Entrepreneurial Experience and Science Parks and Business Performance in Beijing, China

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Abstract

China is the second largest economic entity in the world. It is well acknowledged that small businesses have made significant contributions to Chinese economic development in terms of employment generation, income generation and poverty reduction. Entrepreneurs are the key people who are driving small businesses forward, and the Chinese Government has invested substantially in science parks. However, our understanding of entrepreneurship activities, science parks and especially prior business experience and business performance in China remains under researched. Therefore, to fill this gap, this research explores entrepreneurs' business performance of those who were on science parks against those whose businesses were off-park in Beijing China.

Human Capital theory and the Resource-Based View of the firm (RBV) provide the theoretical frameworks which were used to test the entrepreneur's prior business ownership experience against the performance of the businesses in terms of innovation, exporting activity, employment growth, profitability and the usage of e-commerce. This research adopted a quantitative methodology to analyse a new data set gathered by the researcher. In the year of 2009, 462 valid questionnaires were received from the firms located on and off ZhongGuanCun Science Park (ZSP), and that represented a 12% response rate.

The results show that prior business ownership experiences and science park location have strong associations with business performances. In particular, firstly habitual entrepreneurs are more likely than novice entrepreneurs to be innovators, and in general to have a better business performance; secondly, business located on science parks generally performed better than off-park businesses and lastly, interestingly, there is no clear evidence showing that habitual entrepreneurs have better usage of e-commerce than novice entrepreneurs. According to these key research findings, implications are elucidated for Chinese practitioners and policy makers.

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Acronyms

AURRP	Association of University Related Research Parks
BEZ	Beijing Experimental Zone
CAS	Chinese Academy of Sciences
DSP	Daeduck Science Park
EDI	Electronic Data Interchange
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HEI	Higher Education Institution
HSIP	Hsinchu Science Industrial Park
IT	Information Technology
MIT	Massachusetts Institute of Technology
NPD	New Product Development
NTBF	New-Technology-Based Firm
OECD	Organisation for Economic Co-operation and Development
RBV	Resource-Based View
R&D	Research and Development
RTP	Research Triangle Park
SCA	Sustainable Competitive Advantage
SME	Small and Medium Enterprise
SOE	State-Owned Enterprise
SPP	Science Park of Patras
WATP	Western Australian Technology Park
ZSP	ZhongGuanCun Science Park

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Declaration

I certify that the material contained in the thesis has previously not been submitted for a degree in this or any other university. I also hereby guarantee that no part of this research has been published in any institution of higher learning in this or any other country.

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Liang Zhan

Statement of copyright

Chapter 1

Introduction

1.1 Overview

The People's Republic of China is the third largest country in the world with an area of 9.6 million km^2 (http://english.gov.cn, 2011). It has the world's largest population: just over 1.37 billion people in 2011 (National Bureau of Statistics, 2011). China is now one of the world's major economic entities and boasts a high growth rate. Indeed, its gross domestic product (GDP) reached 47.16 trillion Yuan (7.26 trillion U.S. dollars) in 2011, which is up by 9.2% year on year (China statistical yearbook, 2011).

Small and Medium Enterprises (SMEs) in the Republic of China have played an important role in the national economy. Statistics provided by a Developmental Report of China's SMEs in 2010 show that there are some 41.53 million SMEs in China, representing a 4.5% growth in 2009 (China's National Development and Reform Committee, 2010). It is expected that there will be a continuous expansion of SMEs in China over the next five years. The number of SMEs will maintain the 7-8% growth rate, and the total number in 2012 reached 50 million, taking up about 99% of all registered enterprises all over the economy (http://www.sme.gov.cn/, 2013).

The growing importance of SMEs in China's economy is hard to ignore. Chinese and foreign experts estimate that SMEs are now responsible for about 60% of China's industrial output and employ about 75% of the workforce in China's cities and towns (http://www.sme.gov.cn/, 2011). SMEs are responsible for creating the majority of new urban jobs, and they are the main destination for workers who re-enter the workforce after being dismissed by state-owned enterprises (SOEs) (Chen, 2006; Wu et al., 2008).

There is a growing research interest in China on the owners of SMEs: the entrepreneurs. However, there is still a strong need for more research on the emerging Chinese entrepreneurship. The creation and newness of entrepreneurship activities in China could be very different from those in more advanced economies, and our understanding of them remains limited (Ahlstrom and Young, 2004; Bruton et al., 2008). Entrepreneurship is commonly linked to small business management because it involves the process of recognising opportunities and the development of new ventures, but crucially in entrepreneurship studies the unit of analysis is the entrepreneur rather than the business. Entrepreneurs play a crucial role in the development of SMEs as they are the people who create and manage these businesses. In this dissertation the empirical research utilises the entrepreneur as the unit of analysis. Focusing upon their entrepreneurial experience, entrepreneurs can be divided into three types: novice, serial or portfolio entrepreneurs (MacMillan, 1986; Westhead and Wright, 1998a; Rosa, 1998; Ucbasaran et al., 2008). Novice founders are those who have no prior entrepreneurial experience as a founder, an inheritor, or a purchaser of a business. Portfolio founders retain their original business and inherit, establish, and/or purchase another business. Serial founders are those who sell their original business but at a later date inherit, establish, and/or purchase another business. Evidence from the developed countries suggests that there are significant differences in the characteristics, motivations, and behaviour of novice founders compared with habitual founders with business experience (i.e., serial and portfolio founders with previous business ownership experience) (Westhead and Wright, 1998a). However, what are the situations in a developing country like China? What are the characteristics of Chinese entreprenerus and SMEs?

The aim of this study was to use human capital theory and the RBV to econometrically test the performance of the Chinese entrepreneurs' businesses on science parks against those whose businesses were off-park. This dissertation's particular contribution is to look into the role of prior entrepreneurship experience and a battery of business performance measures (innovation, exporting, employment growth, profitability and e-commerce). The new data set consisted of 462 responses, which were harvested between October 2008 and June 2009. The businesses were located on and off ZSP. Given the large volume of responses, the healthy 12% response rate and the care that was taken to gather the data, it is believed that the data and the subsequent analysis reported in this dissertation was robust and valid.

1.2 Small business definition

Different countries has adopted different criteria for the definition of SMEs, such as the number of employees, volume of output or sales, value of assets, and even energy consumption, are used (Storey, 1994，Walker and Preuss, 2008, Pittino and Visintin, 2011). There is not a universal definition accepted by all the countries in the world. Depending on each different country’s culture, history and economic background, their definition of SMEs can be hugely different. For example, in Germany, SMEs are those that have less than 500 employees, whereas South Korea defines SME as having less than 1000 employees (Zhou and Cheng, 2003). Table 1.1 shows a table of various international definitions of SMEs.

Table 1.1 Definitions of SMEs all over the world.

Country	Category of industry	Definition
European Union	Micro business	< 10 employees ≤ € 2 M turnover
	Small business	< 50 employees ≤ € 10 M turnover
	Medium business	< 250 employees ≤ € 50 M turnover
Canada	Manufacturing	< 200 employees
France	SME	10–499 employees
Germany	SME	< 500 employees
Hong Kong	Manufacturing	< 100 employees
	Non-manufacturing	< 50 employees
Indonesia	SME	< 100 employees
Ireland	SME	< 500 employees
Italy	Small enterprises	< 200 employees
Japan	Manufacturing, mining and transportation construction industries	< 300 employees or invested capital < 100 million Yen
	Wholesale trade	< 100 employees or capitalisation < 30 million Yen
	Retail trade and services	< 50 employees or capitalisation < 10 million Yen
Korea	Manufacturing	< 300 employees, Won 20–80 billion of capital (assets)
	Mining and transportation	< 300 employees construction; < 200 employees commerce
	other service business	< 20 employees

Malaysia	Small and medium industries	< 75 full-time workers or with a shareholder fund of < RM 2.5 million (US$1 million)
	Small industries	Manufacturing establishments employing between 5 and 50 employees or with a shareholders fund up to RM 500 000
Netherlands	Small enterprises	< 10 employees
	Medium enterprises	10–100 employees
Philippines	Small enterprises	< 200 employees, revenue < P 40 million
Singapore	Manufacturing	Fixed assets < S$ 15 million
	Services	< 200 employees and fix assets < S$ 15 million
Spain	Small enterprises	< 200 employees
	Medium enterprises	< 500 employees
Sweden	SME	Autonomous firms with < 200 employees
Taiwan	Manufacturing, mining and construction industries	< NT$60 million and < 200 employees
	Services industries and others	< NT$80 million of sale volume and < 50 employees
Thailand	Labour intensive sectors	< 200 employees
	Capital intensive sectors	< 100 employees
United States	Very small enterprises	< 20 employees
	Small enterprises	20–99 employees
	Medium enterprises	100–499 employees
Vietnam	SME	No fixed definition, generally < 200 employees

(Sources: Adapted from www.smallbusinesseurope.org, www.esba-europe.org, www.sba.gov, www.sme.ne.jp, www.ifm.bonn.org, European commission recommendation -- enterprise and industry 2003)

Similarly, within countries definitions may differ by sector and stage of economic development. In China, for instance, a power station of 50,000 KW was a large enterprise in the early 1950s, but is a small enterprise under the SMEs classification standard of 1988 (Zhou and Cheng, 2003). Last year, a new standard of Chinese SMEs was published (www.sme.gov.cn, 2011) (see table 1.2). In my research, the definition is based on the number of employees, defining an SME as a company that has from 8 to 250 employees. Enterprises with less than 8 people will be regarded as micro businesses, whereas enterprises with more than 250 employees are considered large companies (Loecher, 2000).

Table 1. 2 Chinese SME classification by employment.

Sectors	Micro	Small	Medium
Telecom internet	<10	10-100	100-2000
Business Service	<10	10-100	100-300
Transportation	<20	20-300	300-1000
Posts	<20	20-300	300-1000
Property management	<100	100-300	300-1000
Wholesale	<20	20-100	100-200
Retail	<10	10-50	50-300
Warehousing	<20	20-100	100-200
Restaurants	<10	10-100	100-300
Hotels	<10	10-100	100-300
Software and IT	<10	10-100	100-300
Others	<10	10-100	100-300

(Source:http://www.sme.gov.cn/web/assembly/action/browsepage.do?channelid=20124&contentid=1309401552118 (18.06.2011))

1.3 The importance of small business

Acs (1992) distinguished four consequences of the increased importance of small firms: entrepreneurship, routes of innovation, industry dynamics and job generation. His claims are that small firms play an important role in the economy, serving as agents of change through entrepreneurial activity, being the source of considerable innovative activity, stimulating industry evolution and creating an important share of the newly generated jobs.

SMEs are a fundamental part of our national economy, and play an important role in its rapid growth. They are a significant and irreplaceable force in promoting China's economic and social development. Should a country's economy grow and become stronger, there is a need for successful SMEs. In a sector such as manufacturing, SMEs often provide product parts and related services to large company, thus being a necessary condition for the success of large enterprises (Lin, 2009). The well-known Chinese economist, Jinglian Wu, also states that: "the role of SMEs in China's economic growth should not be underestimated" (Xia, 2008, p8). The particular contribution of SMEs in China can be demonstrated in the following 6 areas.

1.3.1 An important part of the national economy

There are various ways in which entrepreneurship may affect economic growth. Entrepreneurs may introduce important innovations by entering markets with new products or production processes (Acs and Audretsch, 1990, 2003). Entrepreneurs often play a vital role in the early evolution of industries; examples of such entrepreneurs include Thomas Edison, Henry Ford, and Bill Gates (Stel et al., 2005). In addition, entrepreneurs may increase productivity by fostering competition (Geroski, 1989; Nickel, 1996; Nickel et al., 1997). Schumpeter (1950) also emphasises the role of the entrepreneur as a prime cause of economic development. He describes how the innovating entrepreneur challenges incumbent firms by introducing new inventions that make current technologies and products obsolete.

At present in China, SMEs account for 99% of national registered enterprises in national business registration number. As for industrial output value, sales income, and taxes, SMEs account for 60%, 57% and 40%, respectively (China private economy development report 2009-2010). In addition, they account for more than 90% of national retail outlets. SMEs provide about 75% of urban employment opportunities, and account for 60% of national exports (State administration for industry and commerce report 2009). The important role of SMEs in China suggests that their development is critical for sustained growth of the economy.

1.3.2 The basis to increase employment

Since David Birch's (1979) original findings were presented and challenged (see Brown et al., 1990; Davis et al., 1996 for criticisms), studies in many countries have come to the same conclusion: small and newly founded firms create the most jobs, or at least have a higher share of job creation than of the employment base (Baldwin and Picot, 1995; Davidsson et al., 1995a; 1998; Fumagalli and Mussati, 1993; Kirchhoff and Phillips, 1988; Spilling, 1995; Storey, 1994; and Storey and Johnson, 1987). Audretsch and Thurik (1999) showed that an increase of the rate of entrepreneurship (number of business owners per labour force) led to lower levels of unemployment in 23 Organisation for Economic Co-operation and Development (OECD) countries over the period from 1984 to 1994.

SMEs are an important channel of employment. In China, labour-intensive industries are the key survival and development environment of SMEs, and the unit labour and investment to accommodate the increase in the investment in a new labour force is significantly higher than in larger enterprises. Additionally, in most areas the figure even more than doubled (Wang, 2009). At present in China, employment in SMEs accounts for about 80% of the total national employment, and over 85% of new job opportunities come from SMEs. Of the country's 150 million industrial workers, 110 million people are located in SMEs, representing about 73% (National bureau of statistics report 2009).

1.3.3 Important innovative force

Cooperative research and development (R&D) is a useful way to overcome the lack of internal business resources and to improve innovativeness and competitiveness, particularly for SMEs. In fact, as pointed out by Kleinknecht and Reijnen (1992, p. 347), "R&D cooperation does not typically occur between big, high tech firms."

Innovation and new product development (NPD) are considered to be important to economic development (Schumpeter, 1934). Innovation and NPD have been traditionally associated with large enterprises only (Vossen, 1998) mainly due to their comparative advantages in capital-intensive industries with scale economies. Caputo et al. (2002) explain that high costs, fear, moderate knowledge base, limited time and modest financial resources affect owner-managers' opportunities for developing new products. However, small firm researchers (Acs and Audretsch, 1990; Rothwell, 1991) reveal that the strengths of innovation and NPD of SMEs lie in their behavioural characteristics, such as skilled labour, flexibility and motivated management.

The above statement is exactly the case of SMEs in China, as they easily build a model organisational structure, which places an emphasis on flexibility and adaptability. This structure is conducive to technological innovation and achievement transformation; China's SMEs have become a new force of China's technological innovation. In terms of technological innovation, 70 % of China's invention patents and 82% of new product development are from the SMEs (http://www.sme.gov.cn/, 2010).

1.3.4 Balancing regional economic structure

In China, SMEs are often located in rural and urban junctions; this critical location plays the important role of combining, complementing and coordinating the urban and rural economies. The development of SMEs in small towns in rural areas according to the proposed rural modernisation strategy has also been a priority (Li, 2009). In addition, SMEs play an important role in the national western development strategy, where is relatively poor and underdeveloped area of China (Gao, 2010).

1.3.5 A major force in exports

In a study of 14,072 Canadian manufacturing firms, Calof (1994) did not discover a significant relationship between size and export performance. Bonaccorsi (1992), in a study of 8,810 Italian exporting firms, had mixed findings, reporting a negative association of size with exporting intensity. Other studies in the past have also reported either no significant relationship (Diamantopoulos and Inglis, 1988), or even a negative relationship (Cooper and Kleinschmidt, 1985).

In the 1950s and 1960s, during the period of the Japanese economic boom, 40-60% of the exports were from SMEs. This laid a solid foundation for Japan as the world's largest trading economy (Pang, 2012; Su, 2011). SMEs in China have also made a significant contribution to the improvement of China's export development and foreign trade business. The share of manufactured goods increased year by year in China's foreign export products. Of the major export products such as clothing, handicrafts, hardware, light industry, textiles, toys and others, mainly provided by SMEs, the most prominent products are textiles (25.54%) and light industrial products (15.58%) (Top 500 industrial SME exports analysis report, 2010). Many advantages such as flexible mechanisms and low labor cost have increased the export choice for Chinese SMEs. In addition to export growth, foreign investment has increased annually (Yu and Jia, 2010), and starting a business abroad has also been a new development (Li, 2009).

1.3.6 Ensure the healthy development of large enterprises

Large companies develop from small businesses, and due to the establishment of a socialist market economy system, SMEs are embarking on a path of independent development. Today's SMEs are likely to become the big businesses of the future.

Enterprise reform and institutional innovation involving contracting, leasing, mergers, bankruptcies, are generally first tested on SMEs, and then gradually advance to the large state-owned enterprises (Zhou and Zhang, 2009). Compared to large enterprises, reform and innovation in SMEs have their own advantages, such as low cost, convenience, limited social unrest, and swift introduction of new mechanisms

(Yang and Zhang, 2004). Therefore, SMEs play the role of a "testing ground" for its large counterpart, which provides valuable and useful experience for a more extensive reform of large enterprises (Zhao, 2006).

1.4 Science parks in China

Since the late 1970s, profound reform has fundamentally transformed the economic background in China, resulting in an environment that is particularly encouraging to entrepreneurial activities. Unlike the former Soviet republics and Eastern European countries, which adopted a “Big Bang” approach to reform, China followed a more soft and steady approach, in which programs and measures to reform its economy were introduced in phases (Tan, 2006). Following such an evolutionary route to reform, China gradually issued a set of programs and measures that provided the conditions to open the economy. These changes led to more domestic and international competition and cooperation (Tan and Litschert, 1994), as well as to the emergence of entrepreneurship and the birth and growth of more flexible, self-financed, technology-based firms.

Beginning in the late 1980s, the Chinese government has established science parks in 53 major Chinese metropolises under its “Torch” Program, a science and technology initiative to promote technology transfer and diffusion. The objective was to build within these parks a concentration of high-technology companies through policy incentives such as deducted tax. The science parks were expected to expedite technology adoption and diffusion and create collaborations among the academic and corporations in the park.

The science parks offer various policy incentives to encourage investment and new firm formation in the parks. For example, new firms are exempted from corporate income tax for two years. License is waived for the import of materials and parts used in producing goods for export. A firm's revenue from technology transfer is only taxable beyond the first 300,000 yuan. Intangible assets such as intellectual property can be factored into a company's registered capital (Hu, 2007). To gain entry to the science parks and be qualified for the policy incentives, firms are required to have the high- and new-technology nature of their technology and products certified by a government agency (MOST, 2001). One criterion is that firms have to spend at least 3% of sales on research and development. Such high-technology status test is to be repeated every year, failing of doing so would disqualify a firm from enjoying the various policy incentives provided by the government.

It is not surprising that most of the science parks mainly exist in China's largest cities and metropolises, where most of the technological and educational resources and industrial capability are located. Each of the four central-government supervised municipalities, Beijing, Shanghai, Tianjin, and Chongqing, hosts a science park. Twenty three provincial capitals also play host to science parks.

Technology parks have been growing at an astonishing pace. In eight years, technology parks' share of their host city's industrial output has increased from 2% to nearly one third; labor productivity has quadrupled; and the number of firms in the parks has more than tripled. Beijing has by far the largest number of firms in the park, 100000 versus Shanghai's 3600 (Hu, 2007). An explanation of the observation is that the Beijing park has many more small firms, possibly start-ups than Shanghai. Both Beijing and Shanghai possess great educational resources as measured by university enrolment, although Shenzhen has managed to grow with relatively little. Shanghai's success in attracting foreign direct investment (FDI) may also be correlated with the development of the science park. Interestingly of the five fastest growing technology parks, only Nanjing is on the east coast, and two of the fastest growing technology parks, Mianyang and Zibo, are located in relatively small cities.

1.5 ZhongGuanCun science park

Since the birth of first private high-tech firm in 1980, the ZSP has developed to a site which has a collection of high-tech firms such as semiconductor, computer, and telecommunication, it also consisting of both domestic and foreign invested firms. The total number of business on site is more than 100000 in 2011, by far it is the largest science park in China (Filatotochev et.al, 2011). In this section the development and management of ZSP and entrepreneurial culture in ZSP will be discussed.

1.5.1 The birth and development of ZSP

The ZSP area has long been renowned as China's largest intellectual region, with its dense concentration of research and education institutions. Among them are over a dozen best Chinese universities and more than two dozen leading research institutes affiliated with the Chinese Academy of Sciences (CAS). Although the Chinese government had heavily invested in this region for decades for the purpose of promoting research and tertiary education, it was not until the early 1980s that the commercial values of scientific and technological knowledge were recognized by the central government.

An innovative atmosphere emerged in the early 1980s when the economic reforms in China began to accelerate (Wang and Wang, 1998). The state government managed to restructure the existing research institutions by establishing some market-oriented mechanisms. For example, the state cut basic funding for research and development (R&D) heavily in all institutes under the CAS and encouraged the CAS to set up self-financed and market-driven new ventures that transfer scientific research to the market. The state also initiated projects to directly support certain scientific research and development initiatives such as "Torch" Program, which contributed to a prosperous of technology start-ups (Wang, 1999). The restructuring of research institutions/universities and the new programs and projects have formed a positive environment for Chinese high-tech development and encouraged state-owned institutes to set up research intensive and market-driven ventures to explore their innovative potential (Abramson, 1989 and Johnson, 1989).

An experimental trial started in 1980 in ZSP when a few professionals acted as risk-takers and devoted themselves to an early experiment for establishing non-state-owned firms in the region (Lu, 2000). Mr. Chen Chunxian, one of the early pioneers, from the Institute of Physics of CAS created an innovative new venture—Advanced Technology Development Board of Plasma Association. However, academics were expected to concentrate on research duties designated by the research institutions or universities they belonged to, leaving entrepreneurial ventures to the businesses. This situation did not change until the beginning of 1983 when the central government supported Chen through a positive assessment of Chen's business as the first Chinese non-state-owed innovative venture. The support subsequently leading to the further development of the ZSP. In May of 1988, a well-defined area was described as the Beijing Experimental Zone (BEZ) for New Technology Industries , widely known as Beijing Science Park, and wide-ranging incentives for the high-tech start-ups were endorsed into law. Since then, as the old economic system was being transformed, the ZSP started to take shape and later led to a group of high-tech start-ups. Some of these technology-oriented ventures, such as the Founder Group of Peking University, Ziguang Group and Tongfang Group of Tsinghua University, and the Lenovo Group of the Institute of Computer Technology of CAS, have grown into leading industrial organizations in China.

1.5.2 Government support and supervision

The start and development of ZSP is inseparable the assistant and support from central government. Most high-tech firms of ZSP have been organized under the "four self-principles" encouraged by the government, e.g., self-chosen partners, self-financing, self-operation (independent decision-making and managerial autonomy), and self-responsibility for all losses incurred by the venture (Tan, 2006). This represents a major departure from the old rules of the "iron rice bowl," and entrepreneurs have responded with unprecedented enthusiasm. The researchers and scientists in state-owned research institutes and enterprises have been thrown into a sea of harsh competition. They have to learn to swim quickly or face extinction.

Having the assistance from government agencies is particularly important in the Chinese transitional economy (Tan, 1999). In the case of the ZSP, the "visible hand" behind the birth and growth of the ZSP was the BEZ, the primary regulatory framework for managing new-tech firms (Gu, 1996).

As a regulatory institution, the Management Commission of BEZ handles affairs such as licensing, taxation, international trade, finance and investment, employment, and intellectual property for new-tech firms, largely in accordance with the stipulations of national policy but with slight local modifications. As a supporting institution, the Management Commission of BEZ invests some initial capital in the infrastructure needed for the new start-ups and provides managerial guidance. It also works as a liaison between high-tech ventures and sources of finance. The area administration frequently provides references, which act as informal guarantees, that allow high-tech firms to apply for bank loans and government funds (Gu, 1996).

Besides providing support, the Management Commission of BEZ also monitors firms to make sure they abide by the law. It awards certificates to firms performing well — a condition to qualify them for the State Scientific and Technological Loans. Firms that perform poorly are removed from the list of high-tech firms and excluded from preferential treatment in BEZ (Tan, 2006).

1.5.3 Entrepreneurial culture

The network of alliances among professionals in the labor pool, suppliers, and competitors would stimulate an environment of creativity and idea exchange (Saxenian, 1994). As Kogut et al. (1994) suggest, firms and their suppliers within a region share tradable resources, but they also share knowledge that is part and parcel of the social community, a public good for all members. Formal and informal information exchange among competitors, suppliers, and other related businesses would leak information about competitors and their innovation practices (Baum and Mezias, 1992 and Saxenian, 1994), contributing to firms' well-developed competitive intelligence within the cluster (Pouder and St. John, 1996).

The Chinese society is generally considered to be bounded by informal interpersonal ties that exist in almost every aspect of social interaction (Boisot and Child, 1988). In the ZSP, a unique characteristic has been that entrepreneurs have transformed their informal interpersonal networks into informal and formal inter-organizational ties. Two types of local inter-firm linkages have been found inZSP: information sharing and input－output transactions.

Information exchange in ZSP has mainly been achieved in two ways. One is through price-listing publications by certain information networks. There are more than 10 such information networks issuing weekly reviews that list price of different types of products available within the ZSP region, each of which can be hundreds of pages long. Such information exchange is mainly supported by membership dues and advertising revenue.

Another form of information exchange is through a few non-profit organizations, such as the Chief Executive Officer Club or the Beijing High-tech Firms Association, and the Non-state-owed Enterprise Association. These networks exist in different periods to solve specific problems, such as adapting to the changing policy in economic reform, seeking credit guarantees by small firms, or finding ways to deal with new situations. However, informal communications have not significantly promoted cooperative innovation, partly because many spin-offs from different state-owned institutions have maintained strong ties with their parent organizations, which are under different government ministries.

1.6. Knowledge gap in literature

China is the largest transition economy in the world. After nearly three decades of sustained market transition, domestic entrepreneurial organisations, including private start-ups, township and collective enterprises, and transformed SOEs, have emerged as one of the most important driving forces behind China's rapid economic development (Yang and Li, 2008). In the literature, a fundamental characteristic of entrepreneurship is a concern with various forms of creation and newness (Brush et al., 2003; Kazanjian et al., 2001). Considering the inherently chaotic and unpredictable nature of institutional transition, the creation and newness of entrepreneurship activities in China could be very different from those in more advanced economies (e.g. Young et al., 2002). Yet to date, the management and entrepreneurship literature has paid only limited attention to these issues. The rapid development of entrepreneurship in China underscores an urgent need for systematic knowledge of its characteristics and growth patterns.

Yang and Li (2008) did a comprehensive literature review on the state of research on China-related entrepreneurship. They reviewed the literature published in 11 leading English-language academic journals of management and entrepreneurship over the 26 years from 1980 to 2005. In total, 68 articles were identified. The researchers found a growing interest in entrepreneurship-related issues in the Chinese context among management scholars and journal editors, as the amount of leading management journals has significantly increased over time, with 11 articles published in the second period (10 years, 1990–1999) and 24 articles published in the third period (only 6 years, 2000–2005). Similarly, the number of articles appearing in the entrepreneurship journals also indicates an increasing interest in the entrepreneurship phenomenon in China.

In addition, whereas 54 of the 68 articles were focused on environmental-level (market transition, business system change) and firm-level studies (firm strategy, firm outcomes), only 14 were related to the individual-level. At this level the authors found that the research mainly focuses on individual managers' or entrepreneurs' cognitions, values, and behaviour. In both domains, many studies analysed the effects of culture and cross-national differences on managers' or entrepreneurs' values/behaviour (e.g. Egri and Ralston, 2004; Mitchell et al., 2000; Vertinsky et al., 1990; Weber and Hsee, 1998, in management journals; Brush and Chaganti, 1996; Busenitz and Lau, 1996;

Hayton et al., 2002; Holt, 1997; McGrath et al., 1992; Mitchell et al., 2002, in entrepreneurship journals). The remaining studies examined entrepreneurs' limited accessibility to private equity (Batjargal and Liu, 2004), growth orientation (Lau and Busenitz, 2001), and innovation and risk-taking attitudes (Tan, 2001, 2002) in the context of a transition economy. The theoretical perspectives employed in this literature included the integrations between the cross-cultural perspective, social cognition theory, and the institutional perspective.

Other than that, only 1 paper has been found studying Chinese serial entrepreneurs (Li et al., 2009). Therefore, there clearly is a gap in the previous literature on studies of habitual and serial entrepreneurship in China. My study, therefore, has the objective to explore the Chinese habitual and novice entrepreneurs' characteristics in terms of their ability to innovate, the business performance under their leadership and the adoption of e-commerce. The next section will discuss my study in detail.

1.7. Focus of this study

After reviewing the literature on habitual entrepreneurship it is clear that this is under-researched in China (Ucbasaran et al., 2008). Indeed, the extant previous research on habitual entrepreneurship in China is very inadequate. To better understand the habitual entrepreneurs and SMEs in China, my research adopts a quantitative methodology, with an initial sample size consisting of a total number of 4000 names and company addresses bought from a commercial database company. All the surveys were posted to those companies, which are located on and off ZSP, Beijing, China.

This research will focus on:

1. To understand the business characteristics of novice and habitual entrepreneurs in China.
2. To identify the characteristics of novice and habitual entrepreneurship and the innovation of the firm located on and off science park.
3. To explore the relationship of entrepreneursl experience and the on and off-park firm's performance in terms of export, employment growth and profitability.

4. To identify the characteristics associated with the use or non-use of e-commerce by novice and habitual entrepreneurs on and off science park.
5. To explore the relationship between science park location and firm performance.

The research questions are:

1. Are the habitual entrepreneurs more innovative than novice entrepreneurs?
2. Are portfolio entrepreneurs more innovative than serial entrepreneurs?
3. Do the businesses led by habitual entrepreneurs perform better than the firms led by novice entrepreneurs?
4. Do the businesses led by portfolio entrepreneurs perform better than the firms led by serial entrepreneurs?
5. Do habitual entrepreneurs have more intention to adopt e-commerce than novice entrepreneurs?
6. Do portfolio entrepreneurs have more intention to adopt e-commerce than serial entrepreneurs?
7. Do the firms located on science park perform better than firms located off science park?

1.8 Significance of this study

Small businesses are the main driving force behind the national economy growth. The major difference between the organisation of a large firm and that of a small one is the role of ownership and management. In a small firm there is usually one person or a very small group of persons who are in control and who shape the firm and its future. The role of such a person is often described with the term "entrepreneurship". My study focused on habitual and novice entrepreneurship in the Chinese economic context, which is still at a transition economy stage, and therefore could be a very different case when compared with more developed countries. There are three main reasons which underpin the importance of this research:

First of all, as addressed in the section about the knowledge gap, there is very limited research that has been done on habitual entrepreneurship in China before; there is still much to be discovered about the characteristics of Chinese entrepreneurs. Therefore, my research will be able to make a contribution to the habitual entrepreneurship theory. Secondly, this research will enhance understanding of the novice and habitual entrepreneurs in China. Thus it will provide policy makers with a basis on which to introduce initiatives that address barriers to enterprise and firm development and encourage the development of existing entrepreneurs and new firms. Last but not least, it gives the entrepreneurs in China a chance to reconnect and recognise the benefits of e-commerce and provides a feasible and practical way for the Chinese entrepreneur to adopt e-commerce.

1.9 Thesis structure

The dissertation is organised into 8 chapters. The first chapter is the introduction chapter which will give an overview of the study background and address the importance of this study. Chapter 2 is the literature review chapter; in this chapter the previous work of science park location and small firm's performance will be reviewed. Chapter 3 is the theoretical background of this research, human capital theory, and the RBV will be introduced in the chapter. Chapter 4 is the methodology chapter; the method of survey and techniques used to analyse the data collected will be presented in this chapter. Chapters 5, 6, and 7 are three empirical chapters, and the research topics of innovation, firm performance, use of e-commerce and characteristics of Chinese entrepreneurs will be explored respectively. And finally chapter 8 concludes the dissertation with outlines of key findings and main contributions of the study. The structure of the dissertation is shown in Table 1.3.

Table 1. 3 Structure of dissertation.

Chapter	Chapter summary	Chapter content
Chapter 1	Introduction	Introduce the entrepreneurship and SMEs in China. Explain why the author study this topic and why this topic is worthy of research.
Chapter 2	Literature review	Examine the literature of the science parks and small business performance that has been previously done by researchers around the world.
Chapter 3	Theoretical background	Introduce Entrepreneurship Theory, Human Capital Theory, and RBV.
Chapter 4	Methodology	Describe the method of data collection and the techniques used to analyse the data collected by the author.
Chapter 5	First empirical chapter	Explore the characteristics of firm innovation by Chinese novice, serial and portfolio entrepreneurs.
Chapter 6	Second empirical chapter	Examine the business export, employment growth and profitability by Chinese novice, serial and portfolio entrepreneurs.
Chapter 7	Third empirical chapter	Identify the characteristics associated with the use and non-use of e-commerce by Chinese novice, serial and portfolio entrepreneurs.
Chapter 8	Conclusion	Outline the main findings and the main contributions of this study, and then provide recommendations for future researches.

1.10. Conclusion

The introduction chapter presents an overview of the dissertation to the reader. In this chapter a general overview of definitions of small business and contributions of small business to national economy level are reviewed. Then the knowledge gap in the literature is discussed, followed by the focus and significance of this study. In addition to this, the structure of the dissertation is provided at the end. It is well acknowledged that small businesses have made significant contributions to the economic development of many nations in terms of employment generation, income generation and poverty reduction (Harvie and Lee, 2002, Albaladejo, 2002). This study therefore investigates the performance differences of small businesses led by habitual and novice entrepreneurs. Evaluating the innovation process and techniques among Chinese entrepreneurs; examining the export, employment growth and profitability of 3 different types of entrepreneurs; and the use of e-commerce and the barriers to the adoption of e-commerce by types of entrepreneur are also important parts of the dissertation. The dissertation explores business adoption of e-commerce under the management of three types of entrepreneur, and explains why they do and do not use e-commerce. The next chapter is the literature review chapter, which presents the international studies of the origin of science parks, and the relationship between the science park location and business performance.

Chapter 2

Science Parks

2.1 Introduction

The initial concept of a Science Park originated in the United States, and currently the US developments continue to be on a much larger scale than those anywhere else in the world (American Electronics Association, 2008). There are three very successful developments in the US: the Massachusetts Institute of Technology (MIT) in Boston, the Stanford University Industrial Park, and the Research Triangle Park (RTP) in North Carolina (Monck et al., 1988). Each of these developments at Boston, Stanford and the Research Triangle is now, by any standards, a major success. For example, Hardin (2008b, p. 27), reports that:

> North Carolina's RTP is the largest and arguably best-known research park in the United States. At more than 2,800 hectares in total size, it currently includes 145 organizations employing more than 39,000 people with combined annual salaries amounting to over $2.7 billion dollars. At least 80 % of its organizations engage in R&D, and more than 93 % of its employees work at those R&D organizations. Even more impressive, at least 80 % of the employees in RTP work for multinational corporations, and the average salary of an RTP employee is $56,000, which is significantly higher than the regional and national average.

Since the success of the three parks' experiments have become a much published success story, the development of Science Parks has become a prominent element in state and regional development strategies in the United States, as well as in Europe and Japan, Australia, and many other developing countries such as China (Monck et al., 1988). Over recent years, continuous increases in the number of science parks have caught the eyes of small business researchers in countries such as: the US, the UK, Sweden, Portugal, Australia, Japan, Korea and China.

The purpose of this chapter is to provide a systematic overview of the concept of science parks and the previous research which has been undertaken to investigate the impact and performance of science parks. A total of 37 papers published between 1986 and 2011 have been reviewed. In synthesising the findings, attention has centered upon: author, country, period analyzed, year of publication, observation, response rate, performance measures, key findings and theory used (see appendix 1).

This chapter is organised into four main sections. The next section presents the definition of a science park and after a brief discussion of the origin of science parks, the objectives of science park will be presented. In the third section, a review of science park performance from all over the world is presented and the final section concludes this chapter and presents the major findings of the chapter.

2.2 Definition and objectives of science parks

Before undertaking the literature review of science park performance, it is important to know what a science park is. It is hard to give a science park a clear and accurate definition and, there are several similar terms used to describe broadly similar developments - such as ‘research park’, ‘technology park’, ‘business park’, ‘innovation center’ (Monck, 1988), ‘research-and-technology parks’, ‘technopoles’ (in the Francophone world), and ‘technopolis’ in Japan (Castells and Hall, 1994).

Currie (1985), and Eul (1985) have attempted to distinguish between innovation centers, science parks and research parks. Currie (1985) stated that innovation centers are small developments that provide facilities, which enable start-up and small businesses to develop ideas. However, they do not provide accommodation either for such businesses once they have grown, or for existing medium-sized or larger businesses. On the other hand, science parks provide accommodation for both start-up and medium-sized establishments, generally in a green field setting, where small scale manufacture can take place (Monck et al., 1988). Eul (1985), however, defines an innovation center as a group of buildings, close to a center of academic excellence, providing managed short occupancy term accommodation for the development of strategic research or prototype development. Eul’s (1985) science park definition is similar to that of Currie (1985), but his definition of a business park is a development which provides high quality accommodation in which a wider variety of activates such as manufacturing, showrooms, and distribution can take place.

The precise distinction between these various concepts is difficult to ascertain. In fact, distinctions are not always made: some authors use different terms to define different entities (Colombo and Delmastro, 2002; Fukugawa, 2006), whereas others use the terms interchangeably (Luger and Goldstein, 1991; Kihlgren, 2003). The diverse set of definitions and the vocabulary problem of what a science park is reflect the fact that there has been no agreement on a universal definition. It seems to be that such parks gather producers of high-technology products and services, and provide the opportunity for a degree of institutional cooperation between university and industry (Bell and Sadlak, 1992). The Association of University Related Research Parks (AURRP, p. 2) defines a science park as “a property-based venture” which has:

1. Existing or planned land and buildings designed for private and public research and development facilities, technology and science based companies relating to support services;

2. A contractual and/or operational relationship with a university or other institution of higher education;

3. A role in promoting research and development by the university in partnership with industry, assisting in the growth of new ventures, and promoting economic development;

4. A role in aiding the transfer of technology and business skills between the university and industry tenants.

This definition has provided a set of distinguishable criteria. Other similar associations, for example the International Association of Science Parks, and the United Kingdom Science Park Association, have adopted broadly similar membership criteria. Regardless of the precise definition, the science parks are expected to stimulate the growth of high-tech activities and to foster the transfer of technology between research and industry (Westhead and Batstone, 1998； Bergek and Norrman, 2008). They are often seen as constituent elements within wider ‘learning regions’ (Carluer, 1999; De Bernardy, 1999; Keeble et al., 1999; Simmie, 1997) which lead to the development of “profitable new products and processes" (Keeble and Wilkinson, 1999, p.296). More specifically, science park objectives can be divided into three main classes: (a) economic development objectives, (b) transfer-of-technology objectives, and (c) local benefit objectives (Massey et al., 1992; Link and Scott, 2003) (see table 2.1).

Table 2.1 Science park objectives. (source: Massey et al, 1992, p. 21).

Economic development

- Stimulate the formation of start-up new-technology-based firms (NTBFs)
- Encourage the growth of existing NTBFs
- Commercialise academic research
- Foster the technologies of the future
- Counter the regional imbalance of R&D capability, investment, innovation
- Attract inward investment, mobile R&D

Transfer of technology

- Encourage spin-offs started by academics
- Encourage and facilitate links between higher education institutes and industry
- Facilitate technology transfer from academic institution to firms on-park
- Increase the ‘relevance’ of the research of higher education institutes to industry
- Give academic institutions access to leading-edge commercial R&D
- Increase the appreciation of industry's needs by academics
- Stimulate science-based technological innovation

Local benefits

- Create employment and consultancy opportunities for academic staff and students
- Create synergy between firms
- Create new jobs for the region
- Improve the performance of the local economy
- Stimulate a shift in perceptions
- Build confidence
- Engender an entrepreneurial culture
- Generate income for academic institutions
- Improve the image of academic institutions in the eyes of central government

The relationship between science park firms and local research institution has been researched. However, the results from the research have not been unanimous (Lai and Shyu, 2005). Massey et al. (1992) suggested that the level of interaction between on-park firms and local university are relatively low. However, on the contrary, other studies argued that firms located in science parks are more likely to have links with local universities (Colombo and Delmastro, 2002; Löfsten and Lindelöf, 2001, 2005) and develop some kinds of organisational relationship with each other because of geographical proximity (Jou and Chen, 2001).

After reviewing the definition and objectives of science parks, the next section will examine the performance of science parks around the world.

2.3 Science park performance studies around the world

The definition and objectives of a science park are cleared stated, but it is difficult to assess the impact and effectiveness of science parks because of the diversity in stakeholders' objectives and expectations of the science parks (Monck et al., 1988) and the difficulties in measuring the relevant performance criteria (Siegel et al., 2003). One well-established method for documenting the effect and assessing the impact of science parks is to compare the performance of technology-based firms located within science parks with the performance of similar firms located off-park (Westhead, 1997). Next, the studies of science park performance will be presented by region/country.

2.3.1 Studies in the UK

The first fieldwork conducted in UK was by Monck et al. (1988) in 1986; they conducted face-to-face interviews with 284 managers, owners or key leaders of small firms, of which 183 were firms on a science park, and 101 were off-park firms. The results showed that, taking the different ages of the firms into account, off-park firms achieved a higher level of employment than comparable on-park firms, thus indicating that science parks even obstruct the development of high-tech firms. Another possible explanation could be the quality and objectives of some of the entrepreneurs who prefer to be located on science parks. A significant number of the underperforming on-park firms were founded and managed by academics or ex-academics. One plausible explanation for this underperformance in employment growth in these firms could be the lack of managerial skills among the academic entrepreneurs.

Using the same methodology (matched sample of on and off science park firms, in terms of sector, age, ownership and location) and dataset, Westhead (1997) conducted two surveys in 1988 and 1992-3 comparing UK science park firms with off-park firms. The results of these surveys showed that science park firms did not directly invest more in R&D than off-park firms, nor did they record significantly higher levels of technology diffusion. The author concluded that:

> It is the similarities between independent science park and comparable off-park firms which are striking, rather than the contrasts (Westhead, 1997, p. 12).

Siegel et al. (2003) performed another test on the dataset which was originally collected by Monck et al. (1988) and Westhead and Storey (1994). In total 89 on-park and 88 off-park firms in UK were examined by the number of new products / services, the number of patents applied for or awarded, the number of copyrights, the R&D expenditures, and the number of scientists and engineers. By contrast, the results suggest that firms located on university science parks have slightly higher research productivity than observationally equivalent firms not located on university science parks (Siegel et al. 2003).

Westhead and Batstone undertook a study of UK science parks in 1998. In total, 47 on-park firms and 48 off-park firms were interviewed during the period of 1992-1993.This study investigated factors which influenced owners to locate their businesses on a science park or an off-park location. In addition, the perceived benefits of science park were explored. The authors suggest that supportive property-based science park initiatives that make a contribution to new firm formation and urban regeneration were valued by technology-based tenant firms. By providing small units with flexible lease terms, many science parks had removed a significant barrier to business start-up and growth. To overcome some of the liabilities of small size and youthfulness, many NTBFs had either been established on science parks or had relocated shortly after start-up on to a supportive science park environment because of the 'prestige and overall image of the site' and the 'prestige of being linked to the higher education institution (HEI)/centre of research' (Westhead and Batstone, 1998, p. 12).

Westhead and Cowling (1995), used the sample data set of Monck (1988) and Westhead and Storey (1992) to evaluate the employment growth of British firms on and off science parks over a 6 years period (1986-1992). They found that in 1986, the mean employment size of the 46 independent science park firms was 11.3 employees compared with a mean of 21.4 employees in the 31 independent off-park firms.

By1992/3 the science park firms had grown to employ on average 26.8 people, whilst the mean employment size for the off-park firms had grown to 37.8 employees, the ‘mean employment increase in both groups of firms was virtually identical’ (15.5 employees compared with 16.4 employees) (Westhead and Cowling 1995, p.129).

2.3.2 Studies in the US

Since the first science parks were established in the US, and they are arguably still the most developed and successful in terms of quality and quantity in the world, the US science parks have attracted substantial attention. Roberts and Wainer undertook studies on them as early as 1968. Roberts and Wainer (1968) studied 200 spin-off companies from MIT and its laboratories. They found that these spin-off companies had a high success rate and phenomenal growth rates.

In 1987, an assessment of the impact of research parks on regional economic development, including job creation, new business formation, and average wage and salary level, was undertaken by Luger and Goldstein (1991). They chose to study three mature parks for case studies, and these were: the RTP, The University of Utah Research Park, and The Stanford Research Park. The interesting results show that regions differ widely in their suitability for research park growth. In general, regions are most likely to host successful research parks if they have:

> 1. An existing base of R&D and high-tech activity, 2. One or several research universities, medical schools and engineering institutes, 3. Good air service, 4. A well-developed network of infrastructure and business service, and 5. Foresightful and effective political, academic, and business leaders (Luger and Goldstein, 1991, chapter 9).

Appold (2004) conducted a comprehensive study of science parks in 3024 US counties during the period of 1960 to 1985. This study examined the effectiveness of research parks in attracting research activity to localities. It compared the number of industrial research laboratories in localities in 1985 to the number in the mid-1960s. The analysis indicated that research parks were not effective local development tools but instead benefited from the growth of research activity (Appold, 2004).

Link and Scott (2003) undertook research on the impact of science parks on the academic missions of universities. In 2001, they send out a survey to 88 universities electronically, and the number of valid replies was 29, which yielded a valid response rate of 33%. In the survey, they tested the research output of each university after involvement with firms on science parks in terms of publications, patents, external research funding, research curriculum, placement of doctoral graduates and ability of the university to hire pre-eminent scholars. The statistical technique applied was ordered probit models. Each model was specified to explain inter-university differences in the extent to which responses agreed or disagreed with the 6 academic mission statements using the Likert-scale: a 5 point scale ranging from strongly disagree to strong agree. Results showed a direct relationship between the proximity of the science park to the university and the probability that the academic curriculum will shift from basic toward applied research (Link and Scott, 2003).

Link and Scott (2006) also conducted further research in 2006, in which they studied 81 parks and an additional 27 parks in the planning stage. The measures that Link and Scott (2006) used were: employment, age of the park and miles from park to university. The results showed that the average growth rate of all parks is 8.4% per year. Parks closer to the university, affiliated with more universities, operated by a private organization, and with a specific technology focus — information technology in particular — grow faster than the average. Whereas research parks with incubator facilities grow nearly 3% slower per year than parks without, and whether the university is private or public has no statistical effects on-park growth. (Link and Scott, 2006).

2.3.3 Studies in Sweden

Löfsten and Lindelöf are two science park experts in Sweden. The pair of them have undertaken several studies which have been published in 6 papers (Löfsten and Lindelöf 2001; Löfsten and Lindelöf, 2002; Lindelöf and Löfsten, 2003; Lindelöf and Löfsten, 2004; Löfsten and Lindelöf, 2005; Lindelöf et al. 2006). In their research they have examined science park performance in terms of employment growth and sales growth of firms located on and off science parks from 2001 to 2006.

