the company's target.

The results collected illustrate that the companies depend heavily on their core products or service and employ strategies to maximize sales of their core product(s). Only one company has not been successful in achieving the sales target for their core product.

6.4.2 Market development

The perspectives on market development were sought and presented in this section.

Three hi-tech firms (B3, B4, B5) started their business by selling domestically and later exported their products to other countries.

B3: The factory producing skincare and cosmetic products started by supplying to Thai traders. Recently, they have produced goods both Thai and international customers. The main target customer group is a trader or distributor. After the company merged with a trader, it expanded the target group in overseas because their partner can deliver products to wholesalers and modern businesses in both the domestic and international markets.

B4: The company started by selling domestically in Thailand to convenience stores. However, after having merged with an OEM business, they began exporting to Vietnam.

B5: In the first year, this engineering company sold its product within the domestic market. The main group of customers is located in the industrial estates in Thailand, for example, sub-contractor to automobile and mobile phone factories. Now they have an international customer in Korea. They are conducting a trial run using new mechanical system for potential customers from Turkey and

India. If they are satisfied, they will order the products from the company. The firm plan to sell their products in the USA soon.

The software company (B1) and the medicinal skin food products (B7) sell their products in Thailand. However, both of them plan to introduce their products to the neighbouring countries in the near future.

B1: Currently, the company supplies its product to the domestic market for both local companies and foreign subsidiary companies which are located in Thailand.

“.... my major customer group is located in Thailand because our partner who is supporting on the web application tools is based in Thailand. However, I plan to sell abroad very soon because I have tried to create software application which is not similar to anyone, however, I need to study the regulations of foreign market such as Lao to see whether they have any red tape or regulation that I need to follow or not.” (B1, Phys Prod Co)

B7: The company has just started producing a medicinal product. They will initially sell in Thailand and later in Laos. However, the volume of orders is very small. Consequently, the concern is that the cost of shipment is not commensurate with the volume of product shipped, which means they will face a loss in their first order.

The third group of companies (B2, B6) only sells abroad. The first company, B2, a frozen food company, exports 100% of its products to the international market. They do not plan to sell in Thailand because the product is a local food and there are many competing local factories and merchants in Thailand. Moreover, Thai people can easily make the product themselves. Their current foreign customers are Hypermarkets, China town and Thai town traders under commercial contract. The second company, B6, is a company that sells super-premium finished goods. The company's goal is to sell abroad because the selling price is comparatively quite high for domestic customers. Sixty percent of their exports are sent to US and the balance to Europe. Does B2 meet your criteria as a high-tech company.

To sum up, it is clear from the interviews that selling abroad is very important for all the companies. If they are currently selling only domestically, they plan to export their products overseas as soon as the chances come.

6.4.3 Customer Base

At establishment, all the companies interviewed focus on specific customer base as show in the table below. The interview data show that the selection of customers is basically determined by the nature of the company's business and products.

Table 6.4: Customer base

Company	Business type	Base of Customer
B1	Web application development tools and website development tools	1) Private Business Company 2) Public University
B2	Frozen food industry	Business (Hypermarket, Wholesaler/Retailer)
B3	Skincare and cosmetic products (manufacturer)	Business (trader)
B4	Skincare and cosmetic products (trader)	1) Business (Modern Trade, Wholesaler, Convenience store) 2) Consumers
B5	Material engineering	Business (Private engineering firms)
B6	Baby Product	Business
B7	Medicinal skin food Product	1) Business (Modern Trade) 2) Consumer

Source: Author

As can be seen, the Software company (B1) has two groups of customer comprising public and private organisations. The frozen food industry (B2)

focuses only on customers in the business sector as this company is an exporter so they deliver their products only to the importers such as Modern Trade, Wholesaler, and Convenience store. The third company, (B4) makes skincare and cosmetic products. As a trader, they support both business and consumer groups. The manufacturer (B3) concentrates only on business group who can deliver the products to customers later. While the engineering company (B5) has narrow customer base as its product is a niche product. They sell their product to the company specialised in engineering business. The sixth company (B6) is a baby products manufacturer is an exporter. They only sell their products to businesses that will dispatch and ship their products to customers. The final firm (B7) which makes medicinal skin food product is a local manufacturer and only sells the products in Thailand. As such, their customers comprise both the business and consumers.

6.5 R&D and innovation activities

The examination of R&D and innovation activities focused on how the participants carried out these activities, the rate of intensity changes, number of R&D staff, and the company's plans to carry out R&D activities in the next two years.

B1: stated that their software product doesn't use the latest technology. However when compared with other businesses, their product is more innovative than that of the competitors which still use older version of Information and Technology (IT) devices. The owner further stated: "...I am confident that we are producing the newest software because I keep improving the existing product, I think software business should improve the product all the time to maintain a high level of innovation advancement" (B1, IAct). He also explained that the company conducts R&D activities occasionally because of time limitation. The company spent 10% of total income on R&D annually.

"...for next year R&D plan, I will try to find the time and manage it properly. Moreover, I plan to do a company performance review every year and plan to have a new project with new investment next year." (B1, IAct)

The frozen food company (B2) is doing R&D constantly. Occasionally it is done via collaboration with public organisations and universities. They claim that

they have to spend 5-10% of the total revenue to support R&D activities with the public sectors. With respect to the number of R&D staff, they do not have full-time staff working 100% on R&D because they receive assistance from the public sector.

“....in the next one or two years we plan to employ full-time R&D staff for our factory without asking for help from the government office. I think it is worth paying for them because they are with us all the time, they are able to re-check easily during the production process and improve the product at the same time.” (B2, IAct)

The skincare and cosmetics trader (B4) does not have own R&D staff but the company's partner takes charge of this activity.

B5, which produces engineering product, does R&D activity regularly. Specifically, all the R&D staff spend time in the laboratory to create and test products before the products are presented to the customers.

B6, the baby product producer, also mentioned that since the start-up of the company, they used a simple innovative machinery. After three years, when their sales increased, they changed their innovative devices from semi-automation to full-automation and the manpower managing some production lines was replaced by machine. The change and know-how helped them to earn more income and reduce costs.

Whilst, the medicinal skin food company (B7) employs R&D staff with degree in science to improve their product. The company created a project called 'shadow training' whereby the staff is trained by an outside consultant to make sure that all R&D staff have the capacity to do their job.

In summary, all the companies are very concerned about innovation activities especially in the research and development field. It is definitely due to the nature of their business. As high technology firms, continuing technological improvement is a major main task for them.

6.6 Market strategy and Internationalization activities

The business environment in which the companies are in is discussed before looking at how they respond to the challenge in this section.

6.6.1 Competition

6.6.1.1 Intensity of competition

This section explores the intensity of competition that the companies encounter in the Thai market and provides an estimate of the amount of time taken for a competitor to launch a similar product/service with superior performance or with similar performance at a lower price. It also considers the company's response with regard to sales support.

B1: The competition in the IT business is extremely intense in both the domestic and international markets. There are two big competitors in Thailand which hold big marketing shares in the software industrial sector. Foreign rivals also offer the same product and service especially in the field of web development. Moreover, there are large direct sale websites or E-commerce businesses, such as Weloveshopping.com, Tarad.com and Lazada.com which also offer similar products and act as an alternative for the customers. To compete with them, the company said that:

“...my strategy is Location, Location and Location. I penetrate only the North-east region market because there is very few software companies. I don't think going for the whole country is the best way. I spend my time to take good care of the existing customers and focus more on the Website installation.” (B1, InCT)

In other words the company's niche is to provide good after-sales service in that region. They are always concerned about the customer's needs. The 'system requirements campaign' is one of the activities that they regularly do to maintain the current customers and to attract new ones. When the competitor offers similar product to customers, the company counters by using the technique of offering lower price to customers:

“... They may offer product quicker than me but our strong point is the cost of sales is lower than the competitors, so we can offer lower price to the

customers. Talking about selling price, our price is much lower, thus I am very confident that I can compete with the competitors better. Moreover, our online selling system is similar to the big E-commerce firms but the customer can add unlimited products into the e-basket while the competitors offered a limited quantity of products.” (B1, I InCT)

The business survives by using the following strategies.

- 1) The product is different from the rivals.
- 2) Sustain after-sales service activity.
- 3) The target customers are organisations located within the company’s service area.
- 4) The technological devices (the internal control system function) for the website installation are unique.

Company **B4** revealed that there are many competitors in the skincare and cosmetics market in Thailand. In Thailand, initially one company had a monopoly on skincare products. Over time, the popularity of skincare products led to start-ups launching similar products. The company used its experience and knowledge in this product field to change strategy to make itself stronger in the market by:

- 1) Changing the ingredients but still maintain the same quality and reduce costs and prices.
- 2) Creating better packaging design.

To implement the strategy, they worked with a partner OEM manufacturer who produced the product for them.

B6: There are many baby product manufacturers in the world but the market is dominated by manufacturers who produce premium quality products. The competition came from three businesses which are all foreign firms. Two of the companies are located in Asia and the other one is in Europe. They use the five forces strategy⁵ to compete with them; consider their selling price, product and packaging, then design the strategic plan by asking themselves how to make packaging more attractive, what colour attracts customer? and who do we sell

⁵ Porter's Five Forces Analysis is an important tool for assessing the potential for profitability in an industry. With a little adaptation, it is also useful as a way of assessing the balance of power in more general situations. They are consist of: Supplier Power, Buyer Power, Competitive Rivalry, The Threat of Substitution, and The Threat of New Entry (MindTools.com, 2011).

to? Market research was needed to determine the best features for the product in order to achieve high standards.

B7: The intensity of competition experienced by the medicinal skin food company is very high, especially from the big and well-known MLM (Multi- Level Marketing) businesses or direct sale entrepreneurs. The competitors offer at much lower price than is offered by the company for similar product type. Moreover, companies in the US are also planning to produce the same type of product in cooperation with a Thai factory. How can the company compete with the new foreign rival whose productivity is many greater than theirs? They said,

“... We are very new to this product type. The main target group is the 40 years old and above, while teenagers are the minor target customers. From our survey we found that the senior group is satisfied but the young customer group is not very happy with the product. The quality of our product is very high as we use the best raw materials produced under the Queen’s project. Thus, explaining the details of our product to the customers is very important. To get clients, besides sending our product to the hyper market, we also attend exhibition and contact the government offices to seek support in selling our products. Sales support activity is very important especially to individual clients because the product is medical in nature so explaining it clearly to the customers is very important.” (B7, InCT)

Two companies surveyed, namely, the frozen food product (B2) and the engineering industry (B5) were not too concerned about competition intensity.

B2: There is a very small group of competitors in this field and only two factories can produce similar products. However, they have a different international target market.

“... I am an OEM factory so our task is to produce by following the purchase requisition from the foreign customers and then the products will be sent for packaging and branding by the customers. As such, the product selling price for each customer is different. We are not really worried about the competitors in the market because we believe that we are strong

enough to compete with them with regard to the product and we also have a niche support activity.” (B2, InCT)

They noted that support activity is very important for the company. Firstly, the customer assistant/salesperson needs a “prior consultancy meeting” because they need to consider the current state of technology before creating a production plan. The second concern is that foreigners are not familiar with the food. Therefore, it is essential that the salespersons explain to the customer how the food is prepared. Lastly, training is also important for the front-line staff. Every two weeks the company provides training on hygiene as part of its after-sales service care campaign.

B5: The respondent insisted that the company doesn’t have any competitors as they are the only producer in the world who produce the aluminium die casting. Though there are several companies which produce aluminium casting but with a much different production process. They also stated that they have a unique machine which is designed for producing speciality quality aluminium liquid. In addition, after-sales service is also very important for their business. They send the technical team to audit the customer company two times a month. This service can help them to collect technical information to create a maintenance plan for their machinery. For a new client, the technical team will work with the customer’s firm to train the machinery operator and to make sure that they can control it and that the machine is working smoothly.

6.6.1.2 Technical innovativeness

Innovativeness describes the best of products/services or technology that could possibly be used to produce the products/services and constantly observes the core technology embedded in the products/services. It highlights whether there have been any disruptive and incremental changes in the technology used over their operational period.

Disruptive change means the company has to invest in or develop significant new technologies or technological skills within the last two years in order to produce their products or services. *Incremental change* means the introduction of a small

or gradual adjustment instead of large or rapid changes to produce the products/services.

B1, B2, and B3 used incremental change to innovate the production of their products and services.

B1: The company incorporated novel technology that has been developed elsewhere. The reason to use this approach is cost saving. The company cannot start business with all new technology because it is too difficult for the owner to run the business within the limited technological resources. It is easier to learn how to adapt the new innovations from other technological patents and apply them to his own product. In the case of the patented technology that the company is using currently, the company has a partnership with the technology owner.

The frozen food industry (B2) also *incorporates new combination of* existing technologies to create their own innovation. They allocated time to keep developing the existing technology.

“....sometimes I need to cut some processes which have effect on the time period for launching product. Previously we uses manpower to produce our product (handmade), but now we replace the manual process with new automated machine which is developed by using the existing technology we have, such as replacing the manual wrapping process that we used.”
(B2, Incr/Disr Chg)

The technology is mostly used for preparing raw materials and ingredients. But, it is out-of-date and as a result, they have to use many machines to prepare it. Now they have modified the production process to use only one innovative machine which saves time and energy and manpower.

The skincare and cosmetics products company (B3) also uses *the “incorporate new combinations of exiting innovative technology”* approach to produce their own product because, basically, cosmetic technology is based on Nano technology which has to be constantly redeveloped in the laboratory room.

“..... Actually, I require Nano emulsion technology, but the cost of the investment is very high, so we have to modify the existing technology to maintain the costs.” (B3, Incr/Disr Chg)

The medicinal skin food company (B7) employs the “*combinations of existing tried and tested technology*” approach as well. The product is based on medicinal mushroom that is not easy to produce. The time is mostly spent in the laboratory room to improve the product. The company utilizes a scientist consultant in its R&D.

By contrast, the engineering company (B5) used the “*disruptive change of technology*” approach to develop their core technology *to produce their product*.

“...Our production technology is considered as the “new innovative technology” because we produce engineering product by incorporating the new technology that we have to develop specifically for each customer. We develop our product prototype using our own knowledge. In addition, we continually do R&D to “try and test” the product regularly.” (B5, Incr/Disr Chg)

6.6.2 Internationalization marketing activities

International business activities refer to the companies’ way of selling the whole range of their products and services overseas.

All the companies except B1, a software company, sell their products/service internationally employing different strategic approaches.

The software company (B1) has not entered the global markets currently, but plans to do so in the coming year and has already started preparing for that.

“....I plan to start sending my product to Laos next year because I have a connection with someone there and the important point is Laos speak the same language as us (North-eastern language). Moreover, at the end of this year I am going to Seattle, USA to study the market there. Selling overseas is my own idea, which is not based on the AEC⁶ (ASEAN

⁶ The establishment of the ASEAN Economic Community (AEC) in 2015 was a major milestone in the regional economic integration agenda in ASEAN, offering opportunities in the form of a

Economic Community) blueprint. I decide to sell internationally by expanding the business structure via connecting with “the foreign sales subsidiary” which enable us to earn more income.” (B1, Int Sel)

The owner is strongly confident of the business growth in the Laos market because Thailand is much well in front in Information and Communications Technology (ICT) than Laos. In Laos there is a small group of competitors. He also claimed that the business culture of the entrepreneurs in Laos is based on trust. So the most critical issue for the company is to develop the trust at the beginning of their international relationship.

The company also liaises with new international partners whenever they have a chance to attend seminar or workshop. They believe that a partner can help them to work better.

“....I had an opportunity to go to Laos under the support of Khon Kaen University. The University helped me in business matching. In addition, the Incubation Centre or I-SAN Software of Khon Kaen University organised the Corporative Project and Business Event to help the Thai entrepreneurs to meet Laos organisations in the industrial sector and forming university partnership... I always join their business campaigns, for example, IT or ICT business exhibition and Khon Kaen University Road show.” (B1, IAct)

The owner of B1 started the business and worked alone. To support his numerous customers, he hires IT subsidiaries to install applications for customers. Currently, all products are produced only in Thailand. In the future, he plans to do a joint venture with a Laos company to service the Laos market. However, he stated that he needs to study the Laos’ regulations to see whether he needs to register a new company or can export the product to the Laos partners who will declare the product as their own before signing MOU (Memorandums of Understanding) with them.

B4: Currently this skincare and cosmetics manufacturer is selling domestically and internationally. The foreign markets are Laos, Vietnam and

huge market of US\$2.6 trillion and over 622 million people. The ASEAN member states are; Brunei Darussalam, Cambodia, Indonesia, Laos PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam (AEC, 2015)

Myanmar. Vietnam has the largest purchase volume. It has been continuously increasing since the company started to export there in 2014. Once they are satisfied that they have a solid market base in Vietnam, they will further plan to export within the AEC member states.

“....Let’s talk about Vietnam market as an example of our achievement. The traders in Vietnam are really happy with the image of our products. When we started the business as a trader, we exported the product to the Vietnam’s distributors who made only a small volume order. After we have a joint venture with the OEM manufacturer, the customers are more trusting of our product because they can have their own standards and products to meet consumers’ preference. So, now it is easier for us to produce based on their requirements. Moreover, logistically it is much faster for us to deliver than other companies. This is why the distributors and traders are interested to order from us rather than from others” (B4, Int Sel)

However, the company has no plans to build their own factory in Vietnam due to local regulations and the raw materials/resources are all in Thailand. The respondent mentioned that even though the cost of labour in Vietnam is much lower than Thailand, but it lacks the skilled staff who can work for them.

The company uses Facebook as the sales channel for receiving the orders from customers. The interviewee said it is a very simple vehicle but this has helped them to achieve business success because they can reduce cost. In the past, they had to spend 50,000 baht (USD 1,430) each time for participating in business exhibition.

B5: The current international market for the engineering industry (B5) is Korea. They are also planning to export to Turkey and India after completing a pilot project. Now, the company has foreign agents in these three countries. The interviewee said that the foreign agent or trader is very important for the company as the very exclusive product characteristic and know-how about the specific details is important. The company’s agents are all skilled and trained staff. For the near future, the company plans to sell the product in Europe and US. The owner has a connection in the US. He graduated from MIT in the US. Although

the total sales in Korea are high, they are not planning to establish a factory abroad because product quality control is very important for them.

“...if we produce overseas, we may not be able to control the quality properly. However, we plan to send our staff to work in other countries (future plan) for collecting data and transferring technological knowledge to customers. The current plan is sending a staff to work full-time in Korea. We are not concerned about cost as we are serious about the reliability of our product. It is a new technological machine. The customer might be confused on how to use it. This is the reason why we send our staff to train and coach them until they can use the machine to produce the product.”
(B5, Int Sel)

The two following companies, the Frozen food industry (B2) and the baby product manufacturer (B6) export their products exclusively.

B2: This company exports their products to Europe, Australia and America. They sell in 10 countries. They do not sell their product in Asia because it is Asian food. The reasons for choosing to export only to international market are product's 'differentiation' and 'noteworthiness'. The three most important international markets based on sales volume are France, USA and Germany because of their food culture. Moreover the competition in these countries is not intense because each competitor has their own target market. The company generates publicity through television shows and magazines to support their sales channel. The company produces all products in Thailand and do not have foreign agents. They export directly to the end-users. The owner said in the near future they may produce their products overseas.

“...if possible, I think Europe is my target for setting-up a new production line. According to tourism statistics, tourists who visit Thailand each year enjoy the variety of Thai food and they love the Thai cooking style. However, the manufacturing investment in Europe is quite high and that's why this is only a future plan” (B2, IS). Another consideration is expanding to the ASEAN market. However, a similar product is being made in Vietnam at a lower cost due to cheaper labour costs in Vietnam.

B6: This baby product company embraces the concept of “marketing orientation”.

“....This strategy is not new but it always helps us to know our position. Marketing mixed or ‘4P’ strategy (Product, price, place, and promotion) is very important for market development. First, we need to know our products and then consider why and where to sell our products? We should know the cost of living in a particular market before setting the price of product. For example, if you know the purchasing power is 70 baht/day/person (USD2), then you could not sell your product at 280 (USD8). By contrast 10 US dollars is nothing for foreigners” (B6, Int Sel).

This is the reason why Thailand and AEC (ASEAN Economic Community) are not their target markets. He also noted that a *market survey* is important to know the customer needs. For instance, in the case of baby goods, even though the mother is the customer who buys the product, but the real consumer is the baby. Thus, the aim of market research is to identify the real needs of the consumer (baby) not the customer (mother). It is able to prevent competitors to copy the product.

The company’s largest international market is the US and follows by Europe. The company has 700 employees worldwide and has wholly owned sales subsidiaries in each country. When they first launch their product into a new market, they use grounded storage who acts as the company’s foreign agent.

“....The agent works on logistics. If we get a good purchasing response from customers, then we will have our own warehouse as the distribution centre. We do in-house training to train the salesperson/distribution team every month and produce the product only in Thailand.” (B6, Int Sel)

B7: This medicinal skin product company joined business matching campaign for opportunities to find new international markets. Sometimes they go overseas to present their product.

“....This approach needs a lot of money but I think to build branding and brand loyalty, we need a lot of time to do it. The big boss (the founder) hired marketing specialists to sell our product for 6 months, but it is not really successful. My task is as a consultant and also in charge of the committee members in the company. I have met the Prime Minister twice

to ask for support from the government and we have just got 1 million baht (USD 28,572) for our project.” (B7, Int Sel)

6.7 Financial aspects of business management

Table 6.5 presents the sources of corporate finance of the participants' companies and show how they have funded their business activities generally.

Table 6.5: Sources of corporate finance

Code	Business Type	Business fund	Percentage (%)	Financial activities
B1	Web application development tools and website development tools	Personal equity	100	Spend most of money for the subsidiaries' payment
B2	Frozen food industry	Personal equity and bank loan (short term loans)	30:70	Use bank loan because it is a private organization, so it is easy to apply for it. If the company plans to invest more on production line, the firm will use their own profit.
B3	Skincare and cosmetic (manufacturer)	Personal equity and bank loans	50:50	Building the factory needs a large amount of money to do, so bank is only first choice for company
B4	Skincare and cosmetic (trader)	Personal equity	100	

B5	Materials engineering	Personal equity	100	Start the business with personal investment, the applying short-term loans from bank for running the business together with sending project proposal to ask for grants from public sectors.
B6	Baby Product	Personal equity	100	At the start-up, finance sources are from shareholders, after getting a good return, company build the new factory with the retained profit.
B7	Medicinal skin food Product	Personal equity and Bank loan	60:40	After started the business, the company asks for Overdraft for developing new products

Source: Author

Note: It should be noted that independent new firms all start their business with personal equity and the rest of the financing is from bank loan.

6.8 Summary

The interviews conducted are to examine the role of the innovative inputs in young Thai hi-technology firms to evaluate how the innovative firms implement the innovation process and the Thai entrepreneurs configure the innovative inputs to influence outputs in general. Thailand as a developing country shares

the challenges faced by its innovative industries as reflected in the interviews with the firm owners and management teams.

1) Entrepreneurial characteristics and skill competencies

The characteristics of the founders and the founding team in terms of skill competencies such as ownership background, education and qualifications in technical and business knowledge, and industry experiences influence the strategies and subsequently, the achievement of the new hi-tech firms.

In general, firms managed by team are more successful (e.g, B2, B6) than firms managed by a single owner (e.g. B7). The management team in the manufacturing industrial sector requires scientific or technical know-how for their survival and growth. Prior industry experience is an important contributor to the performance of the start-ups. The participants argued that lacking of experience is detrimental to their business. If the owners did not have the relevant experiences, typically they would sought to grow expertise internally so that they need not rely on outsider specialists permanently.

2) Product/service development

The study found that all innovative firms primarily sell their products to other businesses, then only to consumers and the public sector. Their best-selling products are ready to use products for business, trader/distributor and end-users. To sustain a high volume of purchase, the firms use strategic inputs such as after-sale services, best quality raw materials, good R&D plan, the best performance product, branding strategy, differentiation techniques both in products and packaging, conforming to world quality standards, and continually doing market surveys.

Three different approaches to market development were discovered; went international from the onset, expanded from selling domestically to overseas markets, and focused on selling domestically but planned to sell abroad in the near future. The last group is generally managed by a single founder who needs to collaborate with outsiders and/or get more knowledge for exporting. The first two groups, on the other hand, have management team/owners with

strong competencies and experience which facilitated the international market development.

3) R&D and innovation activities

One important characteristic of knowledge-based hi-tech firms is the extent of R&D staff members participating directly in R&D activities. The majority of the firms only occasionally engaged in R&D due to time and know-how limitations and rely on third party or the corporate partners to do R&D for them. The company doing R&D regularly does so because their product type is specifically developed for each customer and a big number of staff is involved in R&D and production.

4) Market strategy and International business activities

Most firms interviewed claimed that they did not face intense competition. The start-ups who went internationally claimed to have their own market share and position because their product is difficult to imitate. This holds true for manufacturers of premium quality products and customized products which can command brand loyalty more readily.

5) Financial aspects of business management

All the respondents claimed that there are not many sources providing finance for new firms in Thailand. The start-ups entrepreneurs who plan to have their own business need firstly have personal equity and then try to secure a bank loan to partially finance it.

In conclusion, to answer the two research questions, the interview data suggest that almost all the innovative inputs are regarded as important by the entrepreneurs in the high-tech start-ups.

CHAPTER SEVEN

MODELLING YOUNG HI-TECHNOLOGY FIRMS' GROWTH

7.1 Introduction

In Chapter 4, the characteristics of the companies surveyed were presented descriptively and in Chapter 5, the contingent factors such as the core characteristics of entrepreneurial and firm demographics, skills and competencies, product/service innovativeness, marketing development and factors that constrain firm growth were further analysed statistically to identify and explore the relationships between them and the types of firm establishment. In Chapter 6, the perceptions of the management teams of seven firms selected using the stratified random sampling procedure regarding entrepreneurial characteristics, skill competencies, research and development (R&D) and innovation strategy, product development, extent of market development and international business activities, financial of business, and possible factors assisting or constraining the growth of firms were studied in detail.

This chapter will examine to what extent the characteristics of firms, innovation and firm growth dynamics presented earlier enable the young Thai hi-technology firms to create a meaningful contribution to the future economic growth of the country.

The main aim of this chapter is to explore Research Objective 4, which is 'To determine the core firm growth determinants of young Thai hi-technology firms' and to answer the following research question:

1. What are the core firm growth determinants of young Thai hi-technology firms?

These examinations will show how young innovative firms in Thailand bring together the various inputs to create meaningful contributions to the future economic growth potential of the country. Finally, the discussion will consider whether new theories need to be developed to explain the key characteristics that lead to enhanced economic growth in developing economies.

The regression analysis procedure will be used to analyse the four key-based factors; 1) innovative entrepreneurial characteristics and corporative finance, 2) product/service and innovation activities, 3) new market development, 4) business performance and growth dynamics to examine their influence.

The discussion will first briefly review the key-based factors derived from the core theories which have been discussed extensively in Chapter 2. Hypotheses based on these key firm-based factors formulated will then be tested in the regression analysis.