Löfsten and Lindelöf (2001) examined the growth of sales, growth of employment, and profitability of 263 NTBFs in Sweden where 163 were on-park, and 100 were off-park. The findings suggest that the park milieu appear to have a positive impact on their firms' growths as measured in terms of sales and jobs. To be specific, the general trend of figures in 1994-1996 yearly average turnover rate of NTBFs on science parks against NTBFs off-park are: 45.60%, 12.93%, respectively. Whereas the figure of yearly employment growth rate of the two groups are 27.95% and 10.17% correspondingly. However, there was no evidence of a direct relationship between science park location and profitability (Löfsten and Lindelöf, 2001). The possible reasons for this given by the authors were: first, the academic-owned businesses were less profit-oriented when compared with professional-owned businesses and second, for NTBFs, profit are consistent with age, but some of them are simply too young to make profit.

Subsequently, Löfsten and Lindelöf (2002) in 1999 looked at 134 NTBFs on-park and 139 NTBFs off-park to identify any elements of added value the science park brings to NTBFs. The study showed some differences between the experience of firms on and off-park in respect to innovation and marketing issues. To examine the potential for growth, they tested the location of customers in terms of whether firms are linked to local, national or international markets. One significant finding was that on-park NTBFs have a much wider market distribution throughout Sweden and abroad than off-park small firms. Other significant differences can be seen between science park firms and the off-parks firms. Science park firms tend to be more involved in co-operation with universities, science park managers have an important role not only establishing links, but also encouraging the development of more formal links (Löfsten and Lindelöf, 2002).

In 2003, 2004, 2005 and 2006 by using the same data, their research shows that:

1. There are some differences between the experience of on-park and off-park firms in respect to the motivation of location and strategy issues (Löfsten and Lindelöf 2003).

2. No statistically significant differences between science park NTBFs and off-park NTBFs were recorded with regard to patents/products launched in the last three years (Löfsten and Lindelöf, 2004).

3. On-park firms collaborate less than off-park firms and their technological and economic performance do not significantly differ from the latter (Löfsten and Lindelöf 2001; Löfsten and Lindelöf, 2003).

4. No single university will provide the full range of scientific or management skills

required by the park NTBFs (Löfsten and Lindelöf 2003; Löfsten and Lindelöf, 2005).

5. The level of interaction in the innovation process between firms located on science parks and local universities is generally low, but it is higher than the level of interaction exhibited by firms that are not science park firms (Löfsten and Lindelöf 2001; Löfsten and Lindelöf, 2005).

6. The proximity to a university is especially significant among NTBFs inside parks (Löfsten and Lindelöf 2001; Löfsten and Lindelöf, 2003; Löfsten and Lindelöf, 2005).

7. Infrastructure has a high significance in both on-park and off-park firms whereas the cost of facilities ranges in significance between the firms located on and off science parks (Löfsten and Lindelöf, 2005; Löfsten and Lindelöf, 2006).

Ferguson and Olofsson (2004) found a similar result after performing research on 66 NTBFs in Sweden: 30 on-park, and 36 off-park. Ferguson and Olofsson (2004, p.15-16) found that:

I. Firms located on science parks have significantly higher survival rates than off-park firms. More specifically, of the 66 firms in the 1995 sample, 14 were no longer registered as operating businesses, resulting in a 79% overall survival rate. Of the 30 firms located on science parks in 1995, 28 firms (93.3%) were still in operation in 2002, compared to only 24 of the 36 off-park firms (66.7%).

II. There are insignificant differences in sales and employment between firms located on and off science parks. The average annual growth rates in employment of science park firms and off-park firm are 0.2622 and 0.2070 respectively, the average annual growth in sales of the two groups are 0.5254 and 0.3475.

III. The location benefit associated with cooperation with universities is positively associated with growth. In checking for association between the possible benefits of location and firms' growth, five of the benefits included in the survey were 'recruiting', 'cooperation with universities', 'access to new customers', 'positive image', and 'unique advantages'. Only 'cooperation with universities' is both significantly different between the science park and off-park groups and shows a significant relationship with growth.

2.3.4 Studies in Asia

Chen et al. (2006) examined the number of employees, working capital, R&D expenditure, land area, annual sales and the number of patents of six high-tech industries including semiconductor, computer, communications, photo-electronics, precision equipment, and biotech, in Taiwan's Hsinchu Science Park during the period of 1991-1999. This study applies Data Envelopment Analysis , and Malmquist indices to evaluate the relative efficiency of the six high-tech industries. The results indicate that the computer industry and semiconductor industry had the best performance while the other four industries (communications, photo-electronics, precision equipment, and biotech) were operated relatively inefficient.

Also in Taiwan, Yang et al. (2009) studied innovation and employment in 247 firms, 57 of them within the park in 2005. Their findings show that both the R&D expenditure and R&D productivity (patent) for Hsinchu Science Industrial Park (HSIP) firms are larger than the off-park firms. These findings further reveal that NTBFs located in the science park invest more efficiently. Furthermore, Yang et al. (2009, p. 84-85) further argue that:

> These efficiency gains for NTBFs located within HSIP can be attributed to the support of governmental policies for firms' R&D efforts, the advantage of location, the clustering effect, and network externality.

The Japanese scholar Fukugawa (2006) employed a CD-ROM database of NTBFs and a directory of property-based initiatives in Japan, from which he collected 74 firms on and off science parks from Nikkei Annual Corporation Reports of Venture Business from 2001 to 2003 and JANBO Business Incubation Directory in 2003. By using those data he tested innovation and the education degree of managers in Japanese NTBFs. The results show that on-park NTBFs are more R&D-intensive than off-park NTBFs, and the educational background of NTBF managers does not affect the possibility of locating in science parks. Regarding the determinants of knowledge interaction, firstly, the results show that R&D-intensive NTBFs are likely to engage with a local HEI as a research partner. Secondly, the educational background of NTBF managers does not affect the possibility of establishing knowledge linkage with HEIs.

Phillips and Yeung (2003) studied 34 firms in a Singaporean science park. The study presents some empirical findings on the role of the Singapore Science Park as a place for R&D activities. First, the differences between firms involved in R&D activities and firms who are not involved in R&D are significant. Of those involved in R&D, most tend to focus on the ‘development’ aspect. There are positive relationships between some firm-specific variables (for example, size of research scientists and engineers and expenditure on R&D, duration of stay in the park, and national origins) and major developments. Secondly, foreign (non-local) firms are most likely to be involved in a variety of activities other than R&D. Foreign firms in the park commonly described their activities as the localisation and organisation of R&D activities and the provision of R&D support.

Koh et al. (2005) compared Silicon Valley, the Cambridge Science Park, and the Hsinchu Science Park in terms of growth mechanisms, level of technological capabilities, and the nature of its integration with national or global markets. The paper only examines the growth of the science parks themselves, and did not consider the firms located in the park. Finally, based on the review of the development of science parks in the US and UK, the author evaluated the Singapore science park strategy and presented the challenges faced by science parks in Singapore.

Chan and Lau (2005) in 2003 studied consulting services, public image, networking, clustering geographic proximity, costing and funding of six technology start-ups in the Hong Kong Science Park. They found that cost advantage in the form of rental subsidies and other expenses is the most important benefit that technology tenants can get from incubator programmes. Chan and Lau (2005, p. 1226) argued that:

> It is particularly critical for those tenants whose product technology is still in pre-mature stage or requires longer time to develop.

Also they found that sharing basic structural resources, e.g. administrative support, office equipment, are generally applied to all technology firms within the incubator programme.

Tan (2006) explored the ZSP from Beijing, China. The results show that the ZSP has played a crucial role in facilitating technology transfer and innovation since its inception. However, within a relatively short time, the ZSP cluster has started to show signs of premature aging and decline, especially when compared with other successful clusters such as Silicon Valley, which served as its role model. The author, Tan (2006, p. 846) further stated:

> Without major revitalization, the ZSP region may eventually become a giant electronics town like Akihabara in Tokyo, rather than an innovative center such as Silicon Valley. For technology parks such as ZSP to serve as the vehicle of technology transfer and the engine for innovation it is crucial to build sustainable competitive advantages that will bind clusters of entrepreneurial firms.

Chen (2006) examined the history and performance of 3 science parks in different areas of China in 2005. The three science parks examined were: ZSP in Beijing, the high-tech industrial development zone in Xian and Zhangjiang hi-tech park in Shanghai. The two clear findings from his study are: first, the science parks have benefited the cities that host them. Secondly, science parks in China are progressing steadily with the help of foreign firms, more specifically, relying on the FDI.

Macdonald and Deng (2004) conducted a comprehensive study in China, and their study included 17,498 high technology firms on-park and 4,566 high technology firms off-park during the period of 1988-1999. Macdonald and Deng (2004) considered the creation of the Silicon Valley model, and then speculated on the implications for China of its uncritical acceptance of science parks. The authors concluded that:

> There is little evidence that science parks work as their supporters say, and growing evidence that they do not. There may be benefits, but perhaps for those who can lay claim to a role in a particular model of innovation, rather than for the firms that occupy the science parks (Macdonald and Deng, 2004, p. 1).

The Korean researcher Shin (2000) studied the Daeduck Science Park (DSP) in 1997. His study considered the environment and spaces of DSP, research and educational activities, linkages between the DSP institutions and local industries, synergistic effects among research institutions, employment of local people, and the contribution to the improvement of local cultural and educational activities. It can be concluded that the plan for the DSP was successfully implemented and the guidelines contained in the original plan were well observed. Some problems that emerged in the earlier stages, such as a lack of local economic benefits and political input, are now being corrected. The DSP does provide adequate working and residential environments for those who work for the research and educational institutions that contribute to the advancement of the nation's scientific and technological research.

Filatotchev et al. (2011) investigates the impact of returnee entrepreneurs and their knowledge spillovers on innovation in high-tech firms in Beijing ZSP in China. They used data sample consists of 1,318 firms for the period 2000–2003, of which 222 are foreign-owned, 128 are founded by returnees, and 968 are non-returnee firms. Because all high-tech firms must report their annual financial statements to the Management Committee of the ZSP, the response rate is 100%. The results show that returnee density and internal skill intensity are significantly associated with innovation. The authors have found that returnee entrepreneurs are an important source of external knowledge spillovers, and that returnee presence facilitates knowledge spillovers to non-returnee SMEs.

2.3.5 Studies in Europe

Felsenstein (1994) studied 42 high-technology firms in Israel located both on and off-park in 1994. The results indicate that, first, the information flow and knowledge network associated with university interaction and an entrepreneur's educational degree level do not directly link to the innovation of the firm, and Felsenstein (1994, p. 107) further suggested that: the influence on innovation might "lie somewhere else: in both supply conditions such as the work experience of the entrepreneur and the structure of demand." Secondly, science park location is shown to have only a weak and indirect relationship with innovation level. Felsenstein stated that the location-innovation connection is strengthened when stratified by work experience. This would seem to indicate that science park location, "rather than being seedbed-inducing, could be seedbed-entrenching (1994, p.107)."

Colombo and Delmastro (2002) studied 45 Italian NTBFs located on a technology incubator within 17 science parks and 45 off-incubator firms. Results confirm that input and output measures of innovative activity are only marginally different between on- and off-incubator firms, specifically, 18% of on-incubators firms have patented a new product and/or process against 13% of the sample of NTBFs located off-incubators, and 11% and 9%, respectively, have been granted a copyright. In addition, on-incubator firms show higher growth rates than their off-incubator counterparts (55% against 30% in terms of annual number of employee change). They also perform better in terms of adoption of advanced technologies

(98% against 80%), aptitude to participating in international R&D programs (24% against 9%), and establishment of collaborative arrangements, especially with universities (29% against 13%). Lastly, they find it easier to gain access to public financial funds (51% against 33%).

Bakouros et al. (2002) studied 17 firms located in three Greek science parks: Science and Technological Park of Crete, Science Park of Patras (SPP) and Technological Park of Thessaloniki . The findings indicate that the picture of the three science parks of Greece is not the same in terms of the links between university and industry; informal links have been developed between the firms and the local university, however, only the firms located at SPP have developed formal links, while the formal links of the companies of the other two parks are at the infant level at this time. Synergies between the on-park companies are limited only in commercial transactions and social interactions. The research type synergies are completely absent in all three parks.

Ratinho and Henriques (2010) did a research study on 7 science parks and 4 business incubators in Portugal in terms of their university links and suitability of management. Data were collected using written questionnaires and open phone interviews to the management of each science parks and business incubator. The figures in terms of company creation only have a local level impact. This effect is even more weakened as most of the Portuguese population of science parks s and business incubator s are located in urban areas. Furthermore, the results concerning the science park s' and business incubator s' operational performance are not significant. Apart from the cases of excellence (Tagus Park and Biocant Park), most Portuguese science park s and business incubator s were not planned and are not working towards the creation and development of new ventures. This leads Ratinho and Henriques (2010, p.10) to conclude that "as a result, their contribution to job creation and economic growth is barely visible."

The Finnish researcher Squicciarini (2009) compared the patenting activity that a sample of firms exhibits before locating inside the science park with the innovative output they show after becoming park tenants during the period 1970-2002. The results show that both the firm's size and patents in their portfolios positively affect the firm's likelihood to patent (Each additional employee of the firm has a very small although positive effect on the firm's likelihood to patent (0.0627–0.1004%). And increasing by one unit the number of patents a firm already has leads to 10.45–

20.42% higher likelihood to patent.). He also found that the years spent elsewhere, before joining the parks, negatively influence firms' performance (per each additional year spent inside the science parks, firms increase their likelihood to patent by 13.80–13.95%).

Kihlgren (2003) researched two technology parks and two innovation centers operative in St. Petersburg during the period 1992-1998, and they were: The Technology Park of the Electrical Engineering University and The Technology Park of the Technical University, The Innovation Center of Svetlana and The Innovation Center of Technical University. The author addresses that, due to the absence of comparative statistics, it is hard to judge science parks' contribution to the development of tenant firms, but there are some noteworthy unique features. Science parks in St. Petersburg have been rather successful in securing financing for their tenants, but deficient in providing management assistance such as attracting foreign capital or in finding markets abroad, they do not have an official advisory board which lead to limited degree of consulting, and they are often in unattractive surroundings and located in run-down areas. The transfer of technology to industry has been weak due to the limited demand for high-tech products.

2.3.6 Studies in the rest of the world

In Canada, Shearmur and Doloreux (2000) comprehensively reviewed the 17 Canadian science parks in terms of high-tech employment in the regions in which they are located during 1971-1997. It is found that there is no link between the opening of a science park and employment growth in high-tech sectors. The authors stated:

> Science parks do not appear to have any distinguishable effect upon regional industrial structure, and in particular they have no discernible effect upon high-tech employment whether in the manufacturing or in the service sectors (Shearmur and Doloreux, 2000, p. 14).

Phillimore (1999) examined interaction and networking within Western Australian Technology Park (WATP), as well as between WATP companies and universities. In 1998, a survey was sent to all 58 technology firms based at WATP; a total of 52 replies were received representing a 90% response rate. In addition to that, a more complicated questionnaire asking for more extensive detail on their collaborative activities was sent to all firms again; 38 companies answered, representing a response rate of 65%. The survey found 24 of the 38 WATP companies (or 63%) had at least one link with a local university, which shows that WATP companies have much lower levels of university linkage than their Surrey Research Park counterparts in the UK. The research also shows that WATP firms were slightly less likely to collaborate on R&D than Western Australia Innovation Support Scheme firms (off-park firms) (62% to 67%). However, the performance of WATP firms is quite creditable.

2.4 Derivation of hypotheses

The objectives of science parks can be divided into three main classes: (a) economic development objectives, (b) transfer-of-technology objectives, and (c) local benefit objectives (Massey et al, 1992; Link and Scott, 2003). Therefore it would be expected that the firms located on site should have a better performance than the firms located off a science park. Ferguson and Olofsson (2004), found that firms located on science parks have significantly higher survival rates than those off-park firms.

While other researchers such as Monck et al. (1988) found that, when taking the different ages of the firms into account, off-park firms achieve a higher level of employment than comparable on-park firms, thus indicating that science parks even obstruct the development of high-tech firms. One plausible explanation for this underperformance in employment growth in these firms could be the lack of managerial skills among the academic entrepreneurs. However, overall, the performance of firms on-park should be better than the firms off-park. This will be formally tested in the following hypothesis which is central to the dissertation:

H1: Entrepreneurs located on a science park compared to those entrepreneurs who are located off-park will report superior firm performance.

2.5 Conclusion

Science parks have experienced more than a half century of history, with the first ever science park opening in 1951 in USA, the first European science park was built in the 1970s, the Asian development of science parks started in the 1980s, and more and more are under development all over the world. However, there is still no universal definition of a science park, or of a science park's objectives. Through the study of science parks, it is found that different regions have different science park objectives. Those differences may reflect the differences in the particular objectives in the perceived economic development needs of the region.

According to Felsenstein (1994), science parks were generally established with two primary objectives in mind:

> The first objective of a science park is to be a seedbed and an enclave for technology, and the second is to play an incubator role, nurturing the development and growth of new, small, high-tech firms, facilitating the transfer of university know-how to tenant companies, encouraging the development of faculty-based spinoffs and stimulating the development of innovative products and processes (Felsenstein, 1994, p.1).

The second objective is to act as a catalyst for regional economic development or revitalization, and to promote economic growth.

Link and Scott (2006) summarised the objectives of research parks in the US as being a mechanism for the transfer of academic research findings, a source of knowledge spillovers, and a catalyst for national and regional economic growth. It is almost the copy of Felsenstein’s definition. Whereas Massey and Wield (1992) examined many purposes of UK science parks. Differing from the interpretation of Felsenstein, the objectives are: (a) to create employment, (b) to establish new firms, (c) to facilitate the link between universities and these firms, and (d) to encourage high technology.

However, in Asian countries, including Singapore and China, they have developed science parks with slightly different objectives from those of UK science parks, especially since they emphasise the appeal of foreign investment. These objectives are: (a) to raise the level of technological sophistication of local industries through the promotion of industrial R&D; (b) to promote foreign investments, especially in higher value-added activities; and (c) to accelerate the transition from a labour-intensive to a knowledge-intensive economy (Phillips and Yueng，2003).

This chapter served the purpose of reviewing the empirical studies of science parks, and giving a general idea of what already has been done by science park researchers. After the review, compared with developed countries, it is clear that this specific research is limited in transition economy like China, which set the literature gap for my study of performance of Chinese SMEs located on and off-science parks. The next chapter will look at the human capital theory and the RBV, which is the theoretical background of this dissertation.

Chapter 3

Entrepreneurship Theory, Human Capital Theory and the Resource-Based View of the Firm

3.1 Introduction

Over the last two decades, scholars have attempted to present a modern theory of entrepreneurship. However, these attempts have not yielded any meaningful conclusions because there is a lack of consensus regarding what should be included in a theory of entrepreneurship (Gartner, 2001; Alvarez, 2005). The functional role of entrepreneurship includes coordination, innovation, uncertainty bearing, capital supply, decision-making, ownership and resource allocation (Barreto, 1989; Jääskeläinen, 2000; Friijs et al., 2002). Of these functional roles, innovativeness, opportunity seeking and risk taking are considered to be the three major functions (OECD, 1998; Carree and Thurik, 2002).

In their definition of entrepreneurship, Wennekers and Thurik (1999, pp. 46) summed up the functional role of the entrepreneur as:

> The manifest ability and willingness of individuals, on their own, in terms within and outside existing organisations, to perceive and create new economic opportunities (new products, new production methods, new organisational schemes and new product market combinations) and to introduce their ideas in the market, in the face of uncertainty and other obstacles, by making decisions on location, form and the use of resources and institutions.

Therefore, entrepreneurs are considered to be risk takers who pursue economic opportunities that others either fail to recognise or view as problematic or threatening (UNCTAD, 2008).

This chapter will review the previous literature on the theory of entrepreneurship, and focussed particular attention upon types of entrepreneurs associated with different levels of entrepreneurial experience that are at the heart of the hypotheses investigated in chapters 5-7. More specifically, the theories of entrepreneurship that will be examined below are human capital theory and the RBV theory. Given that the present dissertation has the overall objective of testing how businesses performance on science parks and off-park is linked to different types of entrepreneur and divergent bundles of resources, this chapter provides the theoretical underpinning and contextualisation of the dissertation. The chapter is organised as follows: section two discusses the types of entrepreneurs, section three reviews the human capital theory of the entrepreneur, and section four reviews the RBV theory. Finally, section five concludes this chapter.

3.2. Entrepreneurship theory

3.2.1 What is an entrepreneur?

Richard Cantillion (circa 1700) provided one of the earliest descriptions of an entrepreneur, describing them as rational decision makers who assumed risk and provided management for the firm (Kilby, 1971). It was John Stuart Mill (1848) who first brought the term ‘entrepreneur’ into general use among economists, and he also believed that the key factor in distinguishing a manager from an entrepreneur was the ability to bear risk (Carland et al., 1984). Many other scholars have asserted that risk bearing is a prime factor in entrepreneurial character and function (McClelland, 1961; Timmons et al., 1987; Welsh and White, 1981). However, Schumpeter (1934) argued that risk bearing was only inherent in business ownership. The entrepreneurs are combiners of resources rather than simply owners, and they introduce new combinations to the industry. The combinations of resources are broad, and include new products, new methods of production, new markets and even new organizations. Therefore, risk-bearing propensity should not be a trait of entrepreneurs. Furthermore, Borckhaus (1980) expressed doubt concerning the validity of risk-taking propensity as an entrepreneurial characteristic. In his research, Borckhaus examined 93 businesses licensed by St. Louis County, Missouri, US, during the months of August and September in 1975. Conclusively, Brockhaus (1980) found no statistical difference in the risk preference patterns of a group of entrepreneurs and a group of managers.

Scholars such as Mill (1848), Schumpeter (1934), Gasse (1977) and Sexton (1980), among others, have explored various sets of personality characteristics pertaining to entrepreneurship, and those characteristics include risk bearing, desire for responsibility, a need for power, a need for achievement, energy and ambition. Perhaps the most important factor, from a societal perspective, is the characteristic of innovation (Schumpeter, 1934). Other authors such as McClelland (1961) have argued that the need for achievement, as well as other needs such as power and affiliation, are the main characteristics that helps to distinguish entrepreneurs from others (Robinson et al., 1991). Martin (1982) stressed that entrepreneurial creativity is different from literary or artistic creativity because the entrepreneur does not innovate by creating ideas but by exploiting the value of ideas.

Table 3.1 displays a summary of entrepreneurial characteristics appearing in the literature, the table outlines entrepreneurial traits summarised by previous studies, and it shows that every scholar has given a different distinguishing set of features for entrepreneurs. Entrepreneurs are important to economic development, and therefore it is important to know the nature of entrepreneurs. Moreover, there is a need to make a distinction between small business owners and entrepreneurs. A wrong description of entrepreneurs could lead to a misunderstanding of them and, subsequently, further erroneous studies.

Although there is an overlap between small business owners and entrepreneurship, the concepts are not same. The critical factor proposed to distinguish entrepreneurs from small business owners is innovation. The entrepreneur is characterised by a preference for creating activity, and is manifested by some innovative combination of resources for profit (Carland et al. 1984). Although a risk-taking propensity is mentioned frequently in the literature, Schumpeter (1934) noted that it is inherent in ownership rather than in entrepreneurship exclusively. Brockhaus (1980) supported Schumpeter by stating that risk-taking behavior cannot be used as a distinguishing characteristic of entrepreneurship.

Carland et al. (1984, p358), have given out a set of definitions of small business owners and entrepreneurs:

> A small business owner is an individual who established and manages a business for the principal purpose of furthering personal goals. The business must be the primary source of income and will consume the majority of one's time and resources. The owner perceives the business as an extension of his or her personality, intricately bound with family needs and desires…
>
> An entrepreneur is an individual who establishes and manages a business for the principal purposes of profit and growth. The entrepreneur is characterised principally by innovative behavior and will employ strategic management practices in the business.

The origin and characteristics of an entrepreneur has been presented above, the different types of classifications of entrepreneurs will be presented in the next section.

Table 3.1 Characteristics of entrepreneurs.

Date	Author(s)	Characteristic(s)
1848	Mill	Risk bearing
1917	Weber	Source of formal authority
1934	Schumpeter	Innovation; initiative
1954	Sutton	Desire for responsibility
1959	Hartman	Source of formal authority
1961	McClelland	Risk taking; need for achievement
1963	Davids	Ambition; desire for independence; responsibility; self-confidence
1964	Pickle	Drive/mental; human relations; communication ability; technical knowledge
1971	Palmer	Risk measurement
1971	Hornaday & Aboud	Need for achievement; autonomy; aggression; power; recognition; innovative/independent
1973	Winter	Need for power
1974	Borland	Internal locus of control
1974	Liles	Need for achievement
1977	Gasse	Personal value orientation
1978	Timmons	Drive/self-confidence; goal oriented moderated risk taker; internal locus of control; creativity/innovation
1980	Sexton	Energetic/ambitious; positive reaction to setbacks
1981	Welsh & White	Need to control; responsibility seeker; self-confidence/drive; challenge taker; moderate risk taker
1982	Dunkelberg & Cooper	Growth oriented; independence oriented; craftsman oriented

(Source: Carland et al., 1984)

3.2.2 Types of entrepreneurs

Typologies are important in entrepreneurial research because they assist in the "theoretical development of entrepreneurial behaviour and performance" (Woo et al., 1988, p.165), and "draw attention to the essential heterogeneity of entrepreneurs" (Morrison et al., 1999, p. 30).

Just like a member of the general public, an entrepreneur has his/her own personality. Entrepreneurs are not homogeneous; they come from diverse backgrounds, exhibit different leadership and management styles and motivation levels (Woo et al. 1988). Therefore, it is difficult to label a typical entrepreneur, and it is hard to classify entrepreneurs generally. Although it is tough to categorise them, types of entrepreneurs have been identified with regard to the following variables: structure of the firm (Filley and Aldag, 1978), performance of the venture (Lafuente and Salas, 1989; Westhead and Wright, 1998a, 1998b, 1999), managerial practices (Lorraine and Dussault, 1987), degree of innovation (Davidsson, 1988), venture start-up process (Dunkelberg and Cooper, 1982), the entrepreneur's perception of opportunities (Davidsson,1988, and Robbie and Wright, 1996) and entrepreneurial teams (Carland and Carland, 1992).

Smith (1967), Smith and Miner (1983), Lorraine and Dussault (1987), Davidsson (1988) and Robbie and Wright (1996) have identified two types of entrepreneurs: craftsmen and opportunists. The opportunists are those who have a higher level of education and are often driven by financial desire. The craftsmen are people who normally do not have much education and their motivation for doing business is to "making a comfortable living" (Woo et al., 1991, p.97). However, Woo et al. (1991) have shown that the financial and personal motivations used to determine typologies are often overlapped rather than independent of each other. Additionally, Wright (1997) has suggested that there are other types of entrepreneurs who have not been identified.

Many other researchers have claimed that the typology that focused upon craftsmen and opportunistic entrepreneurs has not covered all types of entrepreneur. For example, Dunkelberg and Cooper (1982) found three types: growth-oriented, independence-oriented and craftsmen-oriented entrepreneurs. The growth-oriented and craftsmen-oriented types are similar to Smith's opportunist and craftsmen models respectively, while the 'independents' were characterised as being largely driven by the need for independence. Smith's theory was based on an entrepreneur's education, background and work experience, but Lafuente and Salas (1989) identified four main types by using work aspiration: 'craftsmen' entrepreneurs are those who enjoy what they do and are motivated by the nature of the work; ‘family’ entrepreneurs are more likely to face the challenge for family welfare; ‘managerial’ entrepreneurs are motivated by economic gain and more concentrated with administrative work; and "risk" entrepreneurs are those who take highly risky actions to pursue profit.

By focusing upon psychological variables, Miner (1997) also identified four types of entrepreneur: the personal achievers, the real managers, the expert idea generators and the empathic super-salespeople. He found differences in business success, and noted that some types of entrepreneurs owned businesses that reported superior levels of performance (Westhead, 1990, 1995). Some other researchers have tried to use previous business ownership experience as a benchmark to categorise entrepreneurs (Birley and Westhead, 1993b; Kolvereid and Bullvag, 1993; Alsos and Kolvereid, 1998; Westhead and Wright, 1998a, b). Previous entrepreneurial experience is at the heart of this study’s hypotheses developed and will be tested in the second half of this dissertation. The following section discusses the business ownership experience-based classification of entrepreneurs.

3.2.3 Novice and habitual entrepreneurship

It is hard to define novice and habitual entrepreneurs because there is no clearly and universally agreed definition. MacMillan (1986) was one of the first scholars to clearly introduce the term habitual/multiple entrepreneurship. MacMillan (1986) defined habitual entrepreneurs as those who have had experience in multiple business start-ups, and are simultaneously involved in at least two businesses. He argued that in order to understand entrepreneurship fully it is necessary to study habitual entrepreneurs (Ucbasaran, 2004).

By focusing on this 'multiplicity', Donckels et al. (1987) introduced the term ‘multiple business starters’ to describe entrepreneurs who, after having started a first company, set-up or participated in the start-up of (an) other firm(s). A similar definition is provided by Kolvereid and Bullvag (1993), who use the term 'experienced business founders' to describe individuals who established more than one business and still owned the most recent business prior to the start-up of the new current, independent venture.

Conversely, Birley and Westhead (1993b) defined novice founders as those individuals with no previous experience of founding a business while, on the other hand, habitual founders are those who have established at least one other business prior to the start-up of the current, new independent venture. Habitual entrepreneurs are observed to get bored once the business is established and running smoothly, and hence they tend to hand over the business to professional managers and seek excitement and challenges associated with new venture creation (Alsos and Kolvereid, 1998).

Hall (1995) stated that 'being a habitual' should encompass not only founding/start-ups, but also ownership of a business. He argued that in the small business context, starting or buying a new business might not be significantly different processes. Building on Hall's understanding of habitual entrepreneurs, Westhead and Wright (1998a) extended the definition of habitual entrepreneurs to include individuals who have established, purchased and/or inherited more than one independent business. This is based on the understanding that entrepreneurship may involve the purchase and/or inheritance of an existing independent business (Cooper and Dunkelberg, 1986).

3.2.4 The definition used in this study

The previous section has served to show that it is very difficult to give habitual entrepreneurs a precise definition as numerous definitions have been used and reported. Most the definitions are defined with regard to three well-established dimensions: business ownership, a decision-making role and an ability to identify and exploit opportunities. Table 3.2 (see appendix 2) from Ucbasaran et al. (2008) summarises the habitual entrepreneur definitions that have been used previously. To allow for a meaningful comparison to be made between studies, Ucbasaran et al (2008, p. 13) have proposed the following definitions of novice, habitual, serial and portfolio entrepreneurs:

> Novice entrepreneurs are individuals with no prior minority or majority business ownership experience either as a business founder or purchaser of an independent business who currently own a minority or majority equity stake in an independent business that is either new or purchased.
>
> Habitual entrepreneurs are individuals who hold or have held a minority or majority ownership stake in two or more businesses, at least one of which was established or purchased. Habitual entrepreneurs are sub-divided as follows:
>
> Serial entrepreneurs are individuals who have sold / closed at least one business which they had a minority or majority ownership stake in, and currently have a minority or majority ownership stake in a single independent business; and portfolio entrepreneurs are individuals who currently have minority or majority ownership stakes in two or more independent businesses.

Evidence suggests that there are significant differences in the characteristics, motivations and behaviour of novice founders when compared with habitual, serial and portfolio founders (Westhead and Wright, 1998a). An experienced serial or portfolio entrepreneur owning a business in the same sector as their previous/current venture may be able to identify, more clearly than novice entrepreneurs, what action is required to earn profit in the selected market. For example, serial and portfolio entrepreneurs may have gained important resource-acquisition skills (Ucbasaran et al., 2003a).

An entrepreneur's cognition can be understood as an important component of entrepreneurship-specific human capital (Alvarez and Busenitz, 2001), and can be shaped by the entrepreneur's level of experience (Ucbasaran et al., 2003b), which provides a framework that can be used to process information (Fiske and Taylor, 1991). This framework reduces the burden of information processing, allowing the experienced individual to concentrate on novel or unique information (Hillerbrand, 1989). Conversely, novice entrepreneurs with no frame of reference can be overwhelmed by information and/or not know how to use the information. Therefore, experienced serial and portfolio entrepreneurs might lead by the information to identify new insights and explore fresh opportunities (Mitchell et al., 2002).

However, serial and portfolio entrepreneurs may differ with regard to their behaviour. Serial entrepreneurs tend to focus on achieving a particular goal and exhibit attitudes and behaviour associated with reducing uncertainty (Wright et al., 1997a). In contrast, portfolio entrepreneurs, who appear to be motivated by wealth creation and are happy to deal with the uncertainty of owning several businesses simultaneously, may be more creative and innovative. It can be reasonably assumed that portfolio entrepreneurs who simultaneously have equity stakes in two or more private firms may have access to wider sources of information. Therefore, portfolio entrepreneurs associated with entrepreneurial cognition and more diverse information may display greater levels of creativity and innovation. Having reviewed the definition and different types of entrepreneur, the human capital theory will be presented in the next section.

3.3. Human capital theory

Human capital theory can be dated back as far as the 17th century. Around the year 1681, British economist Sir William Petty was the first to place a value on human labour by evaluating the cost of lives lost in wars. After this, English philosophers John

Locke (1632-1704) and John Stuart Mill (1806-1873), along with Scottish economist Adam Smith (1723-1790) and German social theorist Karl Marx (1818-1883), all made their own contributions towards the development of human capital theory. The 1960s heralded the start of modern human capital theory, which was developed by the Americans Theodore Schultz and Gary Becker.

According to Becker (1993), human capital theory suggests that education or training raises the productivity of workers by imparting useful knowledge and skills, which expands the workers' future income by increasing their lifetime earnings. Additionally, the human capital approach is often used to explain occupational wage differentials. Human capital can be viewed in general terms, such as the ability to read and write, or in specific terms, which include the acquisition of particular skill with a limited industrial application.

Human capital theory has been adopted by many researchers of entrepreneurs as a conceptual basis to test the firm performance in exporting (Westhead et al., 2001), innovation (Westhead et al., 2001; Mosey, 2007), opportunity identification (Shane, 2000; Ucbasaran, et al., 2003, 2009), firm failure (Ucbasaran et al., 2010) and science park firms (Westhead, 1997; Siegel et al., 2003; Filatotchev et al., 2011).

Cooper et al. (1994) argued that an examination of human capital in general provides for a more controlled evaluation of the effects of specific types of human capital. In the rest of this section, differences between novice and habitual entrepreneurs are discussed with regard to their general and specific human capital.

Human capital theory suggests that knowledge provides individuals with an increase in their cognitive abilities, which leads to more productive and efficient potential activity (Schultz, 1959; Becker, 1964; Mincer, 1974). Therefore, if profitable opportunities for new economic activity exist, individuals with more, or a higher quality of, human capital should be better at perceiving them. Once engaged in the entrepreneurial process, such individuals should also have a superior ability to successfully exploit such opportunities. One weakness in this theory is that it essentially takes a 'black box view of educational production and accumulation activities at equilibrium' (Davidsson and Honig, 2003, p.306).

Previous studies have made a distinction between different types of human capital, categorising it into general and specific groups (Florin and Schultlze, 2000). General human capital consists of acquired knowledge and skills that are applicable to a broad range of activities. On the other hand, specific human capital is composed from acquired skills or knowledge that is useful for a particular context, a single employer or a specific industry. Among start-up and small businesses, the specific human capital required for the operation and activities of the business resides in the skills and capabilities of the entrepreneur (Gartner et al., 1999). After an introduction of the origin and importance of human, the general and specific human capital will be discussed in detail in the next 3 sections.

3.3.1 General human capital

Formal education is a very important component of human capital that can assist in the accumulation of explicit knowledge that may provide useful skills to entrepreneurs. Empirical research has observed a range of results regarding the relationship between education, entrepreneurship and success. Notably, education is frequently observed to produce nonlinear effects that support the probability of becoming an entrepreneur or in achieving success (Gimeno et al., 1997; Moffett et al., 2003). A number of studies have found that, for men, a return to education is conditional on both the industry and higher levels of education, which include college and graduate studies (Honig, 1998). Furthermore, for female entrepreneurs, education seems to be particularly important for success (Bates, 1995). Evidence from Donckels et al. (1987) and Kolvereid and Bullvag (1993) showed that habitual entrepreneurs were more likely to have obtained higher levels of educational qualifications. However, Westhead and Wright (1998b) revealed that, while there were no differences in the education level of novice and serial entrepreneurs, portfolio entrepreneurs reported higher levels of education than the other two groups of entrepreneurs. A possible reason for this finding is that portfolio entrepreneurs who own several businesses at once may require a greater level of knowledge to control multiple businesses simultaneously.

Traditionally, women have been associated with lower levels of human capital, and are more likely to work part-time, at least temporarily, from labour to raise children (Becker, 1993). Consequently, female entrepreneurs may have fewer opportunities to develop relevant experience that allows them to acquire the resources necessary for business ownership (Sexton and Robinson, 1989; Cooper et al., 1994). Therefore, the likelihood of women becoming habitual entrepreneurs may be lower than that of male entrepreneurs. Indeed, empirical evidence supports this view (Kolvereid and Bullvag, 1993; Rosa and Hamilton, 1994; Westhead and Wright, 1998a). Given the traditional earning patterns of women, female entrepreneurs who become habitual entrepreneurs are potentially more likely to adopt the serial entrepreneur model where, in contrast with portfolio entrepreneurship, business ownership takes place asynchronously.

Aldrich (1999) highlights that the age of an individual is strongly and positively correlated with work experience. Moreover, Bates (1995) finds that age is expected to contribute to human capital, and hence benefit the entrepreneur until the diminishing level of effort associated with old age sets it. Kolvereid and Bullvag (1993), as well as Westhead and Wright (1998a, b), found that habitual entrepreneurs started their first business at a younger age than novice entrepreneurs. However, unsurprisingly, habitual entrepreneurs (particularly serial entrepreneurs) were older than their novice counterparts.

3.3.2 Entrepreneurship specific human capital

Cooper et al. (1994) argued that human capital could be acquired directly through personal experience or through observing others (such as parents). The occupation of parents can influence the extent to which an individual is exposed to management and entrepreneurship, and having at least one business-owner parent can help develop the human capital of the individual and also modify one's expectations about what business ownership leads to. Individuals whose parents are business owners appear to be much more likely to follow their parent's footsteps and become business owners themselves (Evans and Leighton, 1989; Curran et al., 1991; Bruderl et al., 1992). It has been argued that habitual entrepreneurs display stronger entrepreneurial cognition, which is formed during early years and reinforced through subsequent activities. When people have gained certain preferences and standards of behaviour they tend to choose activities based on those preferences (Bandura, 1982; Deci, 1992a, b). Consequently, those individuals whose parents are business owners may be more likely to have developed an entrepreneurial cognition and are, therefore, more likely to become habitual entrepreneurs themselves.

Previous knowledge plays a critical role in intellectual performance: it assists in the integration and accumulation of new knowledge, and also helps with integrating and adapting to new situations (Weick, 1996). Knowledge may be defined as being either tacit or explicit (Polanyi, 1967); Tacit knowledge refers to the ‘know-how’: the non-codified components of activity. ‘Know-what’ consists of the explicit type of information normally conveyed through procedures, processes, formal written documents and educational institutions. Solving complex problems and making entrepreneurial decisions utilises an interaction between tacit knowledge, explicit knowledge, social structures and belief systems. Human capital is not only the result of formal education, but includes experiential and practical learning that takes place ‘on the job’ in addition to non-formal education (such as specific training courses). Thus, broad labour market experience, as well as specific, vocationally oriented experience, is theoretically predicted to increase human capital (Becker, 1964). There are studies showing that labour market experience, management experience and previous entrepreneurial experience are significantly related to entrepreneurial activity (Verheul et al., 2006). Therefore, it is likely that the individual who has more previous managerial experience could turn out to be a habitual entrepreneur.

An entrepreneur can compensate for his or her personal human capital deficiencies by attracting other individuals, with more diverse human capital, to join the entrepreneurial ownership team (Ucbasaran et al., 2003a). Attracting additional equity partners into the entrepreneurial team can enable a single entrepreneur to accumulate human capital. For example, a partner may be able to offer a wider range of skills and knowledge in addition to financial resources. The team aspect of entrepreneurship may be important in providing the resources and skills needed to establish and maintain ownership stakes in multiple businesses (Slevin and Covin, 1992). Therefore, it is reasonable to assume that habitual entrepreneurs tend to have a greater likelihood to have a managerial team, whereas novice entrepreneurs tend to run their businesses solely.

Attitudes represent one aspect of cognition (Delmar, 2000) that Delmar argues attitude is a proximal determinant of behaviour (i.e., it is more specific and, because of its specificity, it is considered to be an important determinant of behaviour). Entrepreneurial behaviour involves the identification of opportunities. Therefore, attitudes towards opportunity identification are important and represent one dimension of an entrepreneur's entrepreneurial-specific human capital. Alertness exists when one individual has the ability to recognise the value of an opportunity when it presents itself while others do not (Kirzner, 1997). Long and McMullan (1984) argue that opportunity identification is a process whereby social, personal (i.e., knowledge and experience), cultural and technological forces come together and result in the eventual development of opportunity. It was argued that habitual entrepreneurs were more likely to manipulate incoming information into recognisable patterns, and then match the information more strongly to appropriate actions (Lord and Maher, 1990). If habitual entrepreneurs are indeed similar to experts in this respect, then they might be in a more favourable position to be aware of potential opportunities. This is because they are more able to make sense of the information and opportunities surrounding them. Furthermore, it is safe to say that Habitual entrepreneurs will have more positive attitudes towards the identification of opportunities than novice entrepreneurs.

3.3.3 Venture specific human capital

Motivation also represents an important aspect of cognition, and relates to what the individual likes and dislikes. On the other hand, Attitude differs from motivation in that attitude refers to what the individual finds important and unimportant. Together, attitude and motivation tend to form a set of preferences that guide our choices (Delmar, 2000). Gimeno et al. (1997) suggests that the motivation for establishing a new venture can be viewed as a component of venture-specific human capital. Additionally, the initial reasons leading to the ownership of a business can, in part, influence the development trajectory of a business (O'Farrell and Hitchens, 1988; for a dissenting view see Birley and Westhead, 1994). Therefore, motivation may have an impact on the behaviour and strategy selected by different types of entrepreneurs.

Two types of motivation can be observed: intrinsic and extrinsic motivation. Intrinsic motivation is closely related to interest and enjoyment, and intrinsically motivated behaviours are ones for which there is no apparent reward except for the activity itself. In contrast, extrinsic motivation is based on external motivators (e.g., taking actions to obtain certain incentives, not necessarily because the task is attractive) (Rigby, 1992; Amabile et al., 1994).

A variety of intrinsic and extrinsic motivations related to entrepreneurship have been identified in the following studies (Scheinberg and MacMillan, 1988; Birley and Westhead, 1994), and common intrinsic motivations include personal development and independence/autonomy (Gimeno et al., 1997). In contrast, motivations based on financial considerations, a need for approval and the welfare of others represent extrinsic motivations.

While Donckels et al. (1987), Gray (1993) and Hall (1995) found autonomy to be a key motivation for novice entrepreneurs, and less so for habitual entrepreneurs, Wright et al. (1997b) and Westhead and Wright (1998a) found that autonomy was a key motivation for both novice and habitual entrepreneurs. In addition, while studies found that wealth and materialistic motives become predominant in subsequent ventures owned by habitual entrepreneurs (Donckels et al., 1987; Gray, 1993; and Hall, 1995), Wright et al. (1997b) found that this extrinsic motive was less important for habitual entrepreneurs in subsequent ventures. Westhead and Wright (1998b) also found that portfolio entrepreneurs were more likely than novice or serial entrepreneurs to emphasise wealth related motives for establishing a business.

This section has addressed the importance of human capital theory in the study of entrepreneurship. Human capital, as one of the critical resources of a company, has been mentioned and studied more and more frequently in strategic management. Meanwhile, the resources of a firm are also treated as a decisive factor for the firm to capture a competitive advantage. Therefore, it is necessary to introduce the RBV theory in the next section.

3.4 Resource-based view of the firm theory

The RBV originated from organisational economics literature, which discussed theories of profit and competition associated with the works of Ricardo (1817), Schumpeter (1934), and Penrose (1959), and focussed on the internal resources of the firms to the major determinant of competitive success. In particular, Edith Penrose made her own contribution to the development the RBV, and Kor and Mahoney (2004, p. 191) emphasised that:

> Penrose has been instrumental to the on-going development of the modern RBV of strategic management.

After Penrose's contribution to the RBV field was made in 1960s, Birger Wernerfelt's 1984 paper in the Strategic Management Journal, "A Resource-based Theory of the Firm", is conventionally considered one the founding contributions to the RBV. Lockett et al. (2008, p. 1125) described Wernerfelt as:

> One of the founding fathers of the field of strategic management as we know it today.

A few years later, Jay Barney (1991) gave a clear set of characteristics a resource should have in order to generate a sustainable competitive advantage. Due to this, Barney was also recognised as one of leading contributor to RBV: Wright, et al. (2001,

p. 702-703) stated that:

> Barney's (1991) specification of the characteristics necessary for a sustainable competitive advantage seemed to be a seminal article in popularising the theory within the strategy and other literatures.

The definitions of resource, competitive advantage, and sustained competitive advantage are central to the understanding of the RBV. These resources are discussed in the next section.

3.4.1 What is a resource?

According to Wernerfelt (1984, p. 172) a resource is:

> Anything which could be thought of as a strength or weakness of a given firm…those tangible assets which are tied semi permanently to the firm.

Barney (1991, p. 101) expands his definition to include:

> All assets, capabilities, organizational processed, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness.

According to Barney (1991), resources fall into three categories: physical capital resources, human capital resources, and organizational capital resources. Physical capital resources consist of the firm's plant, equipment, technology and geographic location. Human capital resources include the level and amount of experience, judgment and intelligence of the individual managers and workers in the firm. Organisational capital resources consist of such things as the firm's structure, planning, controlling and coordination systems, and the informal relations among groups within the firm and between the firm and other firms in its environment (Barney, 1991).

Not all aspects of a firm's physical, human and organisational capital are strategically relevant resources, and some of these attributes may prevent a firm from conceiving and implementing valuable strategies (Barney, 1986b). Other attributes may lead a firm to formulate and carry out strategies that reduce its effectiveness and efficiency, and some attributes may have no impact on a firm's strategising processes. After reviewing all the different aspects of a firm's resources, the next section will interpret the way that the useful resources are turned into competitive advantages.

3.4.2 Competitive advantage and sustained competitive advantage

In the RBV theory, resources are the sources of competitive advantage. Barney (1991, p. 102) describes competitive advantages as occurring "when a firm is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors." According to the RBV, competitive advantage can only occur in situations of firm resource heterogeneity and immobility. Furthermore, these assumptions serve to differentiate the resource-based model from the traditional strategic management model. Firm resource heterogeneity refers to the fact that resources vary across firms. In contrast, in the environmentally focused strategy model, firm resources are viewed as homogeneous across firms in an industry (Rumelt et al., 1991). Firm resource immobility refers to the inability of competing firms to obtain resources from other firms or resource markets.

In the environmentally focused strategy model, resources are considered mobile as firms can purchase or create resources held by competing firms. Sustained competitive advantage is a totally different concept of competitive advantage: according to the RBV, a sustained competitive advantage exists only when other firms are incapable of duplicating the benefits of a competitive advantage (Lippman and Rumelt, 1982). In other words, a competitive advantage is not considered sustainable until all the competitors' efforts to duplicate the advantage have failed. Therefore, four criteria must be attributable to the resource in order for it to provide a sustained competitive advantage: first, the resource must add positive value to the firm; second, the resource must be unique or rare among current and potential competitors; third, the resource must be imperfectly imitable; fourth, competing firms cannot substitute the resource with another (Barney, 1991). Having defined a resource and a competitive advantage, it is time now to review the origin of RBV.

3.4.3 The development of resource-based view of the firm

Over the last twenty years, the RBV has reached a pre-eminent position among theories in the field of strategy, but debate continues as to its precise nature (Lockett et al., 2009). Many scholars tried to refine the theory, or to use the theory to tackle conceptual and empirical questions. The process starts with the assumption that the desired outcome of managerial effort within the firm is achieving a sustainable competitive advantage (SCA), which allows the firm to earn economic rents or above average returns. In turn, obtaining SCA focuses attention on how firms achieve and sustain advantages.

The earliest acknowledgement of the potential importance of firm-specific resources was found in the work of economists such as Chamberlin and Robinson in the 1930s (Chamberlin 1933; Robinson 1933), and was subsequently developed by Penrose (1959). Rather than emphasising market structures, these economists highlighted firm heterogeneity and proposed that the unique assets and capabilities of firms were the most important factors giving rise to imperfect competition and the attainment of super-normal profits. For example, Chamberlin (1933) identified that some of the key capabilities of firms included technical 'know-how', reputation, brand awareness, the ability of managers to work together and, particularly, patents and trademarks (many of which have been revisited in the recent strategy and marketing literature) (Day 1994; Hall 1992).

Edith Penrose's much cited work on the theory regarding the growth of the firm (Penrose 1959) arguably provides the most detailed exposition of a RBV in the economic literature. She notes that:

> A firm is more than an administrative unit; it is also a collection of productive resources the disposal of which between different users and over time is determined by administrative decision. When we regard the function of the private business firm from this point of view, the size of the firm is best gauged by some measure of the productive resources it employs (Penrose 1959, p. 24).

Wernerfelt first introduced the RBV in 1984, the author described his article as a "first cut at a huge can of worms" (Wernerfelt, 1984, p.180). However, this theory remained undeveloped for much of the 1980s. Then, increasing dissatisfaction with the 'Porterian cluster' focusing on industry structure was growing towards the latter part of the decade (Fahy, 2000). Empirical research examining performance found differences between firms in the same industry (Cubbin 1988; Hansen and Wernerfelt 1989), and also within the similar strategic groups of same industries (Cool and Schendel 1988; Lewis and Thomas 1990). This resulted in increased interest in firm-specific variables, and the number of contributions claiming to adopt ‘a resource-based perspective’ thrived. Additionally, growing management literature highlighted examples and cases of where companies with particular skills and capabilities were able to out-perform their rivals (Coyne, 1986; Ghemawat, 1986; Grant, 1991; Hall, 1989; Stalk et al., 1992; Williams, 1992). Furthermore, a number of industrial economists contributed rigorous examinations of why performance differences persisted in situations of open competition, which has become one of the core insights of the RBV (Amit and Schoemaker 1993; Barney, 1986; 1991; Dierickx and Cool, 1989; Lippman and Rumelt, 1982; Peteraf, 1993; Reed and DeFillippi, 1990).

3.4.4 The characteristics of advantage-generating resources

The list of resources in any given firm is likely to be a long one. One of the principal insights of the RBV is that not all resources are of equal importance or possess the potential to be a source of sustainable competitive advantage. Therefore, much attention has focused on the characteristics of advantage-creating resources. To this end, Barney (1991) proposes that advantage-creating resources must meet four conditions: value, rareness, inimitability and non-substitutability. Grant (1991) argues that levels of durability, transparency, transferability and replicability are important determinants, and Collis and Montgomery (1995) suggest that advantage-creating resources must meet five further tests: inimitability, durability, appropriability, substitutability and competitive superiority. Amit and Schoemaker (1993) go even further, producing a list of eight criteria: complementarity, scarcity, low tradability, inimitability, limited substitutability, appropriability, durability and overlap with strategic industry factors. In the interests of simplicity, all the above features are considered under the headings of value, barriers to duplication and appropriability (Fahy, 2000).

Value to customers is an essential competitive advantage. Therefore, for a resource to be a potential source of competitive advantage, it must be valuable or enable the creation of value (Fahy and Smithee, 1999). Furthermore, Barney (1991) stated that it must permit the firm to conceive or implement strategies that improve its efficiency and effectiveness by meeting the needs of customers. This implies that although resources may meet other conditions, if they do not enable the creation of value, then they are not a potential source of advantage. It also indicates a complementarity between the RBV and environmental models of competitive advantage (Barney 1991; Collis and

Montgomery 1995). Given marketing's concern with customers, a potential avenue of research might involve an examination of what resources provide the most value to customers. For example, the question of whether market orientation itself is an advantage-generating resource has recently been the subject of consideration (Hunt and Morgan 1995).

The inability of competitors to duplicate resource is a central element of the RBV. However, the discussion of barriers to duplication has been complicated by the inconsistent, and at times conflicting, use of terminology in literature. Several overlapping classification schemata have been proposed, including asset stock accumulation (Dierickx and Cool, 1989), capability gaps (Coyne, 1986), capability differentials (Hall, 1992), ex-post limits to com-petition (Peteraf, 1993), isolating mechanisms (Rumelt, 1984, 1987), uncertain inimitability (Lippman and Rumelt, 1982) and causal ambiguity (Reed and DeFillippi, 1990). Perhaps a useful starting point in explaining barriers to duplication is Grant's (1991) idea of transparency. The most basic problem a competitor might have is an information problem whereby the competitor is unable to identify the reasons behind a given firm's success. This is essential to the concepts of causal ambiguity (Reed and DeFillippi, 1990) and uncertain imitability (where there is ambiguity concerning the connections between actions and results (Lippman and Rumelt, 1982)). Lippman and Rumelt (1982) suggest that, despite free entry, uncertainty regarding which factors are responsible for superior performance explains efficiency differences between both incumbents and potential new entrants. This uncertain imitability gives rise to rents that might accrue to atomistic price takers, and not from market power or restricted entry. Reed and DeFillippi (1990) also note that the ambiguity may be so great that not even managers within the firm understand the relationship between actions and outcomes.

Even where resources are clearly identified and understood their imitation may be prevented through the legal system of property rights (Coyne, 1986; Hall, 1992). Resources such as patents, trademarks and copyrights may be protected through intellectual property laws, and competitive advantages may accrue from other regulatory activities such as the granting of operating licenses (Coyne, 1986). In addition, transparent resources may not be imitated due to the presence of economic deterrents (Collis and Montgomery, 1995; Rumelt, 1984, 1987). For example, imitation may be deterred by a sizable investment that is not replicated by a competitor (although it could be) due to the likelihood of the follower not receiving a satisfactory return on investment (Wernerfelt, 1984).

To sum up, resources are likely to be inimitable when their relationship with advantage is poorly understood and they possess the characteristics of complexity, specificity, regulatory protection and economic deterrence (Fahy, 2000). However, it must also be impossible for a competitor to rent out a value-creating resource; in other words, the resource must also be immobile or imperfectly mobile. Much of the literature focuses on identifying the kinds of resources that are likely to be less mobile. For instance, Grant (1991) proposes that some resources may be geographically immobile due to relocation costs. However, more significant barriers to mobility exist when the resources are firm specific, where property rights are not well defined, where transaction costs are high and/or where the resources are co-specialised (Peteraf, 1993). These are also the kinds of traits closely associated with inimitability. Consequently, the RBV places a premium on resources that are accumulated within the firm (Dierickx and Cool, 1989; Peteraf, 1993; Teece, Pisano and Shuen, 1997) as many of these resources, subject to path dependencies, possess barriers to both imitability and mobility.

3.5 Derivation of hypotheses

Entrepreneurs with greater numbers of started or bought businesses will have more business ownership experience, and therefore also possess more ability to solve complex problems and make entrepreneurial decisions that eventually result in better business performance.

Evidence suggests that there are significant differences in the characteristics, motivations, and behaviour of novice founders compared with habitual and serial and portfolio founders (Westhead and Wright, 1998a). An experienced serial or portfolio entrepreneur owning a business in the same sector as their previous/current venture may be able to identify what is required to earn profits in the selected market more clearly than novice entrepreneurs. For example, serial and portfolio entrepreneurs may have gained important resource-acquisition skills (Ucbasaran et al., 2003a). This leads, formally, to the following hypotheses:

H2a: Entrepreneurs with greater numbers of started or bought businesses will report superior firm performance.

H2b: Habitual entrepreneurs compared to novice entrepreneurs will report superior firm performance.

H2c: Portfolio entrepreneurs compared to novice entrepreneurs will report superior firm performance.

H2d: Serial entrepreneurs compared to novice entrepreneurs will report superior firm performance.

Entrepreneurial cognition can be shaped by the entrepreneur's level of experience (Ucbasaran et al., 2003b). Obviously, serial and portfolio entrepreneurs have more experience than novice entrepreneurs, and that experience provides them with a framework that can be used to process information (Fiske and Taylor, 1991). This framework reduces the burden of information processing, and allows the experienced individual to concentrate on novel or unique information (Hillerbrand, 1989). Conversely, novice entrepreneurs with no frame of reference can be overwhelmed by information and/or not know how to use it. Therefore, experienced serial and portfolio entrepreneurs should lead by the information to identify new insights and explore opportunity (Mitchell et al., 2002). The combination of the experience and science park location variables should have a stronger positive effect on entrepreneurs.

Siegel et al. (2003) performed a test in 2003, and the results suggested that firms located on university science parks have slightly higher research productivity than observationally equivalent firms that are not located on university science parks. However, other studies show different results: Westhead and Cowling (1995) used the sample data set of Monck et al. (1988) and Westhead and Storey (1994) to evaluate the employment growth of British firms on and off science park during a six-year period (1986-1992). They found that over the six-year period "the mean employment increase in both groups of firms was virtually identical" (Westhead and Cowling, 1995 p.129). A possible reason for this might be that science parks have different objectives and ways of management.

The discussion above leads formally to test the following hypotheses:

H3a: Entrepreneurs located on a science park with experience of starting and purchasing greater numbers of businesses will report superior firm performance.

H3b: Habitual entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

H3c: Portfolio entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

H3d: Serial entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

In terms of the factors that influence the successful adoption of internet related technologies within SMEs, Chau and Hui (2001) and Mehrtens et al. (2001) identify three major factors: perceived benefits, organizational readiness and external pressure. In relation to perceived benefits, a number of studies have examined both the tangible and intangible benefits achieved by SMEs from the adoption of e-commerce. Studies by Quayle (2002) and Fisher et al. (2007) found that the tangible benefits derived from e-commerce (such as reduced administration costs, reduced production costs, reduced lead-times and increased sales) were marginal in terms of direct earnings. However, these same studies found that the intangible benefits (such as a global presence, improvement in the quality of information, improved internal control of the business and improved relations with business partners) were of far greater value to SMEs.

However, SME managers need to be convinced of the benefits before fully adopting the technology, which some managers do not feel provide a significant improvement in service compared with traditional methods (Marshall et al., 2000; Mehrtens et al., 2001; EBPG, 2002). Also highlighted in the literature is the important role regarding the attitude of the owner towards IT adoption (Levy and Powell, 2002; Al-Qirim, 2006). Often, most companies that embrace IT and internet technologies are the ones where the owner takes on the role of the innovation champion of IT adoption. In addition, such champions will have a reasonable level of knowledge and understanding regarding the specific technology.

The adoption of internet related technologies is also characterised by increased competition and threats that require that SMEs need to be responsive to customer needs, develop new opportunities and invest in networks and relationships. With regard to external pressures, customer expectations and demands for companies to have an internet presence, as well as the actions of competitors, are also cited as being an important influence in the internet adoption process of SMEs (Mehrtens et al. 2001; Ritchie and Brindley, 2005; Aguila-Obra and Padilla-Meléndez, 2006).

Despite this, there are numerous benefits brought about by e-commerce adoption, but many studies have identified a number of other disadvantages incurred by SME operators in their day-to-day use of e-commerce technologies. Parker and Castleman (2007) found that many SME operators complained of increasing costs in their business dealings attributable to e-commerce use. Lawrence (1997) found that e-commerce, particularly but not exclusively, Electronic Data Interchange (EDI) resulted in reduced flexibility of work practices and heavier reliance on technology. Her findings are supported in studies by MacGregor et al. (1998, 2006), in the study of 131 regional SMEs in Australia, they found that many respondents complained that they were doubling their work effort and was, in part, due to the e-commerce systems not being fully integrated into the existing business systems in the organisation. They also found that many respondents complained that the technology had resulted in higher computer maintenance costs.

Experienced entrepreneurs, with more ability to analyse complex situations and business opportunities, will recognise the importance of websites sooner than others, will have devoted more time and money to e-commerce and will be more successful in generating on-line sales. The discussion above leads to formally test the following hypotheses:

H4a: Entrepreneurs located on a science park compared to entrepreneurs who are located off-park will have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

H4b: Entrepreneurs with greater numbers of started or bought businesses will have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

H4c: Habitual entrepreneurs, compared to novice entrepreneurs, will have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

H4d: Portfolio entrepreneurs, compared to novice entrepreneurs, will have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

H4e: Serial entrepreneurs, compared to novice entrepreneurs, will have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

H5a: Entrepreneurs located on a science park, with experience of starting and purchasing greater numbers of businesses, will have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

H5b: Habitual entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

H5c: Portfolio entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

H5d: Serial entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognised the importance of websites sooner, will have devoted more time and money to e-commerce and will be more successful at generating on-line sales.

3.6 Conclusion

This chapter has provided the theoretical underpinnings of the dissertation. The objectives of this chapter were to comprehensively review the human capital theory and RBV of the firm, presenting the reader a clear image why these two theories are so important to the study of entrepreneurship. In order to better understanding human capital theory, the author has introduced entrepreneurship theory first. After the definition of an entrepreneur was presented, the different types of entrepreneur, especially novice, portfolio and serial entrepreneurs, were described in detail. These three types of entrepreneurs are the focus of this study and will be analysed at later stage. Following the presentation of entrepreneurship, human capital theory has been introduced; the human capital of the entrepreneur consists of education, training, work experience and productive skills (Boxall and Steeneveld, 1999; Rauch et al., 2005). These factors can be classified under two categories: general human capital and specific human capital. Furthermore, the possession of these human resources is necessary for higher performance and success.

Human resources and physical resources are valuable resources to business, and studies of the relationship between business performance and firm resources have formed the RBV theory. The RBV is recognised as the most influential framework for understanding strategic management (Barney et al., 2001; Peng, 2001). In this chapter, the author has defined what a resource is, and following that the development of RBV has been detailed. Finally four key attributes that a resource must have in order to yield a sustainable competitive advantage have been demonstrated.

Having presented the theoretical framework of this dissertation, the author will use the data collected in Beijing, China during the period between 10/2008 and 06/2009 to test these theories – a test that has not been done before by any other entrepreneur researcher. Therefore, this is the first time that someone has brought these theories into the Chinese context, and consequently, this study will apply more contexts to the theories and set out a framework for any further entrepreneur studies carried out in China. The next chapter will discuss the choices of research methods, the methods used to collect data and the validity and reliability of this research.

Chapter 4

Research Methodology

4.1 Introduction

The chapters preceding the research methodology chapter have served to outline the themes and theoretical underpinnings of the dissertation by drawing together pertinent and up-to-date literature. In particular, the following themes were discussed: the human capital of the entrepreneur, entrepreneurial experience, science parks and business performance outcomes (innovation, employment growth, exporting, profitability and the use of the internet as a business conduit). A series of hypotheses were developed in the earlier chapters.

This chapter explains the sampling procedure, how the data was collected and from whom it was collected. Furthermore, the operationalisation of the research models are also discussed. This is an empirical based dissertation, and it is important to assess the quality of the data to ensure that, as far as possible, the data and the subsequent analysis are robust. The generalisability of the research findings, as well as the validity and reliability of measures and constructs that are used, are carefully discussed and assessed. Additionally, an overview of the background characteristics of the sample of firms (and the entrepreneurs who own them) is provided. Lastly, a set of concluding comments completes the chapter.

The data used for this research was gathered between January 2009 and June 2009 in Beijing, China on firms located on the ZSP and off-Park firms that are comparable in industry, size and legal form.

4.2 The rationale for the choice of study

SMEs in China have played an important role in the Chinese national economy. Statistics provided by a Developmental Report of China's SMEs in 2008 show that there are some 42.8 million SMEs in China, representing an 11.2% growth in 2007. In China, it is expected that there will be a continuous expansion of SMEs over the next five years, and that the number of SMEs will maintain the 7% -8% growth rate (http://www.sme.gov.cn/, 2009). The total number of SMEs in China in 2012 is expected to reach 50 million, taking up about 99% of all registered enterprises over the entire economy (http://www.sme.gov.cn/, 2009).

The growing importance of SMEs in China's economy is hard to ignore. Chinese and foreign experts estimate that SMEs are now responsible for about 60% of China's industrial output and employ about 75% of the workforce in China's cities and towns (http://www.sme.gov.cn/, 2009). SMEs are responsible for creating most new urban jobs, and they are the main destination for workers that re-enter the workforce after being laid off from SOEs (Bolotinsky and Jiang, 2008).

There is a growing research interest in the owners of SMEs—the entrepreneurs. There are three types of entrepreneurs: novice, serial and portfolio (Ucbasaran et al., 2008). Novice founders are those who have no prior entrepreneurial experience as a founder, inheritor or purchaser of a business. Portfolio founders retain their original business and inherit, establish and/or purchase another business. Serial founders are those who sell their original business, but at a later date inherit, establish and/or purchase another business. Evidence suggests that there are significant differences in the characteristics, motivations and behaviour of novice founders when compared to habitual founders with multiple business experience (i.e., serial and portfolio founders with previous business ownership experience) (Westhead and Wright, 1998).

However, after reviewing the literature on habitual entrepreneurship, it is clear that entrepreneurship is under-researched in China (Ucbasaran et al., 2008). Indeed, no previous research exists on habitual entrepreneurship in China. Therefore, to better understand the habitual entrepreneurs and SMEs in China my research will focus on the following points:

1. Understanding entrepreneurs' and their business characteristics against entrepreneurial experience. Particular attention is given to entrepreneurial experience to compare novice entrepreneurs to habitual, portfolio and serial entrepreneurs.
2. Investigating the firms' performance by focusing upon innovation outcomes against entrepreneurial experience on science park and off-park.
3. Investigating the firms' performance by measuring exporting, employment growth and profitability. These performance outcomes will similarly concentrate on entrepreneurial experience on science park and off-park.
4. Identifing the characteristics associated with the use and non-use of e-commerce in China by novice portfolio and serial entrepreneurs located on and off science park.

4.3 Time frame

This study survey has been done over nine months (10/2008-06/2009). Therefore, all the small businesses that have been researched in this study should be operating during this period of time. At the same time, all the small business should have been operating for at least three years. All the managers, owners or founders of the small business who have participated in the survey should stay in their position over this nine-month timeframe, and should have stayed at their position for at least one year prior to the conduction of my survey.

4.4 Operationalisation

This section outlines the reasons for using a mail questionnaire as this study's primary research method, the reasons for not choosing other methods and the adoption of quantitative and qualitative research methods. Additionally, this section also explains the choice of research place and sample population, the questionnaire administration, the criteria for sample size selection and how the research was designed.

4.4.1 Qualitative and quantitative research methods

Qualitative research explores attitudes, behaviours and experiences through methods such as interviews or focus groups, and it attempts to get an in-depth opinion from the participants. As it is attitudes, behaviours and experiences that are important, fewer people take part in the research. However, the contact with these people tends to last a lot longer.

Quantitative research generates statistics through the use of large-scale survey research, and uses methods such as questionnaires and structured interviews. If a market researcher has ever stopped you on the street, or you have filled in a questionnaire that has arrived through the post, you have taken part in quantitative research. This type of research reaches more people than qualitative research, but the contact with these people is much quicker than qualitative research.

Over the years there has been a large amount of complex discussion and argument surrounding the topic of research methodology and how inquiry should proceed. Much of this debate has centred on the issue of qualitative versus quantitative inquiry – which is the best and which is more 'scientific'. Different methodologies become popular at different social, political, historical and cultural times during development, and in many researchers opinions' all methodologies have their specific strengths and weaknesses.

In Miles and Huberman's 1994 book 'Qualitative Data Analysis', quantitative researcher Fred Kerlinger is quoted as saying that "there's no such thing as qualitative data. Everything is either 1 or 0" (p. 40). In response to this, another researcher, D. T. Campbell, declares that "all research ultimately has a qualitative grounding" (p. 40). This back and forth among qualitative and quantitative researchers is 'essentially unproductive' according to Miles and Huberman, and many other researchers agree with them that these two research methods need each other more often than not, indeed, a 'mixed method' approach of combining qualitative and quantitative methods together is increasing (Stone and Stubbs, 2007).

However, because qualitative data typically involves words and quantitative data involves numbers, there are some researchers who feel that one is better (or more scientific) than the other. An interesting analysis of 1274 articles published in the top two American sociology journals between 1935 and 2005 found that roughly two thirds of these articles used quantitative methods (Hunter et al., 2008).

In this study, the author adopted a quantitative research method that produced 4000 questionnaires, and all of those questionnaires were sent to small firms located on/off ZSP in Beijing, China. The next section will explain the reason for choosing Beijing, China as the research place.

4.4.2 Choosing a research place

The reasons for choosing Beijing, China as my research place are two-fold: first, after reviewing the literature on habitual entrepreneurship and science parks, it is clear that it is under-researched in China (Ucbasaran et al., 2008). Indeed, no previous research exists on habitual entrepreneurship in China. Therefore, to fulfil my research orientation and cover the current research gap, China has been set as my research target. Second, The People's Republic of China is the third largest country in the world with an area of 9.6 million km^2 (http://english.gov.cn, 2008). It has the world's largest population (just over 1.3 billion people in 2007 http://geography.about.com, 2008), and is now one of the world's major economic entities with a high growth rate. Its GDP reached 7.26 trillion U.S. dollars in 2011, which is up 9.2% annually (http://news.xinhuanet.com, 2012).

Beijing is the political and economic centre of China, and the business located in the Beijing area are typical Chinese business. Therefore, it is sensible to study the characteristics of small firms and entrepreneurs in Beijing. Moreover, as discussed in an earlier chapter, - ZSP is the biggest science park in China: initially established in the early 1980s, after nearly thirty years of development, it is one of the most sophisticated science parks in the world with over 100,000 companies located on site (most of which are high-technology companies). Cai et al. (2007, p. 2) have stated that “the park, home to 232 research institutions, is the first and largest science park in China.” Furthermore, its location is surrounded by several of the most highly ranked universities in China. With its dense concentration of research and education establishments, the ZSP area has long been renowned as China's largest intellectual region (Tan, 2006). It has been shown that universities and other research centres can stimulate regional economic growth and the formation of industry clusters. Additionally, it is easy for researches to access and is becoming one of the major research targets in China.

Because of the above two reasons, Beijing, China has become the place where the author carried out his research.

4.4.3 Criteria for sample size selection

Because of the exploratory nature of the research, and the level of in-depth understanding required, a carefully selected sample is necessary. In statistics, a sample is a subset of a population. Under normal circumstances the population is very large, and all values in the population are either impractical or impossible to fully collect and calculate. However, the scale of a subset of the sample is much more controllable. Samples are collected and statistically calculated so that one can make interpretations and assess the implications of it: this process of gathering information from a sample is called ‘sampling’.

In research studies, a sample is a relatively small number of individuals about whom information is obtained. The larger group, to whom the information is then generalised, is the population. Sampling refers to drawing a sample (a subset) from a population (the full set). In other words, sampling is concerned with the selection of an unbiased or random subset of individual observations within a population of individuals intended to yield some knowledge about the population of concern. This is especially for the purpose of making predictions based on statistical inference. As such, sampling is an important aspect of data collection, and is able to verify that all data is relevant for the purpose of the survey and that the non-essential results are omitted (Cochran, 1977).

The participants were selected based on the following criteria:

1. The business must have at least eight employees, and at most 250 employees.
2. The business must have been in operation for at least three years.
3. The respondent must be the owner, founder or major partner in the case of a co-investment.
4. The business must be independently or privately owned.
5. The business must be located within the ZSP or (in the case of the off-park firms) within Beijing.
6. The business must be engaged in activities within five sectors: business services (financial, legal); education and training; electronics and IT hardware; software; and computer services.

4.4.4 Negotiating access

There are serious challenges and major hindrances to carrying out small business surveys in developing countries (Vulliamy et al., 1990). In order to gain access to entrepreneurs in Beijing, and gain a better understanding of them, the author contacted several business associations, organizations, groups and websites. The contacted associations and agencies are listed below:

1. Association of Beijing SMEs.
2. Beijing SMEs service center.
3. Association of Beijing Electronic commerce.
4. http://www.zgcsme.com
5. http://www.zgc.gov.cn
6. http://www.zhongguancun.com.cn

The Beijing Association of SMES was the first association the author contacted. It is a cross-sector, comprehensive and non-profit community organization under the supervision of Beijing Municipal Commission of Development and Reform. It is established voluntary by SMEs from Beijing, social organisations and institutions, and they provide the following services for SMEs including: accounting and finance, tax, property right trading, law, patents, technical help, assets assessment, human resources and consulting.

The second organisation the author contacted is Beijing SMEs service center. This center, with funding from Beijing's financial budget and management under the Beijing Municipal Commission of Development and Reform, is a governmental non-profit organization, which offers full services for small, medium and private enterprises in Beijing. It is also the vice chairman of China National Small & Medium Enterprise Service Center Consortium. With the support of relevant governmental departments, this center provides SMEs with full services in overall processes, including guidance on system reform and reorganization policies, diagnosis of enterprises, system reform plans, asset evaluation and business guidance Cooperating with more than 350 finance entities, guarantee institutes, agencies, universities and industrial associations in Beijing, this centre has been offering standardised, professional services for 69,000 SMEs in Beijing.

Following it, the author contacted the Association of Beijing electronic commerce-- Beijing E-Commerce Association, it was set up in 2002 and registered as a non-profit social organisation, and is co-founded by the circulation, service, IT, networking, software, logistics and distribution, finance, third party payment, research, education and training co-sponsored enterprises within the administrative region of Beijing. This was the most successful contact the author made during the whole data collection period, after the author introduced himself and his study through email and telephone, the author met their president and general secretary personally, they invited the author to attend their annual conference. More than 100 representatives of small businesses attended the annual meeting, and many of them are managers and owners of businesses. During the conference the author spoke with them and made some good relationships. More importantly, the author sent out his questionnaires to each attendee: more than fifty completed questionnaires were sent back after the conference. This was a really good start for the survey, and from this process the author noticed some flaws in the question's presentation and the questionnaire's structure. As a result of this, all the corresponding improvements have been made.

The fourth, fifth and sixth contact sources are non-profitable websites tailored to ZSP firms. They provide all kinds of services and information to SMEs located on-park, including: business etiquette, public relations skills, company information display, business registration, business building and park information

After the contact and discussion with the above organisations and agencies, the author unfortunately did not get what he originally wanted: the full company list of

Beijing SMEs located on and off science parks with their business name, address, sector and contact detail. However, the discussion and meeting with them gave the author a great opportunity to build a solid relationship with them and gain some important and vital first-hand information about SMEs in Beijing. Because many of the working staff in the associations are business owners or managers themselves, the author received advice from them about how to communicate with businessmen in a more formal and professional manner. The author also learned about designing and administrating his questionnaire.

4.4.5 Reasons for choosing mail questionnaire method

Generally, there are four main research methods that have been widely adopted in social-science study: mail surveys, face-to-face surveys, online surveys and telephone surveys. The author will firstly list these four methods' advantages and disadvantages in detail respectively, and then state why the mail questionnaire method has been chosen.

Mail Survey:

Advantages

1. *Cost is very low, and bulk postage is cheap.*
2. *Respondents can answer at their own convenience (allowing them to break up long surveys; also useful if they need to check records to answer a question).*
3. *No interviewer bias.*
4. *A Large amount of information can be obtained: some mail surveys are as long as fifty pages.*
5. *Response rates can be improved by a following phone call.*

Disadvantages

1. *Long time delays.*
2. *Lower response rates.*
3. *Not suitable for issues that may require clarification.*

Face to Face Survey:

Advantages

1. *Suitable for locations where telephone or mail are not available.*
2. *Suitable for long surveys.*
3. *High response rate.*

Disadvantages

1. *Requires skilled interviewers.*
2. *Potential for interviewer bias.*
3. *Very high cost.*
4. *Some respondents object to allowing strangers into their office.*

Online Survey:

Advantages

1. *Inexpensive to administer.*
2. *Very fast results.*
3. *No interviewer bias.*

Disadvantages

1. *Lower response rate.*
2. *Not suitable for issues that may require clarification.*
3. *Need good internet infrastructure.*
4. *Often difficult to determine/control selection probability, hindering quantitative analysis of data.*

Telephone Survey:

Advantages

1. *Higher response rate compared with internet and mail surveys.*
2. *Interviewers can increase comprehension of questions by answering respondents' questions.*

Disadvantages

1. *Potential for interviewer bias.*
2. *Unreliable for consumer surveys in rural areas where telephone penetration is low.*
3. *Cannot be used for non-audio information (graphics, demonstrations and taste/smell samples).*
4. *Expensive to administer.*
5. *Requires skilled interviewers.*

According to the large-scale nature of this study, the telephone and face-to-face survey were excluded, because the cost of time and economy of the two aforementioned methods are huge for the author to carry out a survey in a limited time, it is impossible to ask the researcher to call or visit each company in person. Therefore, online and mail surveys are the only remaining options. But taking Chinese culture into consideration, businessmen generally feel unsafe in communications through internet, especially when some of the questions in the questionnaire are related to the company finance and performance. After a careful consideration, the mail questionnaire administration technique presents itself as an efficient and relatively more reliable means of collecting data where a large data sample is required. Furthermore, the postal survey is cheaper compared to the telephone survey, and quicker in comparison with a face-to-face questionnaire.

4.5 Questionnaire design

Questionnaires are an inexpensive way to gather data from a potentially large number of respondents. The face-to-face visits to present the questionnaires by the authors and three trained researchers from Beijing University did incur expenses: notably, paying the researchers of their time. Often, they were the only feasible way to reach a number of reviewers large enough to allow statistical analysis of the results. A well-designed questionnaire that is used effectively can gather information on the overall performance of the test system as well as information about specific components of the system.

It is important to remember that a questionnaire should be viewed as a multi-stage process beginning with a definition of the aspects to be examined, and ending with an interpretation of the results. Every step needs to be designed carefully because the final results are only as good as the weakest link in the questionnaire process. Although questionnaires may be cheap to administer when compared to other data collection methods, they are every bit as expensive in terms of design time and interpretation.

The author will discuss the design and administration of questionnaire in the following two steps: a) defining the objectives of the survey, and b) designing the questionnaire.

4.5.1 Objectives of the survey

The major questions the survey wished to address include identifying the characteristics of novice and habitual (serial and portfolio) entrepreneurs in China; investigating whether the firms located on the science park perform better than the firms located off science park; investigating whether the firms located on science park tend to be more innovative, achieve greater employment growth, are more likely to export goods and services, are more likely to be profitable and are more likely to use e-commerce than firms located off science park. Differences in entrepreneurial experience for the businesses outcomes (both on science parks and off-park) form a central part of the analysis.

4.5.2 Design of the questionnaire

When constructing the questionnaire the author considered the following five aspects to gain a higher response rate and more reliable results:

4.5.2.1 Focus of the questionnaire

The questionnaire should be designed to serve the objectives of my dissertation. Therefore, all the questions and hypotheses to be tested have been taken into consideration when designing the questionnaire. There are four main directions that should be considered:

a. Understanding the entrepreneurs' and the business characteristic against entrepreneurial experience on science parks and off-park in China.
b. Investigating the firms' business performance by comparing innovation outcome against entrepreneurial experience on science parks and off-park in China.
c. Investigating the firms' business performance concerning exporting, employment growth and profitability.
d. To identify the characteristics associated with the use and non-use of e-commerce in China.

4.5.2.2 Wording of the questionnaire

The questionnaire was designed in a straightforward and clear manner to avoid misinterpretation and misunderstanding: all the questions are kept short and simple, the questions are not ambiguous, the technical terms are avoided whenever possible and questions relating to a sensitive issue (for example, annual business performance) are asked indirectly. The questions that could lead to feelings of annoyance, offence or embarrassment were all deducted or changed, and the questionnaire starts with an introduction message stating who am I and why I want the information from the survey. Furthermore, the introduction gives an assurance that the information obtained will be kept secret and will only be used in an academic environment, which encourages people to complete the questionnaire. Finally, a short ending note was used to mark the end of questionnaire and express thanks for cooperation. After creating the questionnaire, the author and his supervisor double-checked it for spelling errors and had someone else read and edit it.

4.5.2.3 Translation of the questionnaire

Because the questionnaire was originally designed in English, but the target population are entrepreneurs in Beijing, the questionnaire was translated from English into Mandarin Chinese before being translated back into English by two Chinese professors and one businesswoman in Beijing to ensure its validity.

4.5.2.4 Pilot study

A pilot study was carried out in ZSP and off-park in Beijing where one workshop in each of the two locations was organised. The number of entrepreneurs who attended the workshops was four at ZSP and six off-park. None of the workshop participants are included in the final analysis. The feedback from the two workshops was very helpful and resulted in the questionnaire being modified.

4.5.2.5 Structure of the questionnaire.

After modification, the structure of questionnaire was designed to be manageable for each target population. The questionnaire contained seven sections: section A contained questions relating to the general background of the principal owner (sex, age, education and family background); section B contained questions relating to the adoption of e-commerce; section C had questions relating to the general background of the business; section D had questions on the growth and innovation of the company; section E contained questions relating to information and the environment; sections F had questions relating to premise and facilities; and section G had questions relating to business finance. There were a total of forty-three questions in the questionnaire, and most questions had multiple-choice answers.

4.6 Measures

4.6.1 Dependent variable

In order to do experimental research it is necessary to clearly distinguish between the dependent and independent variables. It is a prerequisite in experimental research that the researcher should be able to manipulate the variable and then to assess the influence of the manipulation of the variable.

According to Landman (1988), the dependent variable is the circumstances or characteristics that change, disappear or appear when the researcher implements the independent variable. A dependent variable is what you measure in the experiment and what is affected during the experiment. Additionally, the dependent variable responds to the independent variable.

4.6.1.1 Innovation

Respondents were asked, "in the last 3 years, has your firm undertaken any form of innovation with regard to seven statements relating to the following" – product or services, production processes (including storage), work practices or workforce organization, supply and supplier relations, markets and marketing, administration and office systems and products or distribution services were presented. We monitored innovation activity with reference to each statement by asking respondents to select one of the four following responses: innovation not tried (scored 1), innovation tried and failed (scored 2), innovation new to firm but not new to the industry (scored 3) and innovation new to industry (scored 4). With reference to these statements, the following six dependent variables were operationalised:

The first dependent is a composite variable that relates to a simple distinction between introducing at least one novel innovation with reference to the seven types of innovation (i.e., product or services [ProductI], production processes including storage [ProcessI], work practices or workforce organization [WorkI], supply and supplier relations [SupplyI], markets and marketing [MarketsI], administration and office systems [AdministrationI] and products or services distribution [DistributionI]) were termed 'novel innovation at least once' respondents (allocated a value of '1'). On the other hand, respondents that reported no introduction of a novel innovation in any of the seven innovation types were termed 'never novel' respondents (allocated a value of '0').

The second dependent variable repeats the process outlined for the first dependent variable, but with the important distinction that it is a simple distinction of introduced at least one incremental innovation with reference to the seven types of innovation.

The third dependent variable relates to businesses that introduced a novel innovation in product/services and/or process innovation (allocated a value of ‘1’), and the respondents that did not report the introduction of a novel innovation in product/services and/or process innovation.

The fourth dependent variable relates to businesses that introduced an incremental innovation in product/services and/or process innovation (allocated a value of ‘1’), and the respondents that did not report the introduction of an incremental innovation in product/services and/or process innovation.

The fifth dependent variable looks at the other five other types of innovation, and corresponds to businesses that introduced a novel innovation in any one or more of the following ways: work practices or workforce organisation, supply and supplier relations, markets and marketing, administration and office systems, and products or services distribution (allocated a value of ‘1’). Businesses that did not have a novel innovation in one of the aforementioned five types of innovation.

The sixth dependent variable corresponds closely to the fifth dependent variable with the important distinction that it is those businesses who introduced an incremental innovation in any one or more of the innovations used in the fifth dependent variable.

4.6.1.2 E-commerce

In order to evaluate the relationship between different types of entrepreneurs and the adoption of e-commerce, the respondents were asked, “do you have a website?” Respondents who reported ‘yes’ to this question were allocated a score of ‘1’, and others were allocated a value of ‘0’

Second, the respondents were also asked, “how often is your website updated?” Respondents have to select one of the four responses: daily (scored 1), weekly (scored 2), monthly (scored 3) and less often (scored 4).

Third, the respondents were presented with the question “currently, approximately what percentage of your turnover do you predict will be accounted for by on-line sales?” The respondents were presented with twelve percentage bands to choose from (0%, 1%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, and 50% or more).

Each respondent who reported 0% were allocated a score of ‘0’, those who reported from “5%-50% or more” were allocated a score of “1”.

4.6.1.3 Employment growth

In question 27 the participants were asked, “how many people are have been employed in this business (including the owner) as full time, part time and casual”. If the respondents replied that the current employment number is more than it was three years ago, then they were allocated as “1”. If the respondents replied that the current employment number is equal to or less than three years ago, then they were allocated as “0”.

The respondents were also asked, “for the last three financial years, has the business operated at a loss, break even or a profit?” The performance measure was operationalised to create a series of three dummy variables with three possible outcomes. For the first variable, respondents who ticked ‘a profit’ were coded as “1”, and respondents who ticked ‘a loss’ or ‘break even’ were coded as “0” (profit). In the case of the second variable, respondents who ticked ‘break even’ were coded as “1”, and respondents who ticked ‘a loss’, or ‘a profit’ were coded as “0” (break even). For the third variable, the entrepreneurs who ticked ‘a loss’ were coded as “1”, and the entrepreneurs who ticked ‘a profit’ or ‘break even’ were coded as “0” (loss). This procedure was undertaken for each of the three time periods: currently, one year ago and three years ago.

4.6.2 Independent variables

The independent variable is, on the other hand, circumstances or characteristics that the researcher can manipulate in his effort to determine what their connection with the observed phenomenon is. Resultantly, the researcher has direct control over this variable.

4.6.2.1 Habitual entrepreneurs

Respondents who reported having prior business ownership experience, with the capacity to start new businesses and launch new products, were coded as habitual entrepreneurs (Westhead et al., 2005b). Habitual entrepreneurs were separated into portfolio and serial entrepreneurs.

4.6.2.2 Portfolio entrepreneur

Respondents who reported having prior business ownership experience and have started, inherited, purchased or acquired a new venture in addition to the existing one were coded as portfolio entrepreneurs (Westhead et al., 2005c).

4.6.2.3 Serial entrepreneur

Respondents who reported having closed or sold previous business they owned, and have started, inherited, purchased or acquired a new venture were coded as serial entrepreneurs (Westhead et al., 2005b).

4.6.2.4 Novice entrepreneur

Respondents who reported having no prior business ownership experience but have started, inherited, purchased or acquired a new venture were coded novice entrepreneurs (Ucbasaran et al., 2001).

Three binary variables were computed: serial entrepreneurs were allocated a value of '1', whilst other (i.e., novice and portfolio) entrepreneurs were allocated a value of '0' (SERIAL); portfolio entrepreneurs were allocated a value of '1', whilst other (i.e., novice and serial) entrepreneurs were allocated a value of '0' (PORTFOLIO); novice entrepreneurs were allocated a value of '1', whilst other (i.e., serial and portfolio) entrepreneurs were allocated a value of '0' (NOVICE).

4.6.2.5 Location of firm: on the science park or off-park

The location variables were used as indicators of the location of the small businesses. Respondents were asked, 'is your office located on a science park?' Entrepreneurs who answered "yes" were allocated a score of '1' (SCIENCE PARK), whilst those citing "no" were allocated a score of '0'.

4.6.3 Control variables

Control is a fundamental characteristic of this type of research, and control groups are a prerequisite. Control groups are selected from a group of selected persons whose experience corresponds with that of the experimental group. However, they do not receive the same treatment as the experimental group (Landman 1988).

4.6.3.1 Industry sector

Five industry dummy variables were considered as control variables: software (no=0, yes=1), computer services (no=0, yes=1), business services (no=0, yes=1), electronics and IT hardware (no=0, yes=1), and training (no=0, yes=1). The reference category is training.

4.6.3.2 Education

Davidsson and Honig (2003) noted that education can enable individuals to generate ideas, and so the educational variable was coded in eight categories (primary school, junior high school, senior high school, college diploma, bachelor degree, master's degree, PhD degree and others). Respondents were presented with the above criteria and were asked to indicate their educational achievement. Respondents who reported 'yes' to a university degree were allocated a score of '1' (DEGREE) and those who reported 'no' were score '0'.

4.6.3.4 Size of firm

The size of the business was measured by the number of employees at the time of the survey, and respondents were asked to indicate the number of employees in their business at the time of responding to the questionnaire. The reported responses were coded into three categories. Using dummy variables of micro, small and medium, respondents who reported employees numbers of up to 49 were coded MICRO business. Respondents who reported employee numbers of between 50 and 99 and those who reported above 100 were coded SMALL and MEDIUM size businesses respectively. In the cross-tabulation analysis, the two categories of 'micro' and 'small and medium' were utilised. In the regression analysis, the size of the firms was included as a continuous variable.

4.6.3.5 Gender

A male or female entrepreneur in this study refers to "a person who has initiated a business, is actively involved in its management, and owns a majority share of the enterprise" (Marlow and Patton, 2005, p. 718). The sex of the entrepreneur, by and large, influences access to, and use of, external finance (Birley et al., 1987; Van Uxem and Bais, 1996). Respondents were asked to indicate their sex: male respondents were allocated a value of '1' and female respondents a value of '0'.

4.6.3.6 Age of the entrepreneur

In the questionnaire, respondents were asked, 'what is your age?' The ages of the entrepreneurs were coded in two indicators: 25-39 years, and 40 or more years. The respondents who reported the 25-39 years age group were allocated a score of '0', and responses of more than 40 years were allocated a score of "1". This categorisation was used in the cross-tabulation analysis. In the regression analysis, the age of the entrepreneur was included as a continuous variable.

4.6.3.7 Relative role model

Curran et al. (1991) noted that individuals with parents as owners of businesses were more likely to follow in the footsteps of their parents by owning their own business. Respondents were asked to indicate their parents' occupations. Respondents who chose "business owner" were allocated a score of '1', and others were allocated a score of '0'.

4.6.3.8 Age of business

Age is a determining factor for small business' access to bank credit (Abor and Biekpe 2006a). Hall et al. (2004) asserted that older businesses possess good track records and more internally generated profit, and are therefore less likely to apply for external finance. The age of the business were measured by the year in which the business was established. Two dummy variables were incorporated for the age of business: businesses aged between one year and six years was termed YOUNG business, and all other businesses above six years were termed OLDER business. These categories were used in the cross-tabulation analysis, whilst in the regression analysis age of the business was included as a continuous variable.

4.6.3.9 Business advice

Firms may utilise public and/or private sector organisations to obtain information and advice that enhance their resource creation capabilities. In turn, this may translate into improved problem solving capabilities and innovation. Respondents were asked, "in the last 3 years, has your firm used the following as sources of business advice, information or support?" Respondents were given a list of thirteen specified public and private sector firms and organizations that could have been utilised. These firms and organisations were: accountants, solicitors/lawyers, banks, customers, business associates, friends/relatives, suppliers, consultants, the Association of Beijing SMEs, Beijing SMEs Service Centre, Beijing SMEs Website (www.bjsme.gov.cn), China SMEs Website (www.sme.gov.cn) and China International SMEs Fair. Additionally, there was another category to capture sources not included in the list. The total number of sources of business advice, information or support was included in the models (business advice).

4.7 Piloting and screening

During the annual conference of Association of Beijing Electronic Commerce, the author sent out the questionnaires to each attendee. All the attendees were SMEs owners or mangers, or were at least a representative of their respective firm. More than fifty completed questionnaires were collected back after the conference, and from the collected data, it showed that respondents included novice, portfolio and serial entrepreneurs. After the collection the author had a discussion with the respondants and they gave valuable advice towards the issues the author would have to address (such as the questions' presentation and the structure of my questionnaire). From this discussion, corresponding improvements have been made. After the mortification of the survey, all questionnaires were posted out to target group; the next section will provide details of the questionnaire's administration.

4.8 Questionnaire administration

In this section, the things need to be considered before the questionnaire distribution will be discussed in detail.

What fundamentally matters for the viability of a statistic from a random sample is the sample size; the right sample size for a particular application depends on many factors, including the following:

- Cost considerations (e.g., maximum budget, desire to minimise cost).
- Administrative concerns (e.g., complexity of the design, research deadlines).
- Minimum acceptable level of precision.
- Confidence level.
- Variability within the population or subpopulation (e.g., stratum, cluster) of interest.
- Sampling method.

Considering that the author have to finish the survey with a limited time and budget, and due to the immense work of administrating of 4000 questionnaires, the author contacted the Business School of Capital Normal University, with their help the author chose thirty business school students. Before allocating them their job, the author gives them a lecture about his study and introduced them to the reason behind the study, research objective, research methodology, research questionnaire and, most importantly, the target population. The author made sure they fully understood his goal and target, and each student was allocated around 100 company names and addresses to help the author distribute the questionnaire. Two weeks after the distribution, the students called each company to encourage a response to the survey, and after that they also contacted the firms allocated to them in person to further encourage responses. The satisfactory results show that this is a feasible way to carry out the research, and all the students who took part in this project have been rewarded by the author and the Business School of Capital Normal University.

The survey started in October 2008 and finished in June 2009. During the nine-month timeframe, a total number of 4000 questionnaires were posted to the firms located on and off ZSP. 2000 were posted to the firms located on ZSP, and another 2000 were posted to firms located off ZSP. During the nine months, the total number of questionnaires the author received was 523, but there are 61 copies are unusable due to reasons such as: owner had retired, the business was no longer in operation, and key questions not answered the (most parts of the questionnaire not answered). Therefore, the valid total number is 462. Table 4.1 shows the details of the 462 replies by 5 industry sectors.