7.2 Multivariate regression analysis

The research conceptual framework focussing on high technology entrepreneurship presented in Chapter 1 is built on the core theoretical perspectives derived from the management and economics literature in three key areas, namely entrepreneurship, innovation and firm growth dynamics. These core perspectives are divided into eight categories to be analysed to fill the current research gap. They are: (1) ownership, governance and firm demographic (Model 1-5), (2) Product characteristics and markets (Model 6-10), (3) Innovation (Model 11-19), (4). Internationalization (Model 20), (5) Production Location (Model 21), (6) Sources of finance (Model 22-31), (7) Skill Shortage within Management team (Model 32-37), (8) Performance Indicator (Model 38-54). The multivariate regression tests are conducted using a sample of 521 Thai SMEs hi-technology start-ups in both the service and manufacturing sectors collected in the survey.

Multiple regression analysis is a commonly used method in social sciences for examining the influence of selected variables to obtain a clear picture of each selected contingent variables (Long, 1997). This statistical technique can examine the relationship between a single dependent variable and a number of independent variables (Hair et al., 1998) and could minimize the probability of overstating the apparent total explanatory power of a group of independent variables (Patton, 1997). Thus, it is an appropriate technique for assessing the models constructed to measure the economic contribution of the young Thai hi-tech firms to the country's economy.

As the data collected comprises ordinal and binary data (Table 7.2), the following regression models are used to meet the analytical requirements (Hardy and Bryman, 2009).

- Ordinary Least Square (OLS)

ordinary least squares (OLS) or **linear least squares** is a method for estimating the unknown parameters in a linear regression model, with the goal of minimizing the sum of the squares of the differences between the observed responses (values of the variable being predicted) in the given dataset and those predicted by a linear function of a set of explanatory variables.

- Poisson regression

Poisson regression is a generalized linear model form of regression analysis used to model count data and contingency tables. Poisson regression assumes the dependent variable Y has a Poisson distribution, and assumes the logarithm of its expected value can be modeled by a linear combination of unknown parameters. A Poisson regression model is sometimes known as a log-linear model, especially when is used to model contingency tables.

- Probit regression

A **probit model** is a type of regression where the dependent variable can take only two values (binary), for example, married or not married. The word is a portmanteau, coming from *probability + unit*. The purpose of the model is to estimate the probability that an observation with particular characteristics will fall into a specific one of the categories. It is a type of binary classification model.

- Ordered Probit regression

Ordered probit is a generalization of the widely used probit analysis. The logit method also has a counterpart ordered logit. Ordered probit, like ordered logit, is a particular method of ordinal regression.

- Ordered Logistic regression

The **ordered logit model** (also as **ordered logistic regression** or **proportional odds model**), is an ordinal regression model, that is, a regression model for ordinal dependent variables, first expounded by McCullagh (1980). For example, if one

question on a survey is to be answered by a choice among "poor", "fair", "good", and "excellent", and the purpose of the analysis is to see how well that response can be predicted by the responses to other questions, some of which may be quantitative, then ordered logistic regression may be used. It can be thought of as an extension of the logistic regression model that applies to dichotomous dependent variables, allowing for more than two (ordered) response categories (Hosmer, et al. 2013).

7.3 Operationalization of the variables

Our primary interest in this chapter is to test for and identify statistically the significant relationships between ownership and governance (type of founding establishment) and the key firm-based factors such as entrepreneurship, innovation and firm growth dynamics. In order to measure these potential relationships the firms are classified according to ownership and governance structure at the point of their formation. Whilst this can be operationalized in different ways, we adopt a dual approach combining both the classifications commonly adopted in previous works and a more practical grouping based on the observed sample sizes in the data.

Table 7.1 describes the classification of firms based on ownership and governance (type of founding establishment) and their respective sample sizes in the survey response data.

Table 7.1: Ownership and governance (type of establishment) classification

Independent variable		
Original survey variable	Number of observations	Ownership and Governance group
Q3a: merger with a larger firm	136	Category 1
Q3b: merger with a similar size firm	138	Category 2

Q3c: acquisition of another firm in your industry sector	(33)	Category 4
Q3d: acquisition of another firm outside your core industry sector	(25)	Category 4
Q3e: a management buy-out or management buy-in	(22)	Category 4
Q3f: a change of ownership	(24)	Category 4
Q3g: a change of management	(26)	Category 4
Q3h: Independent new firm	93	Category 3

Source: Author

As can be seen in Table 7.1, the number of cases in five types of ownership establishments is too small in number to be practical for use in the data analysis. These small establishments are grouped in a category labelled as 'Other' for use in the analysis. As a result, the distribution of the firms is categorised into four main groups for use in the analysis, namely, Merger with large firm (Category 1), Merger with a similar sized firm (Category 2), Independent new firms (Category 3) and Other (Category 4).

The classification of the dependent variables is summarised in Table 7.2.

Table 7.2: Summary of dependent variables

Dependent variable		
Ownership and governance		
Variables	Type of Data	Measurement
The number of full time equivalents	Ordinal	Number of employees

The total employees with technical/scientific education	Ordinal	Number of employees
The total management team with business qualifications	Ordinal	Number of current management team
The number of founders	Ordinal	Number of owners
The management team with previous industry experience outside company	Ordinal	Number of current management team
Product/service characteristics		
Variables	Type of Data	Measurement
Developed intention to sell abroad	Binary	Coding variable (yes=1, no=2, don't know=3)
Primary product/service	Binary	Coding variable (yes=1, no=2, don't know=3)
Intermediate product/service	Binary	Coding variable (yes=1, no=2, don't know=3)
Final product/service	Binary	Coding variable (yes=1, no=2, don't know=3)
Intensity of competition in Thailand market	Ordinal	5 point Likert scale
Innovativeness: <ul style="list-style-type: none"> - Tried and tested - Incorporates novel technology with developed elsewhere - Incorporates novel technology with developed for the company 	Binary	Coding variable (yes=1, no=2, don't know=3, refuse=99)
Sales support activities: <ul style="list-style-type: none"> - technical consultation prior to sales - individual client customization - specific configuration or system requirement - complex or time-consuming installation 	Ordinal	5 point Likert scale

<ul style="list-style-type: none"> - regular maintenance and upgrade - specialized training required for front-line and sales personnel 		
Internationalization		
Variables	Type of Data	Measurement
International sales	Binary	Coding variable (yes=1, no=2, don't know=3, refuse=99)
Physically produce company's products/service overseas		Coding variable (yes=1, no=2, don't know=3, refuse=99)
Sources of finance		
Variables	Type of Data	Measurement
<ul style="list-style-type: none"> - Personal equity - Directors' loan - Retained profit - Other international finance - Short term loans - Long term loans - Other sources of debt - Venture capital - Business angles - Other external finance 	Binary	Coding variable (1=yes, no=2, don't know=3, refuse=99)
Constraining growth process factors		
Variables	Type of Data	Measurement
<p>Factor has constrained the growth process of company:</p> <ul style="list-style-type: none"> - Availability of finance - Availability of skilled employees 	Ordinal	5 point Likert scale

<ul style="list-style-type: none"> - Availability of experienced management - Access to sales channels - Access to commercial or market information - Red tape or official regulations 		
Skill shortage within management team		
Variables	Type of Data	Measurement
<p>Constraining by the shortage of skills within the management team:</p> <ul style="list-style-type: none"> - Marketing - Sales and distribution - Financial management - Organization and general management - Production, Manufacturing and Logistics - Research and Development 	Ordinal	5 point Likert scale
Performance distribution		
Variables	Type of Data	Measurement
<p>Business performance attribution factors:</p> <ul style="list-style-type: none"> - Developing international markets - Developing new products/service - Investment in human capital - Access to skilled staff - Collaboration with other businesses - Collaboration with other organizations (eg. universities) 	Ordinal	5 point Likert scale

- Innovation - Ease of accessing investment		
Firm's general performance over the years against the rest of the industry	Ordinal	5 point Likert scale
Firm's current position with regard to the industry level of technology against the rest of industry	Ordinal	5 point Likert scale
The rate of innovation in the company and the current position relative to the current rate of innovation	Ordinal	5 point Likert scale
The rate of availability of skills for company	Ordinal	5 point Likert scale
The level of investment in new capacity in the company and the current position relative to the industry benchmark on investment in new capacity	Ordinal	5 point Likert scale

Source: Author

7.4 The formulation of hypotheses.

This research has formulated empirically testable hypotheses (Zikmund, 2013) to test the relationships between the different important variables such as formation mode, size, education and experience, innovativeness and technological advancement of product and process, competition intensity, market development and internationalization activities, and finance which are expected to be a function in the various dimensions of growth of firm. A summary of the formulated hypotheses which have been presented in full in Chapter 2 is presented in the Table 7.3 to verify the postulations derived from the core theories which have been extensively discussed in earlier chapters.

Table 7.3: Summary of hypotheses formulated

Key firm-based factor	Category of variable	Hypothesis
Entrepreneurship	Ownership, governance and firm demographic	H1 - size of firms
		H2 – human capital
Innovation	Characteristics of product/services and markets	H3 - developed for international market
		H4 - nature of product/service
		H5 - intensity of competition
	Innovation	H6 - innovativeness
		H7 - sales support activities
Firm growth dynamics	Internationalization	H8 - internationalization
	Production location	H9 – production location
	Source of finance	H10 - source of finance
	Skills shortage within management team	H11 - shortage skills within management team
	Performance indicators	H12 - performance distribution and general performance
	Performance indicators	H13 - technology, innovation and skills
		H14 - investment in new capacity and benchmark position

Source: Author

7.4.1 Characteristics of Innovative Entrepreneurs Ownership, governance and firm demographic

The characteristics of the start-ups greatly affect the firms' survival. (Brüderl, Preisendörfer, and Ziegler, 1992; Carroll, 1984; Stinchcombe, 1965). These include individual characteristics which are link to the achievement of the entrepreneur (Karugu, 2013; Landström, 1999). Prior knowledge (Stevenson and Gumpert, 1985) is correlated with the entrepreneurial alertness for business opportunity (Ardichvili, Cardozo, and Ray, 2003). Stevenson, Roberts, Grousbeck, and Bhide (1994) stated that the capability of new ventures to select the right opportunities is a considerably important driver to entrepreneurial achievement.

7.4.1.1 Initial firm start-up size

Hypothesis1: The type of establishment is related to the firm's start-up size.

- Model 1: Start-up size

A number of studies have found positive correlation between size and survival of firms (Agarwal and Audretsch, 2001; Audretsch and Mahmood, 1995; Mata, Portugal, and Guimaraes, 1995) as it can indicate the potential impact on innovation and innovativeness of firms (Frenkel, 2001). Agarwal and Audretsch (2001). They also found that the smaller size firms in the United States have a lower rate of survival than their bigger counterparts. Moreover, many studies argued that the growth of business is particularly determined by the size of the firm at the start-up period (Almus and Nerlinger, 1999) and firm's size is strongly related to better business performance (Mcmahon, 2001).

On the other hand, research by different scholars has rejected Gibrat's law model (Audretsch, Santarelli, and Vivarelli, 1999; Evans, 1987a, 1987b; Goddard, Wilson, and Blandon, 2002; Hall, 1988; Hart and Oulton, 1996; Lotti and Santarelli, 2004). They found no correlation between size and firm growth on this testing model (see Audretsch, 1995; Wagner, 1992). For example, research by Calvo (2006) on Spanish innovative start-ups found that the small firm has an

opportunity to grow faster than larger ones. Audretsch and Mahmood, (1995) asserted that US manufacturing start-ups exploit their size and entrepreneurial structure to influence the survival of their business

Here we consider whether different establishment structures have any relationship with the start-up size.

Table 7.4: Test for relationships between ownership and governance with start-up size

	Model 1	
Model Type	Ordinary Least Squar (OLS)	
	Start-up size	
	Coef.	Sig.
Foundation type		
Merger with large firm (ref)		
Merger with same size firm	-6.181518	0.214
Independent	9.085149	0.169
Other	-2.443423	0.816
Constant	28.51485	0.000
R2	0.0101	
Significance	0.1214	
N obs	280	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

The results presented in Table 7.4 show that the type of establishment was not a differentiating factor associated with the size of firm at formation.

Hypothesis 1 is therefore rejected.

7.4.1.2 Human capital

In general, human capital is a significant determinant of new firms' performance (Davidsson, 2006). Colombo and Grilli (2010) claimed that human capital should be considered as an important driver for the growth of innovative start-ups. Therefore, education and experience within the founding team are factors linked to human capital which could be used for growth prediction.

Having greater prior work experience in technical functions and greater university level education in management and economics (Colombo and Grilli, 2005) leads to faster growth and more opportunities to receive venture capital than other firms. (Colombo and Grilli, 2010). Industrial and marketing experiences are also considered as important drivers for business success for new innovative industries in the United States (Song, Podoyntsyna, Van Der Bij, and Halman, 2008). In short, previous experience and relevant skills are vital factors for enhancing entrepreneurial characteristics and defining entrepreneurship opportunities to drive more creativity and innovation for further economic development. For instance the research of Italian ICT start-ups by Grilli (2011) found that the higher level of work experience within the founding team improved chances for business survival. This research had the same findings as research in Norway and Sweden. Aspelund, Berg-Utby, and Skjevdal (2005) stated that the experience of the management team is of great importance to the survival of innovative firms. Finally, the study of Israel hi-technology start-ups also found that the experience of the founder and management team is considerably significant to the achievement of the business (Chorev and Anderson, 2006). While Burgel and his team illustrated in their research that the entrepreneur who had previous industrial experience had a positive impact on growth (Bürgel, Fier, Licht, and Murray, 2000).

Human capital both in work experience and education foster survival and improve economic performance (Acs et al., 2007; Bates, 1990; Gimeno et al., 1997). They are important drivers for the growth of innovative start-ups (Colombo and Grilli, 2010). Bürgel et al., (2000) also support the notion that the founders' experience has a beneficial impact on growth

Hypothesis 2: The type of establishment is related to human capital as measured by prior work experience, technical and business education qualification, number of owners and prior industry experience

Technical and business educational qualifications

Kundu and Renko (2005), in their research on Indian and Finish innovative firms, found that entrepreneurial characteristics such as educational background is an important factor for the success of the business. Other research has shown that when the founder has a particular know-how it will lead to the growth of the firm in the foundation period (1-4 years) (Littunen and Niittykangas, 2010). Moreover, the prior knowledge is a key-based factor for a firm to enable it to exploit their new market opportunity (Cohen and Levinthal, 1990).

Storey and Tether (1996) found that the entrepreneur who is highly educated in science is more enabled to learn and implement new technical knowledge for the firm (Ohyama 2007). McKelvie, Wiklund, and Short (2007) also asserted that technical skill is the greatest condition to improve innovativeness of firms in Sweden.

The poisson regression is used when the variable is count data and the probit regression is used when the variable is binary in nature.

The results of the regression analysis to verify hypothesis 2 are presented in Table 7.5.

Table 7.5: Models to test relationships between ownership and governance with management team education qualifications

	Model 2	Model 3
Model Type	Poisson	Poisson
	Number of Management Team with Technical Education	Number of Management Team with Business Education

	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger with same size firm	.0151054	0.366	-.045581	0.002***
Independent	-.0656278	0.001****	-.0420586	0.011**
Other	.0074204	0.783	-.0036891	0.886
Constant	4.472187	0.000	4.592944	0.000
R2	0.0108		0.0045	
Significance	0.0000****		0.0086***	
N obs	261		279	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

The poisson regression is used because the variable is count data.

Source: Author

Model 2 examines the relationship between type of establishment and technical and scientific knowledge available in the firms. The results presented in Table 7.5 show that the type of establishment was a differentiating factor associated with technical/scientific and business knowledge available. However, the R squared value might be significant, it was rather small in size. Independent firms were negatively associated with technical and scientific knowledge available in the firms.

Model 3 looks at the relationship between type of establishment and business qualification possessed by members in the firm. The results show that the type of establishment was a differentiating factor associated with business knowledge available. However, the R squared value might be significant, it was rather small in size. Merger with same size and independent firms were negatively associated with business qualification possessed.

Number of owners and prior industry experience

- Model 4: Number of Owners

The size of the founding ownership team is a measure of the collective human capital in the firm. The data collected show that independently founded firms, on average, had a smaller ownership team than firms created through merger with existing firms, large or of similar size. On average, they have 1.4 or fewer owners, indicating a more concentrated ownership structure. Whilst a smaller ownership team may improve the team's clarity on objectives, in the hands of fewer entrepreneurs, it may also negatively impact on the potential for survival and future growth.

Model 4 (Table 7.6) investigates the relationship between type of establishment and number of owners in the firm. The results show that the type of establishment was a differentiating factor associated with number of owners. However, the R squared value might be significant, it was rather small in size. Independent firms and Other were negatively associated with number of owners.

- Model 5: Industry Experience

The Founders or managers with prior industrial specific experience was investigated in model 5 (Table 7.6). The regression findings reveal the differently founded firms was not a differentiating factor with the management team's previous industry experience. This suggests that the founders or managers who work in the companies that were founded differently are all likely to have equal opportunity to achieve growth in the future.

Table 7.6 presents the regression analysis results of the test relationships between ownership and governance with of number of owners and prior industry experience.

Table 7.6: Models to test relationships between ownership and governance with number of owners and industry experience

	Model 4		Model 5	
Model Type	Poisson		Poisson	
	Number of Owners		Industry Experience	
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger with same size firm	-0.6521174	0.203	.7838464	0.149
Independent	-1.427295	0.004***	-.2553331	0.616
Other	-1.782646	0.005***	-.2507154	0.715
Constant				
R2	0.0434		0.0789	
Significance	0.0044**		0.0356	
N obs	338		86	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

The regression analysis results illustrate that types of establishment were significantly related to prior work experience, technical education qualification, and number of owners. However, the entrepreneurial characteristic, prior industry experience outside of their firm among the current management team, was not a differentiating factor.

To sum up, Hypothesis 2 is only partially supported by the findings.

7.4.2 Characteristics of Product/Services and Market

Economic theory considers how material resources are transformed into products and services (Murphy, Liao, and Welsch, 2006). As propounded by resource-based view theory (RBV), this transformation process involves innovation that

helps the entrepreneur to access more resources and opportunity for firm growth (Alvarez and Busenitz, 2001) and to sustain competitive advantage (Barney, 1986).

Innovation is broadly defined 'as development of new product, process, new sources of supply and also 'the exploitation of new markets and the development of new ways to organize business' (Szirmai, Naude, and Goedhuys, 2011, p. 5). The importance of a product's technological content characteristics has been established in many studies such as the research by Bürgel et al. (2000). How new firms utilize innovativeness and technology to produce their products or services, for example, the initial adaptation of technological strategy to integrate the production lines with new complementary products can determine business efficiency (Nambisan, 2002). Bürgel et al. (2000) claimed that the technological sophistication of a product probably influences the growth rate for hi-tech startups.

7.4.2.1 Developed for International markets

Fryges (2009) suggested that the method for new firms to enter the new international market is by improving product/services and concentrating on R&D activities that could eliminate rivals and avoid sharp competition when selling abroad.

Hypothesis 3: The type of establishment is related to the firms' international market development.

- Model 6: Relationships between ownership and governance with development for International Markets

Table 7.7: Models to test relationships between ownership and governance with firms' international market development

	Model 6	
Model Type	Probit	
	Developed for International Market	
	Coef.	Sig.
Foundation type		
Merger with large firm (ref)		
Merger same sized firm	.2982495	0.265
Independent	-.0479686	0.880
Other	.2316722	0.586
Constant	-1.614666	0.000
R2	0.0133	
Significance	0.5479	
N obs	318	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

The probit regression is used because the variable is binary in nature.

Source: Author

The results presented in Table 7.7 show that ownership type was not a differentiating factor in the development of product with the intention to sell abroad at founding. This suggests that establishment type is not a distinguishing factor in relation to the intention to internationalise the products at commercialisation.

Thus, hypothesis 3 was not supported.

7.4.2.2 The nature of product/service

Kakati (2003) suggests that the criteria to measure the success of a business are not only the nature of product characteristics as the product cannot stand alone to help the entrepreneur to achieve success but also the ability of the firm to meet the unique customers' needs. In addition, another way to enter new market is to

develop the type of product related to the technological efficiency of the firm (Markusen et al., 1986; Florida and Kenny, 1988). The primary nature of the product produced by a firm can be divided into three different categories, namely capital, intermediate and final goods.

Hypothesis 4: The type of establishment is related to the nature of product/service

- Model 7-9 Relationships between ownership and governance with nature of product/service (primary, intermediate and final goods)

Models 7-9 examine the association between the product or service which is offered at the establishment of the firms.

Table 7.8A: Models to test the relationships between ownership and governance and products/services nature

	Model 7		Model 8	
Model Type	Probit		Probit	
	Capital Goods		Intermediate Goods	
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	-0.1419892	0.660	-0.2573533	0.336
Independent	-0.712596	0.020**	-1.508531	0.001****
Other	-0.7348277	0.075*	-1.749487	0.001****
Constant	1.885177	0.075	1.644854	0.000
R2	0.0542		0.2164	
Significance	0.0372		0.001****	
N obs	331		328	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Table 7.8B: Models to test the relationships between ownership and governance of young hi-tech firms and their product/services nature

	Model 9	
Model Type	Probit	
	Final Goods	
	Coef.	Sig.
Foundation type		
Merger with large firm (ref)		
Merger same sized firm	-0.3707495	0.034**
Independent	-0.1902503	0.326
Other	.1296425	0.674
Constant	.5448472	0.000
R2	0.0138	
Significance	0.1143	
N obs	329	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

The regression results indicate that establishment type was only associated significantly with intermediate goods. The negative coefficients suggested independently established firms and firms in the Other category, on average, were less likely to produce intermediate goods for the markets.

Hypothesis 4 which states that the nature of product/service offered at the initial start-up stage is related to the firms' establishment nature is partially supported.

7.4.2.3 The intensity of competition encountered in the Thailand market

In facing intense competition, there are several techniques for succeeding in such condition. The first technique is employing innovative planning that balances 'technology push' and 'market pull' (Benkenstein and Bloch, 1994, p. 15). The second method is the use of technological planning process strategically to

achieve market position (Roberts, 1989). Innovation strategy, especially incremental innovation, encouraged strategic development.

Firms that enter the market earlier than their competitors can meet industrial standards faster, however their rivals can catch up by launching competitive product/service that meets customers' satisfaction as fast as they can or compete by offering the product/service at lower price (Benkenstein and Bloch, 1994). Firm which can produce technologically better product and enter the market later will perform better (Bruton and Rubanik, 2002). It is a challenge for all the start-ups at the stage of entering the market in intense competition situation.

Hypothesis 5: The type of establishment is related to the intensity of competition.

- Model 10 : Relationship between ownership and governance with intensity of competition

Table 7.9: Models to test the relationship between ownership and governance and intensity of competition

	Model 10	
Model Type	Ordered Probit	
	Intensity of Competition	
	Coef.	Sig.
Foundation type		
Merger with large firm (ref)		
Merger same sized firm	-.1066516	0.510
Independent	-.0526002	0.767
Ownership change	-.2555952	0.328
Constant		
R2	0.0017	
Significance	0.7759	
N obs	338	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

The regression results show that intensity of competition is not a differentiation factor among business ownership at the founding stage. This suggests that all start-ups firms are equally likely to face strong competition in Thailand.

The results obtained reject hypothesis 5.

7.4.3 Innovation

Innovation is widely exploited to enter into new market (Bascavusoglu-Moreau, 2011). Bürgel et al. (2000), claimed that the technological sophistication of production possibility has influenced the growth rate of UK and German hi-tech start-ups. Young US software ventures grew by integrating production lines with new complementary products (Nambisan, 2002). Manimala, Jose, and Thomas (2005), who investigated innovative start-ups in India, reported that the innovation strategy for Indian hi-tech industries, especially incremental innovation, encouraged strategic development. Robson, Haugh, and Obeng (2009) studied innovation and entrepreneurship in Ghana using a multilevel theoretical framework to analyse the different types of innovative activity that related to the characteristics of entrepreneurship. They found that incremental innovation is considerably important for the firm. In addition, innovation is also associated with educational level, size of firm, and exports. As such, adopting technological strategy can influence the efficiency of a business.

7.4.3.1 Innovativeness

The term 'innovativeness' is 'most frequently used as a measure of the degree of newness of an innovation', in engineering, marketing, management and economics (Garcia and Calantone, 2002, p. 112). The hi-technology industry is an important driver of economic growth and generally faces challenges in producing highly innovative goods to serve national and international markets.

Hypothesis 6: The type of establishment is related to the firms' innovativeness.

- Model 11-13 Relationships between ownership and governance with Innovativeness (tried and tested, outside and inside novel technology)

As the business' survival is also dependent upon customers and competition (Reynolds, 1991), a firm has to create products/services new to the world (Song et al.,1998), new to the industry (O'Connor, 1998), new to the consumer (Ali, et al.,1995) and new to the market (Kleinschmidt and Cooper 1991) to meet the trends of the market system (Schumpeter, 1934; Simpeh, 2011).

Models 11 - 13 study the relationship between ownership and governance with different forms of innovativeness which possibly could be used to produce the goods by the new firms

Table 7.10A: Models to test the relationships between ownership and governance and innovativeness

	Model 11	
Model Type	Probit	
	Innovativeness: Tried and Tested	
	Coef.	Sig.
Foundation type		
Merger with large firm (ref)		
Merger same sized firm	3.851936	0.986
Independent	4.139561	0.985
Other	3.972496	0.986
Constant	-5.704109	0.979
R2	0.0927	
Significance	0.0392	
N obs	338	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

The results of Model 11 shows that the type of establishment was not a significantly associated with 'tried and tested' innovative approach.

Table 7.10B: Models to test the relationships between ownership and governance and innovativeness

	Model 12		Model 13	
Model Type	Probit		Probit	
	Innovativeness: Outside Novel Technology		Innovativeness: Inside Novel Technology	
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	-0.0426882	0.858	-0.2037099	0.270
Independent	.3384831	0.159	-.2933768	0.143
Other	.8138612	0.011**	-.6243435	0.033**
Constant	-1.362383	0.000	.8347719	0.000
R2	0.0377		0.0133	
Significance	0.0277		0.1586	
N obs	338		338	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Models 12 and 13 show that establishment type was not significantly associated with Outside Novel Technology and Inside Novel Technology. It, therefore, can be concluded that differently established firms was not significantly associated with the firms' innovativeness.

Thus, Hypothesis 6 is rejected.

7.4.3.2 Sales Supports

In order to compete in the market, firms not only need to consider how to sell their product or services successfully but also to maintain their customer base. Strengthening competition can bring a decrease in customer and brand loyalty (Murphy, 2002). Capgemini (2000) stressed that the cost of accessing new customer is five times higher than keeping the old customer. Sales support

activities such as technical consultant, individual client customisation, specific configuration, time-consuming installation, regular maintenance and specialised training for front-line and sales personnel are therefore regularly offered by firms to sustain the sale efforts. The management of customer relations is as important as information technology development (Murphy, 2002).