Table 4.1 Overview of survey responses by business sectors.

	Software	Computer Service	Business Service	Electronic & Information Hardware Manufacturing	Education Training	Total
On-park	57	37	69	41	38	242
Off-park	52	40	52	31	45	220
Total	109	77	121	72	83	462

The 462 replies generated a 12% response rate: compared to other studies carried out in China, this response rate is similar. According to the latest statistics, there are 300,000 SMEs located in Beijing, and so the 462 responses yielded a confidence interval of 4.56 when setting the confidence at 95%.

4.9 Data coding and analysis

After obtaining the data from the questionnaires, the software of statistical package for the social sciences was used for entering the set of coded data into the computer to form the database. The statistical package for the social sciences software was used because it is one of the most widely used programmes for statistical analysis in social sciences, has data management and data documentation as one of its features, and can be used for setting up both data files and files' descriptions.

In order to ensure that the results and analysis were robust, a series of tests were undertaken, which included parametric (i.e. Bonferroni test) and non-parametric tests (i.e. Mann Whitney and Chi-Square tests). The tests were run against the variables listed above; none of the tests were statistically significant at the 0.05 level or better.

4.10 Examining non-response bias

In data collection, there are two types of non-response: item and unit non-response. Item non-response occurs when a respondent does not answer certain questions in a survey, and unit non-response takes place when a randomly sampled individual cannot be contacted or refuses to participate in a survey. The bias occurs when answers to questions differ among the observed and non-respondent items or units.

In order to avoid the non-response bias from the target population, the following methods were taken before or during the questionnaire survey.

Expert interpretation

Because the questionnaire was originally designed in English, but the target population were entrepreneurs in Beijing, the questionnaire was translated from English into Mandarin Chinese, and was then back-translated by two Chinese professors and one businesswoman in Beijing to ensure its validity.

Interview training

To ensure the quality of survey, the author and all the helpers received full training in interview techniques provided by experts from Capital Normal University.

Flexible time to respond

The target group was questioned and interviewed, and all were given a flexible time to respond. They were allowed to fill in the questionnaire in their own time, and there was no pressure on them to finish the survey quickly.

Pilot test

To improve the quality of the survey, a pilot study was undertaken by the author when he attended the annual conference for the Association of Beijing Electronic Commerce. A total of 56 responses were received after the conference, which made an important contribution to the final form of the questionnaire.

Anonymity assured

All the participants were assured of their anonymity: all their data, including the firm and personal information they provided, is kept in secret and will only be used in academic way.

Parametric and nonparametric tests

In addition to the above methods, both parametric and nonparametric tests were used to test non-response bias. Using chi-square and Mann-Whitney U tests, no statistically significant response bias was detected between the respondents and non-respondents with regard to industry, legal form, age of business and employment size. Therefore, I can conclude that a representative sample has been collected.

Following the test of non-response bias, the data presentation and analysis will be discussed next.

4.11 Validity and reliability of the survey

The results of sample surveys are always subject to some uncertainty because only part of the population has been measured, and because errors of measurement are made. This uncertainty can be reduced by taking larger samples and by using superior instruments of measurement, but this usually costs time and money (Cochran, 1977).

To avoid bias for my representative sample, the best way was to select a random sample (also known as probability sampling). There are a few types of random sampling, which include simple random sampling, stratified random sampling, cluster random sample and a systematic sample.

To gather a large sample of respondents, it was decided to send the questionnaire to 4000 businesses. A stratified random sample of 4000 independent firms was drawn from a list of business names provided by Emage: a well-known and trustworthy information providing company in China. In order to control response bias, the structured questionnaire was posted to a single key respondent (the principal owner and/or founder and the key decision-maker) in each of the 4000 randomly selected businesses. This rich data set would provide a platform for reliability to be assessed.

The survey started in October 2008 and finished in June 2009. In the nine-month timeframe, a total number 61 copies were unusable for reasons including the following: the previous owner had retired, the business was no longer trading or the business had been taken-over. These non-valid respondents were removed from the sampling frame. Further to that, some were considered non-respondents simply because the key questions were not answered, or only few questions were answered. They were also excluded from subsequent data analysis. Therefore, a valid total number of 462 usable questionnaires were obtained from a final sampling frame of 4000 independent firms, yielding a 12%

valid response rate. This response rate was considered acceptable.

Non-response bias was conducted to assess whether the results from the sample can be representative to the population of SMEs in China. Chi-square tests were conducted to detect differences between responding and non-responding businesses, and no statistically significant response bias was detected between the respondents and non-respondents. Based on the above point, there is no reason to suspect that the valid sample of SMEs is not an accurate representative sample. Overall, based on the sampling procedure followed, the non-bias test results and the final sample size, we can be confident that the results can be generalised to the wider population of SMEs in China.

4.12 Problems encountered during the survey

During the nine-month long survey there were a lot of problems that will be discussed in this section. The most pressing and biggest problem was accessing the business information of SMEs in Beijing. In order to gain this information, the author contacted six small business-related organisations, associations and entities. Three of them are associations of Beijing SMEs, and the other three are ZSP small business websites. Before visiting them the author called each of them, but none of the businesses would like to meet the author or provide the information the author wanted. But it is still worthy seeing them in person, after 3-4 times communications through email and telephone, the Association of Beijing Electronic Commerce believed the author only have academic purpose, they invited the author to their annual conference. During the conference the author has built a good relationship with some entrepreneurs, and they provided some valuable advice about the questionnaire.

Although the business information was bought from a famous and trustworthy company, the accuracy of the information was still not good enough as the address of some companies were not up to date, which took a large amount of time to rectify. Even if the business address was correct, other problems, such as the closure of a company or the change of owners, were other major problems faced by the author.

The returned questionnaires were not fully completed because some only completed the first page and left the rest blank, which also wasted much time and energy.

To get the permission for an interview was also a big problem. Some companies refused to respond to us (even after they promised to have an interview with us) and changed their mind without notice, and others failed to answer our telephone calls for further contact.

4.13 Conclusion

The purpose of this study is to use human capital theory and RBV as a theoretical construct to develop the understanding of entrepreneurial experience and firm performance on science parks and off-park in Beijing, China. The research methodology was chosen to fulfil the objective of identifying Chinese entrepreneurs' character, innovation and adoption of e-commerce. My study selected firms from the largest science park in China – ZSP, and a compared group of off-park firms. Participants were selected based on the following criteria: the business must have at least eight employees, and 250 employees at most; the business must be in operation for at least three years; in the case of a co-investment, the respondent must be the owner, founder or major partner; the business must be independently or privately owned; the business must be engaged in activities within the following five sectors: business services (financial, legal); education and training; electronics and IT hardware; software; and computer services. Furthermore, the business must be located within the ZSP or, in the case of the off-park firms, within Beijing. China is a huge country, but given the limited time and financial resources it was necessary to focus on only one part of China. Beijing is the capital of China and, being the author's home city, has a good network among my family to help enhance the data gathering.

The author chose a list of 2000 business names from ZSP and a comparable sample of 2000 off-park firms based on industry, size and legal form. The questionnaire was administered between October 2008 and June 2009, and to reduce response bias and measurement error, face-to-face interviews were conducted with key informants (Kumar et al., 1993) in firms who had sufficient knowledge and an adequate level of involvement with regard to the issues under investigation.

The measurement of the variables for the empirical analysis was grouped into dependent, independent, control and demographic variables. The dependent variables were innovation, e-commerce adoption and firm performance. The independent variables included portfolio, serial and novice entrepreneurs. The control variables included sector, size, age of the business and location. The demographic variables included general and specific human capital, social capital, sex, the entrepreneur's age and potential relative role model. In total, 462 respondents (242 entrepreneurs located in ZSP and 220 entrepreneurs located off-park) provided complete data, yielding a response rate of 12%. This rate is comparable to similar entrepreneur, firm and innovation studies (Storey, 1994; Becheikh et al., 2006).

This chapter has comprehensively reviewed the rationale behind the choice of the study and data-gathering methodology for empirical investigation. The next three chapters provide the empirical findings from the investigations and analysis carried out on the primary data. The last chapter then provides a conclusion and recommendations to entrepreneurs, practitioners and policy makers, limitations of this study and recommendations for future researches are also presented in the last chapter.

Chapter 5

Business Performance – Innovation

5.1 Introduction

A cornerstone of enterprise policy in developed and developing countries is to increase the 'supply' of 'high quality' entrepreneurs and firms, which leverage knowledge and technology to create and exploit market opportunities (Technology Strategy Board, 2008). With the support of universities, local governmental authorities and various financial institutions, Governments have sought to stimulate the formation of new technology-based firms (NTBFs). Governments have directly and (indirectly) sought to address the 'market failures' (i.e., property, financial, information, skill and networking barriers) impeding the formation and development of NTBFs. Notably, inexperienced academics with no prior business ownership experience may face attitudinal, financial, skill and expertise barriers that may impede the successful commercialization of knowledge (Lambert, 2003).

Science Parks are property-based initiatives that can reduce uncertainty (and fixed costs) for entrepreneurs (Johannisson et al., 1994), as well as enable entrepreneurs with limited social / business networks to acquire and leverage social capital to address barriers to firm development. Institutional factors within a Science Park can provide a context for acquiring tacit knowledge and experience. Studies conducted in developed countries suggest that firms located on Science Parks generate positive spillovers. They generally report superior levels of firm performance with regard to firm employment growth, R&D activity and productivity (Siegel et al., 2003), although many studies show that the results are not clear-cut (Squicciarini, 2009). Despite massive private and public sector investment in Science Parks, relatively few studies outside developed countries (Löfsten and Lindelöf, 2003) have been conducted monitoring the performance of Science park firms (Yang et al. 2009; Chen et al., 2006, and Wright et al., 2005 are notable exceptions). Developed economy findings may not be equally applicable in an emerging region (Bruton et al., 2008). For example, the injection of risk capital in these contexts may have a limited effect. Calls have been to monitor the performance of firms located on and off Science Parks (Phan et al., 2008), and to ascertain the entrepreneur (i.e., human capital) and firm (i.e., social capital) factors associated with superior Science Park performance in developing country contexts (Stam and Elfring, 2008).

Science Park studies are generally focused on the firm, yet there is appreciation that the entrepreneur rather than solely the firm is a key unit of analysis (Shrader and Siegel, 2007). An entrepreneur's general and specific human capital profile (i.e. entrepreneurship capital) (Audretsch and Keilbach, 2004) can shape firm performance. Yet, there remain gaps in the knowledge base relating to the profiles of entrepreneurs located on and off Science Parks that report superior firm performance, particularly outside developed country contexts. In an emerging region context, where there are likely entrepreneurial deficits, it is important to understand whether there are differences between firm performance of those located on Science Park and off-Park. Also it is important to know whether entrepreneurs' levels of experience influences firm performance, and lastly whether entrepreneurs can compensate for resource deficiencies in terms of their experience by leveraging resources on science parks to improve firm performance. This chapter focuses upon innovation. The following novel research questions are explored: Do Science Park firms report superior levels of performance relative to off-Park firms, controlling for characteristics of the firm and the entrepreneur? Do entrepreneurs' human capital profiles, particularly the nature or extent of prior business ownership increase the firms' performance? Do Science Park firms who utilize accumulated previous entrepreneurial experience report superior performance than other firms, irrespective of location?

A broad definition of innovation has been incorporated in this study; one which includes technological innovations as well as less studied areas such as new work practices and workplace organization, new product or service distribution, new sources of supply or materials, new administration and office systems, and the exploitation of new markets or means of reaching these markets (Cosh and Wood, 1998).

Many factors associated with the determinants of innovation has been identified by scholars, however, few studies have been conclusive (Robson et al., 2009). This study replicates previous studies by exploring the links between the entrepreneur (i.e. demographic characteristics, general and specific human capital), the firm (i.e., resource profile), and domestic market context (i.e. domestic environment) and innovation measures. We explore whether firms located on Science

Parks owned by lead entrepreneurs with potentially enhanced human profiles report superior levels of innovation performance than firms located off-Park. This study extends previous research relating to Science Park spillovers with reference to an emerging region within China (Tan, 2006). Some entrepreneurs can compensate for a dearth of skills and experience by selecting a Science Park location, and acquiring resources on a science park. Guided by human capital theory, hypotheses will be derived, and then they are tested with reference to a unique hand-collected dataset. Information was gathered from 242 lead entrepreneurs located on Zongguancun Science Park in Beijing, China and a control group of 220 lead entrepreneurs owning off-Park firms (i.e., comparable in terms of industry, size and legal form). Logit regression was used to analyze the variables associated with innovation.

This chapter has the objective to explore how entrepreneur's experience and science park location influences business performance with regard to innovation, in Beijing, China. The reader is reminded that the following hypotheses are tested in the chapter.

H1: Entrepreneurs located on a science park compared to those entrepreneurs who are located off-park will report superior firm performance.

H2a: Entrepreneurs with greater numbers of started or bought businesses will report superior firm performance.

H2b: Habitual entrepreneurs compared to novice entrepreneurs will report superior firm performance.

H2c: Portfolio entrepreneurs compared to novice entrepreneurs will report superior firm performance.

H2d: Serial entrepreneurs compared to novice entrepreneurs will report superior firm performance.

H3a: Entrepreneurs located on a science park with experience of starting and purchasing greater numbers of businesses will report superior firm performance.

H3b: Habitual entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

H3c: Portfolio entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

H3d: Serial entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

The chapter is structured as follows: Section two looks at the operationalization of the innovation business performance measures and the appropriateness of econometric techniques[1]. This is followed by the results in section three where appropriate logit econometric regression techniques are utilised. A discussion of the findings and the implications of the results is then provided in section four. Lastly, in section five a conclusion completes the chapter.

5.2 Operationalization of variables and econometric techniques

5.2.1 Measures

5.2.1.1Dependent variables

Respondents were asked, "In the last 3 years, has your firm undertaken any form of innovation with regard to seven statements relating to the following" – product or services, production processes (including storage), work practices or workforce organization, supply and supplier relations, markets and marketing, administration and office systems, and products or services distribution were presented. The author operationalized innovation activity with reference to each statement by asking respondents to select one of the four following responses: innovation not tried (scored 1), innovation tried and failed (scored 2), innovation new to firm but not new to the industry (scored 3), and innovation new to industry (scored 4). With reference to these statements, the following six dependent variables were operationalized.

[1] This section is presented in this chapter rather than the methodology chapter because the researcher feels that this reads better and avoids the reader keep having to return to a previous chapter.

The first dependent is a composite variable which relates to a simple distinction between introduced at least one novel innovation with reference to the seven types of innovation (i.e., product or services (ProductI), production processes (including storage) (ProcessI), work practices or workforce organization (WorkI), supply and supplier relations (SupplyI), markets and marketing (MarketsI), administration and office systems (AdministrationI), and products or services distribution (DistributionI)) were termed 'novel innovation at least once' respondents (allocated a value of '1'), whilst respondents that reported no introduction of a novel innovation in any of the seven innovation types were termed 'never novel' respondents (allocated a value of '0').

The second dependent variable relates to those businesses who introduced a novel innovation in product/services and/or process innovation (allocated a value of '1'), and the respondents that did not report the introduction of a novel innovation in product/services and/or process innovation.

The third dependent variable looks at the other five types of innovation, and corresponds to those businesses who introduced a novel innovation in any one or more of the following: work practices or workforce organization, supply and supplier relations, markets and marketing, administration and office systems, and products or services distribution (allocated a value of '1'), and those businesses who did not have a novel innovation in one of the aforementioned five types of innovation.

5.2.1.2 Independent variables

Entrepreneur demographic characteristics

The Male entrepreneurs were allocated a value of '1', and the female entrepreneurs were allocated a value of '0' (Gender). The age of the entrepreneurs was included as a continuous variable (Age of entrepreneur). The entrepreneurs who indicated that their parents and/or relatives had business ownership experience were allocated a value of '1', and those entrepreneurs that indicated that their parents and/or relatives possessed no business ownership experience were allocated a value of '0' (Relative).

General human capital

Whilst the questionnaire included the full range of education possibilities it was decided to focus upon including one education variable in our models, and following established precedent this was university degrees. Those respondents who indicated that they had a university degree were allocated a value of '1', and those who did not have a degree were allocated a value of '0' (Degree).

Specific human capital

Those entrepreneurs who had been able to secure co-investors who invested at the time that the firm was started were given a value of '1', and those who had not attracted co-investors were allocated a value of '0' (Partners). The entrepreneurs were asked to indicate the number of businesses which they had bought, established, or inherited. We have focused upon the number of businesses which the entrepreneur had bought or established in which they had minority or majority ownership stakes (Number of Businesses). We also included a separate measure of entrepreneurial experience – whether the entrepreneurs were novice entrepreneurs (who at the time of the survey possessed minority or majority ownership stakes in one business that was either new or purchased) and habitual entrepreneurs (who at the time of the survey possessed minority or majority ownership stakes in two or more businesses that were either new or purchased. In other words, we distinguished between the entrepreneurs for whom the surveyed business was the only business in which they had a minority or a majority ownership stake which they had either established or purchased, but not inherited; and habitual entrepreneurs for whom they had ownership of the aforementioned type but in two or more businesses – the surveyed business and one or more other businesses. The habitual entrepreneurs were allocated a value of '1' and the novice entrepreneurs were given a value of '0' (Habitual). With regard to the habitual entrepreneurs previous research has shown that it is important to distinguish within the habitual entrepreneurs between serial and portfolio entrepreneurs. Serial entrepreneurs were those individuals who had at the time of the survey previously either sold or closed a business in which they had possessed a minority or a majority ownership stake in, and also at the time of the survey they had a minority or a majority ownership stake in a single independent business which was either new or had been bought. The portfolio entrepreneurs in contrast were individuals who at the time of the survey being undertaken possessed a minority or a majority ownership stakes in two or more independent businesses that were new and/or bought. Then three additional binary independent variables were generated. The serial entrepreneurs were allocated a value of '1' and the other entrepreneurs were allocated a value of '0' (Serial). The portfolio entrepreneurs were given a value of '1' and the other respondents were given a value of '0' (Portfolio). In the case of the novice entrepreneurs they were given a value of '1' and the other respondents were given a value of '0'. In the regression models only one measure or type of entrepreneurial experience was included in any given model. In the case of the serial, portfolio and novice entrepreneur dummy variables the excluded comparison variable is novice entrepreneurs.

5.2.1.3 Control variables

External environmental context: Five industry dummy variables were considered as control variables Software (no=0, yes=1), computer services (no=0, yes=1), business services (no=0, yes=1), Electronics & IT Hardware (no=0, yes=1), and training (no=0, yes=1). The reference category is training.

Firm resources

Previous studies in developed and also emerging nations have indicated that the size of a firm can influence not just the quantity and breadth of resources which are at their disposal, but that these in turn may have an influence upon innovation. Consequently those firms which lack or are deficient in resources may discover that their capacity to innovate is hampered and possibly severely limited. Previous research by Freel (2005) found that generally the firms which have a larger number of employees tend to have a higher propensity to innovate. Thus, the total size of the firms as measured by the number of employees was incorporated into the models. Some studies have found evidence of non-linear relationships between size and innovation and accordingly we initially included the square term of the number of employees in the models. However, there was found to be no evidence of a non-linear relationship between size and innovation so the reported models present the results without the squared size term. Previous reviews of the evidence have found that superior firm performance is frequently achieved by younger aged firms (Storey 1994). The age of the businesses was included as a continuous variable (Age Businesses).

Younger entrepreneurs may have more enthusiasm and capacity to look at problems with fresh eyes which results in more favourable outcomes and innovation. Alternatively, the older entrepreneurs with greater experience may be more likely to spot gaps in the market than their younger counterparts. The age of the entrepreneurs was included as a continuous variable (Age Entrepreneur). As with size it is essential to see if a non-linear relationship is present between our two measures of age – that of the entrepreneur and also the business against innovation outcomes. Accordingly, we initially incorporated squared terms, separately and then together, for both the age measures. However, there was no evidence of a non-linear relationship for either (or both) the measures of age and innovation so hence the reported results do not report the squared terms of age. Entrepreneurs who did use their own savings when the firm was established were allocated a value of '1', whilst those who did not were given a value of '0' (Own Savings).

Social capital: Social capital encapsulates many facets; it relates to the ability of entrepreneurs to leverage benefits from their social structures, networks and memberships (Ozgen and Baron, 2007), and also to develop their firms (Davidsson and Honig. 2003). Firms may utilize public and/or private sector organizations to obtain information and advice which enhance their resource creation capabilities. This in turn may translate into improved problem solving capabilities and innovation. Respondents were asked "in the last 3 years, has your firm used the following as sources of business advice, information or support?" Respondents were given a list of thirteen specified public and private sector firms and organizations that could have been utilized and these were: accountants, solicitor/lawyer, bank, customers, business associates, friends/relatives, suppliers, consultants, the Association of Beijing SMEs, Beijing SMEs Service Center, Beijing SMEs Website (www.bjsme.gov.cn), China SMEs Website (www.sme.gov.cn), and China International SMEs Fair. Additionally, there was another category to capture sources not included in the list. The total number of sources of business advice, information or support was included in the models (Business Advice).

5.2.2 Validity

The content validity was assessed by having the structured questionnaire tested during a pilot survey which consisted of two workshops, one on a science park and one off-park. To identify potential problems and overcome the problem of face validity, ten entrepreneurs took part in the two workshops. Subsequently the modified questionnaire was then piloted again on six different entrepreneurs. None of the piloted entrepreneurs are included in the subsequent analysis.

5.2.3 Common method bias

It is important to minimize common method bias (Krishnan et al., 2006). Every effort was undertaken to make sure that as far as possible the common method bias was as low as feasibly achievable. In other words, this was operationalized by making sure that the entrepreneurs who took part in the survey were anonymous; statement ambiguity was minimized by the careful piloting and testing of the questionnaire; and, also by as far as possible the questions and statements which related to the dependent variables were not located on pages very close to the independent variables. Lastly, all of the variables were included in a principal component analysis. The Harman one-factor test (Podsakoff et al., 2003) suggests no evidence of common method bias.

5.2.4 Data analysis

Logistic estimation was used to identify the combination of variables associated with the propensity of entrepreneurs to report each of the three variables, commencing with ‘novel innovation at least once’ across the seven specified innovation outcomes. This process was also repeated for the variable ‘novel innovation in product/service and/or process’, and, ‘novel innovation in other business areas’.

For each of the three separate dependent variables a base model was established which included the set of control variables and the variables which were the first set of human capital and business characteristics. Then the science park dummy variable was added to all subsequent models, and the three sets of entrepreneurial experience were added, separately.[2]

There is no agreed goodness-of-fit measure relating to logistic regression analysis. Two commonly used coefficients are reported. Deviance as indicated by the log likelihood coefficient is a 'badness-of-fit' measure, and weak 'explanatory' models generally report higher deviance coefficients. We also report the Nagelkerke R^2 values, which is a pseudo R^2 to provide a measure to show the 'explanatory' power of the models. While similar in principle to the adjusted R^2 reported in ordinary least squares regression models, non-ordinary least squares regression models generally report lower pseudo R^2 coefficients. We also report the log likelihood coefficients of the models.

In Appendix 3 a correlation matrix of the control and independent variables which we have used in the models are presented. The variance inflation factor scores and the correlation values do not show any reason for us to believe that the results are distorted.

[2] Also we re-run the models with the independent variable of science park location removed and each of the three types of entrepreneurial experience were added.

5.3 Results

In Table 5.1 the columns shows three composite measures for the seven types of innovation: firstly, relating to all seven types of innovation; secondly, relating to product/service and/or processes; and, thirdly, a measure relating to work, supply, markets, administration and/or distribution. Whilst the rows of Table 5.1 show the four different innovation outcomes: innovation not tried, innovation tried and failed, incremental innovation and novel innovation. Incremental innovation is new to the firm but not new to the industry. Novel innovation is new to the firm and to the industry. There were statistically significant differences at the 0.05 level between science park and off-park firms and the four innovation outcomes for the combined measure relating to all seven types of innovation. Overall, 19.0% of the firms had one or more novel innovation. This was 19.0% for science park firms which was larger than the 17.3% found for off-park firms. 63.0% of the firms had one or more incremental innovations, but no novel innovations. Incremental innovation was also larger for science park firms compared to off-park firms – 66.9% against 58.6%, respectively. 17.3% of firms had innovation tried and failed at least once, but with no innovations – novel or incremental. The corresponding values were 10.7% for science parks and 23.6 for off-park firms. Comparatively very few firms, 0.6%, had never tried to innovate across the seven types of innovation.

The bivariate analysis in Table 5.1 was also repeated for product/service and/or process innovation and the four outcomes possibilities and again the results were statistically significant at the 0.05 level. There were more science park firms who were novel and also incremental product/service and/or process innovators. More off-park firms than science park firms had not tried to innovate with regard to the aforementioned types of innovation. There was however, little difference between those firms on science parks and off-park firms who had tried and failed, but not had some measure of success.

The third set of bivariate results in Table 5.1 relate to work, supply, markets, administrator or distribution innovation. As with the results for the all and the product and/or process innovation it was clear that firms on science parks appeared to be novel and also incremental innovators compared to off-park firms. Nearly twice as many off-park firms compared to science park firms had tried and failed to innovate, with the figures 31.4% and 16.9%, respectively.

Table 5.1 The innovation strategies and outcomes for composite types of innovation.

	All			Product/Service and/or Processes (including storage)			Work, Supply, Markets, Administration or Distribution (1 or more)		
	All	Science Park	Off-Park	All	Science Park	Off-Park	All	Science Park	Off-Park
Innovation Never Tried	0.6	0.8	0.5	13.4	8.3	19.1	0.9	1.2	0.5
Innovation Tried & Failed, and/or did not try	17.3	10.7	23.6	37.9	37.6	38.2	23.8	16.9	31.4
Incremental Innovation	63.0	66.9	58.6	41.3	45.0	37.3	58.0	61.2	54.6
Novel Innovation	19.0	21.5	17.3	7.4	9.1	5.5	17.3	20.7	13.6
Chi-Square		14.86***			14.22***			14.97***	
n	462	242	220	462	242	220	462	242	220

Incremental Innovation is innovation which was new to the firm but not new to the industry. Novel innovation is innovation which was new to the firm and new to the industry. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

5.3.1 One or more novel innovations

Logistic regression analysis is utilized when the dependent variable takes values of 0 or 1. We performed maximum likelihood estimates of the dichotomous dependent variable relating to 'one or more novel innovations' (allocated a value of '1') and 'no novel innovations' respondents (allocated a value of '0'). Control variables relating to the propensity to report the 'one or more novel innovations' outcome were included in Model 1 in Table 5.2.

The model has a Nagelkerke R^2 of 0.21 and is significant at the 0.01 level. An independent variable relating to science park location was added to the control variables and is reported in Model 2. Model 2 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.25 which is an increase of 0.04 compared with Model 1. With regard to Model 2, those located on science parks were more likely to report 'one or more novel innovations' compared to those located off-park and this supports hypothesis H1.

Independent variables relating to years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 3, 4 and 5, respectively. Models 3, 4 and 5 are individually statistically significant at the 0.01 level. In model 3 the Nagelkerke R^2 is 0.26 and is significant at the 0.01 level. However, the respondents reporting more businesses established or purchased compared to those reporting fewer businesses established or purchased were not statistically significantly more likely to report 'one or more novel innovations'. Hypothesis H2a is thus not supported.

Model 4 has a Nagelkerke R^2 of 0.26 and is significant at the 0.01 level. Habitual entrepreneurs were more likely at the 0.05 level to report 'one or more novel innovations'. Hypothesis H2b is supported. Model 5 has a Nagelkerke R^2 of 0.26 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly more likely than novice entrepreneurs to report 'one or more novel innovations'. Hypothesis H2c is supported. Serial entrepreneurs were not significantly more likely than novice entrepreneurs to report 'one or more novel innovations'. Hypothesis H2d is not supported.[3]

[3] Models 3, 4 and 5 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar.

Table 5.2 Logit regression of novel innovation in at least one field .

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Control Variables								
Software	**1.43*** **	**1.45*** **	**1.46*** **	**1.46*** **	**1.46*** **	**1.49*** **	**1.59*** **	**1.56*** **
Computer Services	**0.88***	**0.88***	**0.87***	**0.86***	**0.84***	**0.85***	**0.86***	**0.85***
Business Services	0.53	0.55	0.58	0.60	0.60	0.60	0.57	0.46
Electronics & IT Hardware	0.78	0.79	0.78	0.76	0.78	0.79	0.78	0.79
Age of Business	**0.17*** **	**0.17*** **	**0.16*** **	**0.17*** **	**0.16** **	**0.17** **	**0.16** **	**0.15** **
Size	**0.46** **	**0.45** **	**0.45** **	**0.49** **	**0.48** **	**0.44** **	**0.51** **	**0.54** **
Own Savings	-0.40	-0.40	-0.39	-0.40	-0.39	-0.35	-0.39	-0.33
Gender	0.27	0.27	0.26	0.25	0 .23	0.24	0.26	0.20
Age of Entrepreneur	-0.03	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05
Relative	0.24	0.24	0.22	0.19	0.19	0.19	0.20	0.18
Degree	**0.45** **	**0.46** **	**0.48** **	**0.46** **	**0.47** **	**0.48** **	**0.46** **	**0.48** **
Partners	0.08	0.10	0.10	0.10	0.10	0.10	0.10	0.11
Business Advice	**0.30*** **	**0.31*** **	**0.31*** **	**0.30*** **	**0.30*** **	**0.33*** **	**0.31*** **	**0.33*** **
Main Effects								
Science Park (SP)	--------	**0.15** **	**0.18** **	**0.22** **	**0.22** **	**0.21** **	**0.22** **	**0.22** **
Number of businesses	--------	--------	0.13	--------	--------	0.06	--------	--------
Habitual	--------	--------	--------	**0.55** **	--------	--------	**0.55** **	--------
Serial	--------	--------	--------	--------	0.43	--------	--------	0.51
Portfolio	--------	--------	--------	--------	**0.59** **	--------	--------	**0.50** **
Two-way interactions								
SP*No. of businesses	--------	--------	--------	--------	--------	0.17	--------	--------
SP * Habitual	--------	--------	--------	--------	--------	--------	**1.39** **	--------
SP * Serial	--------	--------	--------	--------	--------	--------	--------	**2.19***
SP * Portfolio	--------	--------	--------	--------	--------	--------	--------	**2.45*** **
Constant	**-2.16*** **	**-2.17*** **	**-2.18*** **	**-2.18*** **	**-2.17*** **	**-2.24*** **	**-1.75*** **	**-1.79*** **
Log likelihood	**46.65*** **	**48.05*** **	**49.88*** **	**50.57*** **	**50.73*** **	**54.54*** **	**46.65*** **	**49.88*** **
Likelihood Ratio	-201.63	-200.54	-200.03	-199.67	-199.59	-197.43	-201.63	-191.09
Nagelkerke R^2	0.207	0.247	0.258	0.263	0.263	0.272	0.306	0.339
Change in Nagelkerke R^2	--------	0.040	0.051	0.056	0.056	0.065	0.099	0.132

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. * p < 0.10; ** p < 0.05; *** p < 0.01

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 6, 7, and 8, respectively. Models 6, 7 and 8 are each statistically significant at the 0.01 level.

Model 6 has a Nagelkerke R^2 of 0.27. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against our innovation measure of 'one or more novel innovations'. Thus, the evidence is not consistent with hypothesis H3a.

Model 7 has a Nagelkerke R^2 of 0.31. The two way interaction effect is found to be statistically significant in Model 7. This indicates that those firms located on a science park who are habitual entrepreneurs are more likely compared to novice entrepreneurs to have 'one or more novel innovations'. This supports hypothesis H3b.

Model 8 has a Nagelkerke R^2 of 0.34. In model 8 there are two two-way interaction terms between science park location and portfolio, and serial entrepreneurs. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.01 level. Thus, firms located on a science park who are portfolio entrepreneurs are more likely to have 'one or more novel innovations' and this supports hypothesis H3c. Whilst in Model 8 the interaction term for firms located on a science park and where they are serial entrepreneurs is weakly statistically significant at the 0.10 level. Thus, the evidence weakly supports hypothesis H3c.

5.3.2 Product/service and/or process novel innovation

The same regression methodology was applied to the second set of results relating to whether or not the businesses had introduced 'a novel innovation in products/services and/or processes' (allocated a value of '1') and 'no novel innovations in products/services or processes'. The control variables and general human capital and business characteristics were included in Model 9 in Table 5.3.

The model has a Nagelkerke R^2 of 0.18 and is significant at the 0.01 level. The independent variable relating to the location on a science park was added to the set of control variables in Model 9, and the results are shown in Model 10. Model 10 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.22. The science park location variable is statistically significant at the 0.05 level. Thus firms on science parks compared to those firms which are off-park are more likely to report ‘a novel innovation in products/services and/or processes’. This supports hypothesis H1.

The number of businesses established or purchased, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 11, 12 and 13, respectively. Thus, these models augment the model with the control variables and the independent variable of science park location by each one of the measures of entrepreneurial experience. Models 11, 12 and 13 are individually statistically significant at the 0.01 level.

Model 11 has a Nagelkere R^2 of 0.24. The number of businesses established or purchased is statistically significant at the 0.01 level. The results indicate that the greater the number of businesses established or purchased the greater the likelihood of the firm having the outcome of ‘a novel innovation in products/services and/or processes’. This supports hypothesis H2a with regard to the outcome ‘a novel innovation in products/services and/or processes’.

Model 12 has a Nagelkerke R^2 of 0.24 and adds the habitual entrepreneurship dummy variable to the control variable model. The habitual entrepreneurship variable is statistically significant at the 0.05 level and this supports hypothesis H2b with regard to the outcome ‘a novel innovation in products/services and/or processes’.

Model 13 has a Nagelkerke R^2 of 0.24. The portfolio entrepreneur dummy variable is statistically significant at the 0.01 level, but the serial entrepreneurship dummy variable is not statistically significant. Thus, portfolio entrepreneurs compared to novice entrepreneurs, are more likely to have the outcome ‘a novel innovation in products/services and/or processes’. Whilst for serial entrepreneurs compared to novice entrepreneurs there is no statistically significant difference with the aforementioned outcome measure. Thus, the results in model 13 support hypothesis H2c but does not support hypothesis H2d with regard to the outcome measure of ‘a novel innovation in products/services and/or processes’.[4]

In models 14, 15 and 16 the two way interaction effects are added and uses the same techniques which are also applied in Tables 2 and 4. In models 14, 15 and 16 the models are each statistically significant at the 0.01 level.

[4] Models 11, 12 and 13 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 11, 12 and 13.

Table 5.3 Logit regression of novel innovation in Product/Service and/or Process Innovation.

	Model 9	**Model 10**	**Model 11**	**Model 12**	**Model 13**	**Model 14**	**Model 15**	**Model 16**
Control Variables								
Software	**1.95****	**1.95****	**1.95****	**1.95****	**2.00****	**2.00****	**1.95****	**2.00****
Computer Services	**1.06****	**1.07****	**1.10****	**1.10****	**1.06****	**1.06****	**2.07****	**2.06****
Business Services	0.47	0.47	0.46	0.55	0.47	0.46	0.55	0.39
Electronics & IT Hardware	1.89	1.90	1.90	1.90	1.90	1.90	1.99	1.09
Age of Business	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.14
Size	**0.98*****	**0.98****	**0.96*****	**1.03*****	**1.09*****	**0.94*****	**1.16*****	**0.95*****
Own Savings	**0.91****	**0.97****	**1.20****	**1.04****	**1.08****	**1.15****	**1.04****	**1.31****
Gender	0.55	0.55	0.56	0.58	0.54	0.55	0.57	0.58
Age of Entrepreneur	-0.04	-0.04	-0.04	-0.04	-0.08	-0.12	-0.12	-0.08
Relative	0.89	0.90	0.90	0.91	0.91	0.957	0.79	0.92
Degree	**1.68*****	**1.78*****	**1.97*****	**1.73*****	**2.04*****	**1.97*****	**1.75*****	**1.95*****
Partners	0.03	0.04	0.04	0.04	0.04	0.06	0.04	0.05
Business Advice	**0.32*****	**0.32****	**0.32*****	**0.32*****	**0.31*****	**0.30****	**0.32*****	**0.33*****
Main Effects								
Science Park (SP)	--------	**0.52****	**0.54****	**0.54****	**0.54****	**0.54****	**0.54****	**0.54****
Number of businesses	--------	--------	**0.44*****	--------	--------	0.65	--------	--------
Habitual	--------	--------	--------	**1.39****	--------	--------	**1.39****	--------
Serial	--------	--------	--------	--------	0.48	--------	--------	0.49
Portfolio	--------	--------	--------	--------	**1.78*****	--------	--------	**1.78*****
Business Advice								
Two-way interactions								
SP * No. of businesses	--------	--------	--------	--------	--------	0.33	--------	--------
SP * Habitual	--------	--------	--------	--------	--------	--------	**1.50*****	--------
SP * Serial	--------	--------	--------	--------	--------	--------	--------	1.12
SP * Portfolio	--------	--------	--------	--------	--------	--------	--------	**1.70****
Constant	**-0.50*****	**-0.50*****	**-0.51*****	**-0.51*****	**-0.60*****	**-0.49*****	**-0.52*****	**-0.52*****
Log likelihood	323.60	303.05	287.65	295.43	288.56	281.04	280.71	239.41
Likelihood Ratio	**102.11****	**100.54*****	**99.04*****	**95.14*****	**98.58*****	**98.58*****	**95.25*****	**98.55*****
Nagelkerke R^2	0.184	0.223	0.236	0.239	0.240	0.243	0.244	0.284
Change in Nagelkerke R^2	--------	0.039	0.052	0.055	0.056	0.059	0.060	0.10

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

In model 14 the Nagelkerke R^2 is 0.24. The two way interaction effect of being located on a science park and the number of businesses established or purchased is not statistically significant. Thus, for the innovation outcome of ‘a novel innovation in products/services and/or processes’ the results are not consistent with hypothesis H3a.

In model 15 the Nagelkerke R^2 is 0.24. The two-way interaction effect of being located on a science park and being an habitual entrepreneur is statistically significant at the 0.01 level. Firms located on a science park where the entrepreneurs are habitual entrepreneurs are more likely to have ‘a novel innovation in products/services and/or processes’ and this supports hypothesis H3b with regard to the aforementioned innovation outcome.

In model 16 the Nagelkerke R^2 is 0.28. The results in model 16 find mixed evidence when habitual entrepreneurship is split into serial and portfolio, against novice entrepreneurs and combined with science park location as a pair of interaction effects. More specifically, the two-way interaction effect of science-park location and portfolio entrepreneurship is statistically significant at the 0.05 level, but the two-way interaction effect of science-park location and serial entrepreneurship is not statistically significant. Thus, for the innovation outcome ‘a novel innovation in products/services and/or processes’ the results support hypothesis H3c and do not support hypothesis H3d.

5.3.3 One or more novel innovation in other business areas (work, supply, markets, administration and product/service distribution)

The control variables and the base entrepreneurial and business characteristics relating to the propensity to report ‘one or more novel innovations in work, markets, supply, administration and distribution’ are included in Model 17 in Table 5.4. The model has a Nagelkerke R^2 of 0.21 and is significant at the 0.01 level. The specification of Model 17 is supplemented with the addition of the science park location variable in Model 18.

Model 18 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.24. In model 18 the science park location variable is statistically significant at the 0.01 level. This shows that those located on science parks were more likely to report ‘one or more novel innovations in work, markets, supply, administration and distribution’ compared to those located off-park and this supports hypothesis H1.

Table 5.4 Logit regression of novel innovation in one or more of the following, Work, Markets, Supply, Administration, Distribution.

	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22	Model 23	Model 24
Control Variables								
Software	**1.27*** **	**1.28*** **	**1.30*** **	**1.30*** **	**1.29*** **	**1.45*** **	**1.40*** **	**1.36*** **
Computer Services	0.40	0.39	0.37	0.37	0.37	0.39	0.38	0.37
Business Services	0.38	0.40	0.42	0.43	0.43	0.42	0.45	0.33
Electronics & IT Hardware	0.13	0.22	0.35	0.28	0.27	0.42	0.35	0.34
Age of Business	**0.17** **	**0.17** **	**0.16** **	**0.17** **	**0.17** **	**0.15** **	**0.15** **	**0.14** **
Size	**0.48** **	**0.48** **	**0.47** **	**0.49** **	**0.49** **	**0.46* **	**0.49** **	**0.54** **
Own Savings	-0.34	-0.32	-0.32	-0.32	-0.35	-0.31	-0.32	-0.29
Gender	0.21	0.20	0.19	0.17	0.17	0.19	0.15	0.19
Age of Entrepreneur	0.02	0.02	0.04	0.03	0.03	0.04	0.04	0.04
Relative	0.38	0.37	0.35	0.32	0.32	0.34	0.26	0.33
Degree	**0.31** **	**0.32** **	**0.33** **	**0.32** **	**0.31** **	**0.28** **	**0.33** **	**0.37** **
Partners	-0.08	-0.09	-0.11	-0.11	-0.11	-0.12	-0.10	-0.11
Business Advice	**0.34*** **	**0.33*** **	**0.33*** **	**0.33*** **	**0.33*** **	**0.30*** **	**0.38*** **	**0.38*** **
Main Effects								
Science Park (SP)	--------	**0.18** **	**0.19** **	**0.25** **	**0.25** **	**0.34** **	**0.28** **	**0.26** **
Number of businesses	--------	--------	**0.14* **	--------	--------		--------	--------
Habitual	--------	--------	--------	**0.40** **	--------	--------	**0.46** **	--------
Serial	--------	--------	--------	--------	0.48	--------	--------	0.53
Portfolio	--------	--------	--------	--------	**0.57** **	--------	--------	**0.87** **
Two-way interactions								
SP * No. of businesses	--------	--------	--------	--------	--------	0.24	--------	--------
SP * Habitual	--------	--------	--------	--------	--------	--------	**0.97* **	--------
SP * Serial	--------	--------	--------	--------	--------	--------	--------	0.59
SP * Portfolio	--------	--------	--------	--------	--------	--------	--------	**2.18** **
Constant	**-2.66** **	**-2.68** **	**-2.89** **	**-2.34** **	**-2.38** **	**-1.50** **	**-1.15** **	**-1.20** **
Log likelihood	-192.43	-191.44	-190.58	-191.22	-191.18	-187.03	-185.80	-182.38
Likelihood Ratio	**40.97*** **	**42.34*** **	**44.68*** **	**43.39*** **	**43.47*** **	**50.77*** **	**54.06*** **	**61.08*** **
Nagelkerke R^2	0.212	0.237	0.264	0.269	0.269	0.346	0.366	0.413
Change in Nagelkerke R^2	--------	0.025	0.052	0.057	0.057	0.134	0.154	0.201

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Independent variables relating to years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 19, 20 and 21, respectively. Models 19 to 21 are individually statistically significant at the 0.01 level.

Model 19 has a Nagelkerke R^2 of 0.26. The number of businesses established or purchased is statistically significant at the 0.10 level. The results indicate that the greater the number of businesses established or purchased the greater the likelihood of the firm having the outcome of 'one or more novel innovations in work, markets, supply, administration and distribution'. This supports hypothesis H2a with regard to the outcome 'a novel innovation in products/services and/or processes'.

Model 20 has a Nagelkerke R^2 of 0.27 and has the habitual entrepreneurship dummy variable added to the control variable and science park location model. The habitual entrepreneurship variable is statistically significant at the 0.05 level and this supports hypothesis H2b with regard to the outcome 'one or more novel innovations in work, markets, supply, administration and distribution'.

Model 21 has a Nagelkerke R^2 of 0.24. The portfolio entrepreneur dummy variable is statistically significant at the 0.05 level, but the serial entrepreneurship dummy variable is not statistically significant. Thus, portfolio entrepreneurs compared to novice entrepreneurs, are more likely to have the outcome 'one or more novel innovations in work, markets, supply, administration and distribution'. Whilst for serial entrepreneurs compared to novice entrepreneurs there is no statistically significant difference with the aforementioned outcome measure. Thus, the results in model 21 support hypothesis H2c but does not support hypothesis H2d with regard to the outcome measure of 'one or more novel innovations in work, markets, supply, administration and distribution'.[5]

In models 22, 23 and 24 the two way interaction effects are incorporated adopting the same techniques which are also applied in Tables 2 and 3. In models 22, 23 and 24 the models are each statistically significant at the 0.01 level.

In model 22 the Nagelkerke R^2 is 0.35. The two way interaction effect of being located on a science park and the number of businesses established or purchased is not statistically significant. Thus, for the innovation outcome of 'one or more novel innovations in work, markets, supply, administration and distribution' the results are not consistent with hypothesis H3a.

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[5] Models 19, 20 and 21 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 19, 20 and 21.

In model 23 the Nagelkerke R^2 is 0.37. The two-way interaction effect of being located on a science park and being an habitual entrepreneur is statistically significant at the 0.10 level. Firms located on a science park where the entrepreneurs are habitual entrepreneurs are more likely to have the outcome 'one or more novel innovations in work, markets, supply, administration and distribution' and this supports hypothesis H3b with regard to the aforementioned innovation outcome.

In model 24 the Nagelkerke R^2 is 0.41. The results in model 24 find mixed evidence when habitual entrepreneurship is split into serial and portfolio, against novice entrepreneurs and combined with science park location as a pair of interaction effects. More specifically, the two-way interaction effect of science-park location and portfolio entrepreneurship is statistically significant at the 0.05 level, but the two-way interaction effect of science-park location and serial entrepreneurship is not statistically significant. Thus, for the innovation outcome 'one or more novel innovations in work, markets, supply, administration and distribution' the results support hypothesis H3c and do not support hypothesis H3d.

5.4. Discussion and implications

5.4.1 Key findings

The analysis in this chapter has contributed to filling the knowledge gap on our understanding of science parks and entrepreneur's experience record in influencing innovation outcomes, in a rapidly developing nation context of Beijing, China. These are neglected areas and it is important that they are better understood to allow us to know more about the Chinese context. This chapter has focused upon three composite measures of innovation outcomes: 'one or more novel innovations', 'a novel innovation in products/services and/or processes', and 'one or more novel innovations in work, markets, supply, administration and distribution'. For each of these three innovation outcomes we examined whether the location on a science park and prior business ownership experience had associations with novel innovation outcomes. Several hypotheses were supported.

Firms located on science parks were more likely than firms located off-park to report each of the three composite measures of innovation outcomes: 'one or more novel innovations', 'a novel innovation in products/services and/or processes', and 'one or more novel innovations in work, markets, supply, administration and distribution'. These results are consistent with and support hypothesis H1. Thus, this evidence suggests that at least as far as these performance outcomes are concerned science parks can outperform off-park firms.

The results showed that the length of prior business ownership experience was not related to the three innovation outcome measures. This does not support hypothesis H2a. The type of prior business ownership experience found much stronger associations with the three innovation outcomes. In particular, habituals, and within that type the portfolio but not the serial entrepreneurs were found to be more likely to report the three innovation outcomes. Thus, hypothesis H2b and H2d were supported, but H2c was not supported. The evidence suggests that portfolios but not serial entrepreneurs in comparison with novice entrepreneurs are able to draw upon some different sets of skills, experience and creativity to better achieve innovation outcomes.

The author augmented the models with interaction terms between science park location and the three sets of entrepreneurial experience. The results consistently found that the length of entrepreneurial experience and the science park location interaction variables were not statistically significant. Thus, hypothesis H3a was not supported. However, the type of entrepreneurial experience and the science park location interaction effect variables were significant in all three sets of models. This set of results supported hypothesis H3b. Thus, habitual entrepreneurs are able to leverage resources on science parks to achieve a greater likelihood of achieving innovation outcomes.

The interaction effects also split habitual entrepreneurs into portfolio and also serial entrepreneurs and each of these two types of entrepreneurial experience was interacted with the science park location. Interestingly the serial entrepreneur and science park interaction variable was found to be weakly statistically significant in the model of 'any one or more novel innovation' outcome. Thus, whilst serial entrepreneurs as a separate independent variable was not related to 'one or more novel innovation' outcome, the serial entrepreneurs on science parks are able to leverage resources to compensate for their lack of experience and skills, and to boost the probability of achieving 'any one or more novel innovation' outcome. Thus there is mixed support for hypothesis H3c.

Whilst for the portfolio and science park location interaction variables they were each found to be related to each of the three innovation outcomes. These results supported hypothesis H3d. Thus, portfolio entrepreneurs located on science parks consistently seemed to be better able to leverage resources to boost the likelihood of achieving innovation outcomes.

Two entrepreneur control variables were consistently significant in all of the models. Entrepreneurs with degrees were significantly more likely than those entrepreneurs without degrees to have 'one or more novel innovations', 'a novel innovation in products/services and/or processes', and 'one or more novel innovations in work, markets, supply, administration and distribution'. Entrepreneurs who used greater numbers of sources of business advice were found to be more likely to have 'one or more novel innovations', 'a novel innovation in products/services and/or processes', and 'one or more novel innovations in work, markets, supply, administration and distribution'. The use of own savings was positively related to 'a novel innovation in products/services and/or processes' and this was statistically significant at the 0.05 level, but it was not statistically significant for our other two dependent measures.

Two firm control variables were consistently significant in models 1 to 24. Larger (Size) firms were more likely to report ‘one or more novel innovations’, ‘a novel innovation in products/services and/or processes’, and ‘one or more novel innovations in work, markets, supply, administration and distribution’. Older (Age of Business) firms were more likely to report ‘one or more novel innovations’, ‘a novel innovation in products/services and/or processes’, and ‘one or more novel innovations in work, markets, supply, administration and distribution’. A third set of control variables relating to sector were also found to be significant but there were some differences across the three innovation outcomes. In models 1 to 16 respondents engaged in software industry, and also the computer services industry – compared to the training sector were more likely to report ‘one or more novel innovations’, and ‘a novel innovation in products/services and/or processes’. Whilst in models 17 to 24 respondents engaged in software industry, and also the computer services industry – compared to the training sector were more likely to report and ‘one or more novel innovations in work, markets, supply, administration and distribution’.

5.4.2 Practitioner implications

Innovation policy is important in developed countries such as the US and the UK but it is equally of importance in developing or emerging nations such as China. The results consistently show that firms are more likely to be innovators if they are located on a science park compared to off-park. This suggests that the government policy of creating science parks and developing businesses on science parks can provide fruitful results, at least in terms of innovation outcomes.

Prior to this study the previous research on entrepreneurship in China, particularly the research pertaining to different types of entrepreneurship has been extremely limited. The evidence presented in this chapter suggests that the type of entrepreneurial experience background needs to be considered more by the policy makers in China. This applies particularly if the focus of attention is novel, or radical forms of innovation. The results showed that habitual entrepreneurs, and in particular the portfolio entrepreneurs but not the serial entrepreneurs were more likely to report each of the three composite measures of novel innovation outcomes. This suggests that practitioners may be able to improve the business environment by considering and adopting one of at least two possible avenues to pursue. If the practitioners desire to maximize their returns then the focus of attention should be upon targeting habitual entrepreneurs and the subset of portfolio entrepreneurs rather than serial entrepreneurs. Alternatively, resources would need to be deployed to attempt to bring the competencies and skills of the serial entrepreneurs towards the level of their portfolio entrepreneur counterparts. This latter policy measure would be extremely difficult to implement, and further research would be needed to more fully understand the differences within and between serial and portfolio entrepreneurs.

Clearly the identification of certain types of entrepreneurial profiles, combined with the information on the location on a science park, compared to off-park, which are more likely to be innovators, and that science park location and habitual and portfolio interaction effects are important in achieving novel innovation outcomes, does allow the practitioners to mobilize national and more local resources to attempt to sustain and improve the innovation performance of Chinese businesses.

5.5 Conclusion

Using the data from a new and unique data set of 462 entrepreneurs in Beijing, China who were on science parks and off-park, this chapter has explored whether entrepreneurs' human capital profiles, particularly the length and types of prior business ownership experience, have the effect of increasing the probability that they will achieve novel innovations using three composite measures. There is a lack of previous research which has adopted a large scale sampling technique to look at the performance of entrepreneurial ventures on science parks and of-park and the types of entrepreneurial experience of entrepreneurs in China. This chapter has contributed to the debate on science parks and prior entrepreneurial experience in an emerging nation of China. In particular, this was the first study to make the distinction between serial and portfolio entrepreneurs compared to novice entrepreneurs with no prior business experience. Moreover, this was complimented with the careful inclusion of the number of businesses established or purchased (but not inherited) to compare a series of types of entrepreneurial experience with innovation.

A key finding and conclusion of the chapter is that portfolio entrepreneurs were more likely than the other types of entrepreneurs to introduce novel innovation outcomes. This suggests that the policy makers in China could consider channeling more resources towards portfolio entrepreneurs. Alternatively, the policy makers need to weigh up whether to instead devote and channel resources to other types of entrepreneurs to help to build them up towards becoming portfolio entrepreneurs.

The next chapter is the second empirical chapter which examines the exporting, employment growth and profitability of different types of entrepreneurs located on and off ZSP.

Chapter 6

Business Performance– Exporting, Employment Growth and Profitability

6.1 Introduction

The methodology and data gathering techniques were presented in chapter 4. Chapter 6 is the second of the empirical chapters which tests a series of hypotheses about business performance which were derived in the front-end chapters of the dissertation. In this chapter the measures of business performance which are examined are exporting activity, employment growth and also profitability. More specifically, chapter 6 explores entrepreneurs' entrepreneurial experience and the business performance of firms who are located on science parks and off-park in Beijing, China. There has been a substantial amount of research on science parks and business performance – particularly the US, UK and mainland European countries such as Sweden, Portugal, Grace and Italy, as well as comparatively smaller numbers of research studies of other part of the world like Canada, Australia and China, where the later is the focus of this dissertation. To a lesser extent in some emerging nations such as Ghana and Nigeria there is a growing amount of research. Countries such as Japan, Korea, and Singapore, as well as areas such as Taiwan and Hong Kong have attracted increased levels of attention during the last decade, as they are the most developed countries or areas in Asia. However, in China there are comparatively few studies on science parks (Macdonald and Deng 2004, Chen 2006, Tan 2006, Filatotchev, 2011), and fewer still studies which have examined business performance and/or entrepreneurial experience on science parks (Cai et al. 2007, Filatotchev et al. 2011). In particular within the studies of developed and also emerging nations there is comparatively little research on entrepreneurial experience and business performance on science parks and also off-park using large scale studies and performing econometric techniques. This chapter is seeking to make a contribution to addressing this gap in the knowledge base.

Promoting entrepreneurship is viewed as part of a formula that will reconcile economic success with social cohesion (Organization for Economic Co-Operation and Development, 1998). Since early 1980s, China has been taking an extraordinary speedy economic reform by promoting private small business, during the economic reform, China has became more closely integrated in the global economy. ZSP is a highly representative example in this process, which has attracted more and more researchers' attention (Tan 2006, Chen 2006). To better understand China's small business, more specifically the relationship between small business performance and business location and entrepreneurs' experience, it is fundamental to study and research it using econometric analysis to test hypotheses with a large scale survey.

This chapter has the objective to explore how entrepreneur's experience and science park location influences business performance in Beijing, China. The theoretical construct utilised is human capital theory and the RBV which has then been applied to multivariate logistic regression analysis – logit and ordinary least squares techniques. The reader is reminded that the following hypotheses are tested in the chapter.

H1: Entrepreneurs located on a science park compared to those entrepreneurs who are located off-park will report superior firm performance.

H2a: Entrepreneurs with greater numbers of started or bought businesses will report superior firm performance.

H2b: Habitual entrepreneurs compared to novice entrepreneurs will report superior firm performance.

H2c: Portfolio entrepreneurs compared to novice entrepreneurs will report superior firm performance.

H2d: Serial entrepreneurs compared to novice entrepreneurs will report superior firm performance.

H3a: Entrepreneurs located on a science park with experience of starting and purchasing greater numbers of businesses will report superior firm performance.

H3b: Habitual entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

H3c: Portfolio entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

H3d: Serial entrepreneurs located on a science park are more likely than novice entrepreneurs to report superior firm performance.

The chapter is structured as follows: Section two looks at the operationalization of the business performance measures and the appropriateness of econometric techniques[6]. This is followed by the results in section three where appropriate econometric regression techniques (Ordinary least squares and Logistic) are utilised. A discussion of the findings and the implications of the results is then provided in section four. Lastly, in section five a conclusion completes the chapter.

6.2 Operationalization of variables and econometric techniques

This section provides an operationalization of the twelve dependent variables which cover three sets of performance – exporting, financial performance, and growth. This is accompanied with an indication of the appropriateness of econometric techniques and evaluation criteria for the models.

6.2.1 Measures

Dependent variables

Respondents were asked, "What percentage of your gross sales were exported outside of China over the last year? If zero exports please write NIL". Exporting was operationalized exporting with reference to the aforementioned question by coding non-exports as 0, and coding those businesses which exported with a value of 1 (Exporter).

Respondents were asked, "How many people are/have been employed in this business, 3 years ago, 1 year ago Currently?" Respondents were then presented with a grid which allowed them to provide the three pieces of information with regard to Full-time, Part-time and Casual employment.

[6] This section is presented in this chapter rather than the methodology chapter because the researcher feels that this reads better and avoids the reader keep having to return to a previous chapter.

Respondents were asked, "For the following three time periods has the business operated at: a loss, break even, a profit?" Respondents were then presented with a grid where they could enter a tick with regard to three time periods – currently, one year ago, and three years ago. The performance measure was operationalized to create a series of three dummy variables with regard to the three outcome possibilities. For the first variable those respondents who ticked 'a profit' were coded as 1, and respondents who ticked 'a loss' or 'break even' were coded as 0 (Profit). In the case of the second variable the respondents who ticked 'break even' were coded as 1, and respondents who ticked 'a loss', or 'a profit' were coded as 0 (Break Even). Whilst for the third variable the entrepreneurs who ticked 'a loss' were coded as 1, and the entrepreneurs who ticked 'a profit', or 'break even' were coded as 0 (Loss). This procedure was undertaken for each of the three time periods – currently, one year ago, and three years ago.

6.2.2 Data analysis

As was the case with the analysis of innovation in the previous chapter logistic estimation was used to identify the combination of variables associated with the propensity of entrepreneurs to report exporting. For the profit, break even and loss variables for each of the three time periods logistic regression is also appropriate and was also used to find the combination of variables associated with these overall financial performance of the businesses.

The two measures of employment growth, the three year annualized rate of employment growth, and the one year rate of employment growth have a series of responses which range from negative values for firms who have decreased their number of employers through to zero growth for those businesses which have remained the same size and on to positive values for firms which have expanded and taken on employees. Ordinary least squares estimation techniques were used to identify the combination of variables which are associated with the two employment growth measures.

For each of the twelve separate dependent variables a base model was established which included the set of control variables and the variables which were the first set of human capital and business characteristics. Then the science park dummy variable was added to all subsequent models, and the three sets of entrepreneurial experience were added, separately.[7]

There is no agreed goodness-of-fit measure relating to logistic regression analysis. Two commonly used coefficients are reported. Deviance as indicated by the log likelihood coefficient is a 'badness-of-fit' measure, and weak 'explanatory' models generally report higher deviance coefficients. The author also reports the Nagelkerke R^2 values, which is a pseudo R^2 to provide a measure to show the 'explanatory' power of the models. While similar in principle to the adjusted R^2 reported in ordinary least squares regression models, non-ordinary least squares regression models generally report lower pseudo R^2 coefficients. The author also reports the log likelihood coefficients of the models.

6.3 Results

This section provides the results of the models which cover the twelve dependent variables which cover three sets of performance – exporting, financial performance, and growth. This allows the testing of the hypotheses relating to location and entrepreneurial experience

6.3.1 Exporting

Logistic regression analysis is utilized when the dependent variable takes values of 0 or 1. The author performed maximum likelihood estimates of the dichotomous dependent variable relating to 'exporter' (allocated a value of '1') and 'non exporter' respondents (allocated a value of '0'). Control variables relating to the propensity to be an exporter were included in Model 1 in Table 6.1.

The model has a Nagelkerke R^2 of 0.09 and is significant at the 0.01 level. An independent variable relating to science park location was added to the control variables and is reported in Model 2. Model 2 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.12 which is an increase of 0.03 compared with Model 1. Observing the results in Model 2, it shows that entrepreneurs located on science

[7] Also we re-run the models with the independent variable of science park location removed and each of the three types of entrepreneurial experience were added.

parks were more likely to be exporters compared to those located off-park and this evidence supports hypothesis H1.

Independent variables relating to years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 3, 4 and 5, respectively. Models 3, 4 and 5 are individually statistically significant at the 0.01 level. In model 3 the Nagelkerke R^2 is 0.15 and is significant at the 0.01 level. However, the respondents reporting more businesses established or purchased compared to those reporting fewer businesses established or purchased were not statistically significantly more likely to be an exporter. Hypothesis H2a is thus not supported with regard to exporting.

Model 4 has a Nagelkerke R^2 of 0.18 and is significant at the 0.01 level. The habitual entrepreneurs variable was statistically significant at the 0.01 level and appeared with a positively signed coefficient. Thus, habitual entrepreneurs were more likely than novice entrepreneurs to be exporters. Hypothesis H2b is supported with regard to exporting. Model 5 replaces the habitual entrepreneurship variable with the two dummy variables for portfolio and serial entrepreneur, respectively. Model 5 has a Nagelkerke R^2 of 0.19 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly more likely than novice entrepreneurs to be exporters. Thus, hypothesis H2c is supported with regard to exporting. Also, the serial entrepreneurs variable also appeared with a positively signed coefficient was also statistically significant. The results suggest that serial entrepreneurs were more likely than novice entrepreneurs to report being an exporter. Hypothesis H2d is supported with regard to exporting.[8]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 6, 7, and 8, respectively. Models 6, 7 and 8 are each statistically significant at the 0.01 level. Model 6 has a Nagelkerke R^2 of 0.20. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the exporting

[8] Models 3, 4 and 5 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 3, 4 and 5.

variable. Thus, the evidence is not consistent with hypothesis H3a with regard to exporting.

Model 7 has a Nagelkerke R^2 of 0.23. Interestingly, the two way interaction effect is found to be statistically significant at the 0.01 level in Model 7. Comparing model 7 with model 4 it is apparent that the inclusion of the interaction effect has increased the Nagelkerke R2 from 0.18 to 0.23. The statistically significant two way interaction effect being highly statistically significant indicates that those firms located on a science park who are habitual entrepreneurs are more likely than other firms to have been an exporter. This supports hypothesis H3b with regard to exporting.

Model 8 replaces the habitual and science park two way interaction effect with two way interaction effects: between science park location and portfolio, and serial entrepreneurs. Model 8 also has a Nagelkerke R^2 of 0.23. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.01 level. Thus, firms located on a science park who are portfolio entrepreneurs are more likely to have been an exporter and this supports hypothesis H3c. Interestingly in Model 8 the interaction term for firms located on a science park and where they are serial entrepreneurs is weakly statistically significant at the 0.10 level. Thus, the evidence weakly supports hypothesis H3d with regard to exporting.

Table 6.1 Estimates of a logit of the expectation of being an exporter.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Control Variables								
Software	**0.25 (0.07)[a]**	**0.24 (0.07)[a]**	**0.23 (0.07)[a]**	**0.25 (0.07)[a]**	**0.25 (0.07)[a]**	**0.23 (0.07)[a]**	**0.24 (0.08)[a]**	**0.23 (0.08)[a]**
Computer Services	0.56 (1.23)	0.50 (1.24)	0.18 (1.29)	0.61 (1.27)	0.65 (1.29)	0.07 (1.31)	0.39 (1.29)	0.27 (1.34)
Business Services	0.23 (0.94)	0.26 (0.94)	0.19 (0.96)	0.26 (0.94)	0.21 (0.96)	0.10 (0.97)	0.13 (0.94)	0.22 (0.97)
Electronic & IT Hardware	**0.28 (0.08)[a]**	**0.28 (0.08)[a]**	**0.29 (0.09)[a]**	**0.28 (0.09)[a]**	**0.28 (0.09)[a]**	**0.28 (0.08)[a]**	**0.28 (0.09)[a]**	**0.28 (0.09)[a]**
Age of Business	-0.20 (0.13)	-0.21 (0.13)	-0.22 (0.14)	-0.21 (0.14)	-0.24 (0.14)	-0.22 (0.14)	-0.23 (0.14)	-0.25 (0.14)
Size	**0.53 (0.08)[a]**	**0.54 (0.08)[a]**	**0.55 (0.09)[a]**	**0.54 (0.08)[a]**	**0.54 (0.08)[a]**	**0.54 (0.09)[a]**	**0.54 (0.09)[a]**	**0.55 (0.09)[a]**
Own Savings	**-0.90 (0.53)[c]**	**-0.92 (0.54)[c]**	**-0.88 (0.54)[c]**	**-0.95 (0.54)[c]**	**-0.91 (0.54)[c]**	**-0.91 (0.54)[c]**	**-0.92 (0.54)[c]**	**-0.92 (0.53)[c]**
Gender	**-2.92 (0.73)[a]**	**-2.88 (0.73)[a]**	**-2.92 (0.73)[a]**	**-2.88 (0.73)[a]**	**-2.86 (0.73)[a]**	**-2.88 (0.73)[a]**	**-2.92 (0.73)[a]**	**-2.89 (0.73)[a]**
Age of Entrepreneur	0.02 (0.04)	0.02 (0.04)	-0.01 (0.05)	0.03 (0.05)	0.03 (0.05)	-0.01 (0.05)	0.03 (0.05)	0.04 (0.05)
Relative								
Degree	0.47 (0.61)	0.51 (0.62)	0.44 (0.62)	0.54 (0.63)	0.57 (0.64)	0.46 (0.62)	0.58 (0.64)	0.60 (0.65)
Partners	0.15 (0.25)	0.22 (0.27)	0.27 (0.27)	0.19 (0.28)	0.14 (0.28)	0.27 (0.27)	0.21 (0.27)	0.16 (0.28)
Business Advice	**0.50 (0.14)[a]**	**0.52 (0.14)[a]**	**0.53 (0.14)[a]**	**0.53 (0.14)[a]**	**0.54 (0.14)[a]**	**0.54 (0.14)[a]**	**0.55 (0.15)[a]**	**0.57 (0.15)[a]**
Main Effects								
Science Park (SP)	--------	**0.89 (0.14)[a]**	**0.90 (0.15)[a]**	**0.86 (0.14)[a]**	**0.81 (0.14)[a]**	**0.91 (0.15)[a]**	**0.97 (0.14)[a]**	**1.01 (0.13)[a]**
Number of businesses	--------	--------	0.15 (0.15)	--------	--------	0.20 (0.17)	--------	--------
Habitual	--------	--------	--------	**0.94 (0.16)[a]**	--------	--------	**0.97 (0.12)[a]**	--------
Serial	--------	--------	--------	--------	**0.86 (0.22)[a]**	--------	--------	**0.91 (0.24)[a]**
Portfolio	--------	--------	--------	--------	**0.92 (0.20)[a]**	--------	--------	**0.95 (0.21)[a]**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	-0.13 (0.25)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**1.54 (0.19)[a]**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**0.96 (0.47)[c]**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**1.78 (0.32)[a]**
Constant	**-27.94 (4.55)[a]**	**-28.44 (4.63)[a]**	**-28.36 (4.65)[a]**	**-28.56 (4.65)[a]**	**-28.81 (4.73)[a]**	**-28.58 (4.67)[a]**	**-29.38 (4.82)[a]**	**-29.87 (4.94)[a]**
Log likelihood	-59.72	-59.45	-58.90	-59.38	-58.85	-58.76	-58.18	-57.47
Likelihood Ratio	**248.61[a]**	**249.13[a]**	**250.24[a]**	**249.28[a]**	**250.34[a]**	**250.51[a]**	**251.69[a]**	**253.10[a]**
Nagelkerke R^2	0.09	0.12	0.15	0.18	0.19	0.20	0.23	0.23
Change in Nagelkerke R^2	--------	0.03	0.06	0.09	0.10	0.11	0.14	0.14

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

6.3.2 Employment growth –3 year annualized rate

Ordinary least squares analysis is utilized when the dependent variable takes a broad range of values which is the case for our investigation of employment growth. The Cook and Weisberg (1983) test for heteroscedasticity was performed on all of the models of employment growth and there was no evidence of heteroscedasticity[9]. Thus, it was not necessary to re-estimate any of the growth models specifying the Huber/White/sandwich estimator of variance (to correct for heteroscedasticity) instead of the traditional calculation (Hardin and Schmiediche, 2003). The author performed ordinary least squares estimates of the annualized 3 year rate of employment growth dependent variable. Control variables relating to the propensity to grow were included in Model 9 in Table 6.2.

The model 9 has an adjusted R^2 of 0.179 indicating that the model with the control variables, after adjusting for the number of variables included in the model is able to explain approaching 18% of variation in the annualized 3 year rate of employment growth. The F test evaluates the null hypothesis that in the population the coefficients on the variables included in the model equal zero. The F test statistic has a value of 8.71 which is statistically significant at the 0.01 level and indicates that taken together there is a statistically significant relationship between the variables included in the model with the dependent variable.

An independent variable relating to science park location was added to the control variables and is reported in Model 10. The F test in Model 2 is statistically significant at the 0.01 level and the Adjusted R^2 is 0.181 which is a slight increase of 0.002 compared with Model 9. Observing the results in Model 10, the t-test statistic on the science park variable is statistically significant at the 0.01 level. This shows that entrepreneurs firms located on science parks grow by approximately 5% more than those firms located off-park. In subsequent models there are changes in the coefficient values which suggests that businesses located on science parks can grow by up to 5.6% more than businesses located off-park. The science park dummy variable is statistically significant in models 9 to 16 and this evidence supports hypothesis H1 with regard to the annualized 3 year rate of employment growth.

[9] The Durbin-Watson test for first order autocorrelation was also performed but none of the D-W test statistics found any evidence of first order autocorrelation. Heteroscedasticity is more likely to be a problem using cross-sectional data and autocorrelation is a more likely problem using time series data.

Independent variables relating to years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 11, 12 and 13, respectively. The F tests in Models 11, 12 and 13 are individually statistically significant at the 0.01 level.

In model 11 the Adjusted R^2 is 0.189. However, the respondents reporting more businesses established or purchased compared to those reporting fewer businesses established or purchased were not statistically significantly related to the annualized 3 year rate of employment growth. Hypothesis H2a is thus not supported with regard to the annualized 3 year rate of employment growth.

Model 12 has an adjusted R^2 of 0.199. The habitual entrepreneurs variable was statistically significant at the 0.01 level and appeared with a positively signed coefficient. The magnitude of the habitual entrepreneurs variable was 4.02. Thus, the habitual entrepreneurs have an annualized 3 year rate of employment growth which is slightly more than 4% higher than that of the novice entrepreneurs. Hypothesis H2b is supported with regard to the annualized 3 year rate of employment growth.

Model 13 replaces the habitual entrepreneurship variable with the two dummy variables for portfolio and serial entrepreneur, respectively. Model 13 has an adjusted R^2 of 0.209. The portfolio entrepreneurs variable was statistically significant at the 0.01 level and the coefficient is positive and the magnitude is 5.04. Thus, portfolio entrepreneurs have a higher growth of 5.04 for the annualized 3 year rate of employment growth compared to the novice entrepreneurs. Thus, hypothesis H2c is supported with regard to the annualized 3 year rate of employment growth.

The serial entrepreneurs variable also appeared with a positively signed coefficient but it was not statistically significant. The results suggest that there is no statistically significant difference between the annualized 3 year rate of employment growth for serial entrepreneurs compared to novice entrepreneurs. Hypothesis H2d is not supported with regard to the annualized 3 year rate of employment growth.[10]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice)

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[10] Models 11, 12 and 13 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 11, 12 and 13.

entrepreneurs were individually included in Models 14, 15, and 16, respectively. The F tests in Models 14, 15 and 16 are each statistically significant at the 0.01 level.

Model 14 has an adjusted R^2 of 0.224. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the annualized 3 year rate of employment growth. Thus, the evidence is not consistent with hypothesis H3a with regard to the annualized 3 year rate of employment growth.

Model 15 has an adjusted R^2 of 0.249. Interestingly, the two way interaction effect is found to be statistically significant at the 0.01 level in Model 15. Comparing model 15 with model 12 it is apparent that the inclusion of the interaction effect has increased the adjusted R2 from 0.199 to 0.249. The statistically significant two way interaction effect being highly statistically significant indicates that those firms located on a science park who are habitual entrepreneurs have a larger annualized 3 year rate of employment growth compared to the other firms. This supports hypothesis H3b with regard to the annualized 3 year rate of employment growth.

Model 16 is the model where the entrepreneurial experience and science park interaction effects is captured by the two dummy variables: portfolio entrepreneurs on a science park against other types of firms, and secondly serial entrepreneurs on science parks compared to other types of firms.

Model 16 also has an adjusted R^2 of 0.249. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.01 level. The value of the coefficient is 7.14. Thus, firms located on a science park who are portfolio entrepreneurs enjoy a rate of growth which is 7.14 units higher rate of the annualized 3 year rate of employment growth compared to other firms. Thus, this evidence supports hypothesis H3c with regard to the annualized 3 year rate of employment growth.

Additionally, in Model 16 the interaction term for firms located on a science park and where they are serial entrepreneurs is weakly statistically significant at the 0.10 level. Thus, the evidence weakly supports hypothesis H3d with regard to the annualized 3 year rate of employment growth.

Table 6.2 Estimates of an ordinary least squares regression model of annualized 3 year rate of employment growth.

	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
Control Variables								
Software	0.42 (0.43)	0.42 (0.43)	0.42 (0.44)	0.43 (0.45)	0.43 (0.45)	0.44 (0.46)	0.44 (0.46)	0.44 (0.46)
Computer Services	**0.44 (0.22)**[c]	**0.44 (0.22)**[c]	**0.44 (0.22)**[c]	**0.44 (0.22)**[c]	**0.44 (0.22)**[c]	**0.44 (0.22)**[c]	**0.44 (0.22)**[c]	**0.44 (0.22)**[c]
Business Services	0.32 (0.29)	0.32 (0.29)	0.32 (0.29)	0.32 (0.29)	0.32 (0.29)	0.34 (0.29)	0.34 (0.31)	0.34 (0.30)
Electronic & IT Hardware	**-0.25 (0.05)**[a]	**-0.25 (0.05)**[a]	**-0.25 (0.05)**[a]	**-0.25 (0.05)**[a]	**-0.25 (0.05)**[a]	**-0.25 (0.05)**[a]	**-0.25 (0.05)**[a]	**-0.25 (0.05)**[a]
Age of Business	**-0.13 (0.03)**[a]	**-0.13 (0.03)**[a]	**-0.13 (0.03)**[a]	**-0.13 (0.03)**[a]	**-0.13 (0.03)**[a]	**-0.13 (0.03)**[a]	**-0.13 (0.03)**[a]	**-0.13 (0.03)**[a]
Size	**0.15 (0.04)**[a]	**0.15 (0.04)**[a]	**0.15 (0.04)**[a]	**0.15 (0.04)**[a]	**0.15 (0.04)**[a]	**0.15 (0.04)**[a]	**0.15 (0.04)**[a]	**0.15 (0.04)**[a]
Own Savings	**0.73 (0.18)**[a]	**0.73 (0.18)**[a]	**0.73 (0.19)**[a]	**0.73 (0.19)**[a]	**0.75 (0.22)**[a]	**0.78 (0.22)**[a]	**0.79 (0.23)**[a]	**0.80 (0.24)**[a]
Gender	0.21 (0.02)	0.21 (0.02)	0.21 (0.02)	0.21 (0.02)	0.21 (0.02)	0.21 (0.02)	0.21 (0.02)	0.21 (0.02)
Age of Entrepreneur	-0.22 (0.01)	-0.22 (0.01)	-0.22 (0.01)	-0.22 (0.01)	-0.22 (0.01)	-0.22 (0.01)	-0.22 (0.01)	-0.22 (0.01)
Relative	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)
Degree	0.03 (0.01)	0.03 (0.01)	0.03 (0.01)	0.03 (0.01)	0.03 (0.01)	0.03 (0.01)	0.03 (0.01)	0.03 (0.01)
Partners	**1.45 (0.39)**[a]	**1.45 (0.39)**[a]	**1.45 (0.40)**[a]	**1.47 (0.41)**[a]	**1.47 (0.41)**[a]	**1.48 (0.41)**[a]	**1.49 (0.42)**[a]	**1.49 (0.43)**[a]
Business Advice	**0.82 (0.04)**[a]	**0.82 (0.04)**[a]	**0.83 (0.04)**[a]	**0.83 (0.04)**[a]	**0.83 (0.04)**[a]	**0.82 (0.05)**[a]	**0.82 (0.05)**[a]	**0.82 (0.06)**[a]
Main Effects								
Science Park (SP)	--------	**5.02 (0.25)**[a]	**5.03 (0.26)**[a]	**5.05 (0.27)**[a]	**5.05 (0.27)**[a]	**5.06 (0.28)**[a]	**5.06 (0.29)**[a]	**5.06 (0.29)**[a]
Number of businesses	--------	--------	0.21 (0.24)	--------	--------	0.18 (0.25)	--------	--------
Habitual	--------	--------	--------	**4.02 (0.26)**[a]	--------	--------	**4.01 (0.26)**[a]	--------
Serial	--------	--------	--------	--------	3.97 (4.03)	--------	--------	**2.98 (1.46)**[c]
Portfolio	--------	--------	--------	--------	**5.04 (0.27)**[a]	--------	--------	**5.06 (0.28**[a]
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	0.94 (0.86)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**7.09 (0.19)**[a]	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**7.11 (0.30)**[a]
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**7.14 (0.31)**[a]
Constant	**-0.14 (0.03)**[a]	**-0.12 (0.03)**[a]	**-0.12 (0.03)**[a]	**-0.14 (0.06)**[b]	**-0.11 (0.05)**[b]	**-0.12 (0.05)**[b]	**-0.12 (0.05)**[b]	**-0.12 (0.05)**[b]
F Test	**8.71**[a]	**8.26**[a]	**7.74**[a]	**7.81**[a]	**7.39**[a]	**7.24**[a]	**7.32**[a]	**7.56**[a]
Adjusted R^2	0.179	0.181	0.189	0.199	0.209	0.224	0.249	0.249
Change in Adjusted R^2	--------	0.002	0.01	0.02	0.03	0.045	0.07	0.07

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

6.3.3 Employment growth – 12 month rate

Ordinary least squares regression was also used to estimate the one year rate of employment growth. The Cook and Weisberg (1983) test for hetoscedasticity found no evidence of heteroscedasticity. The Durbin-Watson test for first order autocorrelation was also performed but none of the D-W test statistics found any evidence of first order autocorrelation.

The author performed ordinary least squares estimates of the annual rate of employment growth dependent variable. Control variables relating to the propensity to grow were included in Model 17 in Table 6.3. The model 17 has an adjusted R^2 of 0.123 indicating that the model with the control variables, after adjusting for the number of variables included in the model is able to explain slightly more than 12% of variation in the annual rate of employment growth. The F test statistic has a value of 5.95 which is statistically significant at the 0.01 level and indicates that taken together there is a statistically significant relationship between the variables included in the model with the dependent variable.

An independent variable relating to science park location was added to the control variables and is reported in Model 18. In Model 18 the F test is statistically significant at the 0.01 level and the Adjusted R^2 is 0.148 which indicates that taking into account the number of independent variables this model is better than Model 17 by 0.025. Looking at the results in Model 18, the t-test statistic on the science park variable is statistically significant at the 0.01 level. Focusing upon the magnitude of the coefficients it is found that the entrepreneurs' firms located on science parks grow by approximately 5.8 units more than those firms located off-park. In subsequent models there are slight changes in the coefficient values which suggests that businesses located on science parks can grow by up to 5.83 units more than businesses located off-park. The science park dummy variable is statistically significant in models 18 to 24 and this evidence supports hypothesis H1 with regard to the annual rate of employment growth.

Independent variables relating to years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 19, 20 and 21, respectively. The F tests in Models 19, 20 and 21 are individually statistically significant at the 0.01 level.

In model 19 the Adjusted R^2 is 0.157. Interestingly, the respondents reporting more businesses established or purchased compared to those reporting fewer businesses established or purchased was statistically significantly related to the annual rate of employment growth at the 0.05 level. Hypothesis H2a is thus supported with regard to the annual rate of employment growth.

Model 20 has an adjusted R^2 of 0.161. The habitual entrepreneurs variable was statistically significant at the 0.01 level and appeared with a positively signed coefficient. Turning to the magnitude of the habitual entrepreneurs variable this was found to be 5.84. Thus, the habitual entrepreneurs have an annual rate of employment growth which is 5.84 units more than that of the novice entrepreneurs. Hypothesis H2b is supported with regard to the annual rate of employment growth.

In Model 21 the habitual entrepreneurship variable is replaced with its more detailed constituents of two dummy variables – portfolio and serial. Model 21 has an adjusted R^2 of 0.167. The portfolio entrepreneurs variable was statistically significant at the 0.01 level and the coefficient is positive and the magnitude is 6.62. Thus, portfolio entrepreneurs have a higher growth of 6.62 units for the annual rate of employment growth compared to the novice entrepreneurs. Thus, hypothesis H2c is supported with regard to the annual rate of employment growth.

The serial entrepreneurs variable also appeared with a positively signed coefficient but it was not statistically significant. The results suggest that there is no statistically significant difference between the annual rate of employment growth for serial entrepreneurs compared to novice entrepreneurs. Hypothesis H2d is not supported with regard to the annual rate of employment growth.[11]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 22, 23, and 24, respectively. The F tests in Models 22, 23 and 24 are each statistically significant at the 0.01 level.

Model 22 has an adjusted R^2 of 0.168. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the annual rate of employment growth. Thus, the evidence is not consistent with hypothesis H3a with regard to the annual rate of employment growth.

[11] Models 19, 20 and 21 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 19, 20 and 21.

Model 23 has an adjusted R^2 of 0.173. The two way interaction effect between being located on a science park and a habitual entrepreneur is found to be statistically significant at the 0.01 level in Model 23. Indeed, looking at the magnitude of the aforementioned coefficient this was found to be 7.13 which is substantial. When the results in Model 23 are compared with those in Model 20 the adjusted R2 value increases from 0.161 to 0.173. The results in Model 23 provides evidence in support of hypothesis H3b with regard to the annual rate of employment growth.

The last column and set of results in Table 6.3 relate to Model 24. In Model 24 a set of two entrepreneurial experience and science park location variables are included: portfolio entrepreneurs on a science park against other types of firms, and secondly serial entrepreneurs on science parks compared to other types of firms.

Model 24 has an adjusted R^2 of 0.178. Both of the interaction variables are statistically significant at the 0.01 level. The value of the coefficients was 8.12 for firms located on a science park who are portfolio entrepreneurs, and 6.14 for firms located on a science park who are serial entrepreneurs. The coefficients were statistically significant at the 0.01 and 0.10 level, respectively. Accordingly, there is evidence which supports hypothesis H3c with regard to the annual rate of employment growth, and also in support of hypothesis H3d with regard to the annual rate of employment growth.

Table 6.3 Estimates of an ordinary least square regression model of the annual rate of employment growth.

	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22	Model 23	Model 24
Control Variables								
Software	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)
Computer Services	**0.10 (0.05)^b**	**0.10 (0.05)^b**	**0.10 (0.05)^b**	**0.10 (0.05)^b**	**0.10 (0.05)^b**	**0.10 (0.05)^b**	**0.10 (0.05)^b**	**0.10 (0.05)^b**
Business Services	**0.07 (0.03)^b**	**0.04 (0.03)^c**	**0.04 (0.03)^c**	**0.04 (0.03)^c**	**0.04 (0.03)^c**	**0.04 (0.03)^c**	**0.04 (0.03)^c**	**0.04 (0.03)^c**
Electronic & IT Hardware	-0.05 (0.05)	-0.05 (0.05)	-0.05 (0.05)	-0.05 (0.05)	-0.05 (0.05)	-0.05 (0.05)	-0.05 (0.05)	-0.05 (0.05)
Age of Business	**-0.04 (0.01)^a**	**-0.04 (0.01)^a**	**-0.04 (0.01)^a**	**-0.04 (0.01)^a**	**-0.04 (0.01)^a**	**-0.04 (0.01)^a**	**-0.04 (0.01)^a**	**-0.04 (0.01)^a**
Size	**0.16 (0.02)^a**	**0.16 (0.02)^a**	**0.16 (0.02)^a**	**0.16 (0.02)^a**	**0.16 (0.02)^a**	**0.16 (0.02)^a**	**0.16 (0.02)^a**	**0.16 (0.02)^a**
Own Savings	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)
Gender	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)
Age of Entrepreneur	-0.14 (0.03)	-0.14 (0.03)	-0.14 (0.03)	-0.14 (0.03)	-0.14 (0.03)	-0.14 (0.03)	-0.14 (0.03)	-0.14 (0.03)
Relative	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)
Degree	0.23 (0.28)	0.23 (0.28)	0.23 (0.28)	0.23 (0.28)	0.23 (0.28)	0.23 (0.28)	0.23 (0.28)	0.23 (0.28)
Partners	0.33 (0.38)	0.33 (0.38)	0.33 (0.38)	0.33 (0.38)	0.33 (0.38)	0.33 (0.38)	0.33 (0.38)	0.33 (0.38)
Business Advice	**0.54 (0.15)^a**	**0.57 (0.15)^a**	**0.57 (0.15)^a**	**0.57 (0.15)^a**	**0.57 (0.15)^a**	**0.57 (0.15)^a**	**0.57 (0.15)^a**	**0.57 (0.15)^a**
Main Effects								
Science Park (SP)	--------	**5.80 (0.24)^a**	**5.81 (0.24)^a**	**5.81 (0.24)^a**	**5.81 (0.24)^a**	**5.83 (0.24)^a**	**5.83 (0.24)^a**	**5.83 (0.24)^a**
Number of businesses	--------	--------	**0.81 (0.35)^b**	--------	--------	**0.87 (0.10)^a**	--------	--------
Habitual	--------	--------	--------	**5.84 (0.34)^a**	--------	--------	**5.80 (0.23)^a**	--------
Serial	--------	--------	--------	--------	3.51 (3.49)	--------	--------	3.47 (3.51)
Portfolio	--------	--------	--------	--------	**6.62 (0.20)^a**	--------	--------	**6.66 (0.21)^a**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	4.21 (4.13)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**7.13 (1.05)^a**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**6.14 (3.07)^c**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**8.12 (1.05)^a**
Constant	**-0.21 (0.04)^a**	**-0.20 (0.05)^a**	**-0.15 (0.04)^a**	**-0.18 (0.04)^a**	**-0.16 (0.05)^a**	**-0.20 (0.05)^a**	**-0.23 (0.06)^a**	**-0.21 (0.06)^a**
F Test	**5.95^a**	**5.54^a**	**5.52^a**	**5.32^a**	**5.19^a**	**5.35^a**	**5.40^a**	**4.97^a**
Adjusted R^2	0.123	0.148	0.157	0.161	0.167	0.168	0.173	0.178
Change in Adjusted R^2	--------	0.025	0.034	0.038	0.044	0.045	0.05	0.055

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. ^{a} $p < 0.10$; ^{b} $p < 0.05$; ^{c} $p < 0.01$

6.3.4 Profit in the closest time period

Logistic regression analysis was utilized to estimate the dichotomous dependent variable relating to 'a profit' (allocated a value of '1') and 'not a profit' (break even or a loss) respondents (allocated a value of '0'). Control variables relating to the propensity to be profitable were included in Model 25 in Table 6.4. The model has a Nagelkerke R2 of 0.055 and is significant at the 0.01 level.

In Model 26 a dummy variable of science park or off-park location of the businesses was added to the set of variables included in Model 25. Model 26 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.084 which is an increase of 0.029 compared with Model 25.

Looking at the results shown in Model 26 in Table 6.4 it shows that entrepreneurs located on science parks were more likely to be profitable compared to those located off-park and this evidence supports hypothesis H1. The odds ratios for the coefficient results were calculated and science park businesses are 1.16 times more likely to be profitable compared to off-park firms.

The independent variables relating to the different measures of experience are added to the independent variables included in Model 26 and these augmented models are shown in Models 27, 28 and 29. These three models are all statistically significant at the 0.01 level.

Looking at the goodness of fit of Model 27 it is clear that the Nagelkerke R^2 is 0.099. Thus, the pseudo R2 value is approximately 10%. However, modeling profitability, like growth is fraught with difficulties and a comparatively low pseudo R^2 is often found by researchers. Looking at the coefficient values the augmented variable of the number of businesses established or purchased is not statistically significant at the 0.05 level, or better. Accordingly, hypothesis H2a is not consistent with the data with regard to profitability.

In Model 28 the Nagelkerke R^2 is 0.101 and is significant at the 0.01 level. In this model the measure of entreprneurship experience is the habitual entrepreneurs dummy variable and this is statistically significant at the 0.01 level. The coefficient has a positive sign. Thus, habitual entrepreneurs were more likely than novice entrepreneurs to be profitable. Hypothesis H2b is supported with regard to profitability in the most recent time period.

Model 29 replaces the habitual entrepreneurship variable with the two dummy variables for portfolio and serial entrepreneur, respectively. Model 29 has a

Nagelkerke R^2 of 0.101 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly more likely than novice entrepreneurs to be profitable but this relationship is only weakly statistically significant at the 0.10 level. Thus, hypothesis H2c is supported with regard to profitability in the closest time period.

However, the serial entrepreneurs variable appeared with a negatively signed coefficient but this was not statistically significant at the 0.10 level or better. The results suggest that serial entrepreneurs were not more likely than novice entrepreneurs to report being profitable in the closest time period. The data is not consistent with regard to Hypothesis H2d and profitability in the closest time period.[12] Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 30, 31 and 32, respectively. Models 30, 31 and 32 are each statistically significant at the 0.01 level.

[12] Models 27, 28 and 29 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 27, 28 and 29.

Table 6.4 Estimates of a logit of the expectation of being profitable in the closest time period.

	Model 25	Model 26	Model 27	Model 28	Model 29	Model 30	Model 31	Model 32
Control Variables								
Software	**-0.58 (0.33)[c]**	**-0.58 (0.33)[c]**	**-0.57 (0.33)[c]**	**-0.58 (0.33)[c]**	**-0.59 (0.33)[c]**	**-0.58 (0.33)[c]**	**-0.58 (0.33)[c]**	**-0.58 (0.33)[c]**
Computer Services	-0.38 (0.38)	-0.36 (0.38)	-0.40 (0.38)	-0.39 (0.38)	-0.40 (0.38)	-0.40 (0.38)	-0.41 (0.38)	-0.42 (0.38)
Business Services	-0.32 (0.33)	-0.34 (0.33)	-0.28 (0.34)	-0.33 (0.33)	-0.33 (0.33)	-0.33 (0.33)	-0.33 (0.33)	-0.32 (0.33)
Electronic & IT Hardware	**-1.15 (0.38)[a]**	**-1.17 (0.37)[a]**	**-0.99 (0.35)[b]**	**-1.12 (0.37)[a]**	**-1.11 (0.38)[a]**	**-1.13 (0.37)[a]**	**-1.11 (0.38)[a]**	**-1.12 (0.38)[a]**
Age of Business	0.08 (0.05)	0.07 (0.05)	0.05 (0.05)	0.07 (0.05)	0.06 (0.05)	0.05 (0.05)	0.07 (0.05)	0.07 (0.05)
Size	**0.45 (0.16)[a]**	**0.46 (0.16)[a]**	**0.49 (0.16)[a]**	**0.48 (0.16)[a]**	**0.50 (0.16)[a]**	**0.53 (0.16)[a]**	**0.50 (0.16)[a]**	**0.50 (0.16)[a]**
Own Savings	**0.39 (0.22)[c]**	**0.40 (0.22)[c]**	**0.43 (0.22)[b]**	**0.40 (0.22)[c]**	**0.44 (0.22)[b]**	**0.44 (0.22)[b]**	**0.44 (0.22)[b]**	**0.44 (0.22)[b]**
Gender	**-0.87 (0.36)[b]**	**-0.87 (0.36)[b]**	**-0.87 (0.36)[b]**	**-0.87 (0.36)[b]**	**-0.87 (0.36)[b]**	**-0.87 (0.36)[b]**	**-0.86 (0.36)[b]**	**-0.75 (0.36)[b]**
Age of Entrepreneur	-0.01 (0.02)	-0.01 (0.02)	-0.03 (0.02)c	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Relative	-0.13 (0.34)	-0.11 (0.34)	-0.11 (0.34)	-0.12 (0.34)	-0.12 (0.34)	-0.12 (0.34)	-0.12 (0.34)	-0.12 (0.34)
Degree	**0.71 (0.21)[a]**	**0.71 (0.21)[a]**	**0.71 (0.21)[a]**	**0.71 (0.21)[a]**	**0.71 (0.21)[a]**	**0.69 (0.21)[a]**	**0.49 (0.26)[c]**	**0.69 (0.21)[a]**
Partners	-0.09 (0.09)	-0.08 (0.09)	-0.07 (0.09)	-0.08 (0.09)	-0.09 (0.09)	-0.08 (0.09)	-0.09 (0.09)	-0.09 (0.09)
Business Advice	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**
Main Effects								
Science Park (SP)	--------	**0.15 (0.05)[a]**	**0.20 (0.06)[a]**	**0.16 (0.05)[a]**	**0.16 (0.05)[a]**	**0.16 (0.05)[a]**	**0.16 (0.05)[a]**	**0.16 (0.05)[a]**
Number of businesses	--------	--------	**0.16 (0.07)[b]**	--------	--------	**0.12 (0.06)[c]**	--------	--------
Habitual	--------	--------	--------	**0.88 (0.13)[a]**	--------	--------	**0.90 (0.32)[a]**	--------
Serial	--------	--------	--------	--------	-0.22 (0.32)	--------	--------	-0.23 (0.45)
Portfolio	--------	--------	--------	--------	**0.44 (0.22)[c]**	--------	--------	**0.48 (0.23)[c]**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	0.10 (0.11)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**0.53 (0.16)[a]**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**0.25 (0.12)[c]**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**0.71 (0.34)[c]**
Constant	**0.46 (0.07)[a]**	**0.31 (0.08)[a]**	**0.71 (0.21)[a]**	**0.38 (0.09)[a]**	**0.48 (0.12)[a]**	**0.80 (0.21)[a]**	**0.75 (0.19)[a]**	**0.73 (0.19)[a]**
Log likelihood	-298.79	-298.52	-295.74	-298.21	-291.99	-291.67	-293.70	-290.47
Likelihood Ratio	**34.54[a]**	**35.10[a]**	**40.65[a]**	**35.71[a]**	**48.14[a]**	**48.78[a]**	**44.72[a]**	**51.18[a]**
Nagelkerke R^2	0.055	0.084	0.099	0.101	0.101	0.146	0.153	0.153
Change in Nagelkerke R^2	--------	0.029	0.044	0.046	0.046	0.091	0.098	0.098

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

Model 30 has a Nagelkerke R^2 of 0.146. However, whilst the two way interaction effect of the number of businesses established or purchased and science park location is positive the coefficient is not statistically significant at the 0.10 level or better. Thus the data is not consistent with regard to hypothesis H3a.