Hypothesis 7: The type of establishment is related to the firms' sales support.

- Models 14 -19 Relationships between ownership and governance with six sales support activities.

Table 7.11A: Models to test the relationships between ownership and governance and sales support activities

	Model 14		Model 15	
Model Type	Ordered Probit		Ordered Probit	
	Sales	Support:	Sales	Support:
	Consultantion		Customisation	
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	.1434366	0.346	.1434366	0.346
Independent	.0746323	0.655	.0746323	0.655
Other	-.0613299	0.811	-.0613299	0.811
Constant				
R2	0.0019		0.0019	
Significance	0.7489		0.7489	
N obs	338		338	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Table 7.11B: Models to test the relationships between ownership and governance and sales support activities

	Model 16		Model 17	
Model Type	Ordered Probit		Ordered Probit	
	Sales Configuration	Support:	Sales Installation	Support:
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	.3039851	0.040**	.1678769	0.241
Independent	.4487446	0.006***	.2280464	0.148
Other	.1836163	0.465	.0453834	0.851
Constant				
R2	0.0118		0.0031	
Significance	0.0411**		0.4743	
N obs	338		338	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Table 7.11C: Models to test the relationships between ownership and governance and sales support activities

	Model 18		Model 19	
Model Type	Ordered Probit		Ordered Probit	
	Sales Maintenance	Support:	Sales Training	Support:
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	.3980715	0.011**	.3394445	0.034**
Independent	.1764995	0.302	.2451418	0.162
Other	.0656191	0.802	-.239137	0.346
Constant				
R2	0.0117		0.0128	
Significance	0.0771		0.0467**	

N obs	335		338	
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Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Tables 7.11(A-C) present the regression analysis linking governance and ownership with the six sales support activities, namely, technical consultation prior to sales (Model 14), individual client customisation (Model 15), specific configuration of system requirements (Model 16), regular maintenance and upgrade (Model 17), Complex or time consuming installation (Model 18), and Specialized training required for front-line and sales personnel (Model 19).

Based on the results of the six regression analyses, type of establishment was found to be significantly associated with specific configuration of system requirements (model 16) and Specialized training required for front-line and sales personnel (model 19).

For these start-ups, they were more likely to provide these three sales support activities.

As such, hypothesis 7 was partially supported.

7.4.4 Internationalization

The research done on Western firms (Bürgel et al. 2000) found that new firms who focus more on selling abroad grow more than those firms who sell only domestically. This is due to the robust international market competition and the frequency of exports (Fier, Licht, and Murray, 2001).

Hypothesis 8: The type of establishment is related to the firms' internationalisation of sale

- Model 20 Relationships between ownership and governance with International Sales

Table 7.12: Model to test relationships between ownership and governance and internationalisation of sale

Model 20		
Model Type	Probit	
	International Sales	
	Coef.	Sig.
Foundation type		
Merger with large firm (ref)		
Merger same sized firm	.2159238	0.476
Independent	-.1872454	0.597
Other	-.0516348	0.922
Constant	-1.593219	0.000
R2	0.0146	
Significance	0.6216	
N obs	267	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Model 20 indicates that there was no significant link between type of establishment and internationalisation of sales. This is probably a consequence of the higher cost of doing business overseas which is a barrier for business development as found in UK international firms (Chaplin, 2013).

As such, hypothesis 8 is not supported.

7.4.5 Production location

The issue on choosing a location to produce product/service was mentioned by many researches (Bar-El and Shefer, 1989; Shefer and Bar-El, 1993). These scholars highlighted that the consideration for firms to choose their initial location for production development and innovation is the site's close proximity to centre of research and science which provides a good opportunity for rapid market distribution of products. The clustering of these facilities close together will afford the most advantageous condition for technological changes (Frenkel, 2001)

whilst some studies highlighted that the regional/in-house infrastructure is the most important for innovative industries (Thwaites, 1982; Camagni and Rabelotti, 1986; Button, 1988).

Hypothesis 9: The type of establishment is related to the firms' production location.

- Model 21 Relationship between ownership and governance with production location

Table 7.13: Models to test relationships between ownership and governance and production location

	Model 21	
Model Type	Ordered Probit	
	Production Location	
	Coef.	Sig.
Foundation type		
Merger with large firm (ref)		
Merger same sized firm	-.1743933	0.486
Independent	-.1472229	0.588
Other	-.0171668	0.967
Constant		
R2	0.0034	
Significance	0.8985	
N obs	320	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

The regression results presented in Model 21 show that there was no significant link between type of ownership and production location.

Therefore, hypothesis 9 is not supported by the results.

7.4.6 Sources of finance

The availability of financial capital has long been a focus of economic theory (Giudici and Paleari, 2000; Westhead and Storey, 1997) and is recognized as an important factor for new start-up firms (Ganotakis, 2010) as their growth is hampered by financial constraints (Campello et al., 2010). Aldrich (1999) claimed that financial capital enables a company to make available more resources for improving the efficiency and effectiveness of business and is especially essential for new innovative start-ups. Capital is required to fund research and development, production, marketing, and growth as the firm moves from the seed stage through the start-up and later stages of firm development.

The characteristics of small technology based firms have an important impact on their ability to raise capital. Issues such as high risk, unproven markets, lead-time on product development, limited asset base, intellectual property rights, etc. often present important constraints on the ability of technology-based firms to raise capital.

The following models (22-31) examine the link between the different ownership types and the sources of corporate finance of Thai innovative start-ups.

Hypothesis 10: The type of establishment is related to the firms' sources of corporate finance.

- Models 22-31 Relationships between ownership and governance with sources of corporate finance

Table 7.14A: Models to test relationships between ownership and governance and source of finance

	Model 22		Model 23		Model 24	
Model Type	Probit		Probit		Probit	
	Funding Business: Personal Equity		Funding Business: Director's Loans		Funding Business: Retained Profit	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.

Foundation type						
Merger with large firm (ref)						
Merger same sized firm	.8209993	0.002***	.1906358	0.495	.785095	0.004***
Independent	1.767488	0.000****	-.284662	0.308	1.532585	0.000****
Other	.9498533	0.022**	-.125010	0.769	.8550048	0.039**
Constant	-.062706	0.752	-.377391	0.087	.0321418	0.873
R2	0.1804		0.0190		0.1450	
Significance	0.0001***		0.2647		0.0001***	
N obs	182		164		181	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Table 7.14B: Models to test relationships between ownership and governance of young hi-tech firms and source of finance

	Model 25		Model 26		Model 27	
Model Type	Probit		Probit		Probit	
	Funding Business: Other Internal Finance		Funding Business: Short Term Loans		Funding Business: Long Term Loans	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	.2942388	0.272	.8560748	0.001****	.8263147	0.002***
Independent	-.004612	0.986	.1474865	0.568	.2533471	0.319
Other	.0431517	0.915	-.261724	0.517	1.16e-15	0.517
Constant	-.139710	0.505	-.361201	0.079	-.253347	1.000
R2	0.0088		0.0681		0.0511	

Significance	0.5642		0.0001***		0.0056	
N obs	167		177		179	

Note: **** significant at p<0.001, *** significant at p<0.01, ** significant at p<0.05, * significant at p<0.10

Source: Author

Table 7.14C: Models to test relationships between ownership and governance of young hi-tech firms and source of finance

	Model 28		Model 29		Model 30	
Model Type	Probit		Probit		Probit	
	Funding Business: Other Source of Debt		Funding Business: Venture Capital		Funding Business: Business Angles	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	.7732649	0.004 ***	.8708786	0.001* ***	.7069314	0.012* *
Independent	1.135651	0.000 ****	-0.043497	0.863	.6044191	0.028* *
Other	.6670564	0.077	.2653716	0.457	.7579695	0.055*
Constant	-0.125661	0.527	-0.125661	0.527	-0.841621	0.000
R2	0.0848		0.0697		0.0333	
Significance	0.0004****		0.0006****		0.0522	
N obs	179		182		175	

Note: **** significant at p<0.001, *** significant at p<0.01, ** significant at p<0.05, * significant at p<0.10

Source: Author

Table 7.14D: Models to test relationships between ownership and governance of young hi-tech firms and source of finance

	Model 31	
Model Type	Probit	
	Funding Business: Other External Finance	
	Coef.	Sig.
Foundation type		
Merger with large firm (ref)		
Merger same sized firm	.9210293	0.001***
Independent	.4152126	0.120
Other	-.1195668	0.767
Constant	-.5549229	0.010
R2	0.0639	
Significance	0.0016***	
N obs	173	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

The regression modelling on the use of ten different sources and types of finance highlights that six of them, personal equity, retained profit, short-term loan, other source of debt, venture capital, and other external finance were significant.

The findings are consistent with the predictions of the financial growth life cycle model (Berger and Udell, 1998) which state that at the startup stage entrepreneurs rely on initial insider's capital sources and that firms have different financial needs and options as they grow and become less opaque informationally. It posits a pecking order suggesting that, in early stages of the firm's life, the entrepreneur relies on initial insider financial sources (i.e., personal savings, loans from friends and family, quasi-equity, personal debt, and business debt), trade credit, and angel finance, whereas, at a later stage, firm gains access to external debt and equity and therefore, personal funding becomes relatively less important (Cotei and Fahart, 2017).

Thus, hypothesis 10 was partially supported.

7.4.7 Skills shortage within management team

The management team with superior skills will bring extraordinary capabilities to the firm advantage (Calantone et al., 1996; Song et al., 1997; Song et al., 2008). The entrepreneurs or founders involved in the creation of their own business usually use their broad skill base to transform their idea to a profitable venture (Bygrave and Hofer, 1992). A broad range of skills in both the managerial and technical possess by the management team could contribute to the firm's success (Kakati, 2003; Oakey, 2003) and the growth of firms and broaden the long-term survival of the business (Oakey, 2003).

We will now consider the six different types of skill shortage within the management team which could impact on the growth of the firms.

Hypothesis 11: The type of establishment is related to the firms' six skill shortages in the management team.

- Models 32-33 Relationships between ownership and governance with shortage of marketing and sales and distribution skills

Saemundsson and Dahlstrnad (2005) suggested that a firm that has both existing market knowledge and new technology market knowledge could grow better than a firm that relies only on new market knowledge. Vesper and Gartner (1995) and Bygrave and Zacharakis (2009) highlighted in their books that the prior marketing/commercial knowledge and experience are important for entrepreneurial venture development. On the other hand, lack of commercial knowledge and its experience could be a cause factor of failure in business (Park, 2005) as O'Connor and Rice (2001) pointed out that the senior manager often is being the person who contributes the critical awareness toward the true commercial value of technological invention. In addition, not only the marketing skill is a significant factor, but also the technical skill is important for the survival of new product firm (Thieme et al., 2003).

Table 7.15A: Models to test relationships between ownership and governance and skills shortage in the management team

	Model 32		Model 33	
Model Type	Ordered Probit		Ordered Probit	
	Shortage	Skills:	Shortage	Skills:
	Marketing		Sales and Distribution	
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	.1139482	0.492	.0707527	0.672
Independent	-.2050192	0.259	-.081846	0.652
Other	.5851848	0.031**	.7626677	0.005***
Constant				
R2	0.0159		0.0183	
Significance	0.0289**		0.0178**	
N obs	288		292	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Models 34 to 37 show the results of the regression analysis on shortage of marketing and sales distribution skills. The type of establishment was found to be significantly associated with both types of skill shortages,

- Models 34 - 37 Relationships between ownership and governance with shortage of financial management, organization management, production, research and development skills

Table 7.15B: Models to test relationships between ownership and skills shortage in the management team

	Model 34		Model 35	
Model Type	Ordered Probit		Ordered Probit	
	Shortage	Skills:	Shortage	Skills:
	Financial Management		Organization management	
	Coef.	Sig.	Coef.	S ig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	.0610893	0.713	-.0130505	0.937
Independent	-.2793337	0.134	-.1752164	0.327
Other	.3030718	0.269	.3153054	0.236
Constant				
R2	0.0108		0.0061	
Significance	0.1208		0.3258	
N obs	279		286	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.01$

Source: Author

The regression analyses (Model 34 and 35) did not return any significant results that indicated that type of firm establishment was significantly linked to both types of skill shortages.

Table 7.15C: Models to test relationships between ownership and governance and skills shortage in the management team

	Model 36		Model 37	
Model Type	Ordered Probit		Ordered Probit	
	Shortage	Skills:	Shortage	Skills:
	Production		Research and Development	
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	-.0124714	0.939	.0792701	0.625

Independent	-0.1994096	0.260	-0.0572529	0.744
Other	.3565475	0.184	.2918474	0.274
Constant				
R2	0.0074		0.0032	
Significance	0.2198		0.5840	
N obs	283		283	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.01$

Source: Author

The regression analyses (Model 36 and 37) did not return any significant results that indicated that type of firm establishment was significantly linked to both types of skill shortages.

Of the six types of shortage of skills, only the shortage of marketing skills and sales and distribution skills were found to be significantly linked to different establishment types.

Thus, Hypothesis 11 was partially sustained.

7.4.8 Performance indicators

This research is in accord with the argument that the hi-technology industry is considered as a driver of economic growth. Innovative business is producing highly innovative goods to serve both the national and international markets (Schumpeter, 1934), and creating new products to meet the market's demand and which leads to economic growth.

Start-ups have scarce resources and often need to make choices amongst competing activities and investment. This section assess the relative importance of the 8 performance indicating factors

- Developing international markets
- Developing new products/service
- Investment in human capital

- Access to skilled staff
- Collaboration with other businesses
- Collaboration with other organizations
- Innovation
- Ease of accessing investment

in terms of their contribution to performance in different types of start-ups.

7.4.8.1 Performance distribution and general performance

Hypothesis 12: The type of establishment is related to the firms' performance distribution and general performance.

- Models 38 - 46 Relationships between ownership and governance with performance distribution and general performance

Hypothesis 12: The mode of governance and ownership is related to the firms' six skill shortages in the management team.

- Models 38-39 Relationships between ownership and governance with shortage of marketing and sales and distribution skills

Table 7.16A: Models to test relationships between ownership and governance and performance indicators

	Model 38		Model 39		Model 40	
Model Type	Ordered Probit		Ordered Probit		Ordered Probit	
	Performance Distribution: Developing International Market		Performance Distribution: Developing New Product/Service		Performance Distribution: Investment In Human Capital	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	.0768115	0.666	-.043940	0.794	.0147853	0.931

Independent	.935132	0.000****	.497822	0.009***	.1129263	0.544
Other	.812233	0.005***	.2117323	0.463	-.033628	0.907
Constant						
R2	0.0572		0.0187		0.0009	
Significance	0.0001****		0.0146**		0.9165	
N obs	242		263		261	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Table 7.16B: Models to test relationships between ownership and governance of young hi-tech firms and performance indicators

	Model 41		Model 42		Model 43	
Model Type	Ordered Probit		Ordered Probit		Ordered Probit	
	Performance Distribution: Access Skilled Staff		Performance Distribution: Collaboration with Other Businesses		Performance Distribution: Collaboration with Other Organizations	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	.2581697	0.129	.0251769	0.887	-.245189	0.147
Independent	.2716187	0.138	1.10978	0.000****	.3898862	0.034**
Other	.134068	0.633	.515311	0.059*	-.257683	0.353
Constant						
R2	0.0053		0.0698		0.0224	
Significance	0.3893		0.0001****		0.0034***	
N obs	262		234		252	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Table 7.16C: Models to test relationships between ownership and governance of young hi-tech firms and performance indicator

	Model 44		Model 45		Model 46	
Model Type	Ordered Probit		Ordered Probit		Ordered Probit	
	Performance Distribution: Innovation		Performance Distribution: Ease in Accessing Investment		General Performance	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	-.028764	0.867	-.161165	0.348	-.232294	0.249
Independent	.4875981	0.008*	.0844067	0.643	-.318407	0.147
Other	-.178309	0.508	-.451168	0.095*	-.412235	0.243
Constant						
R2	0.0191		0.0082		0.0085	
Significance	0.0107**		0.1943		0.4111	
N obs	257		254		203	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Overall, type of establishment were significantly associated with five performance factors, namely, developing international market, developing new product, collaboration with other business, collaboration with other organisations, and innovation. However, it must be noted that the R squared values obtained were relatively small.

There was no difference in the relative influence of the investment in human capital factor, the access to skilled staff factor and ease in accessing investment factor across different types of start-ups.

Despite the observed differences across many performance factors, general firm performance did not vary significantly across different types of start-ups. This suggest that the different types of start-ups appear to achieve their overall outcomes through very different routes.

Since type of establishment were significantly associated with five out of the eight performance factors, we can conclude that these performance factors present a significant impact on the possibility to achieve business survival and growth.

Hypothesis 12 was partially supported.

7.4.8.2 Advance technology, Innovation and skills

This section looks at how firms assess their industry ratings on technology and innovation and how they fare against the industry benchmark.

Hypothesis 13: The type of establishment is related to the firms' advanced technology, innovation and skills.

Models 47-52: Relationships between ownership and governance with advanced

Table 7.17A: Models to test relationships between ownership and governance and advanced technology, innovation and skills

	Model 47		Model 48		Model 49	
Model Type	Ordered Probit		Ordered Probit		Ordered Probit	
	Level of Advance Technology		Level of technology Position		Rating of Innovation	
	Coef.	Coef.	Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	-.3773563	0.067*	-.340254	0.110	-.264048	0.197
Independent	-.3040918	0.162	-.485126	0.034**	-.419786	0.053*
Other	-.3284788	0.339	-.503877	0.174	-.135274	0.679

Constant					
R2	0.0109		0.0180		0.0115
Significance	0.2939		0.1478		0.2626
N obs	213		207		216

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

Table 7.17B: Models to test relationships between ownership and governance and advanced technology, innovation and skills

	Model 50		Model 51		Model 52	
Model Type	Ordered Probit		Ordered Probit		Ordered Probit	
	Rating of Innovation Position		Rating of availability of skills		Access to Skills	
			Coef.	Sig.	Coef.	Sig.
Foundation type						
Merger with large firm (ref)						
Merger same sized firm	-0.056979	0.785	-0.055929	0.748	.0388846	0.824
Independent	-.425233	0.056*	-.313655	0.099*	-0.249531	0.193
Other	-0.074437	0.815	.0804671	0.781	-0.024929	0.930
Constant						
R2	0.0138		0.0073		0.0058	
Significance	0.2189		0.3010		0.4194	
N obs	218		260		260	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

None of the model had returned a significant correlation between type of establishment and rating of advanced technology, innovation and skills. It was

shown that ownership type was not a differentiating factor with ability to access skills at the founding stage.

The analysis results reject hypothesis 13.

7.4.8.3 Investment in New capacity

The impact of investment in new capacity on young innovative firms in Thailand is considered in this section.

Hypothesis 14: The type of establishment is related to investment in new capacity.

- Models 53-54: Relationships between ownership and governance with level of investment in new capacity and investment benchmark position

Table 7.18: Models to test relationships between ownership and governance of young hi-tech firms and investment in new capacity

	Model 53		Model 54	
Model Type	Ordered Probit		Ordered Probit	
	Investment in New Capacity		Investment Benchmark Position	
	Coef.	Sig.	Coef.	Sig.
Foundation type				
Merger with large firm (ref)				
Merger same sized firm	-0.0495214	0.772	.004995	0.977
Independent	-.1766948	0.342	-.1065828	0.566
Other	-.2104769	0.460	-.1880373	0.508
Constant				
R2	0.0023		0.0016	
Significance	0.7439		0.8389	
N obs	258		258	

Note: **** significant at $p < 0.001$, *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$

Source: Author

The analysis shows that type of establishment was not significantly associated with the level of investment in new capacity in the industry and current relative investment bench mark position.

Therefore, hypothesis 14 was not supported.

7.5 Summary

This chapter examines to what extent the characteristics of firms, innovation and firm growth dynamics presented earlier enable the young Thai hi-technology firms to create a meaningful contribution to the future economic growth of the country.

The analysis in this chapter has explored the relationship between the type of establishment at founding and each of the contingent variables. Eight categories of key-based factors derived from core theories are used. They are:

- 1) Ownership, governance and firm demographic
- 2) Characteristics of product/services and markets
- 3) Innovation
- 4) Internationalization
- 5) Production location
- 6) Source of finance
- 7) Skills shortage within management team
- 8) Performance indicators

The analytical *approaches* such as Ordinary Least Square, Poisson regression, Probit regression, Ordered Probit regression and Ordered Logistics regression are commonly observed in the contingency theory literature. The significant probability level selected is $p < 0.05$.

Table 7.19: summary of the outcomes of the test of the hypotheses.

Table 7.19: Summary of test of hypotheses

Key dormain	Key-based factor	Hypothesis	Supported
Entrepreneurship	Ownership, governance and firm demographic	H1 - size of firms	No
		H2 – human capital	Yes
Innovation	Characteristics of product/services and markets	H3 - developed for international market	No
		H4 - nature of product/service	Yes
		H5 - intensity of competition	No
	Innovation	H6 - innovativeness	No
		H7 - sales support activities	Yes
Firm growth dynamics	Internationalization	H8 - internationalization	No
	Production location	H9 – production location	No
	Source of finance	H10 - source of finance	Yes
	Skills shortage within management team	H11 - shortage skills wihtin management team	Yes
	Performance indicators	H12 - performance distribution and general performance	Yes
		H13 - advance technology, innovation and skills	No

		H14 - investment in new capacity	No
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Source: Author

i) Entrepreneurship

Firm size

Despite many studies have argued that the growth of business is particularly determined by the size of the firm at the start-up period (e.g, Almus and Nerlinger, 1999), it has been found that the type of ownership is not associated with the *size of firm* at the founding stage. It shows that both types of merger firms prefer to start small, even though they have more opportunity to access a greater resource than independent firms by virtue of having more connections (Proac, Thomas, Wilson, Paton and Kanfer, 1995).

Human capital

Whereas, the type of business establishment is related to the *human capital*, which is measured by the management team's technical skills and business education qualification, and prior work experience. The size of the management team was a significant differential factor. The size of the founding ownership team is a measure of the collective human capital in the firm. The findings suggest that the larger firm is intentionally employing higher number of managerial staff with technical/science and business education than the independent new firms. A smaller ownership team may improve the team's clarity on objectives, in the hands of fewer entrepreneurs, it may also negatively impact on the potential for survival and future growth.

ii) Innovation

Developed for International market

Fryges (2009) suggested that the method for new firms to enter the new international market is by improving product/services and concentrating on R&D activities that could eliminate rivals and avoid sharp competition when selling abroad.

Establishment type was not a differentiating factor in the internationalisation of products/services were not when they are commercialised. This suggests that most firms did not develop their products with the intention to sell abroad at founding.

The nature of product/service

Kakati (2003) suggests that the criteria to measure the success of a business are not the nature of its product characteristics as the product cannot stand alone to help the entrepreneur to achieve success. It also depends on the ability of the firm to meet the unique customers' needs.

The primary nature of the product produced by a firm can be divided into three different categories, namely capital, intermediate and final goods.

The analysis results indicate that the firms' establishment nature was related to the nature of product/service offered at the start-up stage.

Intensity of competition encountered in the Thailand market

Business ownership at the founding stage was not a differentiation factor among Intensity of competition. This suggests that all start-ups firms are equally likely to face strong competition in Thailand.

Innovativeness

The utilisation of tried and tested, outside or inside novel technology is used to measure the Innovativeness in production. The insignificant regression analysis results suggested that differently established firms were not significantly associated with innovativeness.

Sales Supports

Type of establishment was not differentiating factors associated with technical consultation prior to sales, individual client customisation and complex or time-consuming installation.

Whereas establishment type was found to be significantly link to the other three sales support activities, namely, specific configuration or system requirements, regular maintenance and upgrades, and specialised training required for front-

line and sales personnel. For these start-ups, they were more likely to provide these three sales support activities

iii) Firm growth dynamics

Internationalization

There was no significant link found between type of establishment and internationalisation. This is probably a consequence of the cost of doing business overseas which is a barrier for business development as found in UK international firms (Chaplin, 2013).

Production location

There was no significant link between type of establishment and production location.

Source of finance

Type of establishment was significantly associated with sources of finance. Personal equity, retained profit, and other non-standard forms of debt were significantly used by all types of firms. Only when all debt sources were exhausted did firms seek external equity.

Skills shortage within management team

Six different types of skill shortage within the management team which could impact on the growth of the firms were considered. The results of the regression analysis indicated that type of establishment was found to be significantly associated with shortage of marketing and sales distribution skills.

Performance distribution and general performance

Eight performance indicating factors, developing international markets, Developing new products/service, Investment in human capital, Access to skilled staff, Collaboration with other businesses. Collaboration with other organizations, Innovation, Ease of accessing investment were tested.

Type of establishment was significantly associated with five performance factors, namely, developing international market, developing new product, collaboration

with other business, collaboration with other organisations, and innovation. However, it must be noted that the R squared values obtained were relatively small. There was no significant influence of the investment in human capital factor, the access to skilled staff factor and ease in accessing investment factor across the different types of start-ups. Overall, we can conclude that these performance factors presented a significant impact on the possibility to achieve business survival and growth.

General firm performance did not vary significantly across different types of start-ups. This suggest that the different types of start-ups appear to achieve their overall outcomes through different paths.

Technology, innovation and skills

How firms assessed their industry ratings on technology and innovation and how they fared against the industry benchmark were analysed.

It was observed that ownership type was not a differentiating factor with ability to access skills at the founding stage as the analysis had not indicated a significant correlation between type of establishment and rating of advanced technology, innovation and skills.

Investment in New capacity

There was no significant association between type of establishment with the level of investment in new capacity and current relative investment bench mark position.

In conclusion, all the core firm growth determinants that have been examined, to a certain extent, can create an economic growth in young hi-technology firms in Thailand. To be sustainable and compete, firms must firstly, accumulate productive resource, then deliver more innovation outputs that will enable the firm to develop new markets or compete more effectively in existing markets. In turn, this entrepreneurship-innovation-growth causal chain will create a self-reinforcing dynamic enabling a persistent growth in unique and highly entrepreneurial and innovative firms.

CHAPTER EIGHT

DISCUSSION AND CONCLUSION

8.1 Overview

Chapter 8 concludes the discussion by summarising the key findings derived from the empirical data in the context of answering the research questions drawn from the theories identified in the review of literature. It will also provide an assessment of whether or not the young high-tech firms in Thailand can make a significant contribution to the future economic growth potential of the country. By doing so, the researcher hopes to answer the broader question whether existing theories developed to explain how Western firms secure growth from entrepreneurial and innovative capabilities can substantially explain the entrepreneurial patterns and dynamics observed in the context of a developing country. Finally, a review of the practical and theoretical contributions of the study and recommendations for future research are deliberated.

8.2 Summary of research objectives, research questions, and hypotheses

The overall aim of this research investigation is to identify the key firm-based factors that are associated with the long term development of young Thai innovative high technology SME start-ups which need to focus on their sustainability and growth during the early start-up stage.

A summary of the four research objectives and their associated research questions and hypotheses are presented in Table 8.1.

Table 8.1: Summary of the four research objectives and their associated research questions and hypotheses

Research Aim		
To identify the key firm-based factors that might be associated with the long term growth of young high-technology firms in Thailand		
Objectives	Research Questions	Related section and hypothesis

1. To examine the core characteristics of hi-technology entrepreneurship	i. What are the core entrepreneurial characteristics of Thai innovative firms?	4.4 (4.4.1- 4.4.4), 4.5 (4.5.1 – 4.5.2), 4.6 (4.6.1-4.6.4), 4.7 (4.7.1– 4.7.2)
2. To examine the relationship between key predictors of firm growth and young hi-technology firms in Thailand	i. What are the relationships between the contingent factors and types of firm establishment of young Thai hi-technology firms? ii. What are the factors constraining or assisting firm growth of young hi-technology firms?	3.1.8 5.3 (Hypothesis 1) 5.4 (Hypothesis 2) 5.5 (Hypothesis 3) 5.6 (Hypothesis 4) 5.7 (5.7.1-5.7.2)
3. To examine the role of the innovative inputs in young Thai hi-technology firms	i. How do innovative firms implement the innovation process? ii. How the Thai entrepreneurs configure the innovative inputs to influence outputs in general?	6.3 , 6.4, 6.5, 6.6, 6.7
4. To determine the core firm growth determinants of young Thai hi-technology firms.	i. What are the core firm growth determinants of young Thai hi-technology firms?	2.6 (2.6.1-2.6.8) 7.4.1 (Hypotheses 1, 2) 7.4.2 (Hypotheses 3, 4, 5) 7.4.3 (Hypothesis 6, 7) 7.4.4 (Hypotheses 8) 7.4.5 (Hypothesis 9) 7.4.6 (Hypothesis 10) 7.4.7 (Hypothesis 11) 7.4.8 (Hypothesis 12, 13, 14)

Source: Author

8.3 Research Objective One

The first research objective 'To examine the core characteristics of hi-technology entrepreneurship' aims to identify the key entrepreneurial characteristics of innovative start-ups. The core characteristics examined are entrepreneurial demographics, firm characteristics, skills and competencies, research and development, products characteristics, market development, internationalisation, and finance.

The research question asked is:

- i. What are the core entrepreneurial characteristics of Thai innovative firms?

Four main categories, namely 1) Ownership, governance and firm demographics, 2) Product characteristics and innovation, 3) Market development and internationalization, and 4) Source of finance were analysed,

8.3.1 The core characteristics of the entrepreneurial demographics, firm demographics, skills and competencies of Thai innovative firms

Firm establishment and governance

With respect to establishment types, less than one in five new firms could be considered as independent, de novo start-ups. In fact, the overwhelming majority of high technology start-ups in Thailand was formed through merger amongst existing firms and acquisitions. The typical technology firm had between three to four owners. More than half of the firms had not changed their ownership team since their initial formation. The overall control of the firm of majority of those that did undergo an ownership change remained with the founding owners.

Initial firm size

The median employment number at start-up stage was 11 which is above the classified micro firm cut-off point of nine employees but is within the small firm class size range (10-49 employees). This contrasts with a huge volume of research which states that conventional start-ups typically start (and end) as single person entity. Although the range of the median employment number for

all types of establishment was small in comparison, independent start-ups were on average had much bigger number of staff than start-ups formed by merger or acquisition of existing firms. It supports what has been found earlier, firm specific characteristics, such as the degree of human capital; generic human capital, such as the formal educational degree of the founders, and specific human capital, such as successful entrepreneurship, of the founding entrepreneurs influence the start-up size of new firms (Astbro and Bernhardt, 2005; Colombo, Delmastro and Grilli, 2004; Colombo and Grilli, 2005). Colombo et al. (2004) assert that founders with greater human capital usually come along with a higher personal wealth, better entrepreneurial ability and confidence in the firm's post-entry performance. Consequently they can achieve the desired initial firm size more easily.

Skills and competencies (Human capital)

Human capital such as skills and competencies support the acquisition of new knowledge and assist in the creation of advantage for the start-ups (Bradley et al., 2012). Thai high-technological start-ups had a very high concentration of technically educated employees. More than half of the managers had no industry specific experience. The lack of industry specific experience was particularly evident in the independent start-ups. However, virtually all managers had a business qualification which suggests that at the managerial level, general nature human capital rather than specific form of human capital is the dominant form. The entrepreneurs who are highly educated in sciences and engineering are more capable to learn and implement new technical knowledge (Ohyama, 2007), create more innovative products and services (Boyer & Blazer, 2014), and response quickly to new technology and market changes (Gimmon and Levie, 2010). This, in turn, makes it more difficult for rivals to imitate them (McEvily and Chakravarthy, 2002; Slater et al. 2014).

A diversified management team in which technological and managerial expertise coexist is recognised as an important factor for the growth of new high-tech ventures (Colombo and Grilli, 2005; McGee et al., 1995).

In general, the characteristics such as firm size, skills and competences that the Thai hi-technology start-ups possessed are believed could enhance the survival of these firms (Birley and Stockley, 2000; Colombelli, 2015, Colombo and Grilli,

2005; Wright et al., 2007; Bradley, McMullen, Artz and Simiyu, 2012; Calvo, 2006).

8.3.2 The core characteristics of the product, R&D, and aspect of innovation of Thai innovative firms

In this research, the examination of the firm's product characteristics and innovation is through the investigation of the best-selling product or service and how long does it take to offer a best-selling product or service since founding.

The Thai high technology firms, at the start-up stage, were adopting strategies that could enhance their survival. They either had already developed a 'best-selling' product or service at the formation stage or focused only on a single product or service line. Most of the products or services offered by the firms were of the intermediate type. Among the three types of business customers they had, the biggest customer group was the business group and follow by the consumer and government groups. In terms of innovation, only a few of them spent additional time to develop the product or service. The findings show that the new firms were lacking in-house technological innovation and there was a clear preference by them to use outside novel technology to compensate the deficiency.

In developing countries, technical knowledge is carried by incumbent firms and the incumbents may enjoy advantages by incorporating technical progress regardless of whether the relevant knowledge is external or internal to the firm (Burachik, 2000). Cala et al. (2015) assert that small new firms in developing countries mainly innovate by imitating or incorporating knowledge developed by other organizations, while innovative entry is an infrequent phenomenon in contrast with advanced countries, where small, new firms enjoy an innovative advantage if the relevant knowledge is codified and external to the incumbent firms.

The findings suggest at the start-up stage, survival was of the greatest importance to all the firms. Pursuing innovations leads to riskier, more complicated, and less linear start-up processes (Samuelsson and Davidsson, 2009). An innovative startup may face a greater liability of novelty than its non-

innovative counterparts (see, e.g., Amason et al., 2006). Other scholars argue that such firms suffer from having few collateralizable assets and long and uncertain payback times (Brown et al., 2012; Minetti, 2011). Consequently, innovative startups have more limited access to external financing, which leads to a greater likelihood of failure (Berger and Udell, 2006). What the firms were doing seem to be in line with what Maidique and Hayes' (1983) assertion that the entrepreneur who concentrates on one or two technological polices tend be the most successful because it minimizes risk.

8.3.3 The core characteristics of the competition, market development and internationalisation activities of Thai innovative firms

There existed a very strong competitive force in the market because the rivals introduced their competitive products at lower prices in the market within the first year of the launch of a product. Sales support activities such as technical consultation prior to sales, individual client customization, specific configuration requirement, time consuming installation, regular maintenance and upgrade, and specialise training for front-line and sales personnel to enhance their marketing skills were utilized by all the firms to retain their customers. Moreover, the start-ups focused mainly on the domestic market rather than ventured into the international market during the early stage of founding. This clearly indicates that the new firms were responding to the market challenges encountered to sustain competitive advantage.

The firms' response to competition and market development is in line with the Austrian market process theory's assumptions which place an important role on the function of the market-based system and state that it is crucial for firms to create new products to meet the trends of the market system (Schumpeter, 1934; Simpeh, 2011). It is also in accord with the opportunity base theory which predicts that firms that exploit existing market knowledge can gain more growth than firms that rely only on new market knowledge (Saemundsson and Dahlstrand, 2005). Engaging after sales services extensively would enhance customers' satisfaction and perception. The factors such as customer satisfaction, business credibility, and product appreciation greatly affect customer perspective and directly affect

market opportunity. Business with positive image will induce brand loyalty in customers, attract new customers, and increase business stability (Nalintippayawong et al. 2018).

The Thai young start-ups all aspired to internationalise their market. This seems to be in line with the research studies (Baum et al., 2011, Fryges, 2009, Koch, 2017) which indicate that early internationalisation would bring distinct advantage to the firms. However, most Thai-high technology firms focused on domestic market initially. This could be the results of the financial constraints encountered in the start-up stage as was revealed by the firms in the survey and interview conducted. Most of the firms had to utilise own capitals to start up the firms.

8.3.4 The characteristics of the source of finance of Thai innovative firms

In accordance with the findings of previous studies (Ebben and Johnson, 2006; Hanlon and Saunders, 2007; Carpenter and Petersen, 2002; Colombo and Grilli, 2007), the Thai high-tech start-ups faced difficulty in securing external financing and depended on personal funds and short-term bank loans as the main sources of finance to set up the business. Retained profits were used later to finance growth after the business had started to generate surplus revenue.

8.4 Research Objective Two

The second research objective 'To determine the relationship between key predictors of firm growth and young hi-technology firms in Thailand' explores the relationships between the types of firm establishment and the contingent factors such as the core entrepreneurial characteristics and firm demographics, skills and competencies, product/service innovativeness, marketing development, source of finance and factors that constrain or assist firm growth.

The two research questions asked are:

- i. 'What are the relationships between the contingent factors and the types of firm establishment of young Thai hi-technology firms?

- ii. What are the factors constraining or assisting firm growth of young hi-technology firms?

Research question 1: What are the relationships between the contingent factors and the types of firm establishment of young Thai hi-technology firms?

Six categories of key firm based factors subsumed under three main areas; entrepreneurship, innovation and firm growth dynamics derived from the core theories are identified.

The key firm based factors are:

- 1) Human entrepreneurial capital
- 2) Characteristics of product/services and markets
- 3) Innovation
- 4) Internationalization
- 5) Production location
- 6) Source of finance

It is hypothesised that there are significant differences in managerial skills, competencies and experience, product/service innovativeness, market development and source of finance among young Thai hi-technology firms. The correlational analysis has indicated that Human entrepreneurial, capital, product/service innovativeness, new market development, and sources of finance were related to entrepreneurship and innovation of young Thai hi-technology firms. Many significant positive relationships between types of establishment and sub-contingent factors were found, however, many non-significant relationships were observed, too. Many of the sub-contingent factors, such as business qualification, intensity of completion, the timing of the launching of competitive product by rivals, to name a few, did not have significant correlation with any type of establishment.

The results produced by the testing of the hypotheses had indicated that the assumption that the key based contingent factors would be equally important to firms of different establishment type was not sustained. It was observed that there was a difference in the pattern on how the different types of establishment

correlated with the different contingent factors. The different types of firm establishment varied significantly in human capital, nature of product/service, innovativeness, sales support activities, source of finance, and shortage skills within management team.

The findings suggest that to a certain extent, the entrepreneurial behaviour of the Thai young high-tech firms are in line with the underlying assumptions of the Contingency theory (Fiedler, 1967) and the Resource-based view (RBV) (Barney, 1991). The contingency theory claims that there is no best way to organize a corporation, to lead a company, or to make decisions. Instead, the optimal course of action is contingent (dependent) upon the internal and external situation. Since the condition and environment of each organization is different, its design must also be unique. To face the challenging competitions, the firms are striving to look for a sustainable and competitive advantage that would help them to achieve better performance (Barney, 1991). Barney, Wright, and Ketchen (2001) suggest that a company is a collection of resources, competencies and capabilities. These strategic resources can be exploited by the firm in order to achieve sustainable competitive advantage. As contend by Bhargava, Dubelaar and Ramaswami (1994) and Venkatraman and Ramunajam (1986), the firm's management needs to use integrated diverse measurements so as to accomplish excellent business process performance.

The resource-based view argues that the source of sustainable advantage derives from doing things in a superior manner; by developing superior capabilities and resources (Barney, 1991). The resource-based view asserts that not all resources are of equal importance, nor do they possess the potential to become a source of sustainable competitive advantage (Fahy and Smithee, 1999). The sustainability of any competitive advantage depends on the extent to which resources can be imitated or substituted (Lowson, 2003). The strategic resources can be exploited by the firm in order to achieve sustainable competitive advantage. The difference between companies can be noted by their respective resources, competencies and capabilities, all of which can determine the firm's competitive advantage. Each organisation must formulate and execute the appropriate strategies to build its competitive advantage (Bowen, et al. 2009; Mazanai and Fatoki, 2011).

Research question 2: What are the factors constraining or assisting firm growth of young hi-technology firms?

The crucial six factors that might constrain the growth of the business are availability of finance, skilled employees, management experience, access to sales channels and distribution, commercial information and official regulations.

It was hypothesised that new Thai high-tech firms faced the same factors constraining or assisting firm growth. The hypothesis was not supported as the different types of firm did not encounter the same constraints in similar manner. However, it is interesting to note that the regression analysis shows that the firms formed by merging with similar size firm were significantly related to most of the factors.

Financial resources support the survival and growth of new firms (Cooper et al., 1997; Ganotakis, 2010; Doutriaux, et al., 1987). All participants claimed that finance/money was very important if they wanted to invest in materials/equipment, to expand the business and human capital to effectively exploit opportunity (Clausen, 2006) and to get more resources to start new business (Aldrich, 1999).

Finance is a major constraint to all types of firms in general. The findings indicate that financial bootstrapping is a common strategy use for financing business. All participants affirmed that there were not many sources providing finance to new small firms in Thailand. The entrepreneurs who planned to start up their own business needed to have personal equity to fund it first and then later try to secure external finance such as bank loan to further finance it (Ajagbe et al., 2015; Ajagbe et al., 2016; Baldock et al., 2015; Wilson, 2015; Cotei and Farhat, 2017; Hechavarria, 2016; Wille, 2017; Wonglimpiyarat, 2015).

Skilled employees and managerial experiences were also crucial factors because without them it would be very difficult to run the business efficiently and thus, resulting in waste of time and money. For instance, managers need to have the necessary knowledge and expertise to make decisions about the scope of the firm and the scale of the operations (Daily et al., 2002); to access funding

(Pissarides, 1999); to develop and cultivate network relationships (Lechner & Cowling, 2003); and to decide on the allocation of limited resources. Managerial capacity is particularly critical to compete in today's highly dynamic markets (Zahra and Filatotchev, 2004), especially for small firms, where the managers' failure to respond to the effects of rapid change can be very costly,

Access to sales channels and commercial information was important for the new start-ups. Kangasharju (2000) asserts that demand for a firm's products is the major external determinant of small firm growth, and follow by the market actions of competitors, the supply of production factors, and the features of the local business environment. The respondents acknowledged that they needed the public sector to support them by providing market information, including the way to expand to international markets. The advent of the ASEAN ECONOMIC COMMUNITY (AEC) has had a big impact on their firms. Information about regulations in AEC countries was still lacking. They feared the introduction of similar products by international competitors. The exception was that the Thai IT companies thought that they might benefit from the lower level of IT technology in the neighbouring AEAN countries.

Similar to what Orser et al. (2000) have found out, the impact of the constraints on the Thai high-tech firms varied from firm to firm. The firms reacted strategically to the constraints faced to maximise output and to compete in the market.

8.5 Research Objective Three

The research's third objective is 'To examine the role of the innovative inputs in young Thai hi-technology firms'.

The two research questions are:

- i. How do Thai innovative firms implement the innovation process?
- ii. How the Thai entrepreneurs configure the innovative inputs to influence outputs in general?

Research question 1: How do Thai innovative firms implement the innovation process?

The examination of the Thai entrepreneurs' perception of the role of the innovative inputs in the innovation process focused on five innovative inputs namely, entrepreneurial human capital, product/service development, R&D and innovation technology, marketing development and internationalisation, financial aspects of business management.

Entrepreneurial human capital

The interviewees believed that owner characteristics and skill competencies such as ownership background, education and qualifications in technical and business knowledge, and industry experiences of the founding team strongly influence the achievement of the new hi-tech firms (Evans and Leighton, 1990; Acs, Armington, and Zhang, 2007; Bates, 1990; Gimeno, et. al, 1997).

The participants showed a clear agreement that lacking of experience is detrimental to their business because if the owners did not have the experiences, they would need to seek help from outside specialists. The opinion gathered indicates that business management knowledge was very important for all hi-technology firms.

The companies, particularly those involved with innovative products/services, were concern about the prior industrial experience within their management team especially during the initial start-up period. All of them agreed that prior experience was important for starting the business. Owners with no experience would rely on other management team members to support the running of the business. If the owners did not have relevant experiences typically they would sought to grow expertise internally so that they need not rely on outside specialists permanently. The management who had a previous industry experience was an important contributor to the performance of the start-ups (Bürgel et. al., 2000; Lechner and Gudmundsson, 2014; Altinay et al., 2015; Delmar and Shane, 2006; Song, et al.,2008). The management team of the firms in the industrial manufacturing sector required technical/scientific knowledge for

their survival and growth (Eisenhardt and Schoonhoven, 1990; Reynolds, 1993; Storey, 1994).

In general, the start-ups which managed by team (e.g, B2, B6) were more successful than firms managed by a single owner (e.g. B7) (Carland and Carland, 2012).

Advance technology, Innovation and skills

In terms of where the firms benchmark their technology, innovation and skills against their industry, the independent start-ups perceived themselves to be below the industry average in relation to innovation and ability to access the skills required from the labour market.

On the use of advanced technology, start-ups that were created through merger tended to apply existing advanced technologies in the manufacturing process. The independent start-ups were more likely to operate in industry sectors that were at a lower technological level and with a lower rate of innovation and which might present relatively low barriers for the firms to enter. The independent start-ups were new to the industry. Bringing their initial products/services to market, forming a customer base, and putting into place organizational processes and procedures would be the top priority (Klotz et al. 2014). Thus to begin the business by employing a simpler and less risky approach would be a much preferred alternative. Pursuing innovations leads to riskier, more complicated, and less linear start-up processes (Samuelsson and Davidsson, 2009). Hyytinen et al. (2015) asserts that pursuing innovations appears to lead to a more complicated start-up process that may be disproportionately hindered by the liability of newness. In addition, entering into high technology industry may have negative impact on the survival of the start-up. Investments in innovativeness are frequently associated with long and uncertain payback times (Brown et al., 2012; Minetti, 2011), which further reduces the likelihood of the firm being able to meet its debt and other payment obligations and impacts on their ability to survive any negative revenue shocks.. Startups generally possess fewer tangible assets and thus have limited collateral to

use as pledge for loans (Brown et al., 2012; Minetti, 2011). This lack of collateral restricts their access to external financing to support innovation.

The majority of the firms surveyed only occasionally engaged in R&D due to time constraint and know-how limitations and relied on third party or their corporate partners to do R&D for them. The company which carried out R&D regularly was because their product was specifically developed for each of its customers and had a big number of staff involved in R&D and production.

Investment in New capacity

The level of investment in new capacity in the industry was not a differentiating factor among the different types of establishment. Their current position relative to the industry benchmark on investment in new capacity was also found to be not significantly linked to the type of establishment. Investing in new capacity is a costly affair. Most start-ups lack funding or collateral which could be used to secure loans (Brown et al., 2012; Minetti, 2011). This greatly restricted their access to external financing and impacted their ability to invest on new capacity.

Market strategy and International business activities.

The majority of young Thai firms claimed that they did not face intense competition. Their best-selling products typically were ready to use products for businesses, distributors and end-users. The firms employed strategic inputs such as after-sale services, best quality raw materials, good R&D plan, best performance product, branding strategy, differentiation techniques both in products and packaging, conforming to world quality standards, and continual market surveys to sustain high volume of purchase orders.

Selling abroad was considered as very important by all the companies. This is in accord with previous research findings on the importance of the International expansion for SMEs that traditionally have a small financial base, a domestic focus and a restricted geographic scope (Barringer and Greening, 1998).

Internationalization is the key to a firm's growth (Peng and Delios, 2006; Abdullah and Zain, 2011).

The firms which went internationally straight away at the start-up stage claimed to have their own market share and position because the type of product they produced was difficult to imitate. This holds true for manufacturers of premium quality products and customized products which can command brand loyalty more readily.

For those which were currently selling only in the domestic market, they planned to export their products overseas as soon as the chances come. The motivating factors such as market expansion and increased profit might have influenced the entrepreneurs in entering overseas markets (Zahra et al., 2005).

Summary

- Companies reliant on high technology and science need a more educated management team and equipped with accounting/finance/logistics skills.
- To develop international markets and new products/services to generate better financial returns, the companies need: investment on human capital, access to skilled staff, collaboration with other companies or organisations, innovation, and access to investment.
- The firms need to innovate to reduce costs, develop new products and processes, have value-add products, and create more efficient machinery.
- The last important factor is collaboration with other businesses or public organisations because these partners can help them to expand their market. The partners can also provide critical information such as market information, production information, and competitor information. Moreover, they can also enhance the start-ups' skills and knowledge of the business.

Hi-tech firms are important drivers of economic growth but generally face challenges in producing their highly innovative goods to serve national and

international markets (Ganotakis and Love (2010). Owners may encounter obstacles related to technological advancement and marketing system (Maine and Garnsey, 2006; Saemundsson and Dahlstrand, 2005) and incur a higher initial cost while introducing new products to the market as the innovation takes a long period of time to complete (Oakey, 2003; Saemundsson and Dahlstrand, 2005). Thus, these firms need to launch products to a larger market in order to cover the high cost of R&D, to address the short product life-cycle of hi-tech products, and to rapidly reach the domestic markets in order to be profitable (Saemundsson and Dahlstrand, 2005; Storey and Tether, 1998). Consequently, almost all the innovative inputs are regarded as important factors by the entrepreneurs in the high-tech start-ups.

Research question 2: How the Thai entrepreneurs configure the innovative inputs to influence outputs in general?

The Thai high-tech start-ups possess the typical characteristics of new start-up and employ varied strategies to compete in the market to sustain survival. To retain a high volume of purchase, the firms use strategic inputs such as after-sale services, best quality raw materials, good R&D plan, best performance product, branding strategy, differentiation techniques both in products and packaging, conforming to world quality standards, and continually doing market surveys.

As the impact of the constraints on the high-tech firms varied from firm to firm, the firms reacted to the constraints faced differently and strategically to maximise output and to compete in the market. For example, Thai hi-tech firms used various strategies for new market development. In order to successfully sell a product/service, the merger with large firm offered individual client customisation to support the sale activities. They produce their product/service for selling abroad at the initial stage. Whereas the merger with similar size firms used a specialised training to equip the front-line and sales persons to increase sales.

8.6 Research objective four

The fourth objective of the research is ‘To determine the core firm growth determinants of young Thai hi-technology firms. The research question is ‘What are the core firm growth determinants of young Thai hi-technology firms?’

This final objective is to explore the relationships between the types of business establishment and the eight key firm-based contingent variables: firm demographic, product/service characteristics, innovation, internationalization, finance, skills shortage within managerial team, and performance indicators subsumed under three main areas; entrepreneurship, innovation, and firm growth dynamics (Table 8.2).

Table 8.2: Classification of contingent variables

Main Category	Key firm-based factor
<i>Entrepreneurship</i>	Ownership, governance and firm demographic
<i>Innovation</i>	Characteristics of products/services and markets
	Innovation
<i>Firm growth dynamics</i>	Internationalization
	Production location
	Source of finance
	Skills shortage within management team
	Growth barriers
	Performance indicators

Source: Author

In general, the key based contingent variables identified by previous studies were associated with firm growth and survival (Coviello and Josph, 2012; Aarikka-Stenroos and Lehtimaki, 2014; Nalintippayawong et, al., 2018).

i) Entrepreneurship

The important entrepreneurial characteristics of young firms have been widely discussed (Brüderl, et al., 1992; Carroll, 1984; Stinchcombe, 1965, Coviello and Josph, 2012; Aarikka-Stenroos and Lehtimaki, 2014; Nalintippayawong et al., 2018). These include individual characteristics (Landström, 1999) which are linked to the achievement of the entrepreneur (Karugu, 2013). The psychological and opportunity identification theories have established that prior knowledge is correlated with entrepreneurial alertness for business opportunity (Ardichvili et al., 2003; Stevenson and Gumpert, 1985) and it is a considerably important driver for entrepreneurial achievement (Stevenson et al., 1994). The technical aspects of human capital are particularly important in the technological context and more broadly, in relation to innovative capacity and capabilities (Colombo and Grilli, 2005).

The analysis has shown that type of establishment was not associated with the size of firm at the founding stage. Gibrat's law model suggests that the size of firm is not associated with the survival and growth of the business (Lotti and Santarelli, 2004; Relander, 2011).

The type of business establishment was related to human capital, which is measured by the management team's technical skills and business education qualification, and prior work experience. The finding is in line with the claim of the resource-based theory (Becker, 1975) that human capital is associated with experience and education (Evans and Leighton, 1990). A number of studies (e.g. Lussier and Pfeifer, 2000; Moog, 2002; Unger et al., 2011) have illustrated the importance of the human capital factor in the prediction of entrepreneurship and success of business. The size of the management team was a significant differential factor. The size of the founding ownership team is a measure of the collective human capital in the firm and the size and qualitative composition of the founding team are the factors that most support the growth of new firms (Zucker, et al., 1998).

ii) Innovation

Innovation is broadly defined 'as development of new product, process, new sources of supply, the exploitation of new markets and the development of new ways to organize business' (Szirmai, Naude, and Goedhuys, 2011, p. 5).

a. Characteristics of product/services and markets

The importance of product's technological content characteristic has been established (Bürgel et al., 2000). How new firms utilise innovativeness and technology to produce their products or services, for example, the initial adaptation of technological strategy to integrate the production lines with new complementary products, can determine business efficiency (Nambisan, 2002). Bürgel et al. (2000) claim that the technological sophistication of a product probably influences the growth rate of hi-tech start-ups.

There is a narrow technological approach focusing only on innovation of product and process (Szirmai, Naude, and Goedhuys, 2011). Economic theory considers how material resources are transformed into products and services (Murphy, Liao, and Welsch, 2006). As propounded by the resource-based view theory (RBV), this transformation process involves innovation that will help the entrepreneur to access more resources and opportunity for firm growth (Alvarez and Busenitz, 2001) and to sustain competitive advantage (Barney, 1986).

The development of product/service for selling abroad is important for business survival and growth of new enterprises as internationalisation is the key to a firm's growth (Peng and Delios, 2006; Abdullah and Zain, 2011).

The analysis showed that there was a relationship between types of firms and product type. The firms generally produced intermediate goods for the domestic market. This could be because

they needed their products to rapidly reach the domestic markets in order to be profitable. The firms need to launch products to a larger market in order to cover the high cost of R&D, to address the short product life-cycle of hi-tech products. (Saemundsson and Dahlstrand, 2005; Storey and Tether, 1998).

b. Innovation

Innovativeness

Innovativeness was not significantly related to type of firm establishment. Innovativeness among the differently established firms was found to be different. Different type of establishment used different innovative approach. For instance, B1, B2, and B3 used incremental change to innovate the production of their products and services. By contrast, the engineering company (B5) used the “disruptive change of technology” approach to develop their core technology to produce their product.