Model 31 has a Nagelkerke R^2 of 0.153. The habitual entrepreneurship and science park location interaction term is statistically significant at the 0.01 level. The odds ratios in Model 31 were calculated and habitual entrepreneurs on science parks are 1.70 times more likely to be profitable compared to other firms and locations.

Model 32 replaces the habitual and science park two way interaction effect with two way interaction effects: between science park location and portfolio, and serial entrepreneurs. Model 32 also has a Nagelkerke R^2 of 0.153. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.10 level. Thus, firms located on a science park who are portfolio entrepreneurs are more likely to be profitable in the closest time period and this supports hypothesis H3c. The odds ratios were calculated and the aforementioned relationship is quantified as 2.03 times. The second interaction effect variable of firms located on a science park and where they are serial entrepreneurs is also found to be weakly statistically significant at the 0.10 level. However, the odds ratio from Table 6.4 is 1.28 which is much lower than the 2.03 found for the portfolio and science park interaction term. Thus, the evidence weakly supports hypothesis H3d with regard to profits in the closest time period.

6.3.5 Break even in the closest time period

Following the same procedure as 6.3.4 a series of logistic regression models were run to estimate the dichotomous dependent variable relating to 'break even' (allocated a value of '1') and 'not break even' (a profit or a loss) respondents (allocated a value of '0'). A series of control variables relating to the expectation of achieving a break even outcome were included in Model 33 in Table 6.5. The model has a Nagelkerke R^2 of 0.068 and is significant at the 0.01 level.

Model 34 augments the variables shown in Model 33 with a binary variable of science park versus off-park location being added. Model 34 has a Nagelkerke R^2 of 0.076 and this was significant at the 0.01 level. The science parks variable is statistically significant at the 0.05 level and appears with a positively signed coefficient indicating that there is a higher expectation of a business which is located on a science park achieving a break even outcome compared to those businesses located off-park. This evidence supports hypothesis H1. The odds ratios were calculated and the odds of a science park achieving a break even performance are 1.58 times those of a business located off-park.

The three different types of entrepreneurial experience are added separately in Models 35, 36 and 37. All three of these models are statistically significant at the 0.01 level. In Model 35 the Nagelkerke R^2 is 0.094 and this was 0.026 higher than Model 33 which only contained the set of control variables. The number of businesses appeared with a negatively signed coefficient and this was statistically significant at the 0.05 level. This result is consistent with our expectations and it is thus consistent with regard to hypothesis H2a.

Model 36 focuses upon habitual entrepreneurs and the model has a Nagelkerke R^2 is 0.096 and is significant at the 0.01 level. The habitual entrepreneurship dummy appears with a negatively signed coefficient but it was not statistically significant at the 0.10 level, or better. Thus the data is not consistent with hypothesis H2b.

Model 37 has a Nagelkerke R^2 of 0.096 and is significant at the 0.01 level. The serial and also the portfolio dummy variables appear with negatively signed coefficients but it is only the later dummy variable which is weakly statistically significant at the 0.10 level. Thus, portfolio entrepreneurs are less likely than novice entrepreneurs to break even. Thus the data is not consistent with hypothesis H2c or H2d.

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 38, 39 and 40, respectively. Models 38, 39 and 40 are each statistically significant at the 0.01 level.

Model 38 has a Nagelkerke R^2 of 0.128. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the exporting variable. Thus, the evidence is not consistent with hypothesis H3a with regard to breaking even.

Table 6.5 Estimates of a logit of the expectation of achieving a break-even performance in the closest time period.

	Model 33	Model 34	Model 35	Model 36	Model 37	Model 38	Model 39	Model 40
Control Variables								
Software	**0.63 (0.34)**[c]	**0.63 (0.34)**[c]	**0.62 (0.34)**[c]	**0.62 (0.34)**[c]	**0.62 (0.34)**[c]	**0.62 (0.34)**[c]	**0.62 (0.34)**[c]	**0.60 (0.35)**[c]
Computer Services	0.27 (0.40)	0.21 (0.40)	0.23 (0.40)	0.23 (0.40)	0.24 (0.41)	0.25 (0.41)	0.23 (0.40)	0.23 (0.41)
Business Services	0.13 (0.35)	0.21 (0.35)	0.15 (0.35)	0.20 (0.35)	0.21 (0.36)	0.20 (0.35)	0.20 (0.35)	0.19 (0.36)
Electronic & IT Hardware	**0.97 (0.38)**[b]	**1.00 (0.39)**[b]	**0.85 (0.39)**[b]	**0.98 (0.39)**[b]	**0.99 (0.39)**[b]	**0.98 (0.39)**[b]	**0.98 (0.39)**[b]	**0.89 (0.40)**[b]
Age of Business	-0.07 (0.05)	-0.06 (0.05)	-0.04 (0.05)	-0.06 (0.05)	-0.05 (0.05)	-0.04 (0.05)	-0.06 (0.05)	-0.04 (0.05)
Size	**-0.49 (0.17)**[a]	**-0.54 (0.17)**[a]	**-0.57 (0.17)**[a]	**-0.55 (0.17)**[a]	**-0.59 (0.17)**[a]	**-0.62 (0.17)**[a]	**-0.55 (0.17)**[a]	**-0.52 (0.17)**[a]
Own Savings	**-0.56 (0.22)**[b]	**-0.59 (0.23)**[a]	**-0.62 (0.23)**[a]	**-0.59 (0.23)**[a]	**-0.68 (0.23)**[a]	**-0.65 (0.23)**[a]	**-0.59 (0.23)**[a]	**-0.64 (0.23)**[a]
Gender	0.45 (0.37)	0.49 (0.37)	0.51 (0.37)	0.50 (0.37)	0.53 (0.38)	0.50 (0.37)	0.50 (0.37)	0.41 (0.38)
Age of Entrepreneur	0.01 (0.02)	0.01 (0.02)	0.02 (0.02)	0.01 (0.02)	0.01 (0.02)	0.02 (0.02)	0.01 (0.02)	0.02 (0.02)
Relative	0.15 (0.36)	0.08 (0.36)	0.09 (0.36)	0.08 (0.36)	0.09 (0.36)	0.08 (0.36)	0.08 (0.36)	0.11 (0.37)
Degree	**0.75 (0.28)**[a]	**0.74 (0.28)**[b]	**0.78 (0.29)**[a]	**0.74 (0.28)**[a]	**0.78 (0.27)**[a]	**0.74 (0.28)**[a]	**0.76 (0.28)**[a]	**0.85 (0.29)**[a]
Partners	0.06 (0.09)	0.04 (0.09)	0.03 (0.09)	0.03 (0.09)	0.03 (0.10)	0.03 (0.09)	0.03 (0.09)	0.02 (0.10)
Business Advice	**0.10 (0.05)**[b]	**0.10 (0.05)**[b]	**0.09 (0.05)**[c]	**0.09 (0.05)**[c]	**0.10 (0.05)**[c]	**0.10 (0.05)**[c]	**0.09 (0.05)**[c]	**0.10 (0.05)**[c]
Main Effects								
Science Park (SP)	--------	**0.46 (0.21)**[b]	**0.50 (0.22)**[b]	**0.46 (0.21)**[b]	**0.46 (0.21)**[b]	**0.46 (0.21)**[b]	**0.46 (0.21)**[b]	**0.47 (0.22)**[b]
Number of businesses	--------	--------	**-0.15 (0.07)**[b]	--------	--------	**-0.14 (0.06)**[b]	--------	--------
Habitual	--------	--------	--------	-0.11 (0.25)	--------	--------	-0.12 (0.33)	--------
Serial	--------	--------	--------	--------	-0.51 (0.33)	--------	--------	-0.47 (0.45)
Portfolio	--------	--------	--------	--------	**-0.50 (0.26)**[c]	--------	--------	**-0.50 (0.25)**[c]
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	-0.07 (0.12)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	-0.44 (0.43)	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	0.28 (0.60)
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	0.72 (0.47)
Constant	**-0.40 (0.09)**[a]	**0.10 (0.03)**[a]	**-0.29 (0.04)**[a]	**0.15 (0.04)**[a]	**0.17 (0.04)**[a]	**0.15 (0.04)**[a]	**0.17 (0.04)**[a]	**0.50 (0.10)**[a]
Log likelihood	-280.63	-278.29	-275.94	-278.18	-268.15	-271.22	-273.12	-270.29
Likelihood Ratio	**40.98**[a]	**45.65**[a]	**50.36**[a]	**45.86**[a]	**52.91**[a]	**59.78**[a]	**55.98**[a]	**51.66**[a]
Nagelkerke R^2	0.068	0.076	0.094	0.096	0.096	0.128	0.141	0.141
Change in Nagelkerke R^2	--------	0.008	0.026	0.028	0.028	0.06	0.073	0.073

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

Model 39 has a Nagelkerke R^2 of 0.141. The habitual entrepreneurship and science park location interaction term is not statistically significant at the 0.01 level. Thus, the evidence is not consistent with hypothesis H3b with regard to breaking even. Model 40 replaces the habitual and science park two way interaction effect with two way interaction effects: between science park location and portfolio, and serial entrepreneurs. Model 40 has a Nagelkerke R^2 of 0.141. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is not statistically significant at the 0.10 level or better. Thus, the evidence is not consistent with regard to hypothesis H3c. Similarly, the second interaction term in Table 6.5 of firms located on a science park and where they are serial entrepreneurs was not statistically significant at the 0.10 level or better. Thus, the evidence does not support hypothesis H3d with regard to breaking even in the closest time period.

6.3.6 Loss in the closest time period

Logistic regression analysis was utilized to estimate the dichotomous dependent variable relating to 'a loss' (allocated a value of '1') and 'not a loss' (break even or a profit) respondents (allocated a value of '0'). This is the third of the groups of models relating to the financial performance of the businesses in the closest time period.

Control variables relating to the propensity to be making a loss were included in Model 41 in Table 6.6. The model has a Nagelkerke R2 of 0.061 and is significant at the 0.01 level. In Model 42 a dummy variable of science park or off-park location of the businesses was added to the set of variables included in Model 41. Model 42 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.087 which is an increase of 0.026 compared with Model 41. Thus the results in Model 42 indicate that entrepreneurs located on science parks were less likely to be making a loss compared to those who were off-park and this result supports hypothesis H1. The odds ratios were calculated from the information given in Table 6.6 and indicate that businesses located on science parks are 0.62 times likely to be making a loss compared to those businesses located off-park.

Models 43, 44 and 45 augment Model 42 with the three different measures of entrepreneurial experience, and all three models were statistically significant at the 0.01 level. Model 43 has a Nagelkerke R^2 is 0.094. Looking at the coefficient values the augmented variable of the number of businesses established or purchased is weakly statistically significant at the 0.10 level. The coefficient is also negatively signed. Thus the hypothesis H2a is supported by the results with regard to making a loss.

Model 44 has a Nagelkerke R^2 of 0.099 and is significant at the 0.01 level. The second measure of entrepreneurial experience is the habitual entrepreneurs dummy variable. This coefficient has a negative sign and it is statistically significant at the 0.01 level. Thus habitual entrepreneurs are less likely than novice entrrpeneurs to make a loss. Table 6.6 quantifies this in terms of the odds ratios. The odds ratios of habitual entrepreneurs compared to novice entrepreneurs was 0.41. This evidence supports hypothesis H2b with regard to making a loss in the most recent time period.

In Model 45 the habitual entrepreneurship variable is replaced with the two dummy variables for portfolio and serial entrepreneur, respectively. Model 45 has a Nagelkerke R^2 of 0.099 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly less likely than novice entrepreneurs to be making a loss and this relationship is weakly statistically significant at the 0.10 level. Thus, hypothesis H2c is supported with regard to making a loss in the closest time period.

The serial entrepreneurs variable also appeared with a negatively signed coefficient but this was not statistically significant at the 0.10 level or better. The results suggest that serial entrepreneurs were not less likely than novice entrepreneurs to report making a loss in the closest time period. The data is not consistent with regard to Hypothesis H2d and making a loss in the closest time period.[13]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 46, 47 and 48, respectively. Models 46, 47 and 48 are each statistically significant at the 0.01 level.

Model 46 has a Nagelkerke R^2 of 0.126. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the expectation of making a loss. Thus, the evidence is not consistent with hypothesis H3a with regard to making a loss.

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[13] Models 43, 44 and 45 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 43, 44 and 45.

Table 6.6 Estimates of a logit of the expectation of making a loss in the closest time period.

	Model 41	Model 42	Model 43	Model 44	Model 45	Model 46	Model 47	Model 48
Control Variables								
Software	**0.39 (0.19)[c]**	**0.4 (0.20)[c]**	**0.41 (0.19)[c]**	**0.41 (0.20)[c]**	**0.41 (0.20)[c]**	**0.41 (0.20)[c]**	**0.41 (0.20)[c]**	**0.41 (0.20)[c]**
Computer Services	0.50 (0.71)	0.51 (0.71)	0.52 (0.72)	0.54 (0.72)	0.51 (0.72)	0.52 (0.72)	0.49 (0.72)	0.51 (0.72)
Business Services	0.79 (0.67)	0.62 (0.68)	0.58 (0.68)	0.60 (0.68)	0.62 (0.68)	0.59 (0.68)	0.61 (0.68)	0.67 (0.68)
Electronic & IT Hardware	**0.90 (0.19)[a]**	**0.78 (0.21)[a]**	**0.66 (0.21)[a]**	**0.68 (0.21)[a]**	**0.69 (0.22)[a]**	**0.73 (0.22)[a]**	**0.72 (0.22)[a]**	**0.69 (0.22)[a]**
Age of Business	-0.02 (0.09)	-0.04 (0.09)	-0.02 (0.09)	-0.03 (0.09)	-0.05 (0.09)	-0.04 (0.09)	-0.04 (0.09)	-0.07 (0.09)
Size	**-0.32 (0.08)[a]**	**-0.33 (0.09)[a]**	**-0.33 (0.09)[a]**	**-0.33 (0.09)[a]**	**-0.34 (0.11)[a]**	**-0.34 (0.11)[a]**	**-0.34 (0.11)[a]**	**-0.34 (0.11)[a]**
Own Savings	**-0.25 (0.12)[c]**	**-0.26 (0.13)[c]**	**-0.26 (0.13)[c]**	**-0.26 (0.13)[c]**	**-0.26 (0.13)[c]**	**-0.28 (0.14)[c]**	**-0.28 (0.14)[c]**	**-0.28 (0.14)[c]**
Gender	**0.75 (0.22)[a]**	**0.77 (0.24)[a]**	**0.77 (0.24)[a]**	**0.78 (0.25)[a]**	**0.78 (0.25)[a]**	**0.79 (0.31)[b]**	**0.79 (0.31)[b]**	**0.79 (0.31)[b]**
Age of Entrepreneur	0.03 (0.04)	0.03 (0.03)	0.04 (0.03)	0.04 (0.03)	0.04 (0.03)	0.04 (0.03)	0.04 (0.03)	0.04 (0.03)
Relative	-0.14 (0.70)	-0.14 (0.70)	-0.07 (0.71)	-0.02 (0.70)	-0.02 (0.70)	-0.02 (0.70)	-0.02 (0.70)	-0.02 (0.70)
Degree	-0.46 (0.11)[a]	-0.46 (0.11)[a]	-0.48 (0.14)[a]	-0.48 (0.14)[a]	-0.47 (0.14)[a]	-0.48 (0.15)[a]	-0.49 (0.16)[a]	-0.49 (0.16)[a]
Partners	0.12 (0.17)	0.21 (0.17)	0.20 (0.17)	0.21 (0.17)	0.23 (0.17)	0.21 (0.17)	0.19 (0.17)	0.22 (0.16)
Business Advice	**-0.15 (0.09)[c]**	**-0.15 (0.09)[c]**	**-0.15 (0.09)[c]**	**-0.16 (0.09)[c]**	**-0.17 (0.09)[c]**	**-0.16 (0.09)[c]**	**-0.16 (0.09)[c]**	**-0.16 (0.09)[c]**
Main Effects								
Science Park (SP)	--------	**-1.02 (0.42)[b]**	**-1.01 (0.42)[b]**	**-1.01 (0.42)[b]**	**-1.01 (0.42)[b]**	**-1.01 (0.42)[b]**	**-1.02 (0.42)[b]**	**-1.01 (0.42)[b]**
Number of businesses	--------	--------	**-0.09 (0.04)[c]**	--------	--------	**-0.10 (0.05)[c]**	--------	--------
Habitual	--------	--------	--------	**-0.88 (0.25)[a]**	--------	--------	**-0.90 (0.26)[a]**	--------
Serial	--------	--------	--------	--------	-0.46 (0.39)	--------	--------	-0.48 (0.42)
Portfolio	--------	--------	--------	--------	**-0.49 (0.24)[c]**	--------	--------	**-0.54 (0.26)[c]**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	-0.25 (0.21)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**-0.84 (0.24)[a]**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**-0.79 (0.38)[c]**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**-0.87 (0.43)[c]**
Constant	**-4.91 (1.98)[b]**	**-5.92 (2.01)[a]**	**-6.12 (2.03)[a]**	**-6.02 (2.02)[a]**	**-5.99 (1.94)[a]**	**-7.05 (2.05)[a]**	**-6.90 (2.05)[a]**	**-6.58 (2.06)[a]**
Log likelihood	-116.42	-113.19	-112.93	-112.86	-111.60	-112.22	-112.47	-111.14
Likelihood Ratio	**35.77[a]**	**-34.64[a]**	**32.03[a]**	**32.17[a]**	**33.89[a]**	**34.05[a]**	**34.89[a]**	**35.18[a]**
Nagelkerke R^2	0.061	0.087	0.094	0.099	0.099	0.126	0.139	0.139
Change in Nagelkerke R^2	--------	0.026	0.033	0.038	0.038	0.065	0.078	0.078

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

Model 47 has a Nagelkerke R^2 of 0.139. The habitual entrepreneurship and science park location interaction term is statistically significant at the 0.01 level. The interaction variable appears with a negative sign. The data in Table 6.6 was used to calculate odds ratios, and it was found that the odds ratios and in the case of Model 47 it is found that the odds ratio of a loss making outcome for habitual entrepreneurs located on science parks compared to other outcomes is 0.43.

In Model 48 the science park location and portfolio, and serial entrepreneurs interaction dummies are included. Model 48 has a Nagelkerke R^2 of 0.139. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.10 level. The data from Table 6.6 was used to calculate the odds ratio of a portfolio entrepreneur located on a science park compared to other location and entrepreneurial experience is 0.42. Thus, firms located on a science park who are portfolio entrepreneurs are less likely to make a loss in the closest time period and this supports hypothesis H3c.

The second interaction effect variable of firms located on a science park and where they are serial entrepreneurs is also found to be weakly statistically significant at the 0.10 level in Model 48 in Table 6.6. The odds ratio was calculated from the data in Table 6.6 and is 0.45. Thus, the evidence weakly supports hypothesis H3d with regard to making a loss in the closest time period.

6.3.7 Profit one year ago

This section starts the analysis of financial performance in the second time period – one year ago. The same procedures followed in section 6.3.4 are followed here and this contributes to understanding the extent to which the results found in the most recent time period also apply to this earlier time period, one year ago.

A logit model of a profit outcome versus one of the other two combined outcomes was estimated. Control variables relating to the propensity to be profitable were included in Model 49 in Table 6.7. The model has a Nagelkerke R^2 of 0.095 and is significant at the 0.01 level.

In Model 50 a dummy variable of science park or off-park location of the businesses was added to the set of variables included in Model 49. This model is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.116. Thus, the Nagelkerke R^2 has increased by 0.021. Turning to the science park location dummy this was found to be weakly statistically significant at the 0.10 level. Thus, entrepreneurs located on a science park are more likely to be profitable compared to those who are off-park. Table 6.7 shows that businesses located on science parks compared to those businesses which are located off-park are 1.22 times more likely to make a profit. Thus, the results support hypothesis H1 with regard to making a profit one year ago.

The independent variables relating to the different measures of experience are added to the independent variables included in Model 50 and these augmented models are shown in Models 51, 52 and 53. In each of the three models they are statistically significant at the 0.01 level.

Model 51 has a Nagelkerke R^2 of 0.124. The number of businesses established or purchased variable was statistically significant at the 0.10 level and this appeared with a positively signed coefficient. Thus, the results in Model 51 support hypothesis H2a with regard to profitability one year ago.

Model 52 has a Nagelkerke R^2 is 0.129 and is significant at the 0.01 level. This model includes the second measure of entrepreneurial experience – being a habitual entrepreneur. The habitual entrepreneur variable appeared with a positively signed coefficient and this was also statistically significant at the 0.10 level. The data from Table 6.7 was used to calculate the odds ratios. The odds ratio of habitual entrepreneurs compared to novice entrepreneurs making a profit one year ago was 1.48 Thus, hypothesis H2b is supported with regard to making a profit one year ago.

Model 53 has a Nagelkerke R^2 is 0.129 and is significant at the 0.01 level. This model includes the third measure of entrepreneurial experience – splitting being a habitual entrepreneur into a pair of dummies to capture being a portfolio and also a serial entrepreneur. Portfolio entrepreneurs were significantly more likely than novice entrepreneurs to be profitable but this relationship is only weakly statistically significant at the 0.10 level. Thus, hypothesis H2c is supported with regard to profitability one year ago.

However, whilst the serial entrepreneurs variable appeared with a positively signed coefficient this was not statistically significant at the 0.10 level or better. The results suggest that serial entrepreneurs were not more likely than novice entrepreneurs to report being profitable in the time period of one year ago.

Table 6.7 Estimates of a logit of the expectation of being profitable one year ago.

	Model 49	Model 50	Model 51	Model 52	Model 53	Model 54	Model 55	Model 56
Control Variables								
Software	-0.40 (0.33)	-0.40 (0.33)	-0.40 (0.33)	-0.40 (0.33)	-0.40 (0.33)	-0.39 (0.33)	-0.41 (0.33)	-0.41 (0.33)
Computer Services	0.51 (0.38)	0.53 (0.38)	0.51 (0.38)	0.54 (0.38)	0.54 (0.38)	0.51 (0.38)	0.54 (0.38)	0.52 (0.39)
Business Services	-0.44 (0.33)	-0.48 (0.33)	-0.44 (0.34)	-0.48 (0.33)	-0.48 (0.33)	-0.43 (0.34)	-0.48 (0.33)	-0.48 (0.34)
Electronic & IT Hardware	**-1.08 (0.37)[a]**	**-1.09 (0.37)[a]**	**-0.97 (0.38)[b]**	**-1.12 (0.38)[a]**	**-1.12 (0.38)[a]**	**-0.96 (0.38)[a]**	**-1.13 (0.38)[a]**	**-1.12 (0.38)[a]**
Age of Business	0.07 (0.05)	0.07 (0.05)	0.05 (0.05)	0.07 (0.05)	0.07 (0.05)	0.05 (0.05)	0.07 (0.05)	0.07 (0.05)
Size	**0.28 (0.16)[c]**	**0.29 (0.16)[c]**	**0.31 (0.16)[c]**	**0.29 (0.16)[c]**	**0.29 (0.16)[c]**	**0.31 (0.16)[c]**	**0.29 (0.16)[c]**	**0.28 (0.16)[c]**
Own Savings	**0.44 (0.22)[b]**	**0.44 (0.22)[b]**	**0.43 (0.21)[c]**	**0.43 (0.21)[c]**	**0.43 (0.21)[c]**	**0.44 (0.21)[c]**	**0.44 (0.22)[c]**	**-0.44 (0.22)[b]**
Gender	**-0.93 (0.35)[a]**	**-0.94 (0.35)[a]**	**-0.98 (0.36)[a]**	**-0.94 (0.35)[a]**	**-0.94 (0.36)[a]**	**-0.99 (0.36)[a]**	**-0.94 (0.35)[a]**	**-0.94 (0.36)[a]**
Age of Entrepreneur	-0.02 (0.02)	-0.02 (0.02)	-0.03 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.03 (0.02)c	-0.01 (0.02)	-0.01 (0.02)
Relative	-0.23 (0.37)	-0.21 (0.37)	-0.20 (0.37)	-0.21 (0.37)	-0.21 (0.37)	-0.20 (0.37)	-0.19 (0.37)	-0.17 (0.37)
Degree	**0.60 (0.18)[a]**	**0.62 (0.19)[a]**	**0.62 (0.19)[a]**	**0.62 (0.19)[a]**	**0.62 (0.19)[a]**	**0.64 (0.20)[a]**	**0.64 (0.20)[a]**	**0.64 (0.20)[a]**
Partners	**0.28 (0.09)[a]**	**0.29 (0.09)[a]**	**0.29 (0.09)[a]**	**0.29 (0.09)[a]**	**0.29 (0.09)[a]**	**0.30 (0.10)[a]**	**0.30 (0.10)[a]**	**0.29 (0.09)[a]**
Business Advice	**0.25 (0.05)[a]**	**0.26 (0.05)[a]**	**0.26 (0.06)[a]**	**0.26 (0.05)[a]**	**0.26 (0.05)[a]**	**0.28 (0.06)[a]**	**0.28 (0.06)[a]**	**0.28 (0.06)[a]**
Main Effects								
Science Park (SP)	--------	**0.20 (0.10)[c]**	**0.23 (0.11)[c]**	**0.23 (0.11)[c]**	**0.23 (0.11)[c]**	**0.24 (0.12)[c]**	**0.24 (0.12)[c]**	**0.24 (0.12)[c]**
Number of businesses	--------	--------	**0.11 (0.05)[c]**	--------	--------	**0.12 (0.05)[c]**	--------	--------
Habitual	--------	--------	--------	**0.39 (0.18)[c]**	--------	--------	**0.41 (0.20)[c]**	--------
Serial	--------	--------	--------	--------	0.11 (0.15)	--------	--------	0.13 (0.17)
Portfolio	--------	--------	--------	--------	**0.38 (0.19)[c]**	--------	--------	**0.39 (0.19)[c]**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	0.15 (0.17)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**0.31 (0.15)[c]**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**0.19 (0.09)[c]**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**0.53 (0.26)[c]**
Constant	**-0.54 (0.12)[a]**	**-0.74 (0.19)[a]**	**-0.47 (0.11)[a]**	**-0.77 (0.19)[a]**	**0.77 (0.20)[a]**	**-0.38 (0.13)[a]**	**-0.90 (0.21)[a]**	**-0.84 (0.23)[a]**
Log likelihood	-289.88	-289.43	-288.17	-289.35	-289.34	-288.08	-289.07	-288.28
Likelihood Ratio	**60.70[a]**	**61.61[a]**	**64.14[a]**	**61.78[a]**	**61.78[a]**	**64.30[a]**	**62.33[a]**	**63.92[a]**
Nagelkerke R^2	0.095	0.116	0.124	0.129	0.129	0.157	0.0163	0.163
Change in Nagelkerke R^2	--------	0.021	0.029	0.029	0.029	0.062	0.068	0.068

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

Accordingly the results are not consistent with regard to Hypothesis H2d and profitability in time period of one year ago.[14]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 54, 55 and 56, respectively. Models 54, 55 and 56 are each statistically significant at the 0.01 level.

Model 54 has a Nagelkerke R^2 of 0.157. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against making a profit one year ago. Thus, the evidence is not consistent with hypothesis H3a with regard to making a profit one year ago.

Model 55 has a Nagelkerke R^2 of 0.163. The two way interaction effect of the number of businesses established or purchased and science park location is positive the coefficient is not statistically significant at the 0.10 level or better. Table 6.7 shows the odds ratios. Habitual entrepreneurs located on science parks compared to other types of entrepreneur and location were 1.36 times more likely to make a profit one year ago. Thus the data is consistent with regard to hypothesis H3b.

In Model 56 there are two interaction variables included in the model - science park location and portfolio, and serial entrepreneurs. Model 56 has a Nagelkerke R^2 of 0.163. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.10 level. This result indicates that firms located on a science park who are portfolio entrepreneurs are more likely to be profitable in the time period one year ago and this supports hypothesis H3c. The data from Table 6.7 was used to calculate the odds ratios. The odds ratio corresponding to Model 56 in Table 6.7 for portfolio entrepreneurs located on science parks are 1.70 times more likely to make a profit one year ago compared to other types of entrepreneurs and other locations.

The second interaction effect variable is of firms located on a science park and where they are serial entrepreneurs is also found to be weakly statistically significant at the 0.10 level. The odds ratio from the data in Table 6.7 was calculated and is 1.21

[14] Models 51, 52 and 53 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 51, 52 and 53.

which is much lower than the 1.70 found for the portfolio and science park interaction term. Thus, the evidence weakly supports hypothesis H3d with regard to profits in the time period of one year ago.

6.3.8 Break even one year ago

Following the same procedure as 6.3.5 logistic regression models were run to estimate the dichotomous dependent variable relating to 'break even' (allocated a value of '1') and 'not break even' (a profit or a loss) respondents (allocated a value of '0') in the time period of one year ago. A series of control variables relating to the expectation of achieving a break even outcome were included in Model 57 in Table 6.8. The model has a Nagelkerke R^2 of 0.088 and is significant at the 0.01 level.

In Model 58, the author has added the science park location variable to the same set of variables included in Model 57. Model 58 has a Nagelkerke R^2 of 0.091 and this was significant at the 0.01 level. The science parks variable is not statistically significant at the 0.10 level, or better. This evidence does not supports hypothesis H1 with regard to breaking even one year ago.

Next, Model 58 was separately augmented with augmented with three different types of entrepreneurial experience one at a time in Models 59, 60 and 61. Each of these later three models was statistically significant at the 0.01 level. In Model 58 the Nagelkerke R^2 is 0.091 and this was the same measure of goodness of fit found in Model 59. Thus, the inclusion of the number of businesses purchased or established has no visible improvement on the model specification. The number of businesses purchased or established appeared with a positively signed coefficient but this was not statistically significant. This result does not support hypothesis H2a with regard to breaking even one year.

In Model 60 the habitual entrepreneurs variable is included and the model has a Nagelkerke R^2 is 0.095 and is significant at the 0.01 level. The habitual entrepreneurship dummy appears with a positively signed coefficient but it was not statistically significant at the 0.10 level, or better. Thus the data is not consistent with hypothesis H2b and breaking even one year ago.

Model 61 has a Nagelkerke R^2 of 0.095 and is significant at the 0.01 level. The serial and also the portfolio dummy variables appear with positively signed coefficients but both dummy variable are found to not be statistically significant at the

0.10 level, or better. Accordingly the data is not consistent with hypothesis H2c or H2d.

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 62, 63 and 64, respectively. Models 62, 63 and 64 are each statistically significant at the 0.01 level.

In Model 62 the Nagelkerke R^2 is 0.129. The two way interaction effect is found to not be statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the other entrepreneurial experience and location scenarios. Thus, the evidence is not consistent with hypothesis H3a with regard to breaking even one year ago.

Model 63 has a Nagelkerke R^2 of 0.163. The habitual entrepreneurship and science park location interaction term is not statistically significant at the 0.10 level or better. Thus, the evidence is not consistent with hypothesis H3b with regard to breaking even in the time period of one year ago.

The last column of Table 6.8 presents the results for Model 64 where the habitual and science park two way interaction effect is replaced with two variables of interaction effects: between science park location and portfolio, and serial entrepreneurs, respectively. In Model 64 the Nagelkerke R^2 is 0.163.

The interaction effect of those firms located on a science park who are portfolio entrepreneurs appears with a positively signed coefficient which is what was expected but this is not statistically significant at the 0.10 level or better. Thus, the evidence is not consistent with regard to hypothesis H3c with regard to breaking even in the time period of one year ago. Similarly, the second interaction term in Model 64 of firms located on a science park and where they are serial entrepreneurs was also not statistically significant at the 0.10 level or better. Thus, the evidence does not support hypothesis H3d with regard to breaking even one year ago.

Table 6.8 Estimates of a logit of the expectation of achieving a break-even performance one year ago.

	Model 57	Model 58	Model 59	Model 60	Model 61	Model 62	Model 63	Model 64
Control Variables								
Software	0.03 (0.33)	0.03 (0.33)	0.03 (0.33)	0.04 (0.33)	0.04 (0.33)	0.03 (0.33)	0.04 (0.33)	0.05 (0.33)
Computer Services	**-0.66 (0.39)[c]**	**-0.70 (0.40)[c]**	**-0.70 (0.40)[c]**	**-0.76 (0.41)[c]**	**-0.76 (0.41)[c]**	**-0.70 (0.41)[c]**	**-0.77 (0.41)[c]**	**-0.74 (0.41)[c]**
Business Services	0.18 (0.34)	0.22 (0.34)	0.22 (0.34)	0.26 (0.34)	0.26 (0.34)	0.23 (0.34)	0.25 (0.34)	0.25 (0.34)
Electronic & IT Hardware	0.53 (0.38)	0.55 (0.38)	0.55 (0.38)	0.64 (0.38)	0.65 (0.38)	0.55 (0.38)	0.66 (0.38)	0.67 (0.38)
Age of Business	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.10 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.10 (0.05)[c]**
Size	**-0.35 (0.17)[b]**	**-0.38 (0.17)[b]**	**-0.38 (0.17)[b]**	**-0.35 (0.17)[b]**	**-0.36 (0.17)[b]**	**-0.38 (0.17)[b]**	**-0.35 (0.17)[b]**	**-0.35 (0.17)[b]**
Own Savings	**0.83 (0.23)[a]**	**0.81 (0.23)[a]**	**0.81 (0.23)[a]**	**0.81 (0.23)[a]**	**0.82 (0.23)[a]**	**0.81 (0.23)[a]**	**0.83 (0.23)[a]**	**0.84 (0.23)[a]**
Gender	0.52 (0.36)	0.54 (0.36)	0.54 (0.36)	0.50 (0.36)	0.51 (0.36)	0.54 (0.36)	0.51 (0.36)	0.51 (0.36)
Age of Entrepreneur	**0.03 (0.02)[b]**	**0.03 (0.02)[b]**	**0.03 (0.02)[b]**	**0.03 (0.02)[b]**	**0.03 (0.02)[b]**	**0.03 (0.02)[b]**	**0.03 (0.02)[b]**	**0.03 (0.02)[b]**
Relative	-0.44 (0.37)	-0.47 (0.37)	-0.47 (0.37)	-0.48 (0.37)	-0.48 (0.37)	-0.47 (0.37)	-0.51 (0.37)	-0.52 (0.37)
Degree	0.11 (0.26)	0.10 (0.26)	0.10 (0.26)	0.09 (0.26)	0.09 (0.26)	0.10 (0.26)	0.11 (0.26)	0.09 (0.26)
Partners	**-0.25 (0.09)[a]**	**-0.27 (0.10)[a]**	**-0.27 (0.10)[a]**	**-0.28 (0.10)[a]**	**-0.28 (0.10)[a]**	**-0.27 (0.10)[a]**	**-0.29 (0.10)[a]**	**-0.29 (0.10)[a]**
Business Advice	-0.02 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)
Main Effects								
Science Park (SP)	--------	-0.29 (0.22)	-0.29 (0.22)	-0.29 (0.22)	-0.29 (0.22)	-0.28 (0.39)	-0.63 (0.36)	**-0.61 (0.36)**
Number of businesses	--------	--------	0.20 (0.16)	--------	--------	0.19 (0.17)	--------	--------
Habitual	--------	--------	--------	0.37 (0.25)	--------	--------	0.35 (0.33)	--------
Serial	--------	--------	--------	--------	0.32 (0.33)	--------	--------	0.31 (0.46)
Portfolio	--------	--------	--------	--------	0.40 (0.27)	--------	--------	0.41 (0.35)
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	0.03 (0.11)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	0.51 (0.44)	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	1.01 (0.62)
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	0.33 (0.46)
Constant	**-0.12 (0.03)[a]**	**0.18 (0.05)[a]**	**0.20 (0.05)[a]**	**0.32 (0.08)[a]**	**0.35 (0.08)[a]**	**0.20 (0.08)[a]**	**0.52 (0.13)[a]**	**0.49 (0.14)[a]**
Log likelihood	-279.55	-278.65	-278.65	-277.56	-277.52	-278.65	-276.87	-276.18
Likelihood Ratio	**53.94[a]**	**55.74[a]**	**55.75[a]**	**57.93[a]**	**58.00[a]**	**55.75[a]**	**59.30[a]**	**60.68[a]**
Nagelkerke R^2	0.088	0.091	0.091	0.095	0.095	0.129	0.163	0.163
Change in Nagelkerke R^2	--------	0.003	0.003	0.007	0.007	0.041	0.075	0.075

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

6.3.9 Loss one year ago

This section completes the third set of models for the second time period which has been explored – the results for one year ago. Logit regression techniques were employed to estimate the dichotomous dependent variable relating to 'a loss' (allocated a value of '1') and 'not a loss' (break even or a profit) respondents (allocated a value of '0') one year ago.

Control variables relating to the propensity to be making a loss were included in Model 65 in Table 6.9. The model has a Nagelkerke R^2 of 0.086 and is significant at the 0.01 level. A science park versus off-park dummy variable was added to the variables included in Table 65 and the results are reported in Model 66. Model 66 is statistically significant at the 0.01 level. Turning to the goodness of fit of the model the Nagelkerke R^2 is 0.110 and this was an increase of 0.024 compared with Model 65. The science park location dummy was weakly statistically significant at the 0.10 level and indicates that those firms located on a science park compared to those located off-park are less likely to make a loss one year ago. The corresponding odds ratios to the data in Table 6.9 were calculated and this helps to better quantify the aforementioned relationship. More specifically, in Model 66 the odds ratio of science park firms compared to those located off-park is 0.85 with regard to making a loss one year ago. These results are supportive of hypothesis H1 with regard to making a loss one year ago.

Models 67, 68 and 69 augment Model 65 with the three different measures of entrepreneurial experience, and all three models were statistically significant at the 0.01 level. Model 67 has a Nagelkerke R^2 of 0.129. The first measure of entrepreneurial experience, the number of businesses established or purchased was found to have a negatively signed coefficient and was statistically significant at the 0.10 level. Thus the hypothesis H2a is supported by the results with regard to making a loss, one year ago.

In Model 68 the Nagelkerke R^2 was 0.135 and this was significant at the 0.01 level. This model includes the second measure of entrepreneurial experience, being a habitual entrepreneur. As was expected the habitual dummy variable appears with a negatively signed coefficient and it was found to be statistically significant at the 0.01 level. Thus habitual entrepreneurs are less likely than novice entrepreneurs to make a loss, one year ago. More specifically, the odds ratios of habitual entrepreneurs compared to novice entrepreneurs making a loss one year ago was 0.64. This evidence supports hypothesis H2b with regard to making a loss one year ago.

The third set of measures of entrepreneurial experience was the two dummy variables of portfolio and serial entrepreneurs. The results of including these variables are shown in Model 69. Model 69 has a Nagelkerke R^2 of 0.135 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly less likely than novice entrepreneurs to be making a loss and this relationship was weakly statistically significant at the 0.10 level. Thus, hypothesis H2c is supported with regard to making a loss one year ago.

The second dummy variable to capture entrepreneurial experience in Model 69 was the serial entrepreneur variable and whilst this appeared with a negatively signed coefficient as expected it was however not statistically significant at the 0.10 level or better. Thus, the data is not consistent with regard to hypothesis H2d and making a loss one year ago.

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 70, 71 and 72, respectively. Models 70, 71 and 72 are each statistically significant at the 0.01 level.

Looking at Model 70 and the measure of goodness of fit, the Nagelkerke R^2 was 0.162. The interaction variable is not statistically significant at the 0.10 level, or better in Model 70. Accordingly, there is no evidence to support hypothesis H3a with regard to making a loss one year ago.

Model 71 has a Nagelkerke R^2 of 0.179. The habitual entrepreneurship and science park location interaction term is weakly statistically significant at the 0.10 level. The interaction variable appears with a negative sign. The corresponding odds ratios for Model 71 found that the odds ratio of a loss making outcome one year ago for habitual entrepreneurs located on science parks compared to other outcomes is 0.87.

The last model included in Table 6.9 is Model 72 and this deals with the interaction terms for location on a science park and being a portfolio, and being a serial entrepreneur, respectively. The Nagelkerke R^2 is 0.179. Interestingly, both of these are weakly statistically significant at the 0.10 level. The odds ratio of a portfolio entrepreneur on a science park against other

Table 6.9 Estimates of a logit of the expectation of making a loss one year ago.

	Model 65	Model 66	Model 67	Model 68	Model 69	Model 70	Model 71	Model 72
Control Variables								
Software	0.25 (0.23)	0.25 (0.23)	0.25 (0.23)	0.26 (0.24)	0.26 (0.24)	0.26 (0.24)	0.26 (0.24)	0.26 (0.24)
Computer Services	0.55 (0.58)	0.57 (0.58)	0.58 (0.58)	0.58 (0.59)	0.58 (0.59)	0.59 (0.61)	0.59 (0.61)	0.59 (0.61)
Business Services	0.32 (0.30)	0.35 (0.31)	0.36 (0.31)	0.36 (0.31)	0.36 (0.31)	0.37 (0.32)	0.37 (0.32)	0.37 (0.32)
Electronic & IT Hardware	**1.07 (0.40)[b]**	**1.10 (0.41)[b]**	**1.11 (0.41)[b]**	**1.11 (0.41)[b]**	**1.11 (0.41)[b]**	**1.12 (0.42)[b]**	**1.12 (0.42)[b]**	**1.12 (0.42)[b]**
Age of Business	-0.04 (0.05)	-0.05 (0.05)	-0.07 (0.06)	-0.07 (0.06)	-0.07 (0.06)	-0.07 (0.08)	-0.07 (0.08)	-0.07 (0.08)
Size	**-0.15 (0.07)[c]**	**-0.16 (0.07)[c]**	**-0.16 (0.07)[c]**	**-0.16 (0.07)[c]**	**-0.16 (0.07)[c]**	**-0.17 (0.08)[c]**	**-0.17 (0.08)[c]**	**-0.17 (0.08)[c]**
Own Savings	**-0.46 (0.23)[c]**	**-0.46 (0.23)[c]**	**-0.46 (0.23)[c]**	**-0.46 (0.23)[c]**	**-0.46 (0.23)[c]**	**-0.47 (0.23)[c]**	**-0.47 (0.23)[c]**	**-0.47 (0.23)[c]**
Gender	**0.76 (0.18)[a]**	**0.76 (0.18)[a]**	**0.76 (0.18)[a]**	**0.77 (0.18)[a]**	**0.77 (0.18)[a]**	**0.79 (0.20)[a]**	**0.79 (0.20)[a]**	**0.79 (0.20)[a]**
Age of Entrepreneur	0.04 (0.05)	0.04 (0.05)	0.04 (0.05)	0.04 (0.05)	0.04 (0.05)	0.06 (0.06)	0.06 (0.06)	0.06 (0.06)
Relative	**0.38 (0.19)[c]**	**0.39 (0.19)[c]**	**0.40 (0.19)[c]**	**0.40 (0.19)[c]**	**0.40 (0.19)[c]**	**0.42 (0.19)[c]**	**0.42 (0.19)[c]**	**0.42 (0.19)[c]**
Degree	**-0.49 (0.13)[a]**	**-0.50 (0.14)[a]**	**-0.50 (0.14)[a]**	**-0.51 (0.16)[a]**	**-0.51 (0.17)[a]**	**-0.52 (0.18)[a]**	**-0.52 (0.18)[a]**	**-0.52 (0.18)[a]**
Partners	**-0.19 (0.04)[a]**	**-0.2 (0.05)[a]**	**-0.2 (0.05)[a]**	**-0.2 (0.05)[a]**	**-0.2 (0.05)[a]**	**-0.23 (0.06)[a]**	**-0.23 (0.06)[a]**	**-0.23 (0.06)[a]**
Business Advice	**-0.15 (0.03)[a]**	**-0.15 (0.03)[a]**	**-0.15 (0.03)[a]**	**-0.15 (0.03)[a]**	**-0.15 (0.03)[a]**	**-0.16 (0.04)[a]**	**-0.17 (0.04)[a]**	**-0.17 (0.04)[a]**
Main Effects								
Science Park (SP)	--------	**0.16 (0.08)[c]**	**0.16 (0.08)[c]**	**0.16 (0.08)[c]**	**0.16 (0.08)[c]**	**0.18 (0.09)[c]**	**0.18 (0.09)[c]**	**0.18 (0.09)[c]**
Number of businesses	--------	--------	**-0.19 (0.09)[c]**	--------	--------	**-0.20 (0.09)[c]**	--------	--------
Habitual	--------	--------	--------	**-0.43 (0.21)[c]**	--------	--------	**-0.45 (0.22)[c]**	--------
Serial	--------	--------	--------	--------	-0.29 (0.18)	--------	--------	-0.30 (0.18)
Portfolio	--------	--------	--------	--------	**-0.45 (0.22)[c]**	--------	--------	**-0.46 (0.22)[c]**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	-0.07 (0.19)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**-0.14 (0.06)[c]**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**-0.11 (0.05)[c]**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**-0.16 (0.07)[c]**
Constant	**-1.27 (0.34)[a]**	**-1.46 (0.35)[a]**	**-2.02 (0.34)[a]**	**-1.62 (0.34)[a]**	**-1.69 (0.38)[a]**	**-2.11 (0.40)[a]**	**-1.65 (0.35)[a]**	**-1.73 (0.37)[a]**
Log likelihood	-155.99	-155.86	-152.60	-155.15	-154.90	-152.52	-155.13	-154.87
Likelihood Ratio	**29.28[a]**	**29.54[a]**	**36.07[a]**	**32.66[a]**	**31.45[a]**	**36.22[a]**	**31.00[a]**	**36.88[a]**
Nagelkerke R^2	0.086	0.110	0.129	0.135	0.135	0.162	0.179	0.179
Change in Nagelkerke R^2	--------	0.024	0.043	0.049	0.049	0.076	0.093	0.093

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

combinations of entrepreneurial experience and location was 0.85. The odds ratio of a serial entrepreneur on a science park against the other combinations of entrepreneurial experience and the businesses' location was 0.90. Thus, there is evidence which is supportive of hypotheses H3c and H3d with regard to making a loss one year ago.

6.3.10 Profit three years ago

This section is the first section which covers the financial performance for the time period of three years ago. Following the procedures of the previous sections a logit model was used to estimate the binary relationship of making a profit three years ago versus not making a profit three years ago. Control variables relating to the propensity to be profitable three years ago were included in Model 73 in Table 6.10. The model has a Nagelkerke R2 of 0.086 and is significant at the 0.01 level.

It was then necessary to augment the Model 73 with a dummy variable of science park or off-park location and these results are shown in Model 74 Table 6.10. Model 74 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.104. The Nagelkerke R^2 in Model 74 was 0.018 greater than that found in the base model of Model 73. The results shown in Model 74 indicate that entrepreneurs located on science parks were more likely to be profitable three years ago compared to those located off-park and this evidence supports hypothesis H1.

The corresponding odds rations for the data in Table 6.10 were calculated. In Model 74 science park businesses are 1.32 times more likely to be profitable compared to off-park firms.

Next, the independent variables relating to the three different measures of experience are added to the independent variables included in Model 74 and these augmented models are shown in Models 75, 76 and 77. These three models are all statistically significant at the 0.01 level.

Model 75 has a Nagelkerke R^2 of 0.118. The inclusion of the number of businesses established or purchased has improved the goodness of fit of the model, but this additional independent variable was found to not be statistically significant at the 0.10 level or better. Thus, the results are not consistent with hypothesis H2a with regard to making a profit three years ago.

Model 76 has a Nagelkerke R^2 of 0.125. Here the measure of entrepreneurship experience which has been incorporated into the model is the habitual entrepreneurs dummy variable and this is statistically significant at the 0.01 level. The coefficient has a positive sign. Thus, habitual entrepreneurs were more likely than novice entrepreneurs to report a profit three years ago. Hypothesis H2b is supported with regard to profitability in the time period of three years ago.

In Model 77 entrepreneurial experience is captured by two dummy variables for being a portfolio and a serial entrepreneur, respectively. Model 77 has a Nagelkerke R^2 of 0.125 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly more likely than novice entrepreneurs to be profitable. This relationship was strongly statistically significant at the 0.01 level. Thus, hypothesis H2c is supported with regard to profitability in the time period of three years ago.

However, in the case of the serial entrepreneurs variable this was not statistically significant at the 0.10 level or better. Thus, serial entrepreneurs were not more likely than novice entrepreneurs to report being profitable three years ago. The data is not consistent with regard to Hypothesis H2d and being profitable three years ago.

The last three columns of Table 6.10 show the results for Models 78, 79 and 80 and these incorporate the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs. Models 78, 79 and 90 are each statistically significant at the 0.01 level.

Model 78 has a Nagelkerke R^2 of 0.148. The two way interaction effect is not statistically significant. This indicates that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the making a profit three years ago variable. Thus, the evidence is not consistent with hypothesis H3a with regard to making a profit three years ago. Model 79 has a Nagelkerke R^2 of 0.172. The two way interaction effect of being an habitual entrepreneur and science park location has a positively signed coefficient and this is statistically significant at the 0.01 level. Thus the data is consistent with regard to hypothesis H3b with regard to making a profit three years ago.

Model 80 has a Nagelkerke R^2 of 0.172. This model looks at the third set of measures of entrepreneurial experience: between science park location and portfolio, and serial entrepreneurs. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.01 level. Thus,

Table 6.10 Estimates of a logit of the expectation of being profitable 3 years ago.

	Model 73	Model 74	Model 75	Model 76	Model 77	Model 78	Model 79	Model 80
Control Variables								
Software	-0.08 (0.33)	-0.08 (0.33)	-0.08 (0.33)	-0.08 (0.33)	-0.08 (0.33)	-0.07 (0.33)	-0.10 (0.33)	-0.08 (0.33)
Computer Services	0.52 (0.38)	0.52 (0.38)	0.50 (0.38)	0.50 (0.38)	0.51 (0.38)	0.49 (0.38)	0.50 (0.38)	0.47 (0.38)
Business Services	-0.19 (0.33)	-0.18 (0.33)	-0.15 (0.34)	-0.17 (0.34)	-0.17 (0.34)	-0.15 (0.34)	-0.17 (0.34)	-0.17 (0.34)
Electronic & IT Hardware	**-0.73 (0.17)[a]**	**-0.73 (0.17)[a]**	**-0.64 (0.17)[a]**	**-0.71 (0.17)[a]**	**-0.71 (0.17)[a]**	**-0.71 (0.17)[a]**	**-0.71 (0.17)[a]**	**-0.70 (0.17)[a]**
Age of Business	0.04 (0.05)	0.04 (0.05)	0.03 (0.05)	0.04 (0.05)	0.03 (0.05)	0.03 (0.05)	0.04 (0.05)	0.04 (0.05)
Size	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.21 (0.05)[a]**	**0.20 (0.05)[a]**	**0.22 (0.05)[a]**	**0.20 (0.05)[a]**	**0.19 (0.05)[a]**
Own Savings	**-0.39 (0.19)[c]**	**-0.39 (0.19)[c]**	**-0.39 (0.19)[c]**	**-0.39 (0.19)[c]**	**-0.40 (0.19)[c]**	**-0.39 (0.19)[c]**	**-0.39 (0.19)[c]**	**-0.37 (0.19)[c]**
Gender	**-0.91 (0.33)[a]**	**-0.90 (0.33)[a]**	**-0.92 (0.33)[a]**	**-0.91 (0.33)[a]**	**-0.89 (0.33)[a]**	**-0.93 (0.33)[a]**	**-0.91 (0.33)[a]**	**-0.89 (0.34)[a]**
Age of Entrepreneur	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Relative	**-1.55 (0.48)[a]**	**-1.56 (0.48)[a]**	**-1.56 (0.48)[a]**	**-1.56 (0.48)[a]**	**-1.57 (0.48)[a]**	**-1.55 (0.48)[a]**	**-1.54 (0.48)[a]**	**-1.53 (0.48)[a]**
Degree	**0.54 (0.14)[a]**	**0.54 (0.14)[a]**	**0.54 (0.14)[a]**	**0.54 (0.14)[a]**	**0.54 (0.14)[a]**	**0.55 (0.15)[a]**	**0.55 (0.15)[a]**	**0.55 (0.15)[a]**
Partners	**0.34 (0.09)[a]**	**0.35 (0.10)[a]**	**0.35 (0.10)[a]**	**0.35 (0.10)[a]**	**0.35 (0.10)[a]**	**0.36 (0.11)[a]**	**0.36 (0.11)[a]**	**0.36 (0.11)[a]**
Business Advice	**0.28 (0.04)[a]**	**0.28 (0.04)[a]**	**0.29 (0.05)[a]**	**0.30 (0.05)[a]**	**0.30 (0.05)[a]**	**0.31 (0.05)[a]**	**0.31 (0.05)[a]**	**0.31 (0.05)[a]**
Main Effects								
Science Park (SP)	--------	**0.28 (0.06)[a]**	**0.28 (0.06)[a]**	**0.28 (0.07)[a]**	**0.28 (0.07)[a]**	**0.29 (0.08)[a]**	**0.29 (0.08)[a]**	**0.29 (0.08)[a]**
Number of businesses	--------	--------	0.07 (0.07)	--------	--------	0.05 (0.08)	--------	--------
Habitual	--------	--------	--------	**0.35 (0.07)[a]**	--------	--------	**0.33 (0.08)[a]**	--------
Serial	--------	--------	--------	--------	0.15 (0.17)	--------	--------	0.13 (0.17)
Portfolio	--------	--------	--------	--------	**0.32 (0.08)[a]**	--------	--------	**0.34 (0.10)[a]**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	0.03 (0.05)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**0.25 (0.07)[a]**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**0.15 (0.03)[a]**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**0.20 (0.06)[a]**
Constant	**-1.47 (0.34)[a]**	**-1.37 (0.35)[a]**	**-1.18 (0.36)[a]**	**-1.36 (0.35)[a]**	**-1.24 (0.35)[a]**	**-1.17 (0.34)[a]**	**-1.58 (0.43)[a]**	**-1.36 (0.42)[a]**
Log likelihood	-287.61	-287.53	-286.89	-287.51	-287.10	-286.78	-287.73	-284.43
Likelihood Ratio	**53.98[a]**	**54.14[a]**	**55.41[a]**	**54.18[a]**	**55.00[a]**	**55.65[a]**	**55.74[a]**	**60.34[a]**
Nagelkerke R^2	0.086	0.104	0.118	0.125	0.125	0.148	0.172	0.172
Change in Nagelkerke R^2	--------	0.018	0.032	0.039	0.039	0.062	0.086	0.086

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

firms located on a science park who are portfolio entrepreneurs are more likely to be profitable three years ago and this supports hypothesis H3c. The odds ratios corresponding to Model 80 in Table 6.10 found that the aforementioned relationship is quantified as 1.22 times.

The second interaction effect variable of firms located on a science park and where they are serial entrepreneurs is also found to be highly statistically significant at the 0.01 level. The odds ratio from Model 80 in Table 6.10 is 1.28 times. Thus, the evidence supports hypothesis H3d with regard to profits three years ago.

6.3.11 Break even three years ago

This section reports the results of a series of logistic regression models were run to estimate the dichotomous dependent variable relating to 'break even' (allocated a value of '1') and 'not break even' (a profit or a loss) respondents (allocated a value of '0') in the period of three years ago. A series of control variables relating to the expectation of achieving a break even outcome three years ago were included in Model 81 in Table 6.11. The model has a Nagelkerke R^2 of 0.075 and is significant at the 0.01 level.

The set of control variables in Model 81 is augmented in Model 82 with a binary variable of science park versus off-park location. Model 82 has a Nagelkerke R^2 of 0.091 and this was significant at the 0.01 level. The science parks variable is not statistically significant at the 0.10 level, or better. This evidence does not support hypothesis H1.

The three different types of entrepreneurial experience are added separately in Models 83, 84 and 85. All three of these models are statistically significant at the 0.01 level. In Model 83 the Nagelkerke R^2 is 0.099. The number of businesses appeared with a negatively signed coefficient but this was not statistically significant at the 0.10 level or better. This result is not consistent with regard to hypothesis H2a and breaking even three years ago.

Model 84 has the habitual entrepreneurs dummy variable and the model has a Nagelkerke R^2 is 0.117 and is significant at the 0.01 level. The habitual entrepreneurship dummy appears with a negatively signed coefficient but it was not statistically significant at the 0.10 level, or better. Thus the data is not consistent with hypothesis H2b and breaking even three years ago.

Table 6.11 Estimates of a logit of the expectation of achieving break-even performance 3 years ago.

	Model 81	Model 82	Model 83	Model 84	Model 85	Model 86	Model 87	Model 88
Control Variables								
Software	0.20 (0.34)	0.20 (0.34)	0.20 (0.34)	0.20 (0.34)	0.20 (0.34)	0.20 (0.34)	0.20 (0.34)	0.20 (0.34)
Computer Services	-0.53 (0.41)	-0.57 (0.41)	-0.55 (0.41)	-0.55 (0.41)	-0.56 (0.41)	-0.55 (0.41)	-0.56 (0.41)	-0.53 (0.41)
Business Services	0.23 (0.35)	0.28 (0.35)	0.24 (0.35)	0.28 (0.35)	0.27 (0.35)	0.24 (0.35)	0.27 (0.35)	0.27 (0.35)
Electronic & IT Hardware	**0.71 (0.38)[c]**	**0.73 (0.38)[c]**	**0.73 (0.38)[c]**	**0.72 (0.38)[c]**	**0.70 (0.38)[c]**	**0.72 (0.38)[c]**	**0.72 (0.39)[c]**	**0.71 (0.39)[c]**
Age of Business	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**	**-0.09 (0.05)[c]**
Size	-0.12 (0.17)	-0.14 (0.17)	-0.15 (0.17)	-0.14 (0.17)	-0.14 (0.17)	-0.15 (0.17)	-0.14 (0.17)	-0.13 (0.17)
Own Savings	0.29 (0.23)	0.28 (0.23)	0.26 (0.23)	0.28 (0.23)	0.27 (0.23)	0.27 (0.23)	0.28 (0.23)	0.29 (0.23)
Gender	0.45 (0.37)	0.48 (0.37)	0.49 (0.37)	0.47 (0.37)	0.46 (0.38)	0.48 (0.37)	0.47 (0.37)	0.47 (0.37)
Age of Entrepreneur	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Relative	**1.08 (0.36)[a]**	**1.06 (0.36)[a]**	**1.06 (0.36)[a]**	**1.06 (0.36)[a]**	**1.06 (0.36)[a]**	**1.06 (0.36)[a]**	**1.04 (0.36)[a]**	**1.04 (0.36)[a]**
Degree	0.08 (0.27)	0.06 (0.27)	0.07 (0.27)	0.06 (0.27)	0.07 (0.27)	0.08 (0.27)	0.07 (0.27)	0.07 (0.27)
Partners	-0.13 (0.09)	-0.15 (0.09)	-0.16 (0.09)	-0.15 (0.09)	-0.15 (0.09)	-0.15 (0.09)	-0.15 (0.09)	-0.15 (0.09)
Business Advice	-0.05 (0.05)	-0.06 (0.05)	-0.06 (0.05)	-0.06 (0.05)	-0.06 (0.05)	-0.06 (0.05)	-0.06 (0.05)	-0.06 (0.05)
Main Effects								
Science Park (SP)	--------	-0.24 (0.22)	-0.27 (0.22)	-0.25 (0.22)	-0.25 (0.22)	-0.25 (0.22)	-0.25 (0.22)	-0.25 (0.22)
Number of businesses	--------	--------	-0.09 (0.07)	--------	--------	-0.11 (0.09)	--------	--------
Habitual	--------	--------	--------	-0.07 (0.25)	--------	--------	-0.19 (0.33)	--------
Serial	--------	--------	--------	--------	-0.33 (0.33)	--------	--------	-0.34 (0.33)
Portfolio	--------	--------	--------	--------	-0.38 (0.32)	--------	--------	-0.40 (0.32)
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	-0.04 (0.12)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	-0.25 (0.33)	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	-0.26 (0.20)
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	-0.29 (0.21)
Constant	**0.45 (0.14)[a]**	**0.72 (0.17)[a]**	**0.74 (0.18)[a]**	**0.69 (0.19)[a]**	**0.64 (0.19)[a]**	**0.63 (0.18)[a]**	**0.78 (0.19)[a]**	**0.67 (0.20)[a]**
Log likelihood	-274.65	-274.02	-273.15	-273.98	-273.88	-273.10	-273.81	-272.85
Likelihood Ratio	**44.23[a]**	**45.50[a]**	**47.24[a]**	**45.57[a]**	**45.79[a]**	**47.33[a]**	**45.91[a]**	**47.83[a]**
Nagelkerke R^2	0.075	0.091	0.099	0.117	0.117	0.126	0.158	0.158
Change in Nagelkerke R^2	--------	0.016	0.024	0.042	0.042	0.051	0.073	0.073

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

Model 85 has a Nagelkerke R^2 of 0.117 and is significant at the 0.01 level. The serial and also the portfolio dummy variables appear with negatively signed coefficients but they are both not statistically significant at the 0.10 level, or better. Thus the data is not consistent with hypothesis H2c or H2d.

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 86, 87 and 88, respectively. Models 86, 87 and 88 are each statistically significant at the 0.01 level.

In Model 86 the Nagelkerke R^2 is 0.126. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against breaking even three years ago. Thus, the evidence is not consistent with hypothesis H3a with regard to breaking even three years ago.

In Model 87 the Nagelkerke R^2 is 0.158. The habitual entrepreneurship and science park location interaction term appeared with the expected negative signed coefficient but is not statistically significant at the 0.10 level, or better. Thus, the evidence is not consistent with hypothesis H3b with regard to breaking even three years ago.

Model 88 completes the results reported in Table 6.11. Here there are two interaction effect variables: between science park location and portfolio, and serial entrepreneurs, respectively. Model 88 has a Nagelkerke R^2 of 0.158. The interaction effect of those firms located on a science park who are portfolio entrepreneurs has a negatively signed coefficient but it is not statistically significant at the 0.10 level or better. Thus, the evidence is not consistent with regard to hypothesis H3c and breaking even three years ago. Similarly, the second interaction term of being located on a science park and where they are serial entrepreneurs was also not statistically significant at the 0.10 level or better. Thus, the evidence does not support hypothesis H3d with regard to breaking even three years ago.

6.3.12 Loss three years ago

This section completes the results of the twelve sets of models. A logit model was utilized to estimate the dichotomous dependent variable relating to ‘a loss’ (allocated a value of ‘1’) and ‘not a loss’ (break even or a profit) respondents (allocated a value of ‘0’) three years ago. Control variables relating to the propensity to be making a loss three years ago were included in Model 89 in Table 6.12. The model has a Nagelkerke R2 of 0.106 and is significant at the 0.01 level.

Next, the set of control variables is augmented with a dummy variable of science park or off-park location of the businesses and these results are shown in Model 90. Model 90 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.121 which is an increase of 0.015 compared with Model 89. These results show that entrepreneurs located on science parks were less likely to be making a loss compared to those who were off-park and this result supports hypothesis H1. The odds ratios corresponding to Table 6.12 indicate that businesses located on science parks are 0.69 times likely to be making a loss compared to those businesses located off-park.

Models 91, 92 and 93 then add one at a time the three different measures of entrepreneurial experience, and all three models were statistically significant at the 0.01 level. Model 91 has a Nagelkerke R^2 of 0.133. The number of businesses established or purchased is not statistically significant at the 0.10 level or better. Thus the hypothesis H2a is not supported by the results with regard to making a loss three years ago.

Model 92 has a Nagelkerke R^2 of 0.137 and is significant at the 0.01 level. The habitual entrepreneurs dummy variable is weakly statistically significant at the 0.10 level. This coefficient has a negative sign. The results indicate that habitual entrepreneurs are less likely than novice entrepreneurs to make a loss. The corresponding odds ratios for Table 6.12 quantifies this. The odds ratios of habitual entrepreneurs compared to novice entrepreneurs was 0.78. This evidence supports hypothesis H2b with regard to making a loss three years ago.

Model 93 has two dummy variables for portfolio and serial entrepreneur, respectively. Model 93 has a Nagelkerke R^2 of 0.137 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly less likely than novice entrepreneurs to be making a loss and this relationship is weakly statistically significant at the 0.10 level. Thus, hypothesis H2c is supported with regard to making a loss three years ago.

Table 6.12 Estimates of a logit expectation of making a loss 3 years ago.

	Model 89	Model 90	Model 91	Model 92	Model 93	Model 94	Model 95	Model 96
Control Variables								
Software	-0.17 (0.18)	-0.17 (0.18)	-0.17 (0.18)	-0.17 (0.18)	-0.17 (0.18)	-0.17 (0.18)	-0.17 (0.18)	-0.17 (0.18)
Computer Services	-0.32 (0.28)	-0.32 (0.28)	-0.32 (0.28)	-0.32 (0.28)	-0.32 (0.28)	-0.32 (0.28)	-0.32 (0.28)	-0.32 (0.28)
Business Services	0.05 (0.05)	0.06 (0.05)	0.06 (0.05)	0.05 (0.05)	0.06 (0.05)	0.06 (0.05)	0.06 (0.05)	0.07 (0.06)
Electronic & IT Hardware	0.08 (0.42)	0.05 (0.42)	0.05 (0.42)	0.07 (0.42)	0.05 (0.42)	0.05 (0.43)	0.08 (0.42)	0.06 (0.42)
Age of Business	-0.08 (0.06)	-0.08 (0.06)	-0.08 (0.06)	-0.08 (0.06)	-0.08 (0.06)	-0.08 (0.06)	-0.08 (0.06)	-0.08 (0.06)
Size	**-0.14 (0.03)^a**	**-0.12 (0.03)^a**	**-0.11 (0.03)^a**	**-0.11 (0.03)^a**	**-0.10 (0.03)^a**	**-0.12 (0.03)^a**	**-0.10 (0.03)^a**	**-0.09 (0.03)^a**
Own Savings	0.09 (0.12)	0.11 (0.13)	0.11 (0.13)	0.11 (0.13)	0.11 (0.13)	0.11 (0.13)	0.12 (0.13)	0.10 (0.13)
Gender	**0.86 (0.46)^c**	**0.85 (0.46)^c**	**0.86 (0.46)^c**	**0.84 (0.46)^c**	**0.82 (0.46)^c**	**0.86 (0.46)^c**	**0.84 (0.46)^c**	**0.82 (0.46)^c**
Age of Entrepreneur	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Relative	**0.38 (0.11)^a**	**0.38 (0.11)^a**	**0.38 (0.11)^a**	**0.38 (0.11)^a**	**0.38 (0.11)^a**	**0.40 (0.12)^a**	**0.40 (0.12)^a**	**0.40 (0.12)^a**
Degree	**-0.07 (0.03)^c**	**-0.08 (0.04)^c**	**-0.08 (0.04)^c**	**-0.08 (0.04)^c**	**-0.08 (0.04)^c**	**-0.08 (0.04)^c**	**-0.08 (0.04)^c**	**-0.08 (0.04)^c**
Partners	**-0.06 (0.02)^a**	**-0.09 (0.02)^a**	**-0.09 (0.02)^a**	**-0.09 (0.02)^a**	**-0.08 (0.02)^a**	**0.09 (0.02)^a**	**0.08 (0.02)^a**	**0.08 (0.02)^a**
Business Advice	**-0.22 (0.04)^a**	**-0.24 (0.05)^a**	**-0.24 (0.05)^a**	**-0.24 (0.05)^a**	**-0.24 (0.05)^a**	**-0.24 (0.05)^a**	**-0.24 (0.05)^a**	**-0.24 (0.05)^a**
Main Effects								
Science Park (SP)	--------	**-0.37 (0.12)^a**	**-0.37 (0.12)^a**	**-0.37 (0.12)^a**	**-0.37 (0.12)^a**	**-0.37 (0.12)^a**	**-0.37 (0.12)^a**	**-0.37 (0.12)^a**
Number of businesses	--------	--------	-0.01 (0.01)	--------	--------	-0.05 (0.09)	--------	--------
Habitual	--------	--------	--------	**-0.25 (0.12)^c**	--------	--------	**-0.26 (0.12)^c**	--------
Serial	--------	--------	--------	--------	-0.20 (0.22)	--------	--------	-0.18 (0.23)
Portfolio	--------	--------	--------	--------	**-0.26 (0.12)^c**	--------	--------	**-0.28 (0.14)^c**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	-0.11 (0.12)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**-0.21 (0.05)^a**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**-0.30 (0.15)^c**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**-0.34 (0.08)^a**
Constant	**-1.45 (0.18)^a**	**-1.84 (0.20)^a**	**-1.83 (0.22)^a**	**-1.82 (0.23)^a**	**-1.89 (0.24)^a**	**-2.04 (0.26)^a**	**-1.65 (0.25)^a**	**-1.75 (0.19)^a**
Log likelihood	-248.35	-247.11	-247.11	-247.08	-246.93	-246.71	-246.75	-246.42
Likelihood Ratio	**58.13^a**	**59.59^a**	**60.10^a**	**60.66^a**	**60.97^a**	**61.40^a**	**61.52^a**	**61.98^a**
Nagelkerke R^2	0.106	0.121	0.133	0.137	0.137	0.152	0.179	0.179
Change in Nagelkerke R^2	--------	0.015	0.027	0.031	0.031	0.046	0.073	0.073

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. ^{a} $p < 0.10$; ^{b} $p < 0.05$; ^{c} $p < 0.01$

The second entrepreneurship dummy variable included in Model 93 was the serial entrepreneur variable but this was not statistically significant at the 0.10 level or better. The results suggest that serial entrepreneurs were not less likely than novice entrepreneurs to report making a loss three years ago. The data is not consistent with regard to Hypothesis H2d and making a loss three years ago.

The two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 94, 95 and 96, respectively. Models 94, 95 and 96 are each statistically significant at the 0.01 level.

Model 94 has a Nagelkerke R^2 of 0.152. This goodness of fit is 0.046 higher than the control model of Model 89. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the expectation of making a loss three years ago. Thus, the evidence is not consistent with hypothesis H3a with regard to making a loss three years ago.

Model 95 has a Nagelkerke R^2 of 0.179. This goodness of fit is 0.073 higher than the control model of Model 89. The habitual entrepreneurship and science park location interaction term is statistically significant at the 0.01 level. The interaction variable appears with a negative sign. For Table 6.12 the corresponding odds ratios in the case of Model 95 found that the odds ratio of a loss making outcome for habitual entrepreneurs located on science parks compared to other outcomes is 0.81.

In Model 96 the science park location and portfolio, and serial entrepreneurs interaction dummies are included. Model 96 has a Nagelkerke R^2 of 0.179. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.10 level and this has a negatively signed coefficent. In Table 6.12 the corresponding odds ratio of a portfolio entrepreneur located on a science park compared to other location and entrepreneurial experience is 0.71. Thus, firms located on a science park who are portfolio entrepreneurs are less likely to make a loss three years ago and this supports hypothesis H3c.

The second interaction effect variable of firms located on a science park and where they are serial entrepreneurs is also found to be weakly statistically significant at the 0.10 level in Model 96 in Table 6.12. The corresponding odds ratio from Table

6.12 is 0.74. Thus, the evidence weakly supports hypothesis H3d with regard to making a loss three years ago.

6.4. Discussion and implications

6.4.1 Key findings

The analysis in this chapter has contributed to filling the knowledge gap on our understanding of science parks and firm performance, as well as how entrepreneur's and their firms' performance differs by entrepreneurial experience, as well as a third set of findings related to two way interaction effects of science park location and entrepreneurial experience compared. This chapter has focused upon three sets of firm performance: (i) exporting, (ii) the annualized 3 year rate of employment growth and, the rate of employment growth over the previous 12 months, and (iii) firm profitability relating to one year ago, two years ago and three years ago. For each of these three different sets of performance measures which cover a total of six performance measures the author examined whether the location on a science park and prior business ownership experience was systematically related with superior firm performance.

Several hypotheses were supported. Table 6.13 shows a summary of the dependent variables and hypotheses which were and were not statistically significant and consistent with the hypotheses, respectively. Table 6.14 shows a summary of independent variables included in the models of business performance.

Science Parks

Firms located on science parks were more likely than firms located off-park to report being an exporter; and, they had a higher annualized 3 year rate of employment growth and a higher annual rate of employment growth. The evidence on the three sets of profitability was more mixed. Firms located on science parks were more likely to be profitable in the most recent year, one year ago and also three years ago. Firms located on science parks were also less likely to be making a loss in the most recent year, one year ago and also three years ago. However, with regard to the break even results this variable was only statistically significant in one time period – the most recent one. Thus, overall the results are consistent with and support hypothesis H1.

Table 6.13 Summary of supported and unsupported hypotheses.

	Exporter	3 Year Annual growth rate	12 month growth rate	Profit in the closest time period	Break-even in the closest time period	Loss in the closest time period	Profit 1 year ago	Break-even 1 year ago	Loss 1 year ago	Profit 3 years ago	Break-even 3 years ago	Loss 3 years ago
H1	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	×	✓
H2a	×	×	×	×	✓	✓	✓	×	✓	×	×	×
H2b	✓	✓	✓	✓	×	✓	✓	×	✓	✓	×	✓
H2c	✓	✓	✓	✓	×	✓	✓	×	✓	✓	×	✓
H2d	✓	×	×	×	×	×	×	×	×	×	×	×
H3a	×	×	×	×	×	×	×	×	×	×	×	×
H3b	✓	✓	✓	✓	×	✓	✓	×	✓	✓	×	✓
H3c	✓	✓	✓	✓	×	✓	✓	×	✓	✓	×	✓
H3d	w	w	✓	w	×	w	w	×	✓	✓	×	w

Note: ✓= Supported , ×= Not supported, w=Weakly supported

Table 6.14 Summary of independent variables included in the models of business performance.

	Exporter	**3 year annual growth rate**	**12 month growth rate**	**Profit in the closest time period**	**Break-even in the closest time period**	**Loss in the closest time period**	**Profit 1 year ago**	**Break-even 1 year ago**	**Loss 1 year ago**	**Profit 3 years ago**	**Break-even 3 years ago**	**Loss 3 years ago**
Science Park (SP) (H1)	+a	+a	+a	+a	+b	-b	+c	-	+c	+a	-	-a
Number of businesses (H2a)	+	+	+b/+a	+b/+c	+b	-c	+c	+	-c	+	-	-
Habitual (H2b)	+a	+a	+b/+a	+a	-	-a	+c	+	-c	+a	-	-c
Serial (H2c)	+a	+/+c	+	-	+	-	+	+	-	+	-	-
Portfolio (H2d)	+a	+a	+a	+c	-c	-c	+c	+	-c	+a	-	-c
2 Way interactions												
SP* No. of businesses (H3a)	-	+	+	+	-	-	+	+	-	+	-	-
SP*Habitual (H3b)	+a	+a	+b	+a	-	-a	+c	+	-c	+a	-	-a
SP*Serial (H3c)	+c	+a	+c	+c	+	-c	+c	+	-c	+a	-	-c
SP*Portfolio (H3d)	+a	+a	+b	+c	+	-c	+c	+	-c	+a	-	-a

By using the follow-on sample data of Monck et al. (1988) which were collected by Westhead and Cowling (1995) from surviving firms during late 1992 and early 1993 (46 on-park, 31 off-park). They found that there was no statistically significant difference between the mean employment sizes of the two groups of firms in 1986. By 1992/3 the science park firms had grown to employ on average 26.8 people whiles the mean employment size of the off-park firms had grown to 37.8 employees. Over the six year period, the mean employment increase in both groups of firms saw virtually identical (15.5 employees compared with 16.4 employees).

Westhead and Storey (1994) conducted a follow-up study of Monck et al. (1988), comparing firms located in science parks to firms located off-science park in the United Kingdom. They found that the group of surviving firms located in science parks showed a greater average growth rate over the course of the studied six years. However, Westhead and Storey (1994) note that the average growth of employment in both the on and off-park groups was significantly influenced by the very strong performance of relatively few firms.

It has shown contrary results when comparing my study with other researchers like Monck et al. (1988) who conduced the first fieldwork in the UK in 1988. In their research, they studied 284 firms in total, of which 183 were located on a science park and 101 were located off-park. The results show that, when taking the different age of the firms into account, off-park firms achieve a higher level of employment than comparable on-park firms, this indicating that science parks even obstruct the development of high-tech firms. A possible explanation could be the quality and objectives of some of the entrepreneurs who prefer to be located on science parks. A significant number of the underperforming on-park firms were founded and managed by academics or ex-academics. One plausible explanation for this underperformance in employment growth in these firms could be the lack of managerial skills among the academic entrepreneurs.

Löfsten and Lindelöf are two leading researcher in the field of science park study in Sweden. Form year 2001- 2006, the pair of them have undertaken several studies about the performance of NTBFslocated on and off science parks. More specifically, the areas they were looking at were employment growth, sales growth and profitability of firms.

It shows some interesting results when comparing my research to theirs'. Löfsten and Lindelöf in 2001 examined 263 NTBFs in Sweden where 163 were on-park, and 100 were off-park. The findings suggest that the parks milieu appear to have a positive impact on their firms' growths as measured in terms of sales and jobs. However, there was no evidence of a direct relationship between science park location and profitability (Löfsten and Lindelöf, 2001). The first possible reason behind this is similar to Monck's explanation: the academic-owned businesses were less profit-oriented when compared with professional owned businesses, the second reason given by the authors is, for NTBFs, profit are consistent with age, but some of them are simply too young too make profit.

By using the same data set Löfsten and Lindelöf (2003) did another piece of research about the information on the location of customers which shows whether firms are linked to local, national or international markets, and thus their potential for growth. They found that NTBFs on-Park have a much wider market distribution throughout Sweden and abroad than is typical for small firms. This finding is in line with my research result.

A similar research had been conducted by Ferguson and Olofsson (2004), after a research on 66 NTBFs in Sweden, 30 on-park, and 36 off-park. More specifically, Ferguson and Olofsson (2004, p5) suggests that: "Firms located on science parks have significantly higher survival rates than off-park firms. But there are insignificant differences in sales and employment."

The Number of Businesses Established or Purchased

The results showed that the number of businesses purchased or established was statistically and systematically linked to several of the business performance measures. More specifically, a greater number of businesses purchased or established was found to be statistically associated with a higher rate of annual growth in the last year. There was a positive increased expectation of a firm having a profit in the most recent time period, and a year ago, but not three years ago. These kind of associations are interpreted as a sign of the firms with greater number of businesses purchased or established is growing gradually from three years time in terms of employment and profitability. The three measures of profitability in three years time showed a mixed set of results here. This kind of associations has 3 implications, firstly, the employment growth of greater number of businesses purchased or established compared with less number of business purchased or established was not obvious three years ago, but the growth differences of the two parties in last year was significant. Secondly, both the employment growth and the firm profitability increased in the most recent time rather than 3 years ago. Thirdly, profit growth is proportional to the employment growth,

There was a negative relationship between the number of businesses purchased or established with the most recent time period, and also one year ago. Same as above, it is suggesting that firms with greater number of businesses purchased or established are unlikely to make a loss in the most recent time and also one year ago time.

It is suggesting that the firms with a greater number of businesses purchased or established have less chance to make a loss in the most recent time period, and also one year ago, the negative relationship also proved from a reverse side that firms with a greater number of businesses purchased or established are more profitable in the aforementioned periods.

However, the number of businesses purchased or established was only statistically related to one of the models of breaking even and that was for the most recent time period. The number of businesses purchased or established did not appear to have effect on the one year ago and three years ago break even measures, which means greater number of businesses in the most period of time are more likely to be breaking even or profitable, rather than making a loss.

It is suggesting that in the most recent time period, the firms with a greater number of businesses have more chance to be breakeven. Combined with the analysis above, it is clear that the firms with a greater number of businesses would report either be profitable or be breakeven, definitely not making a loss in the most recent time period.

Thus, overall the evidence supports hypothesis H2a but this is tempered against the finding that this relationship did not hold for exporting activity, the three year annual rate of employment growth or any of the trilogy of profits, break even and a loss in the period two years ago.

Habituals

The type of prior business ownership experience of being a habitual was found to have a much stronger association with the business performance measures. Habitual entrepreneurs' businesses compared to those owned by novice entrepreneurs achieved a higher three year annualized rate of employment growth as well as a higher annual rate of employment growth. Habitual entrepreneurs had a higher expectation of being an exporter, as well as a higher expectation of achieving a profit in all three time periods, and a lower expectation of having a loss in all three time periods. Thus, the evidence strongly supports hypothesis H2b.

Westhead and Wright (1998) conducted a study to explore the differences between novice, portfolio and serial entrepreneurs. The research tested personal motivation, work experience and firm performance of three different entrepreneurs. In total, the pair collected a data set containing 621 firms. 389 of them were novice founders, that is the business concerned was the first to be established by the key founder. 75 businesses were involved portfolio founders, where the key founder had owned two or more businesses and still owned the first business The remaining 157 businesses were serial founders who had owned two or more businesses but who did not now own the first business.

In the research, business performance was examined on several aspects including changes in sales revenues, levels and changes in profitability, and the share of sales exported abroad. Their study shows that no significant differences in performance were identified between firms owned by the three groups of founders. They also found that, a weakly significantly larger proportion of novice rather than habitual founders operated businesses that were profitable (rather than making a loss or at break-even). In terms of levels and changes in employment contrasts among the three groups of firms, part-time and casual employees were taken into account. Again, no statistically significant differences were identified. Nevertheless, serial founder firms reported higher levels of current employment and standardized changes in employment. These findings are surprisingly opposite to my study results which show that habitual entrepreneurs report a stronger rather than weaker firm performance when compared with novice entrepreneurs.

Haynes (2003) gathered 195 randomly selected business founders in US by means of a structured questionnaire administered through telephone interviews. He found a positive relationship between entrepreneurial experience and higher annual sales. Delmar and Shane (2004) observed 223 Swedish new ventures started between January and September 1998 by a random sample of firm founders. They detected that new ventures pursued by more experienced firm founders had a lower hazard of closure than new ventures pursued by less experienced founders. In particular, prior start-up experience was found to reduce the hazard of completing product development, initiating marketing and promotion, and the obtaining inputs. Both of the two studies showed a support to my results.

Ucbasaran et al. (2006) monitored the performance of a large and representative sample of private firms in Great Britain. This study failed to detect any significant firm performance differences between surveyed firms owned by novice, serial, and portfolio entrepreneurs when other aspects of entrepreneurs' human capital, the environment and organizational characteristics were considered. Similar to the study of Westhead and Wright (1998), this study showed a different result compared to my research.

Ucbasaran et al. (2009) used a data set of 630 entrepreneurs to examine the opportunity identification of experienced entrepreneurs. The results of their study shows that experienced entrepreneurs identified more opportunities and exploited more innovative opportunities with wealth creation potential. However, interestingly, their research also identified that entrepreneurs that had owned more than 4.5 businesses explored fewer opportunities. This result partially supported my study.

Portfolio and Serial

When the habitual entrepreneurs were split into the serial and portfolio classification the results were very stark. Being a portfolio entrepreneur was found to be statistically significant at the 0.10 level in the cases of ten of the twelve measures of business performance. Indeed the only two cases where the portfolio dummy variables were not statistically significant was for the expectation of breaking even a year ago, and three years ago. From the results it can safely be said that portfolio entrepreneurs are the most important entrepreneurs under the Chinese context, and where the researchers should pay more attention to them.

In contrast to the results on the portfolio variable, being a serial entrepreneur was found to be statistically related to only two of the measures of business performance – exporting and the three year annualized rate of employment growth. In other words, serial founders are less productive when compared with portfolios.

Thus, overall there is strong evidence to support hypothesis H2c and weak support for hypothesis H2d. The evidence suggests that portfolios but not serial entrepreneurs in comparison with novice entrepreneurs are able to draw upon some different sets of skills, experience and creativity to better achieve business performance outcomes.

Wright et al. (1997) conducted a survey by 2 waves of postal questionnaires, the usable data collected were 55 and 23 respectively. This research tested the serial entpreneurs performance from the view of venture capitalists in UK. The results show that venture capitalists did not report serial entrepreneurs performing better than first-time entrepreneurs in whom they invested in the same period. This study generally supported my research result.

Westhead et al. (2005) studied 354 Scottish firms owned by novice, serial and portfolio entrepreneurs. This study emphasized the behavior and contribution of portfolio and serial founders by comparing these two entrepreneurs to other counterparts with regard to personal background, business financing, opportunity identification, organizational capabilities and business performance. In order to compare my study with it, here we only focus on business performance part.

When comparing Portfolio entrepreneurs with novice and serial entrepreneurs, it shows that in 1999, the average sales revenues of businesses owned by portfolio entrepreneurs were larger than those owned by other entrepreneurs. On average, businesses owned by portfolio entrepreneurs reported larger absolute sales growth over the 1996–1999 period than those owned by novice entrepreneurs. Further, a larger proportion of portfolio rather than novice entrepreneurs, reported that their current operating profit performance was above average relative to competitors.

Similar to the finding relating to sales, portfolio entrepreneur firms were larger than those owned by other entrepreneurs in terms of total employment size in 2001. Moreover, portfolio entrepreneur firms, on average, reported higher absolute and percentage total employment growth over the 1996– 2001 period, than firms owned by other entrepreneurs.

When serial entrepreneurs compared with novice and portfolio entrepreneurs, the results show that, in 1999, the average sales revenues of businesses owned by serial entrepreneurs were larger than those owned by novice entrepreneurs. In addition, a larger proportion of serial rather than novice entrepreneurs, reported that their current profit performance was above average level of their competitors.

In line with the Wright et al. (1997) study, this study done by Westhead and Wright in 2005 showed more evidence to support my study results, which indicating that portfolio entrepreneurs are performing better than serial entrepreneurs and serial entrepreneur are performing better than novice entrepreneurs. We would expect portfolio and serial entrepreneur have more business network and are associated with more resources and skill which would lead to a higher business performance.

Interaction Terms

The author augmented the models with interaction terms between science park location and the three sets of entrepreneurial experience. The results consistently found that the number of businesses purchased or established and the science park location interaction variables were not statistically significant. This applied to all twelve models covering the broad spread of business performance measures. Thus, hypothesis H3a was not supported.

However, the second entrepreneurial experience term of habituals when incorporated into the models with the science park location as an interaction effect variables were found to be statistically significant in all of the models – with the exceptions of each of the three models of the expectation of breaking even. This set of results supported hypothesis H3b. Thus, habitual entrepreneurs are able to leverage resources on science parks to achieve a greater likelihood of achieving exporting, employment growth over one year and also three years; and, there was a higher expectation of them making a profit in all three time periods; as well as a lower expectation of making a loss, in all three time periods.

The interaction effects also split habitual entrepreneurs into portfolio and also serial entrepreneurs and each of these two types of entrepreneurial experience was interacted with the science park location. Consistent with the results of habituals and science park interaction variables the portfolio and science park interaction terms were statistically significant at the 0.01 level across nine of the twelve models. Thus, not only are businesses who are on science parks more likely to have superior performance, and portfolio entrepreneurs possessing a highly likelihood of achieving better performances than their novice entrepreneur counterparts, but combined together portfolio entrepreneurs located on science parks achieve superior business performance. These results consistently supported hypothesis H3c.

The serial entrepreneurs and science park location interaction variable was also found to be statistically significant in nine models. This is an interesting and important finding. In the three models of the expectation of the businesses making a profit in the last year, one year ago, and three years ago the serial entrepreneurs variable alone was not statistically significant. However, in the aforementioned models the science park and serial entrepreneurs interaction variables were statistically significant at the 0.10, 0.10, and 0.01 levels, respectively. Thus, whilst serial entrepreneurs as a separate independent variable was not related to the profit outcome, the serial entrepreneurs on science parks are able to leverage resources to compensate for their lack of experience and skills, and to boost the probability of achieving a profitable outcome in the last year, one year ago and also three years ago. Accordingly, there is support for hypothesis H3d.

Control Variables

There were differences between the control variables which were statistically significant in the six measures of firm performance, but this lack of strong consistency is not unexpected as the models are looking at cover three very different types of firm performance, and in the case of profit, loss or break even the results are covering three time periods. 6.15 Summary of control variables included in the models of business performance.

Table 6.15 Summary of control variables included in the models of business performance.

	Exporter	**3 year annual growth rate**	**12 month growth rate**	**Profit in the closest time period**	**Break-even in the closest time period**	**Loss in the closest time period**	**Profit 1 year ago**	**Break-even 1 year ago**	**Loss 1 year ago**	**Profit 3 years ago**	**Break-even 3 years ago**	**Loss 3 years ago**
Control Variables												
Software	+a	+	+	-c	+c	+c	-	+	+	-	+	-
Computer Services	+	+c	+b	-	+	+	+	-c	+	+	-	-
Business Services	+	+	+c	-	+	+	-	+	+	-	+	+
Electronic & IT Hardware	+a	-a	-	-a	+b	+a	-a	+	+b	-a	+c	+
Age of Business	-	-a	-a	+	-	-	+	-c	-	+	-c	-
Size	+a	+a	+a	+a	-a	-a	+c	-b	-c	+a	-	-a
Own Savings	-c	+a	+	+c	-b	-c	+b	+a	-c	-c	+	+
Gender	-a	+	+	-b	+	+a	-a	+	-a	-a	+	+c
Age of Entrepreneur	+	-	-	-	+	+	-	+b	+	-	-	+
Relative	+	+	-	-	+	+	-	-	+c	-a	+a	+a
Degree	+	+	+	+a	+a	-a	+a	+	-a	+a	+	-c
Partners	+	+a	+	-	+	+	+a	-a	-a	+a	-	-a
Business Advice	+a	+a	+a	+a	+b	-c	+a	-	-a	+a	-	-a

Four entrepreneur control variables were consistently significant in models 1 to 8. Male entrepreneurs' firms were less likely than those owned by women to be an exporter. Entrepreneurs who had used more sources of advice were more likely to be an exporter. Entrepreneurs who had used their own savings when the business was established or purchased were less likely than those who did not use their savings to be an exporter. Larger firms enjoyed a higher likelihood of being an exporter.

This results show 4 implications: Firstly, surprisingly, female entrepreneurs rather than male entrepreneurs are more likely to be an exporter. In other words, women are more willingly to take the risk of exploring business opportunities in international markets. Secondly, the advice provided by public sectors including Association of Beijing SMEs or Beijing SMEs Service Center and private sectors such as accountants or solicitors is a key factor for business owners becoming an exporter, which means the more organizations or individuals entrepreneurs keep in contact with, the more business links they get, and consequently more opportunities to access to foreign business. Thirdly, entrepreneurs who used their own money to set up the business are less likely to become an exporter. Those people who used personal savings as the foundation as their business are tend to be more uncertainty avoidance by refusing entering international market, as it is a unfamiliar context which possibly linked with more ambiguity and risk. Fourthly, firms who have bigger size in terms of employment are more likely to be involved in export activities. The greater size can be equated to a greater level of strength and resources, and therefore these firms have a tendency to have more confidence in competing with foreign companies.

Five entrepreneur control variables were consistently statistically significant in models 9 to 16. Entrepreneurs who had used their own savings when the business was established or purchased enjoyed a higher level of annualized 3 year rate of employment growth than those who did not use their savings. Entrepreneurs who had been able to secure co-investors who invested at the time that the firm was started enjoyed a higher level of annualized 3 year rate of employment growth than those who had not been able to attract co-investors. The larger sized firms and younger aged firms had a higher level of annualized 3 year rate of employment growth. Entrepreneurs who had used more sources of advice were more likely to have a higher level of annualized 3 year rate of employment growth.

This set of results has the following implications: The business founders who used their own money to set up the current business are likely to have a higher 3 year employment growth than other founders who used sources of funding from somewhere else, such as bank loans or mortgage on house or private investors. When firms have co-founders then it is more promising to have a higher rate of 3 year employment growth compared with businesses have only single founder. Business who are greater in size tend to have a quicker employment growth in 3 year time, in other words, the bigger firm was outperforming the smaller sized business in terms of the 3 year employment growth. When the business is younger, its employment in 3 year time grows up faster than the older firms. Finally, the companies who got more information sources from bank, customers, business associates, grow up faster in their 3 year time employment as well.

Three entrepreneur control variables were consistently found to be related to the annual rate of growth in the last year and these were size, age of the business and the use of business advice. There was a positive relationship between firm size and also the number of sources of business advice and the rate of employment growth in the last year. There was a negative relationship between firm age and this measure of employment growth. In other words, the larger the size of the businesses, the greater the number of sources of business advice utilized, and the younger the age of the businesses the higher the rate of employment growth in the last year.

The results indicate that: First, rather surprisingly, the younger firms are growing faster than the older firms in last year employment. Second, the bigger firms are performing better than the smaller businesses in terms of the employment growth in last year. Last, the number of business information used is positively linked with firm growth, that is to say, the more sources of business advice a company used, the faster it grows in last year.