In general, the firms’ innovation was based on the use of existing technology. Cala et al. (2015) assert that in developing countries small, new firms do not enjoy an innovative advantage by incorporating new technical progress. Thus, small new firms mainly innovate by imitating or incorporating knowledge developed by other organizations, while innovative entry is an infrequent phenomenon in contrast with advanced countries.

Sales support activities

The factor ‘Sales support activities’ was significantly related to the types of establishment. There existed a very strong competitive force in the market because the rivals introduced their competitive products at lower prices in the market within the first year of the launch of a product. The firms employed after sales service as a tool to retain customers and sustain sales. Nalintippayawong et al., (2018) find that the factors such as customer satisfaction, business credibility, and product appreciation greatly affect customer

perspective and directly affect market opportunity. Engaging after sales services extensively would enhance customers' satisfaction and perception. In addition, Business with the positive image will induce brand loyalty in customers, attract new customers, and increase the business stability.

iii) Firm growth dynamics

a. Developed for International market

Internationalisation

Internationalisation among firms is on the rise (Burgel, Murray and Fier, 2000). Peng and Delios, (2006) and Nik Abdullah and Zain, (2011) assert that internationalization is the key to a firm's growth. Western new firms which focus more on selling abroad grow more than those firms who sell only domestically (Bürgel et al. 2000). This could be due to the robust international market and the frequency of exports (Fier, Licht, and Murray, 2001).

There was no significant link found between type of establishment and internationalisation. This is probably a consequence of the cost of doing business overseas which is a barrier for business development as found in UK international firms (Chaplin, 2013).

b. Production location

The issue on choosing a location to produce product/service was studied by many researches. Close proximity to the centre of research and science with good opportunity for rapid market commercialisation of products has been highlighted as the rational for firms to choose their initial location for production development and innovation (Bar-El and Shefer, 1989; Shefer and Bar-El, 1993). Technological changes could be facilitated by the clustering of development and innovation facilities (Frenkel, 2001). Some studies highlighted that the regional/in-house infrastructure is the most

important for innovative industries (Thwaites, 1982; Camagni and Rabelotti, 1986; Button, 1988).

The analysis revealed that there was no significant link between type of establishment and production location. Therefore, it could be concluded that physical product/service location was not significantly link with new hi-tech Thai firms.

c. Source of finance

Financial capital enables a company to make available more resources for improving the efficiency and effectiveness of business Alrdich (1999) and is especially essential for new innovative start-ups (Denis, 2004; Gompers, 1995; Kaplan and Stromberg, 2001; Sahlman, 1990).

Personal equity, retained profit, and other non-standard forms of debt are significantly used by all types of firms to finance the setting up of the firm. In addition, start-ups created from a merger of similar sized firms and those created through an ownership change also tapped short and long-term loans, venture capital, and other external sources. There was no significant variation in the use of director loans by all types of firms.

d. Skills shortage within management team

The management team with superior skills will bring extraordinary advantage to the firm (Calantone et al., 1996; Song et al., 1997; Song et al., 2008). The entrepreneurs or founders involve in the creation of their own business usually use their broad skill base to transform their idea to a profitable venture (Bygrave and Hofer, 1991). A broad range of skills in both managerial and technical possessed by the management team could contribute to the firm's success (Kakati, 2003; Oakey, 2003), the growth of firms and broaden the long-term survival of the business (Oakey, 2003).

Saemundsson and Dahlstrnad (2005) suggest that a firm that has both existing market knowledge and new technology market knowledge could grow better than a firm that relies only on new market knowledge. Vesper (1994) and Bygrave (2009) highlighted that prior marketing/commercial knowledge and experience are important for entrepreneurial venture development. On the other hand, lack of commercial knowledge and experience could be a cause factor of failure in business (Park, 2005). O'Connor and Rice (2001) point out that the senior manager is often being the person who contributes the critical information towards the true commercial value of the firm's technological invention. In addition, not only marketing skill, but also technical skill are significant factors important for the survival of new product firm (Thieme et al., 2003).

The shortage of marketing skills and sales and distribution skills was found to be a differentiating factor among the different establishment types.

e. Performance indicator

Generally, start-ups have scarce resources and thus, need to make choices amongst competing activities and investment. Of the eight indicators examined, only two of them, Investment in Human Capital and Access to Skilled Staff, are found to be not significantly differentiating the types of establishment. A possible explanation is that the start-ups have managed to utilise other strategies to circumvent them. It was found that some of them relied on part-time employees to help managed the production. Toppinen (2011) argue that networking creates new channels and new opportunity identification. Networking was opined to be important by the firms. New firms with better supportive networks are more likely to survive and grow (Brüderl and Preisendörfer, 1998). A strategy for networks development is forming joint venture. The formal alliances improve new product development and marketing activities (Doyle, 2000).

Collaboration among firms can provide easy access to resources such as information and technology; acquisition of skills and knowledge through joint training or research and risk-sharing (Murphy, 2002).

A very interesting finding was that the firms were not differentiated by the General performance. This seems to suggest that they have equal opportunity to growth.

The objective of the regression analysis is to determine the characteristics of firms, innovation and firm growth dynamics of young hi-technology firms in Thailand that can create a meaningful contribution to the future economic growth of the country. The analysis has explored the relationship between each of the contingent variables and the types of establishment at founding. Eight categories of key-based factors derived from core theories are used in the study. They are:

- 1) Ownership, governance and firm demographic
- 2) Characteristics of product/services and markets
- 3) Innovation
- 4) Internationalization
- 5) Production location
- 6) Source of finance
- 7) Skills shortage within management team
- 8) Performance indicators

The results of the regression analysis examining the hypotheses stating a positive relationship between the key firm-based contingent factors and types of establishment are presented in Table 8.3.

Table 8.3: Summary of the test of hypotheses

Key dormain	Key-based factor	Hypothesis	Supported
Entrepreneurship	Ownership, governance and firm demographic	H1 - size of firms	No
		H2 – human capital	Yes

Innovation	Characteristics of product/services and markets	H3 - developed for international market	No
		H4 - nature of product/service	Yes
		H5 - intensity of competition	No
	Innovation	H6 - innovativeness	No
		H7 - sales support activities	Yes
Firm growth dynamics	Internationalization	H8 - internationalization	No
	Production location	H9 – production location	No
	Source of finance	H10 - source of finance	Yes
	Skills shortage within management team	H11 - shortage skills within management team	Yes
	Performance indicators	H12 - performance distribution and general performance	Yes
		H13 - advance technology, innovation and skills	No
		H14 - investment in new capacity	No

Source: Author

The regression analysis has shown that to a great extent, the young high-technology firms in Thailand were similar to other firms that had been examined in the literature with regard to their characteristics, innovation and firm growth

dynamics but differed with regard to the utilisation of the sub-factors that subsumed under the three key-based factors, entrepreneurship, innovation and firm growth dynamics. The outcomes of the testing of the hypotheses indicate that to a certain extent the nature and developmental strategy of the young high-technology firms in Thailand are similar to that propounded by the core theories. However, contrary to the assertions made by the core theories which claim that young firms would use the inputs positively to achieve growth, the use of some of these inputs is significantly reduced by certain type of establishment. This seems to suggest that different type of firm by establishment type may utilise different inputs to strategically circumvent the shortages or obstacles encountered to survive.

The Thai young start-ups not only contribute directly to the national GDP but also serve as a catalyst for economic growth by producing intermediate goods which are the feed-stock for the final goods manufactured by their business customers. The findings lead the researcher to postulate that these start-up firms play a very important role in the national economic development.

8.7 Key contributions

This study offers several contributions to the literature in the areas of entrepreneurship.

First, it enriches the understanding of the entrepreneurial determinants by linking it to the key firm-based contingent variables such as firm demographic, product/service characteristics, innovation, internationalization, finance, skills shortage within managerial team, and performance indicators subsumed under three main areas; entrepreneurship, innovation, and firm growth dynamics. This study uses both qualitative and empirical results to validate the relationships between these elements and young high technology firms.

Second, Most of the studies conducted earlier provide evidence from the developed countries. The determinants of entrepreneurship in developing countries, on the other hand, have been studied much less although the economy of these countries has grown tremendously. In addition to studies

conducted in developed countries, evidence from developing countries is also needed in the field of entrepreneurship. The recent contributions investigating the determinants of entrepreneurship on the country or regional level illustrate that the topic of determinants of entrepreneurship is still not fully explored and requires further research attention. This research contributes to the literature by extending the empirical knowledge on the determinants of entrepreneurship in a developing country. It examines the core characteristics of firms, innovation, and firm growth dynamics of young Thai hi-technology firms that can create a meaningful contribution to the future economic growth of the country.

In addition, this thesis investigates the entrepreneurial activities and the potential factors that constrain or assist the growth of these innovative start-ups. The study offers evidence of how high-growth businesses engage in strategic entrepreneurial activities to achieve high-growth performance.

This study has several significant policy implications, especially for the policy makers in Thailand.

First, it is important to have a broader formalised system that is capable of remedying the financial constraints faced by the entrepreneurs of small firms at the different stages of the lifecycle as a consequence of the impact of their cultural practices.

As a complex social behaviour, entrepreneurship can be influenced by many different dimensions of culture. The impact of cultural practices of the Thai entrepreneurs could be seen in the manifestation of their behaviour to secure additional financial resources through merging with other firms, a common practice observed in this study.

The decision-making processes in Thailand is influenced greatly by uncertainty. The UAI (Uncertainty Avoidance Index) score for Thailand is 64, indicating that Thais have a high tendency to dislike uncertainty or unpredictable situations. The influence of Confucianism and Buddhism have also ingrained in the Thais a preference for conservatism and secrecy.

Conservatism encompasses core values such as maintaining the status quo, moderation actions, social order, harmonious relations, reciprocal favors, respect for tradition, and research of security. Conservatism is asserted to be associated with risk aversion and uncertainty. Individuals adopt a conservative attitude because they are not sure about the outcome of a novelty. Thus, they avoid new situations with unknown results.

A preference for confidentiality or secrecy is consistent with a high degree of uncertainty avoidance as the need to restrict the dissemination of information results from the wish to avoid conflict, competition and to ensure safety. Entrepreneurs who prefer secrecy fear that the disclosure of specific information can be used against their interests. Their concerns arise from the desire to protect property rights, discourage fierce competition and avoid professional jealousy.

Consequently, in terms of corporate finance, self-financing offers the advantage of avoiding the disclosure of information on the company's future plans to the investors or creditors, as is mandatory in the case of securing external financing. Thus, if the company does not have the required funds, it will prefer to revert to its own investment rather than to seek it from a bank.

Mechanism such as 'Business Matching' and business incubators (accelerators/bootcamps) are potential vehicles for overcoming the difficulty or malaise faced by new technology based firms to secure financial assistance.

'Business matching' is a platform supporting finance liquidity for further business expansion and offering direct access to local or international market for SMEs and particularly for new start-ups. It assists the business not only to bridge the financial gap but also to embark on market development. (Krungsriguru, 2019; Satitthammajit, 2016; Soonthonsmai, 2018).

1. To bridge the financial gap

The initial high capital investment outlay needed at founding is quite difficult for the start-ups to generate. If the entrepreneurs merge the start-ups with other businesses, it could reduce the starting up investment cost a lot.

2. To reach the international market

Start-ups which plan to sell abroad can merge with businesses which are planning to launch product/service in the new market. For the start-ups which have limited market in other countries could merge with those which are already selling internationally to expand their market segments overseas.

In addition, business matching can support new business creation through the building of relationship between Thai and foreign enterprises. This will enable the start-ups not only to enter international market but also to promote entrepreneurial development within the firms (Soonthonsmai, 2018).

Supportive projects from both the public and private organisations offering business advisory support to all new enterprises and business who are looking for opportunity to expand their business are already avail.

The first 'matching the business' was offered through a website called digital matching launched in 2015. It is to promote Asean Economic Community (AEC) business collaboration. The Thai entrepreneurs could google potential partners online and commence discussion directly with them through the website. It also helps the startups by providing direct access to international network, relevant mentors, partners and information on international banks (Digital Age, 2015).

Business Incubator (accelerator/bootcamp) is another vehicle that could be employed to achieve the objectives. For example, the annual Thailand innovation bootcamp organized by the Thai BISPA (2015) helps and supports young innovative entrepreneurs. This Thailand innovation bootcamp is facilitated by a group of Thailand innovation fellows coming from a range of backgrounds and organisations across Thailand with significant experience working with technologies, researchers, and businesses, and have taken on the challenge of increasing the number of technology business in Thailand. It is supported by a number of like-minded organisations which include the Science, Technology and Innovation Policy Office (STI), The Thailand Business Incubator and Science Park Association (Thai BISPA), The Science Park Promotion Agency (SPA), and the Regional Science Parks Network, as well as a number of private and public

universities. This bootcamp committed significant resources to commercialise the outcomes produced by the participating entrepreneurs.

Without proper business strategy and support, new firms often fail to survive in a highly competitive market. Thus, especially for the SME startups, business matching is an essential key factor for business survival and success.

Second, this study reveals the dimensions and elements for growth in a highly competitive industry and environment to provide an understanding on how entrepreneurs should operate their businesses, particularly the Small and Medium Sized Enterprises (SMEs), the backbone of economy. Identifying the main determinants of entrepreneurial activity is important for helping the decision or policy makers in adopting adequate measures to support the creation and development of new businesses. Small and medium-sized enterprises (SMEs) need to focus on their sustainability and growth during the early start-up stage. Theories and models developed for large firms do not necessarily apply to SMEs. Small firms have been found, for instance, to differ in their competitive behaviour from large firms, a difference which has important implications for their performance and growth. This research may help to mitigate the risk of applying policies that may not be suitable for developing countries because they are based on evidence from developed countries.

Finally, in this research the researcher also aims to address the question of whether the determinants of entrepreneurship are the same and/or have the same impact in developed and developing countries. The analysis leads to the conclusion that in general young Thai start-ups are facing similar challenges faced by the other young start-ups in developed countries but in a different manner. The impact of the key firm-based factors on the growth of these start-ups varied from that reported in previous studies.

8.8 Limitations of the study

This study does have a number of empirical limitations. First of all, a major limitation of the study is with regard to the extrapolation of the findings as the data used are limited to that collected from one developing country, Thailand.

The study has focused on phenomenon in selected industries, so it may not be valid in other contexts. Factors such as environmental differences, extent of government interventions and industry characteristics could suggest a different set of growth strategies for another location. Findings from the case studies and questionnaire survey may not be applicable to other countries in different regions.

The second limitation concerns the respondents in the questionnaire survey. Only three of the eight types of establishment could be used as the remaining five were too small in number to be meaningfully included in the analysis. The small representation may not represent the general opinion of all the technology-based firms in Thailand. As a result, the findings from this research are based on the limited sample however low response rate is common in surveys of top managers on strategy issues.

The third limitation is the validity of the responses collected from the interview. Since the research is on strategic management issues, only top managers/CEOs are suitable respondents for the survey, therefore, only one respondent in each firm was interviewed. This might have resulted in data bias if the decision-makers were more inclined to report optimistic or positive information, although there was no evidence to suggest the presence of common methods bias.

8.9 Recommendations for future research

Based on the limitations elucidated earlier, several recommendations can be made for future research.

The model tested in this study has successfully demonstrated the interactions among different strategic management dimensions in the Thai context. It would be valuable to generalize these findings by replicating the model in studies conducted in other developing countries. This would provide future researchers with a more comprehensive comparison among countries.

The young Thai start-ups are found to respond to the key firm-based factors innovatively and strategically in order to circumvent the constraints encountered

to foster growth. It may be important that this strategic behaviour is studied further to see whether these findings will hold in other Asian countries where the environment is diverse and dynamic so that the knowledge gained could be used to enhance the growth of new start-ups in general.

This study focuses only on growth experiences in the high technology industry, it could be replicated in other highly-volatile industries such as the automobile industry and energy industry.

The current research divides the samples based on type establishment to perform the analysis. On hind sight, it is believed that dividing the samples based on number of years in operation, for example, 1-2 years, 3-4 years, 5 years and above, may yield clearer picture about the role of the key contingent factors in the survival and growth of the hi-tech companies.

8.10 Concluding remarks

High-growth performance is highly related to the right opportunity, especially in terms of; getting the right resources and capabilities; and finally having the right people to craft and implement appropriate strategies for overcoming challenges to sustain performance. Thus it is hoped that this study will be a useful tool for policy makers and business owners, that it will direct their attention to the correct path and help them reap the reward of sustained business growth.

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APPENDICIES

Appendix 1 : The questionnaire (English Version)



No.	Introduction
1	<p>Good morning/Good afternoon. My name is</p> <p>I am currently a PhD student from University of Exeter Business School, United Kingdom and I would like to talk to the owner of your company or the managing director.</p> <p><i>Int.: Repeat this introduction until the right person is on the phone.</i></p> <p>The dissertation is on The Development of Young High Technology firms, this study seeks to identify the key firm-based factors that may be associated with longer term development of technology based firms. The themes we will examine during the following interview include the technological strategy of your company, the extent of your international business activities and possible factors constraining or assisting the growth process of your company.</p> <p>Do you have time now for the interview or when would it be appropriate for you?</p> <p><i>Int.: Please note down the name of the interviewee!</i></p> <div style="border: 1px solid black; height: 20px; width: 100%; background-color: #e0e0e0; margin: 10px 0;"></div> <p>OPTIONAL:</p> <p><i>Int.: Please note the date and the time the interviewee suggests for the interview.</i></p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="border: 1px solid black; width: 150px; height: 25px;"></div> date <div style="border: 1px solid black; width: 80px; height: 25px;"></div> time </div>

2	<p>May I first ask you what's your position in the company?</p> <p><i>Int.: Don't read!</i></p> <p>Owner/proprietor <input type="checkbox"/></p> <p>Managing director <input type="checkbox"/></p> <p>Plant manager <input type="checkbox"/></p> <p>R&D manager <input type="checkbox"/></p> <p>Departmental manager <input type="checkbox"/></p> <p>Commercial manager <input type="checkbox"/></p> <p>Other <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p> <p><i>Int.: If "other", please note down the position of the interviewee!</i></p> <div style="border: 1px solid black; height: 20px; width: 100%; background-color: #cccccc;"></div>																																																		
Background Details																																																			
3	<p>Was your company founded as:</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> <th style="width: 10%; text-align: center;">Don't know</th> <th style="width: 10%; text-align: center;">If Yes, what year?</th> </tr> </thead> <tbody> <tr> <td>A merger with a larger firm</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>B A merger with a similar sized firm</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>C Acquisition of another firm in your industry sector</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>D Acquisition of another firm outside your core industry sector</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>E A management buy-out or management buy-in</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>F A change of ownership</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>G A change of management</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>H Independent new firm</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td> refuse</td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> <td></td> </tr> </tbody> </table>		Yes	No	Don't know	If Yes, what year?	A merger with a larger firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		B A merger with a similar sized firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		C Acquisition of another firm in your industry sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		D Acquisition of another firm outside your core industry sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		E A management buy-out or management buy-in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		F A change of ownership	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		G A change of management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		H Independent new firm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		refuse		<input type="checkbox"/>		
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<p>4</p>	<p>How many persons are employed by your company today including the owners? Please state the number in full-time equivalents.</p> <p style="text-align: center;"><input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p> <p><i>Help for the interviewer:</i> <i>A full-time-equivalent is the conversion of the number of part-time employees in an equivalent number of full-time employees. In case of any difficulties with the conversion, 1 part-time employee counts for 1/2 full-time employee.</i></p>
<p>5</p>	<p>Please state the approximate share (percentage) of your total employees (including management) who have technical/scientific education at degree level</p> <p style="text-align: center;"><input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
<p>6</p>	<p>Please state the approximate share (percentage) of your total employees that are working outside Thailand currently</p> <p style="text-align: center;"><input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
<p>7</p>	<p>How many owners do you have currently?</p> <p style="text-align: center;"><input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>

<p>8</p>	<p>How many of the original founding team are still working in the firm today?</p> <p style="text-align: center;"><input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
<p>9</p>	<p>How many people are there in the current management team?</p> <p style="text-align: center;"><input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
<p>10</p>	<p>How many people in the current management team have previous industry experience outside your firm?</p> <p style="text-align: center;"><input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
<p>11</p>	<p>Please indicate the approximate share (percentage) of the current management team who have formal business qualifications (including university degrees and professional management qualifications)</p> <p style="text-align: center;"><input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>

Product Characteristics													
12	<p>What was your best selling product or service in the first and recent years in terms of revenue?</p> <p><i>Int.: Note down carefully:</i></p> <div style="border: 1px solid black; height: 40px; width: 100%; background-color: #e0e0e0; margin: 10px 0;"></div> <p>Help for the interviewer: <i>“Product or service” is defined as a series of closely related products or services (including various upgrades) whose core elements and technologies are identical. For example, a BMW 7 Series would be a particular product, a BMW 3 Series would be another one, although there are different models (i.e. BMW 318, BMW 323).</i></p>												
13	<p>Please indicate the share (percentage) of total turnover that was generated by your best selling product or service in the last two years</p> <p style="text-align: center;"><input style="width: 50px; height: 20px;" type="text"/> percent of total turnover</p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>												
14	<p>Please indicate the year in which this product or service was first sold.</p> <p style="text-align: center;"><input style="width: 50px; height: 20px;" type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>												
15	<p>Please indicate whether your product has been:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 15%;">Yes</th> <th style="text-align: center; width: 15%;">No</th> <th style="text-align: center; width: 10%;">DK</th> </tr> </thead> <tbody> <tr> <td>Developed primarily for the domestic market</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Developed with the intention to sell abroad</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		Yes	No	DK	Developed primarily for the domestic market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Developed with the intention to sell abroad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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16	Is your primary product/service a:	Yes	No	DK
	Capital goods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Intermediate goods or service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Final goods or service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Which of the following best describes a typical customer for your product or service? [Multiple answers allowed]	Yes.	No	DK
	A Businesses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	B Consumers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	C Government or public sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	D Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	don't know	<input type="checkbox"/>		
	refuse	<input type="checkbox"/>		
18	Please indicate the intensity of competition that you encounter in Thailand market			
	None = 1			
	Very intense = 5			
	<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>			
19	Please indicate how many direct competitors you have for your main product or service.			
	<input style="width: 100px; height: 20px;" type="text"/>			
	don't know	<input type="checkbox"/>		
	refuse	<input type="checkbox"/>		

<p>20</p>	<p>How would you describe the innovativeness of your product or service? I will read out to you different descriptions of technology possibly used to produce your product of service. Please state, which description best applies to your product or service.</p> <p><i>Int.: Read out the four descriptions <u>with</u> the related letters.</i></p> <p>A Your product incorporates “tried and tested” combinations of existing technology. <input type="checkbox"/></p> <p>B Your product incorporates new combinations of existing technology. <input type="checkbox"/></p> <p>C Your product incorporates novel technology that has been developed elsewhere. <input type="checkbox"/></p> <p>D Your product incorporates novel technology that had to be developed specifically for this product by your company. <input type="checkbox"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
<p>21</p>	<p>If we look at the core technologies embodied in your product or service, have there been any <i>incremental</i> or any <i>disruptive</i> changes in these technologies over the last two years?</p> <p>With an <i>incremental</i> change we mean</p> <p>A <i>disruptive</i> change means that you have had to invest in or develop significant new technologies or technological skills within the last two years in order to produce your product or service.</p> <p>Yes, incremental <input type="checkbox"/></p> <p>Yes, disruptive <input type="checkbox"/></p> <p>No change <input type="checkbox"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
<p>22</p>	<p>Please indicate the estimated time in years for a competitor to launch a similar product with superior performance or a product with similar performance at a lower price.</p> <p style="text-align: center;"><input type="text"/> months</p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>

23	<p>In order to sell a product or service successfully often requires a number of different sales support activities. Please indicate on a scale from 1 “unimportant” to 5 “very important” the extent to which your sales efforts require the following support activities</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;">unimportant</th> <th style="text-align: center;">important</th> <th style="text-align: center;">don't</th> <th style="text-align: center;">refuse know</th> </tr> </thead> <tbody> <tr> <td>A Technical consultation prior to sales</td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>B Individual client customisation</td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>C Specific configuration or system requirements</td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>D Complex or time-consuming installation</td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>E Regular maintenance and upgrades</td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>F Specialised training required for front-line and sales personnel</td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		unimportant	important	don't	refuse know	A Technical consultation prior to sales	<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	B Individual client customisation	<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	C Specific configuration or system requirements	<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	D Complex or time-consuming installation	<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	E Regular maintenance and upgrades	<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	F Specialised training required for front-line and sales personnel	<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
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International Activities																																				
24	<p>Now I have some questions to your international business activities. Please note that the following question now refer to the whole range of products and services of your company.</p> <p>Do you currently have any international sales?</p> <p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>																																			
25	<p>If no to Q24, Please indicate the year, when your company expect to sell abroad.</p> <p style="text-align: center;"><input style="width: 80px; height: 20px;" type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>																																			
26	<p>Please indicate the number of foreign countries to which you currently sell.</p> <p style="text-align: center;"><input style="width: 80px; height: 20px;" type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>																																			

27	<p>How are your total sales broken down by region? I read out to you several regions. Please indicate the percentage of total sales your company generated in this region in the recent year. If you don't know the numbers exactly, a rough estimate is also sufficient.</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;">percent</th> <th style="text-align: center;">don't know</th> </tr> </thead> <tbody> <tr> <td>A Domestic (Thailand) sales</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>B Western Europe</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>C Eastern Europe</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>D North America (USA, Canada, Mexico)</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>E Central and South America</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>F China</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>G India</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>H Other South East Asia</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>I Other</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p> <p>Checking: <i>The percentage values must sum up to 100 percent, plus/minus a tolerance of 10 percent. Help for the interviewer: "The given numbers are higher/smaller than 100 percent. Let us ..."</i></p>		percent	don't know	A Domestic (Thailand) sales	<input type="checkbox"/>	<input type="checkbox"/>	B Western Europe	<input type="checkbox"/>	<input type="checkbox"/>	C Eastern Europe	<input type="checkbox"/>	<input type="checkbox"/>	D North America (USA, Canada, Mexico)	<input type="checkbox"/>	<input type="checkbox"/>	E Central and South America	<input type="checkbox"/>	<input type="checkbox"/>	F China	<input type="checkbox"/>	<input type="checkbox"/>	G India	<input type="checkbox"/>	<input type="checkbox"/>	H Other South East Asia	<input type="checkbox"/>	<input type="checkbox"/>	I Other	<input type="checkbox"/>	<input type="checkbox"/>
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28	<p>Please indicate your 3 most important international markets, in order of magnitude, and the year in which you entered the market</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="width: 10%;"></th> <th style="text-align: center;">COUNTRY</th> <th style="text-align: center;">YEAR</th> </tr> </thead> <tbody> <tr> <td>1)</td> <td style="text-align: center;"><input style="width: 100%; height: 20px;" type="text"/></td> <td style="text-align: center;"><input style="width: 100%; height: 20px;" type="text"/></td> </tr> <tr> <td>2)</td> <td style="text-align: center;"><input style="width: 100%; height: 20px;" type="text"/></td> <td style="text-align: center;"><input style="width: 100%; height: 20px;" type="text"/></td> </tr> <tr> <td>3)</td> <td style="text-align: center;"><input style="width: 100%; height: 20px;" type="text"/></td> <td style="text-align: center;"><input style="width: 100%; height: 20px;" type="text"/></td> </tr> </tbody> </table>		COUNTRY	YEAR	1)	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 100%; height: 20px;" type="text"/>	2)	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 100%; height: 20px;" type="text"/>	3)	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 100%; height: 20px;" type="text"/>																		
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32 Please tell me in which areas of the world other than Thailand you produce goods or services.
[Multiple answers allowed]

A	Western Europe	<input type="checkbox"/>
B	Eastern Europe	<input type="checkbox"/>
C	North America (USA, Canada, Mexico)	<input type="checkbox"/>
D	Central and South America	<input type="checkbox"/>
E	China	<input type="checkbox"/>
F	India	<input type="checkbox"/>
G	Other South East Asia	<input type="checkbox"/>
H	Other	

don't know

refuse

Sources of Corporate Finance

After regarding your international business activities, let us turn to the sources of corporate finance of your company.

33 Over the years, please indicate how you have generally funded your business activities

	No	Yes	if Yes	what % of total	don't know	refuse
A Personal equity	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
B Directors' loans	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
C Retained Profit	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
D Other internal finance	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
E Short term loans	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
F Long term loans	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
G Other sources of debt	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
H Venture Capital	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
I Business Angels	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
J Grants	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
K Other external finance	<input type="checkbox"/>	<input type="checkbox"/>		<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>

		Factors Constraining Growth				
34	<p>I will now read out to you six factors that may constrain the growth of your business. Please indicate on a 5-point scale ranging from 1 “no constraint” up to 5 “very important constraint” the extent the named factor has constrained the growth process of your company.</p>					
		no constrain	very important constraint	don't know	refuse	
A	Availability of finance	□—□—□—□—□		□	□	
B	Availability of skilled employees	□—□—□—□—□		□	□	
C	Availability of experienced management	□—□—□—□—□		□	□	
D	Access to sales channels	□—□—□—□—□		□	□	
E	Access to commercial or market information	□—□—□—□—□		□	□	
F	Red tape or official regulations	□—□—□—□—□		□	□	
35	<p>The development of your company may be constrained by the shortage of skills within the management team. Please indicate on a 5-point scale ranging from 1 “no shortage” up to 5 “very serious shortage” whether you currently experience a shortage of skills within your team in the following fields of management.</p>					
		No Shortage	serious shortage	don't know	refuse	
A	Marketing	□—□—□—□—□		□	□	
B	Sales and distribution	□—□—□—□—□		□	□	
C	Financial management	□—□—□—□—□		□	□	
D	Organisation and general management	□—□—□—□—□		□	□	
E	Production, Manufacturing and Logistics	□—□—□—□—□		□	□	
F	Research and Development	□—□—□—□—□		□	□	

36	<p>Please indicate the extent to which you attribute your performance over the years to the following factors.</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 35%;"></th> <th style="width: 15%; text-align: center;">very unimportant</th> <th style="width: 15%; text-align: center;">very important</th> <th style="width: 10%; text-align: center;">don't know</th> <th style="width: 10%; text-align: center;">refuse</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Developing international markets</td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>B</td> <td>Developing new products/ services</td> <td style="text-align: center;"><input 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37	<p>On a 5-point scale ranging from 1 “well below the industry average” up to 5 “well above the industry average”, how would you rate your firm’s general performance over the years against the rest of the industry?</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 35%; text-align: center;">Well below</th> <th style="width: 15%;"></th> <th style="width: 15%; text-align: center;">Well above</th> <th style="width: 10%;"></th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>don't know</td> <td></td> <td></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>refuse</td> <td></td> <td></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </tbody> </table>		Well below		Well above				<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	don't know				<input type="checkbox"/>		refuse				<input type="checkbox"/>																															
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38	<p>We are now interested in where your company stands in relation to the industry. On a scale of 1 ‘very low’ to 5 ‘very high’ please rate the level of advanced technology in your industry.</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 35%; text-align: center;">Very low</th> <th style="width: 15%;"></th> <th style="width: 15%; text-align: center;">Very high</th> <th style="width: 10%; text-align: center;">DK</th> <th style="width: 10%; text-align: center;">Refuse</th> </tr> </thead> <tbody> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td></td> <td colspan="5">Now on a scale of 1 ‘well behind’ to 5 ‘well in front’, how do you rate your firm’s current position with regard to the industry level of technology against the rest of your industry?</td> </tr> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/></td> <td></td> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		Very low		Very high	DK	Refuse		<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		Now on a scale of 1 ‘well behind’ to 5 ‘well in front’, how do you rate your firm’s current position with regard to the industry level of technology against the rest of your industry?						<input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/> — <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>																														
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39	<p>We are now interested in where your company stands in relation to the industry. On a scale of 1 'very low' to 5 'very high' please rate the rate of innovation in your industry.</p> <p style="text-align: center;"> Very low Very high DK Refuse </p> <p style="text-align: center;"> <input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </p> <p>Now on a scale of 1 'well behind' to 5 'well in front', how do you rate your firm's current position relative to the current rate of innovation</p> <p style="text-align: center;"> Well behind Well in front </p> <p style="text-align: center;"> <input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </p>
40	<p>We are now interested in where your company stands in relation to the industry. On a scale of 1 'very low' to 5 'very high' please rate the availability of skills for your industry</p> <p style="text-align: center;"> Very low Very high DK Refuse </p> <p style="text-align: center;"> <input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </p> <p>Now on a scale of 1 'well behind' to 5 'well in front', how do you rate your firm's access to skills relative to the industry overall</p> <p style="text-align: center;"> Well behind Well in front DK Refuse </p> <p style="text-align: center;"> <input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </p>
41	<p>On a scale of 1 'very low' to 5 'very high' please rate the level of investment in new capacity in your industry.</p> <p style="text-align: center;"> Very low Very high DK Refuse </p> <p style="text-align: center;"> <input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </p> <p>Now on a scale of 1 'well behind' to 5 'well in front', how do you rate your firm's current position relative to the industry benchmark on investment in new capacity</p> <p style="text-align: center;"> Well behind Well in front DK Refuse </p> <p style="text-align: center;"> <input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </p>

General Company Information	
42	<p>Finally, I would like to ask you some general questions about your company.</p> <p>Please indicate the total sales turnover of your company for the last full financial year and the year the quoted figure is referred to.</p> <p>sales in £'000s <input type="text"/> last financial year <input type="text"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p> <p><i>Help for the interviewer:</i> As the last financial year we regard XXX</p>
43	<p>Has your company carried out Research and Development activities regularly, occasionally, or not at all?</p> <p>A regularly <input type="checkbox"/></p> <p>B occasionally <input type="checkbox"/></p> <p>C no R&D activities <input type="checkbox"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
44	<p>How much did you spend on research and development in your last financial year as percentage of total sales? If you don't know the percentage exactly, a rough estimate is also sufficient.</p> <p style="text-align: center;"><input type="text"/> percent of total sales</p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p> <p><i>Help for the interviewer:</i> As the last financial year we regard</p>

45	<p>Over the years, how has your R&D intensity changed? Please use a scale of 1 'decreased significantly' to 5 'increased significantly'</p> <p style="text-align: center;"> Decreased Significantly Increased significantly </p> <p style="text-align: center;"> <input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/>—<input type="checkbox"/> </p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
46	<p>How many employees (including the owners) currently work for at least 50 percent of their time on research and the development of existing and new products? You can either state the absolute number of R&D employees in full time equivalents or their percentage of all employees.</p> <p style="text-align: center;"> <input type="text"/> absolute number of R&D employees <input type="text"/> percentage of R&D employees </p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>
47	<p>Does your company plans to carry out Research and Development activities in the next two years?</p> <p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p> <p>don't know <input type="checkbox"/></p> <p>refuse <input type="checkbox"/></p>

Thank you for your cooperation

Appendix 2 : The questionnaire (Thai Version)



แนะนำตัว สวัสดีครับ/ค่ะ กระผม/ดิฉัน ชื่อ.....กระผม/ดิฉันเป็นนักศึกษาระดับ **ปริญญาเอก** (หรือกระผม/ดิฉัน เป็นตัวแทนนักศึกษาระดับ **ปริญญาเอก**) จาก คณะบริหารธุรกิจ University of Exeter ประเทศสหราชอาณาจักร และดิฉัน/กระผมใคร่ขอพูดคุยกับเจ้าของบริษัทหรือกรรมการผู้จัดการ ค่ะ/ครับ **ข้อแนะนำ : แนะนำตัวซ้ำ ๆ จนกว่าบุคคลที่ถูกต้อง(ที่ต้องการ)จะอยู่ในสาย**

ชื่องานวิทยานิพนธ์ฉบับนี้คือ การพัฒนาธุรกิจประเภทไฮเทคเทคโนโลยีของผู้ประกอบการใหม่ เป้าหมายของงานวิจัย ฉบับนี้เพื่อ ต้องการทราบว่าปัจจัยพื้นฐานสำคัญของธุรกิจชนิดใด ที่อาจจะมีส่วนเกี่ยวข้องกับการพัฒนาในระยะยาว ของธุรกิจประเภทนี้

รูปแบบที่เราจะพิจารณาตลอดการสนทนานี้คือการกำหนดกลยุทธ์ทางเทคโนโลยีในบริษัท ขอบเขตการดำเนิน กิจกรรมทางธุรกิจในระดับนานาชาติของบริษัท และปัจจัยที่เป็นไปได้ที่กระตุ้นหรือช่วยสนับสนุนให้เกิด กระบวนการเติบโตของบริษัทของคุณ

คุณมีเวลาสำหรับการให้สัมภาษณ์ในตอนนี้ไหม หรือเมื่อไหร่(ช่วงเวลาใด)ที่จะสะดวกสำหรับคุณ ค่ะ/ครับ **ข้อแนะนำ: ให้เขียนชื่อของผู้ให้สัมภาษณ์(ในช่องข้างล่าง)**

.....

ทางเลือกเพิ่มเติม: ข้อแนะนำ: ให้ระบุวันที่และเวลาที่ผู้ให้สัมภาษณ์แนะนำไว้สำหรับการสัมภาษณ์ วันที่..... เวลา.....

1 - อันดับแรก ดิฉันขอเรียนถามว่า คุณดำรงตำแหน่งใดในบริษัทคะ **ข้อแนะนำ : ไม่ต้องอ่าน**

เจ้าของ/ผู้ถือครอง..... กรรมการผู้จัดการ..... ผู้จัดการโรงงาน.....

ผู้จัดการฝ่ายวิจัยและพัฒนา.....

ผู้จัดการแผนก.....ผู้จัดการเชิงพาณิชย์ การค้า หรือการตลาด..... อื่นๆ

ปฏิเสธ.....

ข้อแนะนำ: ถ้าตอบ “อื่น ๆ” ให้เขียนตำแหน่งของผู้ให้สัมภาษณ์ข้างล่างนี้

.....

.....

รายละเอียดพื้นฐาน

2 - บริษัทของคุณ ได้รับการก่อตั้งขึ้นปีใด.....

3 - ในช่วงระยะเวลาปีที่ผ่านมา บริษัทของคุณ ได้ประสบกับเหตุการณ์ต่อไปนี้บ้างใช่หรือไม่

	ใช่	ไม่ใช่	ไม่รู้	ถ้าใช่ ปีใด,
A- การรวมกันกับบริษัทที่ใหญ่กว่า
B- การรวมกันกับบริษัทที่มีขนาดพอๆ กัน
C- การซื้อกิจการของบริษัทอื่นในภาคอุตสาหกรรม เดียวกัน
D- การซื้อกิจการของบริษัทอื่นนอกภาค อุตสาหกรรมหลักของคุณ
E- ผู้บริหารที่มาจาก การซื้อหุ้นจากหุ้นส่วนใหญ่ ภายในบริษัท หรือ ผู้บริหารที่เข้ามาถือครอง จากบุคคลภายนอก
F- การเปลี่ยนแปลงเจ้าของ
G- การเปลี่ยนแปลงผู้บริหาร
H- บริษัทเอกเทศ (เป็นอิสระ) รายใหม่

4 - จำนวนคนที่ว่าจ้าง โดยบริษัทของคุณรวมทั้งเจ้าของ มีจำนวนเท่าไร

กรุณาระบุจำนวนบุคคลที่ทำงานที่เทียบเท่าเต็มเวลา.....

ไม่รู้.....

ปฏิเสธ.....

ข้อช่วยเหลือสำหรับผู้สัมภาษณ์:

จำนวนที่เทียบเท่าเต็มเวลาคือการแปลงจำนวนพนักงานนอกเวลาเทียบกับจำนวนพนักงานเต็มเวลา ในกรณีที่เกิดความยุ่งยากในการแปลง ให้พนักงานนอกเวลาหนึ่งคน นับเป็น 1/2 คนของพนักงานเต็มเวลา

5 - กรุณาระบุสัดส่วนพนักงานในบริษัทโดยการประมาณการ (เป็นร้อยละ) ของผู้ที่จบการศึกษาในระดับประกาศนียบัตร หรือในระดับปริญญา ต่อพนักงานโดยรวม(รวมถึงระดับผู้บริหาร)

.....

ไม่รู้.....

ปฏิเสธ.....

6 - กรุณาระบุสัดส่วนพนักงานของบริษัทโดยประมาณ (เป็นร้อยละ) ที่ปัจจุบันได้ไปทำงานอยู่นอกประเทศไทย ต่อพนักงานรวม

.....

ไม่รู้.....

ปฏิเสธ.....

7 - ในปัจจุบันมีเจ้าของกิจการหรือผู้ถือหุ้นในบริษัทกี่คน

.....

ไม่รู้..... ปฏิเสธ.....

8 - ทีมผู้ก่อตั้งดั้งเดิมมีกี่คนที่ยังทำงานอยู่ในบริษัทในปัจจุบัน

.....

ไม่รู้..... ปฏิเสธ.....

9 - ทีมผู้บริหารในปัจจุบันมีกี่คน

.....

ไม่รู้..... ปฏิเสธ.....

10 - ทีมผู้บริหารในปัจจุบัน ที่มีประสบการณ์ทำงานในภาคอุตสาหกรรมจากภายนอกมาก่อน มีจำนวนกี่คน

.....

ไม่รู้..... ปฏิเสธ.....

11 - กรณาระบุสัดส่วน (เป็นร้อยละ) ของทีมผู้บริหารในปัจจุบัน ที่ผ่านคุณสมบัติด้านงานบริหารธุรกิจ (รวมถึงผู้ที่จบการศึกษาในระดับปริญญาบัตรจากมหาวิทยาลัยและผู้ที่ได้รับใบประกอบวิชาชีพด้านงานบริหาร)

.....

ไม่รู้..... ปฏิเสธ.....

คุณลักษณะของสินค้า

12 - สินค้าหรือบริการชนิดใดที่ขายดีที่สุดในช่วงปีหนึ่ง และ ปีล่าสุด ของการดำเนินกิจการ ในแง่ของรายได้

ข้อแนะนำ : บันทึกลงไปอย่างระมัดระวัง

.....
.....

ข้อช่วยเหลือสำหรับผู้สัมภาษณ์:

“สินค้าหรือบริการ” นิยามให้เป็นชุดของสินค้าหรือบริการที่มีความเกี่ยวข้องกัน (รวมถึงการอัปเดตต่างๆของสินค้าและบริการ) ซึ่งมีชิ้นส่วนหลักและเทคโนโลยียังคงเป็นแบบเดิม ยกตัวอย่างเช่น BMW ซีรี่ 7 ที่เป็นผลิตภัณฑ์จำเพาะ, BMW ซีรี่ 3 ก็เป็นอีกผลิตภัณฑ์จำเพาะเหมือนกัน แม้ว่าโมเดลจะแตกต่างกันก็ตาม (เช่น BMW 318, BMW 323).

13 - กรณาระบุสัดส่วนโดยประมาณ (เป็นร้อยละ) ต่อผลประกอบการรวม กับที่ได้มาจากสินค้าหรือบริการที่ขายดีที่สุดในช่วงสองปีที่ผ่านมา

..... ร้อยละของผลประกอบการรวม

ไม่รู้..... ปฏิเสธ.....

14 - กรุณาระบุปีที่สินค้าหรือบริการนี้ได้ออกวางขายเป็นครั้งแรก

.....
ไม่รู้..... ปฏิเสธ.....

15 - กรุณาระบุว่าสินค้าของคุณเป็นสินค้าที่ :

	ใช่	ไม่ใช่	ไม่รู้
พัฒนาเริ่มแรกสำหรับตลาดภายในประเทศ
พัฒนาเพื่อที่จะส่งออกขายยังต่างประเทศ

16 - สินค้า/บริการหลักของคุณคือ:

	ใช่	ไม่ใช่	ไม่รู้
สินค้าหรือบริการประเภททุน (เครื่องมือเครื่องจักรที่ใช้ในการผลิต)
สินค้าหรือบริการชั้นกลาง (นำไปใช้เป็นปัจจัยในการผลิต)
สินค้าหรือบริการ เพื่ออุปโภคบริโภค
อื่น ๆ

17 - ข้อใดต่อไปนี ที่บรรยายถึงลูกค้าที่ใช้ผลิตภัณฑ์หรือบริการของคุณ ได้ตรงที่สุด [ตอบได้หลายข้อ]

	ใช่	ไม่ใช่	ไม่รู้
A- กลุ่มธุรกิจ
B- กลุ่มผู้บริโภค
C- ภาครัฐหรือเอกชน
D- อื่น ๆ.....

18 - กรุณาระบุระดับความเข้มข้นของการแข่งขันที่คุณเผชิญอยู่ในตลาดประเทศไทย

(ให้วงกลมรอบหมายเลข 1-5 โดยที่ 1=ไม่มีเลย 5 = แข่งขันสูงมาก) 1 2 3 4 5

19 - กรุณาระบุจำนวนคู่แข่งโดยตรงที่คุณมี สำหรับสินค้าหรือบริการหลักของคุณ

.....
ไม่รู้ ปฏิเสธ

20 - คุณจะบรรยายถึงนวัตกรรมของสินค้าหรือบริการของคุณอย่างไร ดิฉันจะอ่านลักษณะของเทคโนโลยีที่เป็นไปได้ ที่ใช้ใน

การผลิตสินค้าหรือบริการ กรุณาระบุว่าข้อไหนที่ใช้กับสินค้าหรือบริการของคุณได้ตรงที่สุด

ข้อแนะนำ: อ่านคุณลักษณะทั้งสี่ข้อพร้อมกับตัวอักษรที่สัมพันธ์กัน

A- สินค้าของคุณเกิดจาก “การทดลองนำสินค้าไปใช้จริง” ด้วยการผสมผสานของเทคโนโลยีที่มีอยู่ในปัจจุบัน

.....

B- สินค้าของคุณเกิดจากการผสมผสานกันขึ้นมาใหม่จากเทคโนโลยีที่ใช้อยู่ในปัจจุบัน

.....

C- สินค้าของคุณเกิดจากการผสมผสานกันของเทคโนโลยีสมัยใหม่ที่ได้ถูกพัฒนามาแล้วจากที่อื่น

.....

D- สินค้าของคุณเกิดจากการผสมผสานกันของเทคโนโลยีสมัยใหม่ที่ถูกพัฒนาขึ้นมาเป็นพิเศษโดยบริษัทของคุณเองเพื่อสินค้าของคุณโดยเฉพาะ

.....

ไม่รู้..... ปฏิเสธ.....

21 - ถ้าเราพิจารณาถึงแกนหลักของเทคโนโลยี ที่ถูกนำมาใช้กับสินค้าหรือบริการของคุณที่ผ่านมา ในช่วงระยะเวลาสองปีที่ผ่านมา เทคโนโลยีที่ใช้ได้ถูกเปลี่ยนแปลง ในแบบทิศทางที่ค่อย ๆ เป็นค่อย ๆ ไปอย่างต่อเนื่อง หรือเป็นการเปลี่ยนแปลงแบบฉับพลัน

โดย การเปลี่ยนแปลงแบบฉับพลัน เราหมายถึง คุณต้องมีการลงทุนหรือได้ทำการพัฒนาเทคโนโลยีใหม่ ๆ หรือทักษะต่าง ๆ ทางเทคโนโลยี อย่างมีนัยสำคัญ ภายในช่วงระยะเวลาสองปีที่ผ่านมา เพื่อใช้สำหรับการผลิตสินค้าหรือบริการ

ใช่ เป็นแบบค่อยๆเป็นค่อยๆไป.....

ใช่ เป็นแบบฉับพลัน.....

ไม่เปลี่ยนแปลง.....

ไม่รู้.....

ปฏิเสธ.....

22 - กรุณาระบุโดยการประมาณการว่าในช่วงเวลาใดบ้างของปี ที่บริษัทคู่แข่งออกสินค้าที่มีคุณลักษณะที่เหนือกว่า หรือคุณลักษณะที่พอ ๆ กัน ด้วยราคาที่ต่ำกว่าบริษัทของคุณ

.....เดือน

ไม่รู้.....

ปฏิเสธ.....

23 - การที่จะประสบความสำเร็จในการขายสินค้าหรือบริการนั้น บ่อยครั้งที่จะต้องอาศัยกิจกรรมส่งเสริมการขาย หลาย ๆ แบบ กรุณาระบุตัวเลขจาก 1 คือ “ไม่สำคัญเลย” ถึง 5 คือ “สำคัญมาก” เพื่อบ่งบอกได้ว่าโดยรวมค่าใช้จ่ายในการขายทั้งหมดนั้นคุณได้ใช้ในการสนับสนุนกิจกรรมต่อไปนี้มากน้อยเพียงใด

A- การปรึกษาทางด้านเทคนิคก่อนการวางขาย 1 2 3 4 5

B- การปรับรูปแบบสินค้าให้เหมาะกับลูกค้าเฉพาะราย 1 2 3 4 5

C- การกำหนดโครงสร้างเฉพาะหรือความต้องการด้านระบบ 1 2 3 4 5

D- การติดตั้งที่ซับซ้อนหรือใช้เวลานาน 1 2 3 4 5

E- การบำรุงรักษาและการอัปเดตอย่างสม่ำเสมอ 1 2 3 4 5

F- การจัดฝึกอบรมสำหรับพนักงานส่วนหน้า (ติดต่อกู้คำ) และพนักงานขาย 1 2 3 4 5

กิจกรรมระดับนานาชาติ

24 - ตอนนี้ดิฉันมีคำถามที่เกี่ยวกับกิจกรรมทางธุรกิจระหว่างประเทศของคุณ และโปรดทราบว่าคำถามต่อไปนี้ จะเกี่ยวข้องกับสินค้าและบริการทุกประเภท ในบริษัทของคุณ ปัจจุบันคุณมีการขายในต่างประเทศหรือไม่

มี..... ไม่มี..... ไม่รู้..... ปฏิเสธ.....

25 - ถ้าตอบ **ไม่มี** ในข้อ 24 กรุณาระบุปี ว่าเมื่อไหร่ที่บริษัทของคุณคาดว่าจะมีการขายระดับนานาชาติ

จำนวนปี/พ.ศ. ไม่รู้..... ปฏิเสธ.....

26 - กรุณาระบุจำนวนประเทศ (**ต่างประเทศ**) ที่คุณคิดต่อค้าขายอยู่ในปัจจุบัน

.....
ไม่รู้..... ปฏิเสธ.....

27 - ยอดขายรวมทั้งหมดของคุณ โดยแบ่งแยกตามภูมิภาคเป็นอย่างไรบ้าง ดิฉันจะอ่านชื่อภูมิภาคต่างๆให้คุณทราบ โดยให้คุณระบุตัวเลขยอดขายรวมเป็นเปอร์เซ็นต์ ที่บริษัทของคุณได้ดำเนินการในภูมิภาคต่างๆ เหล่านั้นในปีล่าสุด ถ้าคุณไม่ทราบจำนวนเปอร์เซ็นต์ ที่แท้จริง อาจจะประมาณการแบบหยาบ ๆ ก็ได้

A - ยอดขายภายในประเทศ (ไทย) ร้อยละ..... ไม่รู้

.....

B - ยุโรปตะวันตก ร้อยละ..... ไม่รู้

.....

C - ยุโรปตะวันออก ร้อยละ..... ไม่รู้

.....

D - อเมริกาเหนือ (สหรัฐอเมริกา แคนาดา เม็กซิโก) ร้อยละ..... ไม่รู้

.....

E - อเมริกากลางและอเมริกาใต้ ร้อยละ..... ไม่รู้

.....

F - จีน ร้อยละ..... ไม่รู้

.....

G - อินเดีย ร้อยละ..... ไม่รู้

.....

H - เอเชียตะวันออกเฉียงใต้อื่น ๆ ร้อยละ..... ไม่รู้

.....

I - อื่น ๆ ร้อยละ..... ไม่รู้

.....

ไม่รู้..... ปฏิเสธ.....

การตรวจสอบ

ค่าร้อยละจะต้องรวมขึ้นได้เป็น 100 บวกหรือลบอีกไม่เกินร้อยละ 10

ข้อช่วยสำหรับผู้สัมภาษณ์: “ร้อยละที่รวมได้นั้นมากกว่าหรือน้อยกว่า 100 ให้ระบุ”

28 - กรุณาระบุ ตลาดต่างประเทศที่สำคัญที่สุด 3 อันดับแรก เรียงตามขนาด และปีที่เข้าสู่ตลาด

ประเทศ 1)..... ปี (พ.ศ.).....
2).....
3).....

29 - ทั้งสามประเทศข้างต้น กรุณาระบุระดับความเข้มข้นของการแข่งขันในประเทศนั้น ๆ

กรุณาระบุตัวเลขจาก 1 = ไม่มีเลย ถึง 5 = แข่งขันสูงมาก

ประเทศ 1: 1 2 3 4 5
ประเทศ 2: 1 2 3 4 5
ประเทศ 3: 1 2 3 4 5

30 - ดิฉันจะอ่านวิธีค้าขายยังต่างประเทศ ซึ่งแตกต่างกันหกวิธี กรุณาระบุรูปแบบการขายที่โดดเด่น ที่คุณใช้ในการขายยังต่างประเทศนั้น

ข้อแนะนำ :ให้อ่านคำตอบทั้งหกข้อ

A - ส่งออกไปยังกลุ่มผู้ใช้โดยตรง
B - ตัวแทนขายในต่างประเทศ หรือผู้จำหน่ายสินค้าหรือบริการของคุณ
C - บริษัทดำเนินการขายในต่างประเทศ โดยวิธีการร่วมทุน
D - บริษัทดำเนินการขายในต่างประเทศ โดยลงทุนเองทั้งหมด
E - ขายลิขสิทธิ์
ไม่รู้ ปฏิเสธ.....

31 - สินค้าและบริการของบริษัทของคุณได้ผลิตในประเทศไทยเท่านั้น หรือผลิตที่ต่างประเทศ หรือผลิตทั้งในและต่างประเทศ

A - ผลิตภายในประเทศเท่านั้น
B - ผลิตที่ต่างประเทศเท่านั้น
C - ผลิตทั้งในและต่างประเทศ
ไม่รู้..... ปฏิเสธ.....

32 - กรุณาระบุว่ามีที่ใดอีกบ้างในโลกนี้ออกเหนือจากประเทศไทยที่คุณใช้ผลิตสินค้าหรือบริการ

[ตอบได้หลายข้อ]

A - ยุโรปตะวันตก
B - ยุโรปตะวันออก
C - อเมริกาเหนือ (สหรัฐอเมริกา, แคนาดา, เม็กซิโก)
D - อเมริกากลางและอเมริกาใต้
E - จีน
F - อินเดีย
G - เอเชียตะวันออกเฉียงใต้อื่น ๆ

H - อื่นๆ
 ไม่รู้..... ปฏิเสธ.....

แหล่งการเงินของบริษัท

33 - หลังจากที่ได้พูดคุยกันถึงกิจกรรมการชำระค่านานาชาติแล้ว เรามาคูถึงงบการเงินของบริษัทของคุณกัน
 ภายในช่วงเวลาที่ผ่านมา กรุณาระบุว่าโดยทั่วไปคุณได้เงินทุนมาอย่างไรบ้างสำหรับใช้ในกิจการทางธุรกิจ

	ไม่ใช่	ใช่	ถ้าใช่ ก็% ต่อผลรวม	ไม่รู้	ปฏิเสธ
A - ทุนส่วนตัว
B - เงินกู้ของกรรมการผู้บริหาร
C - กำไรสะสม
D - แหล่งเงินทุนภายในอื่นๆ
E - เงินกู้ระยะสั้น
F - เงินกู้ระยะยาว
G - แหล่งเงินกู้อื่นๆ
H - ทุนจากบริษัทร่วมลงทุน
I - ทุนจากนักลงทุนส่วนบุคคล
J - เงินช่วยเหลือจากรัฐบาล
K - แหล่งเงินทุนภายนอกอื่นๆ

ปัจจัยที่เป็นตัวกำหนดต่อการเติบโต

34 - คุณน่าจะอ่านปัจจัยหกข้อที่อาจมีส่วนเป็นกำหนดให้ธุรกิจของบริษัทคุณเติบโต กรุณาระบุระดับจากตัวเลือกห้า
 ระดับ โดย 1 คือไม่มีผล ถึง 5 คือมีผลอย่างยิ่ง โดยระบุตามปัจจัยต่อไปนี้ที่มีผลต่อกระบวนการเติบโตของบริษัท
 ของคุณในช่วงตลอดเวลาที่ผ่านมา

A - ความพร้อมทางการเงิน	1	2	3	4	5	ไม่
รู้..... ปฏิเสธ.....						
B - ความพร้อมของพนักงานที่มีฝีมือ	1	2	3	4	5	ไม่
รู้..... ปฏิเสธ.....						
C - ความพร้อมของผู้บริหารที่มีประสบการณ์	1	2	3	4	5	ไม่
รู้..... ปฏิเสธ.....						
D - การเข้าถึงช่องทางการขาย	1	2	3	4	5	ไม่
รู้..... ปฏิเสธ.....						
E - การเข้าถึงข้อมูลเชิงการค้าหรือข้อมูลทางการตลาด	1	2	3	4	5	ไม่
รู้..... ปฏิเสธ.....						

F — ความล่าช้าในการเดินเรื่องหรือกฎระเบียบทางราชการ	1	2	3	4
5 ไม่รู้..... ปฏิเสธ....				

35 - การพัฒนาของบริษัทคุณอาจจะเกิดข้อจำกัดจากการขาดแคลนทักษะการทำงานของทีมงานของทีมผู้บริหาร กรุณาระบุจากตัวเลือกห้าระดับ จาก 1 คือไม่ขาดแคลน ถึง 5 คือขาดแคลนอย่างมาก ในช่วงระยะเวลาที่ผ่านมา ในทีมบริหารของคุณขาดทักษะเรื่องต่างๆต่อไปนี้บ้างหรือไม่

A- การตลาด	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
B- การขายและการกระจายสินค้า	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
C- การจัดการด้านการเงิน	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
D- การจัดการทั่วไปและการจัดการองค์กร	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
E- การผลิต และระบบโลจิสติกส์	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
F- การวิจัยและพัฒนา	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					

36 — กรุณาระบุ ระดับความสำคัญในปัจจุบันที่กำหนดให้ต่อไปนี้ ที่มีส่วนต่อผลการดำเนินงานของคุณตลอดระยะเวลาที่ผ่านมา จาก 1 คือไม่สำคัญเลย ถึง 5 คือขาดแคลนอย่างมาก

A — พัฒนาการตลาดในระดับนานาชาติ	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
B — พัฒนาการสินค้าหรือบริการใหม่ ๆ	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
C — การลงทุนในทรัพยากรมนุษย์	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
D — การเข้าถึงทีมงานที่มีทักษะอาชีพ	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
E — การร่วมมือกันกับบริษัทอื่น ๆ	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
F - การร่วมมือกับองค์กรอื่น ๆ (เช่น มหาวิทยาลัย)	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					
G — นวัตกรรม	1	2	3	4	5 ไม่รู้.....
ปฏิเสธ.....					

H - ความสะดวกในการลงทุน 1 2 3 4 5 ไม่รู้.....
ปฏิบัติ.....

37 - กำหนดการแบ่ง 5 ระดับ จาก 1 คือ “ทำได้ต่ำกว่าค่าเฉลี่ยของอุตสาหกรรม” ถึง 5 คือ “ทำได้ดีกว่าค่าเฉลี่ยของอุตสาหกรรม” คุณจะให้ตัวเลขระดับใดต่อผลการประกอบการโดยทั่วไปของบริษัทคุณในช่วงระยะเวลาที่ผ่านมา โดยการเทียบกับบริษัทอื่นๆในอุตสาหกรรมเดียวกัน

1 2 3 4 5 ไม่รู้..... ปฏิบัติ.....

38 - เราสนใจที่จะทราบว่า บริษัทของคุณ ขึ้นอยู่ในระดับใดของอุตสาหกรรมประเภทไฮเทคเทคโนโลยี กรุณาระบุระดับความก้าวหน้าทางเทคโนโลยีของบริษัทคุณโดยเทียบเคียงภายในอุตสาหกรรมนี้ จากระดับ 1 คือ ต่ำมาก ถึงระดับ 5 คือ สูงมาก

1 2 3 4 5 ไม่รู้..... ปฏิบัติ.....

บนสเกลที่ 1 คือ ‘ทำได้ล่าช้า’ ถึง 5 คือ ‘ทำได้นำหน้า’ คุณคิดว่าในปัจจุบันนี้บริษัทของคุณอยู่ในตำแหน่งใด เมื่อเปรียบเทียบกับระดับเทคโนโลยีของบริษัทคุณ กับบริษัทอื่นๆภายในอุตสาหกรรมเดียวกัน

1 2 3 4 5 ไม่รู้..... ปฏิบัติ.....

39 - เราสนใจที่จะทราบว่า บริษัทของคุณ ขึ้นอยู่ในระดับใดของอุตสาหกรรมประเภทไฮเทคเทคโนโลยี กรุณาระบุระดับนวัตกรรมของบริษัทคุณโดยเทียบเคียงภายในอุตสาหกรรมนี้ จากระดับ 1 คือ ต่ำมาก ถึง ระดับ 5 คือ สูงมาก

1 2 3 4 5 ไม่รู้..... ปฏิบัติ.....

บนสเกลที่ 1 คือ ‘ทำได้ล่าช้า’ ถึง 5 คือ ‘ทำได้นำหน้า’ คุณคิดว่าระดับนวัตกรรมบริษัทของคุณอยู่ในตำแหน่งใด เมื่อเปรียบเทียบกับนวัตกรรมในระดับปัจจุบัน

1 2 3 4 5 ไม่รู้..... ปฏิบัติ.....

40 - เราสนใจที่จะทราบว่า บริษัทของคุณ ขึ้นอยู่ในระดับใดของอุตสาหกรรมประเภทไฮเทคเทคโนโลยี กรุณาระบุระดับความพร้อมทางด้านทักษะต่างๆของบริษัทคุณโดยเทียบเคียงภายในอุตสาหกรรมนี้ จากระดับ 1 คือ ต่ำมาก ถึง ระดับ 5 คือ สูงมาก

1 2 3 4 5 ไม่รู้..... ปฏิบัติ.....

บนสเกลที่ 1 คือ ‘ทำได้ล่าช้า’ ถึง 5 คือ ‘ทำได้นำหน้า’ คุณคิดว่าระดับการเข้าถึงทักษะต่างๆของบริษัทคุณอยู่ในตำแหน่งใด เมื่อเปรียบเทียบกับอุตสาหกรรมโดยรวม

1 2 3 4 5 ไม่รู้..... ปฏิบัติ.....

41 - ในสเกลที่ 1 คือ ‘ต่ำมาก’ ถึง 5 คือ ‘สูงมาก’ กรุณาระบุระดับการลงทุนในการเพิ่มกำลังการผลิตใหม่ในอุตสาหกรรมของคุณ

1 2 3 4 5 ไม่รู้..... ปฏิบัติ.....

ในสเกล 1 คือ 'ล้าหลังมาก' ถึง 5 คือ 'นำหน้ามาก' คุณคิดว่าการลงทุนในการเพิ่มกำลังการผลิตของบริษัทของคุณ
ที่เป็นอยู่ในปัจจุบัน

อยู่ที่ตำแหน่งใด เมื่อเทียบกับมาตรฐานในกลุ่มอุตสาหกรรมเดียวกัน

1 2 3 4 5 ไม่รู้..... ปฏิเสธ.....

ข้อมูลทั่วไปของบริษัท

42 - สุดท้ายนี้ฉันขอเรียนถามคุณในคำถามทั่วไปเกี่ยวกับบริษัทของคุณ

กรุณาระบุผลประกอบการรวมของบริษัทคุณในปีบัญชีล่าสุด และระบุปีดังกล่าว

ยอดขาย หน่วย พันบาท ปีบัญชีล่าสุด ไม่รู้.....

ปฏิเสธ.....

ข้อช่วยเหลือสำหรับผู้สัมภาษณ์

ปีบัญชีล่าสุดดังกล่าว เรานับเป็น XXX

43 - ในช่วงระยะเวลาที่ผ่านมา บริษัทของคุณได้ทำการวิจัยและพัฒนาอย่างสม่ำเสมอ หรือเป็นบางโอกาส หรือไม่
เคยทำเลย

A- อย่างสม่ำเสมอ B- เป็นบางโอกาส

C- ไม่มีกิจกรรมวิจัยและพัฒนา ไม่รู้..... ปฏิเสธ.....

44 - คุณใช้จ่ายเงินมากเท่าไรในการวิจัยและพัฒนาภายในปีบัญชีล่าสุด เทียบกับเปอร์เซ็นต์ยอดขายทั้งหมดของ
บริษัท

ถ้าคุณไม่รู้ค่าร้อยละที่ถูกต้อง ให้ประมาณการเอาก็ได้

..... ร้อยละของยอดขายรวม ไม่รู้..... ปฏิเสธ.....

ข้อช่วยเหลือสำหรับผู้สัมภาษณ์ ปีบัญชีล่าสุดดังกล่าว เรานับ

45 - ตลอดระยะเวลาที่ผ่านมา ระดับการเอาใจจริงเอาใจต่อการวิจัยและพัฒนาของคุณเปลี่ยนแปลงหรือไม่ กรุณาให้
ตัวเลขซึ่ง 1 คือลดลงอย่างชัดเจน ถึง 5 ซึ่งคือเพิ่มขึ้นอย่างชัดเจน

1 2 3 4 5 ไม่รู้..... ปฏิเสธ.....

46 - มีพนักงานกี่คน (รวมทั้งเจ้าของ) ที่ในปัจจุบันทำงานอย่างน้อยร้อยละห้าสามของเวลางาน ในการทำวิจัยและ
พัฒนาในสินค้าเดิมที่มีอยู่หรือในสินค้าตัวใหม่ โดยคุณสามารถระบุได้ทั้งจำนวนที่แท้จริงของพนักงานวิจัยและ
พัฒนาที่ทำงานเต็มเวลา หรือ อาจจะระบุเป็นจำนวนเปอร์เซ็นต์โดยเทียบจากพนักงานทั้งหมดก็ได้

จำนวนพนักงานวิจัยและพัฒนา ร้อยละของพนักงานวิจัยและพัฒนา

ไม่รู้..... ปฏิเสธ.....

47 - บริษัทของคุณมีแผนที่จะดำเนินกิจกรรมการวิจัยและพัฒนา ในสองปีข้างหน้าหรือไม่

ใช่ ไม่ใช่

ไม่รู้.....

ปฏิเสธ.....

Appendix 3: Consent form

INTERVIEW CONSENT FORM

Title of Study: The Development of Young-High Technology Firms

Introduction and Purpose

Good morning/Good afternoon. My name is

I am currently a PhD student from University of Exeter Business School, United Kingdom and I would like to talk to the owner of your company or the managing director.

Int.: Repeat this introduction until the right person is on the phone.

The dissertation is on The Development of Young High Technology firms, this study seeks to identify the key firm-based factors that may be associated with longer term development of technology based firms. The themes we will examine during the following interview include the technological strategy of your company, the extent of your international business activities and possible factors constraining or assisting the growth process of your company.

Do you have time now for the interview or when would it be appropriate for you?

Int.: Please note the date and the time the interviewee suggests for the interview.

Date

Time

Confidentiality

Thank you for agreeing to be interviewed for this project.
I wish to confirm that:

- Interviews are confidential and anonymised so participants cannot be identified individually from the data.
- Where interviews are recorded and/or transcribed they will be coded in order to protect the identity of respondents. All files will be stored securely in accordance with the UK Data Protection Act.
- Any quotations and/or examples used in research outputs (such as reports, conference papers, presentations, etc.) will remain anonymous.
- Participation in this research is entirely voluntary. Participants are free to refuse to answer any question or terminate the interview at any point.

Questions

If you have any questions about this research, please feel free to contact me. I can be reached at 0814781718 or email: a.binnui@gmial.com

If you have concerns or queries about any aspect of this project please speak to a member of the research team.

* In the **Confidentiality** mention that subjects will be asked for oral rather than signed consent.

CONSENT

If you wish to participate in this study, please sign and date below.

.....
Participant Signature *Print Name* *Date*

.....
Researcher Signature *Print Name* *Date*

A conceptual framework for measuring entrepreneurship and innovation of young hi-technology firms

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Exeter, United Kingdom

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Abstract— This paper examines the different theories that have been developed in economics and innovation management to explain the causal chain of events through which entrepreneurs can deliver more innovation and ultimately higher growth for the benefits of the regional and national economies and identifies the key firm-based factors that lead to survival and long term development of high technology firms. It determines the extent of the entrepreneurial activities and possible factors that constrain or assist the growth process of these firms. It then draws upon the key predictions of the core theories of entrepreneurship and innovation to formulate a model for measuring the characteristics of entrepreneurial hi-tech firms, characteristics of innovating firms, and innovation and firm growth dynamics. The model is developed to explain these key building blocks that might lead to enhanced prior economic growth and the patterns and dynamics observed in a developing country context.

Keywords- entrepreneurship; innovation; hi-technology firm

I. INTRODUCTION

During the past centuries, entrepreneurship and innovation have been viewed by scholars as the critical sources of organizational survival and growth in the national economic evolution. Entrepreneurial activities and technological innovation have been widely recognized as crucial factors for national economic development in Western economies. The theorist Joseph Schumpeter [1] was praised as the “prophet of innovation” [2] since his theory of Economic development has been published. This theory was considered as the first step in the origination of theoretical instruments and concepts which examined the real economic world. The Schumpeterian system of economic thought also assigned crucial role to entrepreneurship together with its indivisible and rooted innovative nature [3] by highlighting

economic development as the core of innovation and the major role of entrepreneur as an innovator [4].

Meanwhile, economist such as Swedberge reaffirmed the influence of Schumpeter’s entrepreneurship studies. He says “...of all the theories of entrepreneurship that exist, his theory is still, to my mind, the most fascinating as well as the most promising theory of entrepreneurship that we have” [5, p.2]. Entrepreneurship has become the crucial driver on economic growth in both low and high income countries [6] which is currently happening at higher rate than at any time during the last century [7]. Typically, in the developing country the innovation context plays an important role [8] in the introduction of new products and services to the market by businesses [9]. While, innovation at all segments and organization levels is imperative for organizations [10] as it involves a complex process with multiplex links between new technology and science as well as capability producers and buyers [11] and, as a result, the businesses can build up the technological capabilities that will allow them to innovate better than other firms [12]. Veeraraghavan [13] concluded that a combination of the Innovation and entrepreneurship factors would lead to successful businesses.

Earlier studies indicated that entrepreneurship and innovation are crucial issues in the development process of firms which want to use them as vehicles to drive economic growth. They are also consider as the fundamentals of technology creation and mobilization for use by the entrepreneurs in both the developed and developing economies to get through to the technology in the world, especially for new firms which are more likely to innovate [14] and to nudge the regional growth [15] due to the entrepreneur’s capabilities to exploit

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technological innovation to bring forth long running economic performance [16].

In the past two decades, high-technology based firms had been crucial in the modern economies [17]. Whilst, the rationale of the research by Almus and Nerlinger [18] highlight that small and medium size of new high-tech enterprises is proliferating. Interestingly, there have been a number of exploratory studies in the area that have addressed the measurement an achievement of young hi-tech firms, but not in the developing country study is known to the authors which systematically surveys the population of new enterprises in hi-technology sectors and the important of the phenomenon on the development of new hi-tech start-up still lower recognize. Moreover the substantial theoretical model explaining the growth of young firms and new hi-tech firms does not have width and breadth enough [19, 20]. In addition, very little work on factors which lead to the survival and growth of small innovative firms and firms' performance, especially on the impact of managerial decisions and research resource [17] has been done despite that small firms can make a positive contribution to economies by increasing productivity, creating new markets, and expanding employment opportunities [21]. Finally, it has been found that there is an overlapping between the quantitative research and case study surveys, especially the empirical subject of case studies nowadays have minority been generated testing by researchers. Also the studies published currently have not applied all relevant theories of young hi-tech entrepreneurship.

From the above comprehensive literature has identified a number of gaps in an existing circumstances and research papers, and it is evident that hi-tech firms have not previously been deeply researched on the development of young hi-technology entrepreneurship. Therefore, to fill the earlier research gaps, the core theories of entrepreneurship, innovation and firm growth have been used in this paper to create a conceptual model for measuring the three main areas, namely the characteristics of Entrepreneurial Hi-tech firms, the characteristics of Innovating firms, and innovation and Firm Growth Dynamics which can be used to explain the casual chain of events from which entrepreneurs can deliver more innovation and ultimately higher growth for the benefit of the regional and national economies.

The research not only adds to existing generic knowledge for high technology entrepreneurs, but also more recently fills a specific gap in the

current understanding and literature on hi-technology entrepreneurship studies in both the theory of entrepreneurship and innovations as these theories have been developed to explain in Western countries.

II. THE DETERMINANT OF ENTRENERUSHIP AND INNOVATION OF HI-TECHNOLOGY FIRMS

A. *Entrepreneurship*

Entrepreneur can be found in every country, it is not unique to any gender, ethnicity, age or economic sector [22]. Entrepreneurs defined as "person who is ingenious and creative in finding ways that add to their own wealth, power, and prestige" [23, p.987]. The function of entrepreneur is "to reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological method of producing a new commodity or producing an old one in new way, opening a new source of supply of materials or a new outlet for products, by organizing a new industry" [1, p.117].

The topic of entrepreneurship is complex and has broad level of meaning context [24-25] and not well-developed component of the modern economic theory [26], so it is difficult to reach a consensus on a proper definition [27]. There is no universally accepted entrepreneurship definition [28-30], so the theorists tended to separately the theory of entrepreneurship [31].

For examples, Kuratko and Hodgetts [32] defined the entrepreneurship as a concept of an individual innovative style of business, which basically refers to a person who has initiated innovation skill and is searching for the higher achievement [33]. While an Austrian economist Joseph Schumpeter who has been designated as the key figure in the literature of entrepreneurship [34] claimed that entrepreneurship is the main issue in the theory and practice of economic growth and development [35]. He explained that entrepreneurship is in the center of the development process for entrepreneur in the modern world to form a 'creative destruction' for creating and exploiting the opportunity for technological production to expand new product, new market and new resources, even though these activities face risk and uncertainties. Thus, entrepreneurship is considered as the important factor to enhance the need of business investment in economy [1]. As such, the general definition of entrepreneurship is the study of the individual discovery and exploitation of entrepreneurial opportunities [36] to create new products, new processes, new resources, new markets, and/or

same product in new market under risk and uncertainty circumstance.

Based on the vast consensus among scholars and theorists, entrepreneurship is an important vehicle for economic growth in both the developed and developing economies [25, 37-39] which plays an important role in wealth and job creation. This belief was the basis of the work of a number of researchers from different economic backgrounds for many decades [40]. In addition it is also considered as an outcome of the balancing of opportunity, risk and reward [41], thus, entrepreneurship is the crucial driver to business success [42-43] and generation of economic development [44].

B. Innovation

The innovation is basically found in developed economies and has been conceptualized in different ways. Fagerberg, Mowery, and Nelson [45] highlighted that the worldwide center of innovation is generally shifted from one sector, region and country to another, for an example the data gathering from the survey of UK, it has been found that the rising of productivity and income of population correlated to the neighbor countries.

Nevertheless, the concept of innovation is broad, as it contains a complex process which combines new science and technology and potential manufacturers and customers [46]. Hagedoorn, [47] who reviewed the work of Schumpeter, said that the definition of innovation that was given by Schumpeter referred to the 'new combinations' associated with technical, marketing and organizational aspects. It is rather too broad in scope to understand the complexity of technological development. This is why the term innovation as defined by Schumpeter has been criticized by many scholars.

Meanwhile, other researchers have defined the innovation framework as the exploitation factor of new market, new business formation and new sources [48-51]. This explanation is very similar to the definition of Szirmai, Naudé, and Goedhuys [4] which states that innovation is involved in the exploitation of new market, new organization and new sources, however, they also pointed out that the development of new products and new processes should also be addressed. Whereas Van Praag and Versloot [25] argued that the innovation approach is associated with the firm's innovative outcome in both quality and quantity of production and has always given impetus by new market and technological opportunities [52].

It is cleared the innovation subject is very important because innovation is a mechanism driving the business survival and success.

C. The Important of Entrepreneurship and Innovation

Referring to the earlier definitions of entrepreneurship and innovation, it has been found that basically entrepreneurship and innovation are debated in the field of economic, business management and others and that they are correlated. The entrepreneur can only be understood if it is placed in the background of innovation theory [51]. To support the argument of the earlier study, Alam and Hossain [52] found that entrepreneurship is a process that people pursue their opportunities and need fulfillment throughout innovations as it is a key-based factor in driving the development especially in small business [53] and pushing the success for business [54-55]. The link between entrepreneurship and innovation is important because not only it acts as a pillar, but also as the enhancement for high potential benefits in developing countries as well [56].

In addition, there is an interesting examination of the correlation between entrepreneurship and innovation by Veeraraghavan. She argued that innovation and entrepreneurship are a two-way relationship as the innovator creates and gives the idea to entrepreneur to introduce that idea into the market system. Then entrepreneurship helps to generate new idea for economy, create culture of independence, risk taking and confidence. As a result, the combination of the factors of innovation and entrepreneurship leads to businesses achievement [13].

D. New Business Formation

Now we turn our attention from the important correlation between entrepreneurship and innovation to the formation of new firms by studying the impact on economic growth. The empirical data reported by The Global Entrepreneurship Monitor (GEM) studying the broad business start-up across 60 countries both in developed and developing countries since 1999 and focusing on key driver of economic growth [57-58] help us to understand the diversity and dynamics of new firm formation. It has been quoted that the entrepreneurs start their own business because "they cannot find a suitable role in the world of work, creating a new business is their best available option" [58, p.217].

There are a number of studies discussed the point of survival and growth of new firms, for

instance, Bartelsman, Scarpetta, and Schivardi [59] found a low level of survival rate of new firms. It was found that from the ten OECD countries approximately 20-40% of young firm failed during the first two years and only 40-50% continued to survive after seventh year of operation. Other studies found that over 50% of new firms exited the market within the first five years in UK [60-61], United States [62-64], and Italy [65]. Whereas the developing countries especially the small start-ups are likely to exit the market in a shorter time after the new-born period as a result of high cost [66].

Although the survival and success of business in an early stage of new start-up showed to be the lower, it is considerably important to economic growth as a whole [67] and beneficial to the economic development in developing countries [68-69]. The advantage of new business creation is not only to generate the employment but also to reduce the unemployment rate both in the developed and developing nations [70-71]. Lastly, even though most entrepreneurial firms are typically small [72] and having low individual market influence [73], they have potential to prosper the wealth of nation and urge the growth of economy [56].

E. Hi-technology Firms

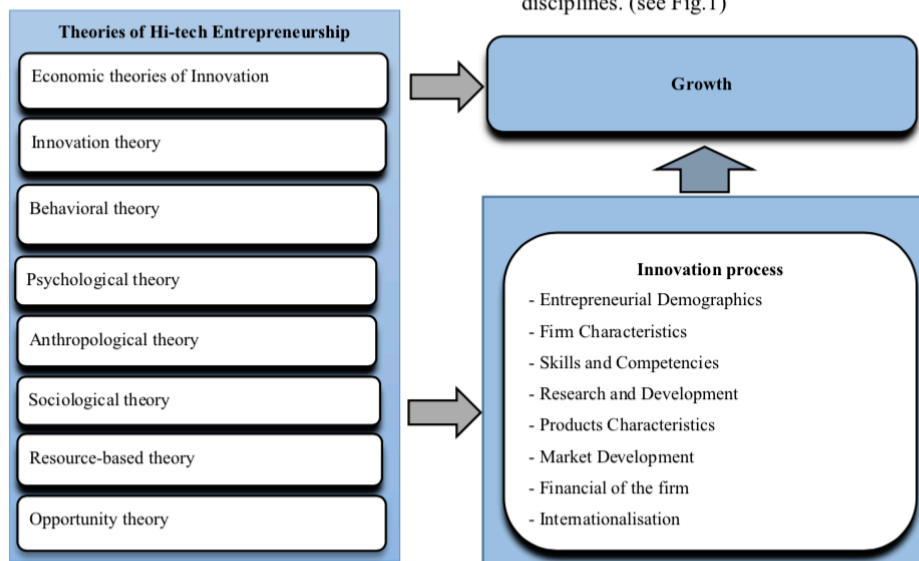
High technology sector is defined as the industry that invests proportionally high in the activity of science and technology than in the general way [74]. The term hi-technology firm is defined as an independently owned, whereby the owner(s) holds at least 50% of the company and operate in a high-technology sector [75].

There are a number of important issues on doing hi-technology businesses. Ganotakis and Love [76] explained that hi-tech firms are important driver to economic growth and because of the nature of the high-tech business; they generally face challenges in producing their highly innovative goods to serve the national and international markets. While other authors said that innovative firms experience only lower failure rates and contribute dramatically to the direct and indirect employment creation, moreover they drive higher sales, asset and export growth than other firms operating in more traditional industry sectors [75,77-78].

III. THEORETICAL UNDERPINNING OF THE MODEL

Nowadays, it is broadly accepted that there is a relationship among entrepreneurship, innovation, and economic growth. This paper synthesizes the different theories which have been developed to explain the causal chain of events through which entrepreneurs can deliver more innovation and ultimately higher growth to benefit the regional and national economies. The key predictions of the core theories of entrepreneurship and innovation will be used to formulate testable hypotheses which form the basis of the empirical testing in the three broad areas namely; characteristics of entrepreneurial high-tech firms, characteristics of innovative firms, and innovation and firm growth dynamics.

The key elements of the core theoretical perspective on the innovative process and the measurement of growth of high technology entrepreneurship are derived from the core theories on high-tech entrepreneurship of many disciplines. (see Fig.1)



A. Table of Summary of Theoretical Framework
Figure 1. Theoretical Framework

The empirical theories on hi-technology entrepreneurship are derived from many subject disciplines including economic theory of innovation, psychology, anthropology, sociology, resource-based view, opportunity identification,

behavioral management and innovation, are used in the current research to explain the association between the theories' assumption and the causal chain of events are shown below:

TABLE 1 TABLE OF THEORETICAL FRAMEWORK SUMMARY

Theory	Main Assumptions	Theoretical Model (Author, Year)	Relevance in Research
<i>The economic theory of innovation</i>	To present the understanding of economic development in the area of technological revolution	Classical (cantillon,1755, Ricardo, 1817, Smith, 1776) Neoclassical (Parker & John, 1978; Murphy et al, 2006) Austrian Economic theories (Keizer, Tieben & Van Zijp, 1997; Kirzner, 1973)	Neo classical brought about new movement known as Austrian Market Process for criticize market systems, entrepreneurship and completion, and market development
<i>Psychological theory</i>	Personality traits to define entrepreneurship, there are 2 theories; Locus of Control and the need of achievement	Locus of Control (Rotter, 1996) The need of achievement (McClelland, 1961)	Characteristics of entrepreneurs driven by creativity and innovation, and management skills. While the theory of achievement associated with the new venture creation
<i>Anthropological theory</i>	Study of social and cultural contexts	Social and culture contexts (Simpheh, 2011)	Cultural environments can produce differences in entrepreneurial behavior
<i>Sociological theory</i>	Study of social network, life course stage, ethnic identification and population ecology for the business	Social theory (Reynolds, 1991)	The impact of factors of government legislation, customers, employees and competition on the survival of entrepreneurs
<i>Resource-based theory</i>	Predict the opportunity identification and the growth of new firms. It is composed of financial, social and human capital	the opportunity identification and the growth of new firms (Alvarez & Busenitz, 2001) financial, social and human capital (Aldrich, 1999)	Human capital (education and experience) and financial exploit entrepreneurial opportunity and business start-up
<i>Opportunity identification theory</i>	Process of opportunity recognition and development includes: entrepreneurial alertness, information asymmetry and prior knowledge, social networks, personality traits and opportunity	Opportunity theory (Ardichvili et al., 2003, Shane, 2000)	Prior knowledge and experience factors are significant capabilities of a successful entrepreneur
<i>Behavioral theory</i>	Examine the people's act and entrepreneurial actions	Personal action (Robbins & Coulter, 2007) Entrepreneurial actions (Bateman & Crant, 1993; Endres & Woods, 2003; Hebert & Link, 1998)	Entrepreneurial action associated with the relationship with suppliers for networking and financial management
<i>Innovation theory</i>	Innovation theory is concerned with the economic change; innovation, entrepreneurial activities and market power	Economic change theory (Schumpeter, 1934)	Bring businesses to improve their new products and processes into market system

We sympathize to claim that the earlier illustration of core theories assumption in entrepreneurship and innovation (Table 1) are necessary to explain the emergence of growth in hi-technology business. We believe that the

theoretical framework can help us to generate the larger phenomenon of new firms that initiate entrepreneurial activities from the first five years of their operation.

B. Overview of Understanding of the Innovation

The following Table 2 presents the key characteristics of innovative firms to illustrate the innovation process. These key innovation inputs might result to different outputs as presented in the theoretical framework and the causal chain of events in the conceptual model (Fig.4). This prediction would lead the firms to enhance the

economic growth, eventually bring forth regional and national growth. The innovation inputs are consist of entrepreneurial demographics, firm characteristics, skills and competencies, research and development, products characteristics, market development, financing, and internationalization.

TABLE 2 UNDERSTANDING OF INNOVATION PROCESS

Key Characteristic	Factor
<i>Entrepreneurial Demographics</i>	Education, Experience, Entrepreneurial founding team
<i>Firm Characteristics</i>	Age, Size, Ownership structure, Legal form
<i>Skills and Competencies</i>	Scientific knowledge, Business qualification
<i>Research and Development</i>	Incremental or disruptive change, R&D inputs, Customization, New or established
<i>Product/Service Characteristics</i>	Best-selling product/service, Product/service portfolio, Technological content of product/service, Novelty
<i>Market Development</i>	Number of customers, Market size, Number and type of customers, Domestic or international markets, Who is customer, Timing of first international sales
<i>Financial of the firm</i>	Debt, Equity, Personal inputs
<i>Internationalization</i>	Exporting, Export markets, Type of country sell in, Mode of international sales, Use of foreign agents

Entrepreneurial Demographics

The earlier psychological and opportunity identification theories claimed that prior knowledge [79] is one of the entrepreneurial alertness to business opportunity [80] and personal characteristics to define entrepreneurship linked to successful entrepreneur [81]. Stevenson et al. [82] concluded that the ability of new ventures to identify and select the right opportunities is the most important driver for entrepreneurial achievement. Similar to the resource-based theory [83] human capital, regarding to experience and education, is associated with entrepreneurship [84] to identify and exploit an

entrepreneurial opportunity for new venture [80,85-86] to stimulate the growth of region [87-88]. While Knight [89] (1921) and Schumpeter [1] paid an attention on the potential characteristic of start-ups' founder. Thus demographic factors that use to predict the growth in this research are in line with human capital; education and experience, and entrepreneurial founding team. Several empirical researches have classified the importance of the entrepreneurial characteristic factors to predict entrepreneurship and business success. There has been determined the human capital is an important driver for young firms survival and improving their economic performance [90-92].

For instance, the empirical research using the panel of industries studied across twelve OECD countries found that human capital plays a significant role in productivity growth for countries [93] both in specific and formal human capitals as they are correlated to the outcome of radical innovation [94]. The number of research stated that human capital has been proposed as the foster of entrepreneurship in high-technology firms, for an example study by Massimo G. Colombo and Grilli [95], they claimed that human capital is particularly considered as an important driver for the growth of innovative start-ups. In addition, Lussier [96], doing a comparative research in US and Central Eastern Europe Croatian Entrepreneurs, found human capital factors; the experience and education are both significant variables for the US but not for Europe entrepreneurs to predict the success and failure of business. Moreno [97] also used these critical variables to analyse the entrepreneurial opportunity identification of new Spanish ventures, he argued that both factors related to identification and exploitation of opportunities. Kundu and Renko [98] examined the characteristic of entrepreneur to explain the export performance in Indian and Finish innovative firms, they found the educational background is considered as an important factor for the successful export performance.

The founders' experience has a beneficially impact on growth [99] and the factor of educational background either commercial or technical levels are all providing more opportunity for the UK new innovative firms to receive funds from the external finance [100]. The same result was found in the survey of Italian young hi-tech entrepreneurs, who have greater prior work experience in technical functions and greater university level education in management and economics [101] are growing larger than other firms and they have more chances to receive Venture Capital support [95], while industrial and marketing experiences are also considered as important drivers for business success for new innovative industries in United States [102].

Lastly, the higher level of the entrepreneurial founding team's work experience in Italian ICT start-ups empowered the survival of the industry [103]. The same trend was found in Norway and Sweden. Aspelund, Berg-Utby, and Skjevvald [104] found in their survey that, not only founding team's experience, but also a technology radicalness are greater importance to the innovative firms survival. Whereas the experience of founder and some management positions such as manager and financier in Israel

new technology ventures are considered as significant driver to the success of business [105].

Firm Characteristics

The characteristics of new firms had been described in the theory of founding characteristics [20,106-107], however, this theory is not considered in the long term development of new business characteristics. Thus, the factor of firm characteristics such as age, size and ownership structure which determine the growth of young firms have been stated in various countries of these following studies.

To begin with the research by Lussier [108], she pointed in her study for the US businesses that age is one of the factors that influence the success and failure prediction. First of all, the age of firm is positive correlated with survival and negative with growth, there has been cited in the research findings of some countries such as in Spain [109], United Kingdom [110], Japan [111] and United States [112] that the firm's age is positively relationship with the business survival, by contrast it appeared to have a negative result with the growth of firms because the old firms grow less than younger counterparts.

The second factor is firm's size, the size of new firms is negatively correlated with survival and growth, this result is rejected Gibrat's law model [65-66,112-116], take for example in the research result of Calvo [109] for young Spanish innovative firms, found that the small firm has grown faster than larger ones. In contrast, there are studies argued that the business growth is typically determined by the size of firms at start-up [117], while firm size is significantly linked to a better business performance [118]. However there are studies that found no correlation between size and firm growth on the testing of Gibrat's law [62, 119]. Turning to the correlation between size and survival, vast studies have found a positive result between the size and survival [62, 120-121]. Meanwhile, Agarwal and Audretsch [122] stated that size and business survival are formed by the technology and the stage of life-cycle of new firms. They have found the interesting result in their research that the smaller firms in US held a lower rate of survival than the bigger counterparts. In addition, the following studies show the important of firm size and relevant factors for the business survival.

Firstly, to study the relationship between size, age and entrepreneurial structure, the research which has been done in Germany by Almus and Nerlinger [117], stated that age and

size of firms, and technical degree of hi-tech firms grow faster than non-innovative firms and also influence the increasing of employment rate in Germany. This result is confirmed by the research of Audretsch and Mahmood [62] for US manufacturers, they concluded that size and entrepreneurial structure influence the survival of business.

The correlation between firm's size and experience, Massimo G. Colombo, Delmastro, and Grilli [122] found in Italian young enterprises, the year of prior experience in same industry, and managerial and entrepreneurial experiences have more positive impacted to the size of firm, they convinced that these critical variables are positive relationship between firm size and business survival.

Turning to the link between firm size and innovation behavior. Sternberg and Arndt [123] found in their research that firms' characteristic is important to determine the innovation behaviour for European firms than other external factors, they pointed that internal factors such as firm size influenced the scope and nature of innovation as it correlated strongly to the quantity and quality of R&D, marketing and pursuing high volume of the qualified employees.

Size of start-ups also related to level of internationalisation [124-125]. The firm with small size, having limited product range and contain a narrow network distribution, facing obstruction to enter larger markets, while the larger counterparts gain more advantage to go for internationalisation due to they have ability to offer the greater diversity of products [126] and establishing more connections [127] to support the international markets entry [128].

Finally, the research in US on new hi-tech venture by Song et al. [102] indicated that size of founding team is also a crucial factor for the success of business. The firms which founded by a team, growing faster than the firms established by a single person, due to the insufficiency of individual know-how that could be compensated by other managerial team members [15, 129-130].

Skills and Competencies

The skills and competencies are important characteristics to define entrepreneurship as they are the vehicle of opportunity to derive higher level of creativity and innovation.

Littunen and Niittykangas [131] conclude in their research which have been done in Finland that there is a significant correlation between

founder's know-how and high growth of firms in their young age during 1-4 years.

There have been claimed by many scholars in the specific skill of new start-up firms, both in the managerial and technical/scientific skills, is better than the general ones to enhance their own performance [101, 117]. The important point of the specific skills such as technical and engineering skills, they affect the technical orientation of the firms [130], while entrepreneurs with highly educated in sciences and engineering background are more capable to learn and implement new technical knowledge [132]. This assertion is confirmed by the study of McKelvie, Wiklund, and Short [133] for Swedish start-ups firms, they found that technological and mechanical knowledge of new firms are the greatest conditions for improving the innovative efficiency of the firms.

Research and Development

Research and Development (R&D) is significant to develop the transfer of technology and create an innovation that is new to the firm [134]. According to Griffith et al. [93] studied productivity growth over twelve OECD countries, they said that R&D is an important driver for both technological catch-up and innovation by knowledge acquirement through learning-by-doing programme and the growth of R&D is generate through the technological transfer from neighbouring countries. Moreover R&D in service firms such as in the West German firms show the correlation to the export activity [135]. This argument is supported by the research of Kundu and Renko [98]. They claimed that the technological innovativeness is one of the crucial drivers for pursuing the success of export performance of Indian and Finish enterprises.

Meanwhile, the study of Manimala, Jose, and Thomas [136] reported that the innovation strategy impact to innovative enhancement for hi-tech industries in India, especially the type of incremental innovation, became the encouraging factor of strategic development for developing countries. Similar to this, the research by Robson et al. [56] which studied innovation and entrepreneurship in Ghana using a multilevel theoretical framework to analyse the different types of innovative activity which related to the characteristics of entrepreneur, found that incremental innovation is considerably important for the firm, in addition innovation is also associated with educational level, size of firm, and exports.

Moreover, Maidique and Hayes [137] stated that the entrepreneur who is more concentrate on one or two technological polices tend be obtained the most successful. This strategy is also able to dominate over risky and company, who invest higher on R&D than competitors do, can maintain technological leadership [139]. As the earlier explanation, the context of R&D is considered as a part of Innovation theory as it linked to the new science and technology, potential producer [46], enhancing the competitive advantage [138-139] and market power for a better outcome [1].

Products Characteristics

There are various aspects of product characteristics considered in this research such as best-selling product, product portfolio and technological content of product.

The factors of production has been described in the Classical and Neoclassical economic theories, it concerned the entrepreneurial activity which regarded as the vehicle of resources change into new product and services [140]. Furthermore, the theory of innovation and resource-based view are also related to product characteristic which help the entrepreneur to access resources for predicting the opportunity identification, firm growth [141] and to sustain the competitive advantage [142] by producing the temporary monopolies which necessary to improve new products and processes [143].

The important of product characteristics based on technological content has been established in many studies such as the research by Bürgel et al. [99]. They argued that the technological sophistication of product has probably impacted the growth rate of UK and German hi-tech start-ups. In addition the initial adoption of technological strategy can also determine the business efficiency such as in young US software ventures; their strategy is operated by integrating the production lines with new complementary products [144]. While the finding of research on innovative firms in Russia show that the business which produce better technological products and enter market later, performed the best [145]. Obviously, Kakati [146] convinced that the product criteria is not relative to the competitors that lead to the business success rather the ability of firm to meet the need of customers can actually bring to success or it can say that the product characteristic cannot stand alone to help entrepreneur to be successful, but the capability to develop multiple resources for backing up the strategies can help producer to push their products for reaching an achievement.

Market Development

This research tries to examine market development by focusing on factors such as number of customers, size of market, number and type of customers, domestic or international markets.

The theory background of market development is sociological theory, this theory focus on the survival of business by concerning the customers and competition [147], while the Austrian market process theory has also play the important role on the function of market-based system [1, 148] which is a crucial function for firms to create their new products to meet the trend of the market system.

Market development context has been found in the research of Gungaphul and Boolaky [149] which has done in Mauritius island, they found that the function of marketing is significant to Mauritius entrepreneurs for their business achievement, whereas the scope of marketing is considered as a crucial driver to the success for US innovative start-ups [102].

However, the challenge of marketing management results in hi-tech firm is the cooperation with R&D [150], so the business needs to work under a balancing between 'technology push' and 'market pull' within the context of innovation planning [151]. Then the process of technological strategic planning for innovative industries, require a period of time to work on the technological development and the effects of competitive advantage to reach the market position [152]. Up to this point, companies which entering market earlier than rivals, need to comply an oriented-competitive strategy to meet the industrial standard as fast as possible due to later followers are also raised their level to meet the customer satisfaction, if companies fail to achieve at this stage, the competition will take place into the market system and cut prices aggressively [151]. Lastly, the firms which seek to employ opportunity base on existing market knowledge and new technology market knowledge can gain more growth than firms that rely on new market knowledge [153].

Financial Resources

Financing context has long been reviewed in economic literature [154-155], especially it has been regarded in resourced- based view [156] and behavioural theories. Aldrich [156] stated that the financial capital is capable for entrepreneurs to get more resources for the efficiency and effectiveness to start their own businesses,

whereas Tipu and Arain [157] concerned about the beneficial credit policy, paying method and financial management for owners.

The mode of finance influences the fundamental contribution to young hi-tech firms [158-160]. It has been generally known that financial resources support the growth of start-up firms [161-162]. Many studies stated new entrepreneurs operated within limited resources [163-164], unless the firm who provide stronger resource-based is more able to survive [164], therefore the capacity to get more resources of founding team is very important to competitiveness and growth of firms [165-166].

There are number research have recognized important of the financial issue for new firms such as Ganotakis [167] claimed in his research for UK hi-tech new ventures that financial capital is typically an important factor for the business survival and growth. The same result of the sample in US innovative start-ups, financial resource is typically a crucial driver for the business success [102]. Obviously, a number of scholars have remarkably clarified that young hi-tech firms seem to face serious problems to access external financial sources, especially debt financing [168].

In addition, Massimo G. Colombo, Grilli, and Verga [169] found that the competency of Italian young innovative founders is a significant determinant for Venture Capitalist on their financial decision, moreover the start-ups who have a high rate of human capital, have more chance to be selected by the VC investors [170-173].

Internationalization

From the review in literature of theoretical implications by Oviatt and McDougall's article, the internationalisation brings a business to a positive performance in the long run through value creation. Thus the new hi-tech firms who create later internationalisation is more probable to survive and grow than the earlier ones [174]. Similar to research result for Chinese enterprises, the entrepreneurs with highly experience on exporting and having a large networks, are less likely to start export early because they think internationalised at early stage may harm the firm's development [175].

Meanwhile, the study of Coeurderoy, Cowling, Licht, and Murray [176] on the determinant of internationalisation and firm survival of young innovative firms in UK and

Germany stated that a good relationship between customer and suppliers produce a higher chance of survival, while Bürgel et al. [99] also using the sample in UK and Germany innovative start-up firms, they found that entrepreneur who sell overseas, gaining greater sales growth than those who sell only in domestic market. In addition, according to the networking factor of internationalisation in German, start-ups with a good supportive networks and founder with a broad network and more social support tend to achieve more survival and growth [177]. Currently the international competition for UK and German firms are highly significant and the frequency of exporting overseas increase over periods [178]. While, characteristics of product and R&D activities are considered as the firm success factors because they can distinguish themselves from rivals when selling abroad [179] such as the study of US technology start-ups illustrated that the factor of size, R&D and prior experience impact on the local resources more effectively and they also raise the capacity of internationalisation competitiveness [128].

The earlier review from various papers finding, it is to confirm the dimension of core theoretical expects in difference key characteristics on understanding of the innovation process for innovative start-ups, revealed additional feature that benefit consideration of entrepreneurial activities and technological innovation to brought about the conceptual model of this paper.

IV. THE CONCEPTUAL FRAMEWORK OF THE MODEL

With regard to the crucial based factors of entrepreneurship and innovation, we consider the extent that firm level factors are associated with the longer term growth of young high technology firms.

The model examines the relationship among different levels and configuration of innovation inputs and innovation outputs in the new market development. Figure 2 establishes how entrepreneurial firms embark on the path that leads from innovation inputs to innovation outputs in the form of new market development by offering new products / services or delivering existing products / services in innovative new ways. The impacts of being more innovative, the final link in the causal chain of events, is forecasted would lead to superior, or enhanced, economic growth at the firm level initially, but ultimately to regional and national growth.

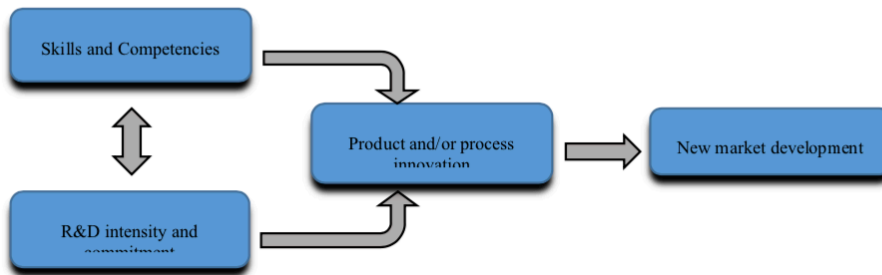


Figure 2. Innovation Inputs and Outputs

According to the above figure, it is hypothesize that firms must first accumulate productive resources and then deliver more

innovation outputs which enable the firm to develop new markets or eventually compete more effectively in existing markets (refer to fig. 3).

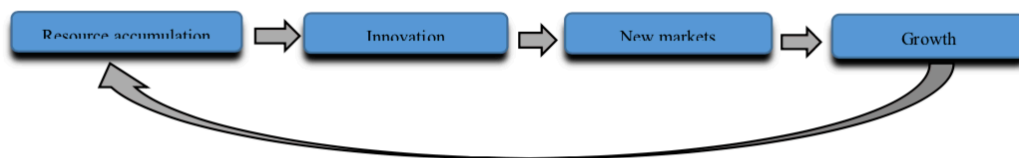


Figure 3. The causal chain from resource accumulation to growth

From Figure 2 and 3, they are predicted that this entrepreneurship-innovation-growth causal chain will create a self-reinforcing dynamic. Previous studies have often identified a pattern of persistent growth from a small subset of unique and highly entrepreneurial and innovative firms.

The model will finally link the chains of events that lead the business to economic growth (refer to Fig.4).

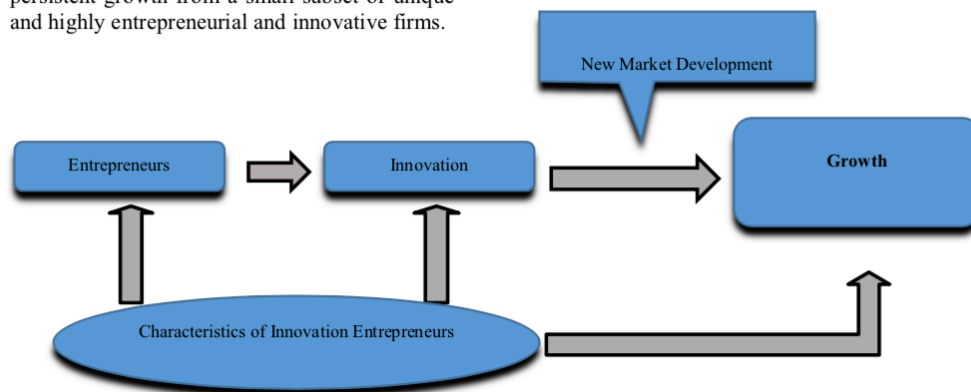


Figure 4. The Conceptual Model

The framework of this model is developed to analyze the core theoretical aspects on innovative entrepreneurship that are well developed in the economics and management literature in Entrepreneurship, Innovation and Growth. This framework draws on the various theories from a range of subject disciplines including economics theory of innovation, psychology, sociology, anthropology, resource-based view, behavioral

management, opportunity Identification and innovation (see Table 1).

In summary, this model is to examine the key characteristics of innovative firms from the sample in different areas namely; entrepreneurial demographics, firm demographics, skills and competencies, research and development, product characteristics, market development, internalization, and finance. Then, it explores the key characteristics of firms in the aspect of innovation context, focusing

more on inputs to the innovative process and later considers how different level and configurations of innovation inputs may influence the different outputs both in scale and breadth. Finally, it establishes how innovative firms broaden innovation inputs through innovation outputs in the form of new market development by launching new products/services or improving existing products/services. The explanation will present the link of casual chain of events that could predict the growth of economy at the firm level both in regional and national growth.

V. DISCUSSION AND CONCLUSION

Currently, there are many different scholarly theories debating the elements of success and failure of entrepreneurship, innovation and economic developments in many different areas, for example, internationalization, firm ownership, employment and human capital.

However, the earlier review of the literature in various papers, have identified a numbers of gaps in the existing research on the development of young hi-technology entrepreneurship. It is found that these theoretical models which explain the growth of young innovative firms do not have sufficient width and breadth. There is number of exploratory studies in the area that have addressed the measurement of survival and achievement of young hi-tech firms in developed economies, but not in the developing country study is known to the researchers which systematically surveys the population of new business in hi-technology industry and the important of the phenomenon on the development of new hi-tech firm still under recognize by authors. Importantly, there is only a small amount of work studying factors enabling and constraining the growth of these firms in the long run.

Therefore, the model presented in this paper has identified the key firm-based factors associated with the long term development of high-tech startups utilizing the entrepreneurial and innovation inputs and outputs to measure the business growth. It will examine how competing theories drawn from economics and Innovation management have been developed to describe the chain of different events through which entrepreneurs brought about more innovation and ultimately succeeded in reaching higher growth to benefit the regional and national economies.

It will then consider how innovative firms differ in terms of their core characteristics of entrepreneurial hi-tech firms, characteristics of Innovating firms, and innovation and firm growth dynamics as these existing theories have been developed to explain entrepreneurial and innovation

dynamics in the Western country economies and explain the key elements that lead to improved economic growth in developing countries. Finally, it will investigate whether the new high-tech firms in developing country can make a meaningful contribution to the future economic growth potential of the country.

Consequently, the model presented in this paper has filled a specific gap by creating a new theoretical framework which utilizes the key elements in the core theoretical assumptions on high-tech entrepreneurship. It, initially, explores the inputs to the innovative process then it demonstrates how different configurations of the innovative inputs may lead to different outputs. Then it shows how entrepreneurial firms use inputs such as new market to innovatively create new products or launch existing products or services in new ways. Finally, it demonstrates how the link of the causal chain of events can predict the economic enhancement at the firm level.

This paper is not only significant for the young entrepreneurs but also for the governments to design policy to support hi-technology industries in both the products and services sectors. Innovation is essential for the young start-ups to secure growth from their superior entrepreneurial and innovative capabilities. Thus, if the government is interested in promoting the success of young SME high technology entrepreneurs, it should encourage the innovation process in hi-tech start-ups which can make a significant contribution to the future economic growth of the country.

Last but not least, the study suggests that there is ample room to increase both awareness and understanding of the important role of the young hi-tech entrepreneurs for SME since they are the important elements in the success of businesses. We hope that the policy makers could use the research results to help young SME hi-tech firms and provide training for new enterprises and graduates in their countries.

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