For the three time periods which modeled the expectation of making a profit the results found that size of the business, the use of own savings, gender, possessing a degree, and using business advice were consistently found to be statistically significant at the 0.10 level or better. Larger sized businesses, entrepreneurs who had used their own savings at start-up, and entrepreneurs who had used more sources of advice had a greater expectation of making a profit. Also, women compared to men were more likely to make a profit. For two time periods – one year ago, and three years ago those businesses where the entrepreneurs had partners had a higher expectation of making a profit.

The interpretations of this result are: First, bigger firms are not only growing faster in employment, but also the lager sized firms are more likely to make a profit than their smaller counterparts. Secondly, entrepreneurs who used their personal savings when establish the business are more likely to make a profit than people who used funds from other sources like families or bank loans or mortgages. Thirdly, again, rather surprisingly, not only women are expected to be an exporter, female are more likely to make a profit than man as well. Fourthly, Founders who had a bachelor degree or above are more likely to make a profit than other founders whose educational background are in the range of primary school, high school and bachelor diploma. Fifthly, businesses with more sources of information and advice used are more likely to make a profit. Lastly, the more partners the entrepreneurs had when set up the business the more possible for the business to make a profit rather than for all three time periods but for two time periods – one year ago, and three years ago.

The results of the logit models of making a loss were also consistent with the results from the models which had focused upon making a profit. Thus, smaller sized businesses, entrepreneurs who had not used their own savings at start up, male entrepreneurs, and those entrepreneurs who had used fewer sources of advice were more likely to make a loss.

The meanings of this set of results are: first, firms who have less employment are more likely to make a loss than the firms who are bigger in employment size. Second, entrepreneurs who did not use their personal savings when set up the business are more likely to make a loss. To put it like this, personal savings are the driven force of business going forward. The third point is a rather interesting result: male entrepreneurs are more likely to make a loss rather than females entrepreneurs. And finally, those entrepreneurs who had used fewer sources of advice were more likely to make a loss, which means the business used more source of information have a better chance to make profit. The age of the entrepreneur was found to not be related to making a loss, or to any of the other eleven sets of business performance. In other words, whether the entrepreneurs were younger or older did not have systematic and significant relationships with the measures of business performance.

Having relatives in business was not important in nine of the sets of models of business performance. However, having relatives in business was a handicap to making a profit three years ago, and it also increased the expectation of making a loss three years ago.

6.4.2 Practitioner implications

In comparison to science parks located in developed countries the science parks in China are only at an infant stage, and there is a lot to be learned and improved. To better understand Chinese science parks and Chinese entrepreneurs' behaviours and contributions, this research studied Chinese novice, portfolio and serial entrepreneurs. It investigated the performance of small firms located on and off ZSP in Beijing China. The measures of business performance which were examined in this chapter were employment growth rate, export activities, and business profit level (loss, breakeven or profit).The study showed comprehensive and representative results. According to these research results presented in the main parts of this chapter there are several practical implication than can be drawn out.

First, the managers of science parks should appreciate that in looking at small firms and the different types of entrepreneurs these are not a homogeneous entity with equal enthusiasm or ability to survive and grow. As noted by Reynolds (1987) in the United States, only a small proportion of firms create the vast majority of additional new jobs. Consequently, a blanket approach to encourage the development of all types of firms (irrespective of need, inclination, or ability) risks being ineffective if the objective of public policy is to foster the maximum level of economic development with the minimum amount of public support. Policy makers should increasingly appreciate the special needs and problems facing small firms seeking to grow, therefore, there is a case for targeting assistance to the small proportion of firms that provides the vast majority of jobs (Storey et al., 1987). Such a policy will lead to "a substantially more effective and efficient use of resources" (Reynolds, 1987, p. 244).

Secondly, from the presented results showed, it is safe to say that businesses located on science park produce a better performance than business located off science park. From the interaction results of habituals and science parks, it is shown that habitual entrepreneurs are able to leverage resources on science parks to achieve a greater likelihood of achieving better business performance of exporting, employment growth, and making profit, as well as a lower expectation of making a loss, in all three time periods. Therefore, the policy makers should raise their awareness of this issue, try to bring entrepreneurs especially the portfolio and serial entrepreneurs who have previous business ownership experience to science park. Normally previous experience means advanced knowledge and valuable skills. This could lead to a better knowledge spillover among types of entrepreneurs, especially benefiting nascent and novice founders. Relative incentives like reduce tax or reduced premise rent should be introduced to those experienced entrepreneurs who are willing to move to science park.

Thirdly, this study shows that, business with more advice outperform those with limited advice, therefore, in order to stimulate firm efficiency, it is suggested that more business advice and help should be brought to firms especially novice firms on science park. Westhead et, al. (2005) presented results that showed that portfolio and serial entrepreneurs used significantly more information than novice entrepreneurs. Taking into account their findings together with the findings presented in this chapter the policymakers and practitioners should consider introducing schemes that address obstacles to regularly search for a various range of information by inexperienced novice entrepreneurs.

Fourthly, as shown in the study, habitual entrepreneurs are those who have previous business ownership experience, and therefore they are far more experienced in the entrepreneurial process, and as a result, could generate more profit than novice founders. In order to maximize returns on their investments, policymakers and practitioners may seek to encourage the development of existing entrepreneurs' firms, rather than solely to provide additional support to increase the supply of nascent entrepreneurs, novice entrepreneurs and new firms (Global Entrepreneurship Monitor, 2004; Westhead et al., 2004, 2005c).

Fifthly, evidence from this study found significant differences among three types of entrepreneurs. Novice founders have the weakest ability to export and expand business. In comparison with serial entrepreneurs, portfolios are able to draw upon some different sets of skills, experience and creativity to better achieve business performance outcomes. Consequently, it is suggested that policy-makers and practitioners need to appreciate more fully the needs, resources, behavior, and contributions of various types of entrepreneur when they are formulating policies (Westhead and Wright, 1998b, 1999). Rather than providing "blanket support" to all entrepreneurs, irrespective of their need or ability, there is a case to tailor support to each type of entrepreneur (Westhead et al., 2004).

Sixthly, in contrast to habitual entrepreneurs, the novice entrepreneurs are inexperienced with less business networks and information, and therefore, there may be scope to develop schemes that encourage novice entrepreneurs to learn the methods of best business practice displayed by successful portfolio entrepreneurs.

Schemes could be introduced to establish mechanisms that encourage networking and information exchange between novice entrepreneurs and successful portfolio entrepreneurs. Initiatives should be put in place, which encourage inexperienced entrepreneurs to learn how to build relationships with experienced managers and potential equity investors (Mosey et al., 2007).

Seventhly, it should be noted that, a distinguishing feature of serial entrepreneurs is the fact that they have exited from at least one business. Exit maybe a signal of an entrepreneur's willingness to establish new ventures (Stokes and Blackburn, 2002), and the perception that the next business offers a more attractive opportunity. It may, however, indicate that this entrepreneur has insufficient managerial skills and resources to grow a business. Policymakers and practitioners should consider why serial entrepreneurs repeatedly exit from their businesses. To maximize returns on investments, policy-makers and practitioners need to be aware of the assets and liabilities (Starr and Bygrave, 1991) associated with serial entrepreneurs. Relevant assistance to serial entrepreneurs who require external support to address the liabilities (i.e., narrower skill and expertise base, tarnished reputation leading to the inability to obtain external financial support on acceptable terms) should be provided

Lastly but not least, the research also shows an interesting results that, female entrepreneurs outperformed males. The research presented that females are not only more likely to be exporters but also more likely to make profit when compared to their male counterparts. Females are as effective as males when it comes to the ability of making profit (Watson, 2002, Westhead, 2003), but in most countries there is significantly less female participating in entrepreneurial activities (Levent et, al., 2003). This should be appreciated by policy makers, assistances and incentives should be given to attract more female entrepreneur to maximize their potential and generate more economic growth.

6.5 Conclusion

The purpose of this chapter was to test a set of hypotheses with regard to business performance and business location and entrepreneurial experience. It is served to close the literature gap on science parks and firm performance by examining how entrepreneur's and their firms' performance differs by entrepreneurial experience and location of business. With respect to firm performance, indicators included three performance measures (i) exporting, (ii) the annualized 3 year rate of employment growth and, the rate of employment growth over the previous 12 months, and (iii) firm profitability relating to one year ago, two years ago and three years ago. The hypotheses were tested by using ordinary least squares and logistic regression techniques.

The findings of this research are a mixed set of results, majority of hypotheses are found significantly associated with the performance measures. The first hypothesis supported is H1. Firms located on science parks are more likely than firms located off-park to report superior performance. Secondly, Habitual entrepreneurs' businesses compared to those owned by novice entrepreneurs achieved a higher rate of employment growth as well as a higher expectation of being an exporter, a higher expectation of achieving a profit in all three time periods, therefore, H2b is strongly supported. Thirdly, being a portfolio entrepreneur was found to be statistically significant at the 0.10 level in the cases of ten of the twelve measures of business performance. H2c is strongly supported as well. Fourthly, when habituals incorporated into the models with the science park location as an interaction effect variables were found to be statistically significant in all of the models – only with the exceptions of each of the three models of the expectation of breaking even. This set of results supported hypothesis H3b. Fifthly, the portfolio and science park interaction terms were statistically significant at the 0.01 level across nine of the twelve models, these results consistently supported hypothesis H3c. Sixthly, the serial entrepreneurs and science park location interaction variable was also found to be statistically significant in nine models, accordingly, there is support for hypothesis H3d.

The summary of the findings discussed in the previous section show that Only 3 hypotheses out of 9 are not or partially not proved correct. They are H2a: Entrepreneurs with greater numbers of started or bought businesses will report superior firm performance, which is partially supported, H2d: serial entrepreneurs compared to novice entrepreneurs will report superior firm performance, which is weakly supported; and H3a: Entrepreneurs located on a science park with experience of starting and purchasing greater numbers of businesses will report superior firm performance, which is not supported. Other than that, the rest hypotheses has been proved that business ownership experience is positively related to business performance, the two way interaction effects of science park location and entrepreneurial experience also has positive relation with business performance. More detailed supported or unsupported hypotheses are shown in table 6.13.

According to the results generated from this study, several possible implications have been given out by the author in order to promote the maximum development of small firms located on and off science park by effectively and efficiently applying limited resources. There are some very interesting and important points which need to be particularly emphasized. Firstly, science park location is the key variable in this research, from the results presented earlier, and it is safe to say that businesses located on a science park produce a better performance than businesses located off science parks. Compared to developed western countries, science parks in China are still at their developing stage, and there is still a great deal to learn from the US and Europe, the governors of parks should raise their service quality in both software (i.e., business consultants,) and hardware (i.e., office buildings or Internet connections) to attract more and more small businesses to locate their firms inside the parks.

Secondly, the type of prior business ownership experience of being a portfolio entrepreneur was found to have a much stronger association with the business performance measures. They achieved a higher three year annualized rate of employment growth as well as a higher annual rate of employment growth. Portfolio entrepreneurs had a higher probability of being an exporter, as well as a lower probability of having a loss in all three time periods. In order to maximize returns on their investments, policymakers should introduce incentives to encourage the development of existing entrepreneurs' firms, rather than provide support to new firms (Westhead et al., 2004).

Last but not least, the serial entrepreneurs and science park location interaction variable is an interesting and important finding. Serial entrepreneurs variable on its own was not statistically significant at making a profit in the last year, one year ago, and three years ago, time periods. However, when the science park and serial entrepreneurs interaction variables connected together, the three models mentioned above were statistically significant at the 0.10, 0.10, and 0.01 levels, respectively. As a result, although serial entrepreneurs themselves could not make higher business performance, the combination of serial entrepreneurs and science parks variable are making chemical reactions to improve the ability of achieving an enhanced result in 3 separate periods of time. This fact should raise the policymakers' awareness.

The next chapter is the third empirical chapter which examines the adoption of electronic commerce by different types of entrepreneurs on and off science park.

Chapter 7

Business Performance - E-Commerce

7.1 Introduction

China's 1949 planned economy was replaced in 1979 by a socialist market economic system (China org, 2006). 30 years later, China is now one of the world's major economic entities, with a high growth rate. Indeed, it's GDP reached 47.16 trillion Yuan (7.26 trillion U.S. dollars) in 2011, up 9.2 % year on year (China statistical yearbook, 2011).

The concept of e-commerce emerged in China in 1993, when the foreign businesses in China started to use EDI to simplify trading processes (Du, 1999). Soon Chinese businesses began to adopt this new technology (Tan et.al, 2007), which subsequently developed in four stages: “Initiation” (1993–1995); “Contagion” (1995–2000); “Cooling” (2000–2004), and “Permeation” (2004 onwards) (Guo and Chen, 2005).

The Ministry of Trade and Economic Cooperation established the China International Electronic Commerce Center in 1996 to research and promote digital business (Efendioglu and Yip, 2004). By 2004, in the “Permeation” Phase, the total number of Internet-users in China had grown to 94 million, making China the second largest Internet-user market in the world (Zhu et. al, 2003). There were 0.67 million websites in China in 2004, of which 60.7% were corporate websites. Most corporate websites provide sections “About the Company (85.3%)” and “Products (81.9%)”(CNNIC, China Internet and Information Resources Investigation Report 2004). For other information, 56.6% have “Events”, 40.0% have “Contact Us”, 36.1% have “Product Search”, 18.6% have “Online Query” and 12.7% have “Virtual Community”. Just over half (50.9%) of company websites have an online database (CNNIC, China Internet and Information Resources Investigation Report 2004).

Last year Boston Consulting Group (BCG) shared research findings predicting that in the year of 2015, China's e-commerce market will worth more than RMB 2 trillion and possibly surpass the size of the U.S. market. They also stated that:

1. Less than 10 % of China's urban population shopped online in 2006. The figure jumped to 23 % in 2010 and will nearly double to 44 % by 2015.
2. An astonishing 30 million additional Chinese consumers are expected to shop online for the first time every year until 2015.
3. E-commerce in China will go from representing 3.3 % of the country's total retail value today to 7.4 % in 2015. It took the United States ten years to achieve that growth.
4. Within five years, most of today's online shoppers in China will be spending RMB 6,220 (or about $980) per year, twice what they are today. That's close to the U.S. average of $1,000. (BCG analysis, 2011).

The above figures have emphasized that the e-commerce have played an importance role in China's national economy development, therefore it is vital to explore the current situation of Chinese small businesses' adoption of e-commerce and usage of websites. Thus, this chapter has the objective to explore how entrepreneur's use of websites and e-commerce is influenced by the entrepreneurs' experience and science park location in Beijing, China.

The theoretical construct utilised are human capital theory and the RBV which has then been applied to multivariate logistic regression analysis – logit and ordinary least squares techniques. The reader is reminded that the following hypotheses are tested in the chapter.

H4a: Entrepreneurs located on a science park compared to those entrepreneurs who are located off-park will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

H4b: Entrepreneurs with greater numbers of started or bought businesses will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

H4c: Habitual entrepreneurs compared to novice entrepreneurs will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

H4d: Portfolio entrepreneurs compared to novice entrepreneurs will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

H4e: Serial entrepreneurs compared to novice entrepreneurs will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

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H5a: Entrepreneurs located on a science park with experience of starting and purchasing greater numbers of businesses will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

H5b: Habitual entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

H5c: Portfolio entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

H5d: Serial entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

The chapter is structured as follows: Section two looks at the operationalization of the business performance measures and the appropriateness of econometric techniques[15]. This is followed by the results in section three where appropriate econometric regression techniques (Ordinary least squares and Logistic). A discussion of the findings and the implications of the results is then provided in section four. Lastly, in section five a conclusion completes the chapter.

7.2 Operationalization of variables and econometric techniques

This section provides an operationalization of the twelve dependent variables which cover three sets of performance – exporting, financial performance, and growth. This is accompanied with an indication of the appropriateness of econometric techniques and evaluation criteria for the models.

Measures

Dependent variables

Respondents were asked, "Does your firm have a website? Yes No". Firms with a website were selected and those without a website were not selected. Of the 462 entrepreneurs, 93% of firms had a website and thus in this chapter we are utilizing 425 observations.

The first dependent variable is the age of the websites. Entrepreneurs who had indicated that they had a website were asked, "The year it was created." Age was then calculated as the year that the survey was implemented minus the year that the entrepreneurs indicated that their websites were created (AgeWebsite).

Respondents were asked, "Approximately, how much did it cost to create the website?" Respondents were then presented with a space to insert the cost of creating their website (CostStartWebsite).

Respondents were asked, "Approximately, how much does it cost to maintain the website annually?" Respondents were then presented with a space to insert the cost of maintaining their website (AnnualCostWebsite).

The fourth dependent variable deals with changes to the websites. More specifically, entrepreneurs were asked, "How often is your website updated?"

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[15] This section is presented in this chapter rather than the methodology chapter because the researcher feels that this reads better and avoids the reader keep having to return to a previous chapter.

Respondents were then presented with a grid where they could tick one of the following boxes: daily, weekly, monthly, less often.

219 entrepreneurs (51.5%) indicated that the websites were updated daily. 160 entrepreneurs (37.7%) indicated that the websites were updated weekly. 44 entrepreneurs (10.4%) and 2 entrepreneurs (0.5%) indicated that the websites were updated monthly and less often, respectively. In order to facilitate easier interpretation of the models, and given the distribution of the responses to the updating of the website question it was decided that a logit model would be more advantageous. Accordingly, those entrepreneurs who indicated that the websites were updated daily were coded as '1' and those entrepreneurs who indicated that the websites were updated weekly, monthly or less often were coded as '0' (UpdateWeb). The fifth dependent variable is the importance of on-line sales for sales turnover. Entrepreneurs were asked, "Currently, approximately what percentage of your turnover do you predict will be accounted for by on-line sales?" Respondents were then given a grid of options: None, 1%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45% and 50% or more. Respondents ticked or circled one response and this was entered as a series of values 1 to 12, where 1 corresponded with entrepreneurs whose businesses generated no sales turnover from on-line sales, and 12 denoted 50% or more of sales turnover came from on-line sales. The piloting of the questionnaire found that entrepreneurs were more inclined to leave this answer blank when they had to enter the exact or the approximate percentage of sales turnover which came from on-line sales. However, the inclusion of the scale employed was favourably received by the entrepreneurs and allowed the information to be harvested.

Data analysis

As was the case with the analysis of innovation in the previous chapter logistic estimation was used to identify the combination of variables associated with the propensity of entrepreneurs to report exporting. For the profit, break even and loss variables for each of the three time periods logistic regression is also appropriate and was also used to find the combination of variables associated with these overall financial performance of the businesses.

As with our earlier analysis of employment growth in chapter 6 ordinary least squares estimation techniques were used to identify the combination of variables which are associated with the age of the website, the cost of creating the website and the cost of updating the websites. Similarly, the frequency of updating of the websites was estimated using logit techniques which were initially used in chapter 5.

The fifth dependent variable requires the use of a third econometric technique. In this case the amount of on-line sales is captured by a series of values from 1 to 12. In this instance this is an ordered relationship, and accordingly ordered logit regression techniques have been followed.

For each of the five separate dependent variables a base model was established which included the set of control variables and the variables which were the first set of human capital and business characteristics. Then the science park dummy variable was added to all subsequent models, and the three sets of entrepreneurial experience were added, separately.[16]

There is no agreed goodness-of-fit measure relating to logistic regression analysis, and also to ordered logit regression techniques. Two commonly used coefficients are reported. Deviance as indicated by the log likelihood coefficient is a 'badness-of-fit' measure, and weak 'explanatory' models generally report higher deviance coefficients. The author also report the Nagelkerke R^2 values, which is a pseudo R^2 to provide a measure to show the 'explanatory' power of the models. While similar in principle to the adjusted R^2 reported in ordinary least squares regression models, non-ordinary least squares regression models generally report lower pseudo R^2 coefficients. The author also report the log likelihood coefficients of the models.

For the ordinary least squares models the goodness of fit can be captured by a variety of statistics. The R^2 value is a measure of the goodness of fit of the model and takes a potential value from 0 to 1 where 0 indicated an extremely poor model which explains zero percent of the relationship being investigated, and 1 indicates a perfect model. In reality if results are close to zero or close to 1 then the models are poor ones. The R^2 value has the potential to increase as the researcher adds more and more control and independent variables to their models. In order to control for the number of control and independent variables included in a model the adjusted R^2 statistics takes this into account and is a better yardstick of whether the model does or does not explain a high or a low percentage of cases being modeled. Accordingly the adjusted

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[16] Also we re-run the models with the independent variable of science park location removed and each of the three types of entrepreneurial experience were added.

R^2 values are reported. Additionally, the F Test statistic scores are presented. The F Test is a test which allows the researcher to see whether taken together there is or is not a statistically significant relationship between the control and independent variables, together or collectively, against the dependent variable. If an F Test is not statistically significant then this would indicate that the model was not a desirable one. Whilst if the F test is statistically significant this indicates that together the variables included in the model do indeed have a statistically significant relationship with the dependent variable.

7.3 Results

This section provides the results of the models which cover the five dependent variables which cover the variables relating to age of websites, the cost of creating and updating websites, the frequency of updating websites, and the amount of sales turnover generated from on-line sales. This allows the testing of the hypotheses relating to location and entrepreneurial experience

7.3.1 The age of the websites

The model 1 has an adjusted R^2 of 0.685 indicating that the model with the control variables, after adjusting for the number of variables included in the model is able to explain more than 68% of variation in the age of the website. The F test statistic has a value of 71.93 which is statistically significant at the 0.01 level and indicates that taken together there is a statistically significant relationship between the variables included in the model with the dependent variable.

An independent variable relating to science park location was added to the control variables and is reported in Model 2. In Model 2 the F test is statistically significant at the 0.01 level and the Adjusted R^2 is 0.692 which indicates that taking into account the number of independent variables this model is better than Model 1 by 0.007. Looking at the results in Model 2, the t-test statistic on the science park variable is statistically significant at the 0.01 level. Focusing upon the magnitude of the coefficients it is found that the entrepreneurs' firms located on science parks having an older website by approximately 0.45 units than those firms located off-park. In subsequent models there are slight changes in the coefficient values which suggests that businesses located on science parks can have a website older by up to 0.49 units than businesses located off-park. The science park dummy variable is statistically significant in models 2 to 8 and this evidence supports hypothesis H4a with regard to the age of websites.

Independent variables relating to years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 3, 4 and 5, respectively. The F tests in Models 3, 4 and 5 are individually statistically significant at the 0.01 level. In model 3 the Adjusted R^2 is 0.694. Interestingly, the respondents reporting more businesses established or purchased compared to those reporting fewer businesses established or purchased was statistically significantly related to the age of website at the 0.05 level. Hypothesis H4b is thus weakly supported with regard to the age of website.

Model 4 has an Adjusted R^2 of 0.691, which indicates that taking into account the number of independent variables this model is better than Model 1 by 0.006. Although it appeared with a positively signed coefficient but the habitual entrepreneurs variable was not statistically significant. The results suggest that there is no statistically significant difference between the ages of website for habitual entrepreneurs compared to novice entrepreneurs. Hypothesis H4c is not supported with regard to the age of website.

In Model 5 the habitual entrepreneurship variable is replaced with its more detailed constituents of two dummy variables – portfolio and serial. Model 5 has an adjusted R^2 of 0.692. The portfolio entrepreneurs variable appeared with a positively signed coefficient but it was not statistically significant. Thus, the age of website established by portfolio entrepreneurs have no significant difference compared to the website established by novice entrepreneurs. Thus, hypothesis H4d is not supported with regard to age of website.

The serial entrepreneurs variable appeared with a negative signed coefficient. The figure suggests an interesting result that when compared with the websites designed by novice entrepreneurs, the websites designed by serial entrepreneurs are even younger. Thus , Hypothesis H4e is not supported with regard to the annualized 3 year rate of employment growth.[17]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years

[17] Models 6, 7 and 8 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 3, 4 and 5.

of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 6, 7, and 8, respectively. The F tests in Models 6, 7 and 8 are each statistically significant at the 0.01 level. Model 6 has an Adjusted R^2 of 0.694. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the age of website. Thus, the evidence is not consistent with hypothesis H5a with regard to the age of website.

Model 7 has an Adjusted R^2 of 0.691. The two way interaction effect between being located on a science park and a habitual entrepreneur is not statistically significant in Model 7. The results in Model 7 provides evidence which do not support hypothesis H5b with regard to the age of website. The last column and set of results in Table 7.1 relate to Model 8. In Model 8 a set of two entrepreneurial experience and science park location variables are included: portfolio entrepreneurs on a science park against other types of firms, and secondly serial entrepreneurs on science parks compared to other types of firms.

Model 8 has an Adjusted R^2 of 0.690. The value of the coefficients was 0.12 for firms located on a science park who are portfolio entrepreneurs, and 0.10 for firms located on a science park who are serial entrepreneurs. Both of the interaction variables are not statistically significant. Accordingly, there is evidence which do not supports hypothesis H5c with regard to the age of website, and also not in support of hypothesis H5d with regard to the age of website.

7.3.2 The cost of creating the websites

The author performed ordinary least squares estimates of the cost of creating the websites dependent variable. Control variables relating to the cost of website were included in Model 9 in Table 7.2.

The model 9 has an Adjusted R^2 of 0.226 indicating that the model with the control variables, after adjusting for the number of variables included in the model is able to explain approaching 23% of variation in the cost of creating the websites. The F test evaluates the null hypothesis that in the population the coefficients on the variables included in the model equal zero. The F test statistic has a value of 10.49 which is statistically significant at the 0.01 level and indicates that taken together there is a statistically significant relationship between the variables included in the model with the dependent variable.

An independent variable relating to science park location was added to the control variables and is reported in Model 10. The F test in Model 10 is statistically significant at the 0.01 level and the Adjusted R^2 is 0.235 which is a slight increase of 0.009 compared with Model 9. Observing the results in Model 10, the t-test statistic on the science park variable is statistically significant at the 0.01 level. This shows that entrepreneurs firms located on science parks spend by approximately 4% more than those firms located off-park.

Table 7.1 Estimates of an ordinary least squares model of the age of a website.

	Model 1	Model2	Model 3	Model4	Model 5	Model6	Model7	Model8
Control Variables								
Software	0.05 (0.23)	0.02 (0.23)	0.02 (0.23)	0.02 (0.23)	0.02 (0.23)	0.02 (0.23)	0.02 (0.23)	0.02 (0.23)
Computer Services	0.24 (0.26)	0.25 (0.25)	0.24 (0.25)	0.24 (0.25)	0.24 (0.25)	0.23 (0.25)	0.24 (0.25)	0.25 (0.25)
Business Services	0.03 (0.23)	0.06 (0.23)	0.06 (0.23)	0.06 (0.23)	0.06 (0.23)	0.06 (0.23)	0.06 (0.23)	0.06 (0.23)
Electronic & IT Hardware	**0.53 (0.25)^{b}**	**0.48 (0.25)^{c}**	**0.57 (0.25)^{b}**	**0.54 (0.25)^{b}**	**0.53 (0.25)^{b}**	**0.57 (0.25)^{b}**	**0.48 (0.25)^{b}**	**0.53 (0.25)^{b}**
Age of Business	**0.69 (0.03)^{a}**	**0.68 (0.03)^{a}**	**0.67 (0.03)^{a}**	**0.67 (0.03)^{a}**	**0.67 (0.03)^{a}**	**0.67 (0.03)^{a}**	**0.68 (0.03)^{a}**	**0.67 (0.03)^{a}**
Size	0.09 (0.11)	0.12 (0.11)	0.12 (0.10)	0.12 (0.10)	0.12 (0.10)	0.12 (0.10)	0.12 (0.11)	0.12 (0.10)
Own Savings	0.02 (0.15)	0.06 (0.15)	0.07 (0.15)	0.07 (0.15)	0.07 (0.15)	0.07 (0.15)	0.06 (0.15)	0.07 (0.15)
Gender	0.15 (0.22)	0.14 (0.22)	0.12 (0.22)	0.13 (0.22)	0.13 (0.22)	0.13 (0.22)	0.13 (0.22)	0.13 (0.22)
Age of Entrepreneur	**0.05 (0.01)^{a}**	**0.04 (0.01)^{a}**	**0.04 (0.01)^{a}**	**0.04 (0.01)^{a}**	**0.04 (0.01)^{a}**	**0.04 (0.01)^{a}**	**0.04 (0.01)^{a}**	**0.04 (0.01)^{a}**
Relative	0.25 (0.26)	0.33 (0.25)	0.33 (0.25)	0.33 (0.25)	0.33 (0.25)	0.33 (0.25)	0.33 (0.25)	0.33 (0.25)
Degree	-0.14 (0.14)	-0.11 (0.14)	-0.11 (0.14)	-0.11 (0.14)	-0.11 (0.14)	-0.11 (0.14)	-0.11 (0.14)	-0.11 (0.14)
Partners	-0.05 (0.06)	-0.02 (0.06)	-0.02 (0.06)	-0.02 (0.06)	-0.02 (0.06)	-0.02 (0.06)	-0.02 (0.06)	-0.02 (0.06)
Business Advice	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)
Main Effects								
Science Park (SP)	--------	**0.45 (0.14)^{a}**	**0.47 (0.14)^{a}**	**0.45 (0.14)^{a}**	**0.45 (0.14)^{a}**	**0.48 (0.14)^{a}**	**0.49 (0.14)^{a}**	**0.45 (0.14)^{a}**
Number of businesses	--------	--------	**0.08 (0.03)^{b}**	--------	--------	**0.08 (0.03)^{b}**	--------	--------
Habitual	--------	--------	--------	0.03 (0.16)	--------	--------	0.03 (0.16)	--------
Serial	--------	--------	--------	--------	-0.13 (0.22)	--------	--------	-0.17 (0.29)
Portfolio	--------	--------	--------	--------	0.10 (0.17)	--------	--------	0.16 (0.23)
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	0.07 (0.07)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	0.07 (0.13)	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	0.10 (0.41)
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	0.12 (0.30)
Constant	**-1.93 (0.60)^{a}**	**-2.36 (0.61)^{a}**	**-2.16 (0.61)^{a}**	**-2.35 (0.61)^{a}**	**-2.29 (0.61)^{a}**	**-2.02 (0.63)^{a}**	**-2.38 (0.63)^{a}**	**-2.34 (0.63)^{a}**
F Test	**71.93^{a}**	**69.08^{a}**	**65.13^{a}**	**64.33^{a}**	**60.44^{a}**	**61.10^{a}**	**60.17^{a}**	**53.54^{a}**
R^2	0.690	0.702	0.705	0.702	0.703	0.706	0.702	0.704
Adjusted R^2	0.685	0.692	0.694	0.691	0.692	0.694	0.691	0.690
Change in Adjusted R^2	--------	0.007	0.009	0.006	0.007	0.009	0.006	0.005

Notes: n=425 Excluded sector, training; novice is the excluded comparison for serial and portfolio. ^{a} $p < 0.10$; ^{b} $p < 0.05$; ^{c} $p < 0.01$

Table 7.2 Estimates of an ordinary least squares model of the costs of creating a website.

	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
Control Variables								
Software	**4.87 (2.82)[c]**	**5.17 (2.80)[c]**	**5.17 (2.80)[c]**	**5.17 (2.80)[c]**	**5.17 (2.80)[c]**	**5.17 (2.80)[c]**	**5.10 (2.80)[c]**	**5.10 (2.80)[c]**
Computer Services	1.16 (3.22)	1.11 (3.20)	1.11 (3.20)	1.11 (3.20)	1.10 (3.20)	1.12 (3.20)	1.10 (3.20)	1.10 (3.20)
Business Services	1.15 (2.87)	2.01 (2.89)	2.01 (2.90)	2.02 (2.90)	2.04 (2.90)	2.01 (2.90)	2.01 (2.90)	2.01 (2.90)
Electronic & IT Hardware	**6.43 (3.16)[b]**	**6.94 (3.15)[b]**	**6.95 (3.15)[b]**	**7.06 (3.20)[b]**	**6.80 (3.20)[b]**	**7.02 (3.20)[b]**	**6.95 (3.15)[b]**	**6.95 (3.15)[b]**
Age of Business	**1.97 (0.41)[a]**	**2.07 (0.41)[a]**	**2.05 (0.41)[a]**	**2.07 (0.41)[a]**	**2.05 (0.41)[a]**	**1.95 (0.41)[a]**	**2.05 (0.41)[a]**	**2.05 (0.41)[a]**
Size	1.29 (1.32)	0.99 (1.31)	1.02 (1.32)	1.03 (1.32)	1.02 (1.32)	0.96 (1.31)	0.96 (1.31)	0.96 (1.31)
Own Savings	0.31 (0.86)	0.11 (0.85)	0.12 (0.85)	0.12 (0.85)	0.12 (0.85)	0.12 (0.85)	0.12 (0.85)	0.12 (0.85)
Gender	-2.26 (2.77)	-2.21 (2.75)	-2.25 (2.75)	-2.26 (2.75)	-2.25 (2.75)	-2.25 (2.75)	-2.25 (2.75)	-2.25 (2.75)
Age of Entrepreneur	**0.40 (0.12)[a]**	**0.41 (0.12)[a]**	**0.39 (0.14)[a]**	**0.40 (0.13)[a]**	**0.40 (0.13)[a]**	**0.41 (0.14)[a]**	**0.41 (0.14)[a]**	**0.42 (0.14)[a]**
Relative	**6.13 (3.22)[c]**	**5.37 (3.22)[c]**	**5.37 (3.19)[c]**	**5.37 (3.22)[c]**	**5.37 (3.22)[c]**	**5.44 (3.21)[c]**	**5.37 (3.22)[c]**	**5.37 (3.22)[c]**
Degree	**-2.56 (0.77)[a]**	**-2.78 (0.79)[a]**	**-2.82 (0.79)[a]**	**-2.80 (0.79)[a]**	**-2.78 (0.79)[a]**	**-2.84 (0.79)[a]**	**-2.80 (0.79)[a]**	**-2.80 (0.79)[a]**
Partners	**1.89 (0.77)[b]**	**1.59 (0.77)[b]**	**1.59 (0.76)[b]**	**1.59 (0.77)[b]**	**1.59 (0.77)[b]**	**1.59 (0.77)[b]**	**1.59 (0.77)[b]**	**1.59 (0.77)[b]**
Business Advice	0.47 (0.41)	0.45 (0.41)	0.39 (0.41)	0.37 (0.41)	0.37 (0.41)	0.39 (0.41)	0.38 (0.41)	0.39 (0.41)
Main Effects								
Science Park (SP)	--------	**4.21 (1.74)[a]**	**4.16 (1.75)[b]**	**4.21 (1.74)[b]**	**4.18 (1.75)[b]**	**4.23 (1.73)[b]**	**4.21 (1.74)[b]**	**4.22 (1.74)[b]**
Number of businesses	--------	--------	0.19 (0.55)	--------	--------	0.21 (0.55)	--------	--------
Habitual	--------	--------	--------	0.43 (0.77)	--------	--------	0.42 (0.77)	--------
Serial	--------	--------	--------	--------	2.38 (2.71)	--------	--------	2.45 (2.71)
Portfolio	--------	--------	--------	--------	1.33 (1.50)	--------	--------	1.34 (1.51)
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	**1.43 (0.09)[a]**	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**7.58 (3.53)[b]**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	4.82 (5.35)
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**7.25 (3.76)[c]**
Constant	**-29.52 (0.76)[a]**	**-25.51 (0.77)[a]**	**-25.01 (0.78)[a]**	**-25.35 (0.77)[a]**	**-26.14 (0.78)[a]**	**-27.91 (0.80)[a]**	**-28.55 (0.78)[a]**	**-28.75 (0.80)[a]**
F Test	**10.49[a]**	**10.27[a]**	**9.58[a]**	**9.57[a]**	**9.17[a]**	**9.05[a]**	**9.34[a]**	**9.09[a]**
Adjusted R^2	0.226	0.235	0.234	0.234	0.234	0.237	0.240	0.245
Change in Adjusted R^2	--------	0.009	0.008	0.008	0.008	0.011	0.014	0.019

Notes: n=425 Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

In subsequent models there are changes in the coefficient values which suggests that businesses located on science parks can spend by up to 4.23% more than businesses located off-park. The science park dummy variable is statistically significant in models 10 to 16 and this evidence supports hypothesis H4a with regard to the cost of creating websites.

Independent variables relating to years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 11, 12 and 13, respectively. The F tests in Models 11, 12 and 13 are individually statistically significant at the 0.01 level.

In model 11 the Adjusted R^2 is 0.234. However, the respondents reporting more businesses established or purchased compared to those reporting fewer businesses established or purchased were not statistically significantly related to the cost of creating the websites. Hypothesis H4b is thus not supported with regard to the cost of creating the websites.

Model 12 has an Adjusted R^2 of 0.234. The habitual entrepreneurs variable was not statistically significant compared with novice entrepreneurs. Thus, Hypothesis H4c is not supported with regard to the cost of creating the websites.

Model 13 replaces the habitual entrepreneurship variable with the two dummy variables for portfolio and serial entrepreneur, respectively. Model 13 has an Adjusted R^2 of 0.234. The coefficient of portfolio entrepreneurs variable is positive and the magnitude is 1.33, however the portfolio entrepreneurs variable was not statistically significant. Thus, portfolio entrepreneurs do not spend more money on the creating of websites compared to the novice entrepreneurs. Thus, hypothesis H4d is not supported with regard to the cost of creating the websites.

The serial entrepreneurs variable also appeared with a positively signed coefficient but it was not statistically significant either. The results suggest that there is no statistically significant difference between the cost of creating of the websites for serial entrepreneurs compared to novice entrepreneurs. Hypothesis H4e is not supported with regard to the cost of creating the websites.[18]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years

[18] Models11, 12 and 13 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 11, 12 and 13.

of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 14, 15, and 16, respectively. The F tests in Models 14, 15 and 16 are each statistically significant at the 0.01 level.

Model 14 has an Adjusted R^2 of 0.237. The two way interaction effect is statistically significant at 0.01 level and the magnitude is 1.43. Comparing model 14 with model 11 it is apparent that the inclusion of the interaction effect has increased the t-test magnitude from 0.19 to 1.43. This evidence shows that there is highly significant interaction between being located on a science park and the number of businesses which have been established or purchased against the cost of creating the websites. Thus, the evidence is consistent with hypothesis H5a with regard to the cost of creating the websites.

Model 15 has an Adjusted R^2 of 0.240. The two way interaction effect is found to be statistically significant at the 0.05 level in Model 15. The two way interaction effect being statistically significant indicates that those firms located on a science park who are habitual entrepreneurs spend more money to create websites compared to the other firms. This weakly supports hypothesis H5b with regard to the cost of creating the websites.

Model 16 is the model where the entrepreneurial experience and science park interaction effects is captured by the two dummy variables: portfolio entrepreneurs on a science park against other types of firms, and secondly serial entrepreneurs on science parks compared to other types of firms.

Model 16 also has an Adjusted R^2 of 0.245. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.10 level. The value of the coefficient is 7.25. Thus, firms located on a science park who are portfolio entrepreneurs spend 7.25 more units to the creation of websites compared to other firms. Thus, this evidence weakly supports hypothesis H5c with regard to the cost of creating the websites.

Additionally, in Model 16 the interaction term for firms located on a science park and where they are serial entrepreneurs shows a positive coefficient. However, the two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and where the entrepreneurs are serial entrepreneurs against the cost of creating the websites. Thus, the evidence is not consistent with hypothesis H5d with regard to the cost of creating the websites.

7.3.3 The cost of maintaining the websites

The author performed ordinary least squares estimates of the cost of maintaining the websites dependent variable. Control variables relating to the propensity to spend money towards maintaining the websites were included in Model 17 in Table 7.3.

The model 17 has an adjusted R^2 of 0.235 indicating that the model with the control variables, after adjusting for the number of variables included in the model is able to explain slightly more than 23% of variation in the cost of maintaining the websites. The F test statistic has a value of 10.43 which is statistically significant at the 0.01 level and indicates that taken together there is a statistically significant relationship between the variables included in the model with the dependent variable.

An independent variable relating to science park location was added to the control variables and is reported in Model 18. In Model 18 the F test is statistically significant at the 0.01 level and the Adjusted R^2 is 0.258 which indicates that taking into account the number of independent variables this model is better than Model 17 by 0.023. Looking at the results in Model 18, the t-test statistic on the science park variable is statistically significant at the 0.01 level. Focusing upon the magnitude of the coefficients it is found that the entrepreneurs' firms located on science parks spend 2.10 units more than those firms located off-park towards the maintaining of websites. In subsequent models there are no changes in the coefficient values which suggests that businesses located on science parks spend exactly 2.10 units more than businesses located off-park. The science park dummy variable is statistically significant in models 18 to 24 and this evidence supports hypothesis H4a with regard to the cost of maintaining the websites.

Independent variables relating to years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 19, 20 and 21, respectively. The F tests in Models 19, 20 and 21 are individually statistically significant at the 0.01 level.

In model 19 the Adjusted R^2 is 0.256. Interestingly, the respondents reporting more businesses established or purchased compared to those reporting fewer businesses established or purchased was not statistically significantly related to the cost of maintaining the websites. Hypothesis H4b is thus not supported with regard to the cost of maintaining the websites.

Model 20 has an Adjusted R^2 of 0.256. The habitual entrepreneurs appeared with a positively signed coefficient, but was not statistically significant. Thus, the habitual entrepreneurs do not spend money on the maintaining of the websites more than that of the novice entrepreneurs. Hypothesis H4c is not supported with regard to the cost of maintaining the websites.

In Model 21 the habitual entrepreneurship variable is replaced with its more detailed constituents of two dummy variables – portfolio and serial. Model 21 has an adjusted R^2 of 0.255. The coefficient of portfolio entrepreneurs variable was positive, but it was not statistically significant. This evidence indicates portfolio entrepreneurs have relatively same spending for the cost of maintaining the websites compared to the novice entrepreneurs. Thus, hypothesis H4d is not supported with regard to the cost of maintaining the websites.

The serial entrepreneurs variable also appeared with a positively signed coefficient but it was not statistically significant either. The results suggest that there is no statistically significant difference between the costs of maintaining the websites for serial entrepreneurs compared to novice entrepreneurs. Hypothesis H4e is not supported with regard to the cost of maintaining the websites.[19]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 22, 23, and 24, respectively. The F tests in Models 22, 23 and 24 are each statistically significant at the 0.01 level.

Model 22 has an Adjusted R^2 of 0.257. The two way interaction effect is statistically significant at 0.01 level and shows that there is highly significant interaction between being located on a science park and the number of businesses which have been established or purchased against the cost of maintaining the websites. Thus, the evidence is consistent with hypothesis H5a with regard to the cost of maintaining the websites.

Model 23 has an adjusted R^2 of 0.261. The two way interaction effect between being located on a science park and a habitual entrepreneur is found to be statistically significant at the 0.10 level in Model 23. The results in Model 23 provides evidence

[19] Models 19, 20 and 21 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 19, 20 and 21.

in weakly support of hypothesis H5b with regard to the cost of maintaining the websites.

The last column and set of results in Table 7.3 relate to Model 24. In Model 24 a set of two entrepreneurial experience and science park location variables are included: portfolio entrepreneurs on a science park against other types of firms, and secondly serial entrepreneurs on science parks compared to other types of firms.

Model 24 has an Adjusted R^2 of 0.269. Both of the interaction variables are statistically significant at the 0.01 level. The value of the coefficients was 1.75 for firms located on a science park who are portfolio entrepreneurs, and 1.48 for firms located on a science park who are serial entrepreneurs. Both of the coefficients were statistically significant at the 0.01. When the results in Model 24 are compared with those in Model 21 the Adjusted R2 value increases from 0.255 to 0.269. Accordingly, there is evidence which supports hypothesis H5c with regard to the cost of maintaining the websites, and also in support of hypothesis H5d with regard to the cost of maintaining the websites.

Table 7.3 Estimates of an ordinary least squares model of the annual costs of maintaining a website.

	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22	Model 23	Model 24
Control Variables								
Software	**2.58 (0.93)[a]**	**2.71 (0.92)[a]**	**2.71 (0.92)[a]**	**2.71 (0.92)[a]**	**2.71 (0.92)[a]**	**2.71 (0.92)[a]**	**2.70 (0.92)[a]**	**2.72 (0.92)[a]**
Computer Services	1.04 (1.05)	1.02 (1.03)	1.03 (1.03)	1.03 (1.03)	1.03 (1.03)	1.03 (1.03)	1.03 (1.03)	1.03 (1.03)
Business Services	0.46 (0.96)	0.57 (0.95)	0.57 (0.95)	0.57 (0.95)	0.57 (0.95)	0.57 (0.95)	0.57 (0.95)	0.57 (0.95)
Electronic & IT Hardware	**1.55 (0.54)[a]**	**1.35 (0.39)[a]**	**1.39 (0.39)[a]**	**1.39 (0.39)[a]**	**1.39 (0.39)[a]**	**1.40 (0.39)[a]**	**1.40 (0.39)[a]**	**1.40 (0.39)[a]**
Age of Business	**0.48 (0.14)[a]**	**0.53 (0.14)[a]**	**0.53 (0.14)[a]**	**0.53 (0.14)[a]**	**0.54 (0.14)[a]**	**0.51 (0.14)[a]**	**0.52 (0.14)[a]**	**0.53 (0.14)[a]**
Size	0.37 (0.44)	0.23 (0.43)	0.22 (0.43)	0.22 (0.43)	0.23 (0.43)	0.21 (0.43)	0.21 (0.43)	0.20 (0.43)
Own Savings	0.32 (0.63)	0.37 (0.62)	0.37 (0.62)	0.37 (0.62)	0.37 (0.62)	0.37 (0.62)	0.37 (0.62)	0.37 (0.62)
Gender	0.20 (0.92)	0.23 (0.90)	0.23 (0.90)	0.22 (0.91)	0.22 (0.91)	0.22 (0.91)	0.22 (0.91)	0.22 (0.91)
Age of Entrepreneur	**0.16 (0.04)[a]**	**0.17 (0.04)[a]**	**0.17 (0.04)[a]**	**0.17 (0.04)[a]**	**0.17 (0.04)[a]**	**0.17 (0.04)[a]**	**0.17 (0.04)[a]**	**0.17 (0.04)[a]**
Relative	0.71 (1.05)	0.69 (1.04)	0.69 (1.04)	0.69 (1.04)	0.69 (1.04)	0.69 (1.04)	0.69 (1.04)	0.69 (1.04)
Degree	-0.19 (0.58)	0.34 (0.58)	0.34 (0.58)	0.34 (0.58)	0.34 (0.58)	0.34 (0.58)	0.34 (0.58)	0.34 (0.58)
Partners	**0.82 (0.25)[a]**	**0.67 (0.25)[a]**	**0.67 (0.25)[a]**	**0.67 (0.25)[a]**	**0.66 (0.25)[a]**	**0.67 (0.25)[a]**	**0.68 (0.25)[a]**	**0.68 (0.25)[a]**
Business Advice	**0.42 (0.13)[a]**	**0.34 (0.13)[b]**	**0.34 (0.13)[b]**	**0.34 (0.13)[b]**	**0.34 (0.13)[b]**	**0.34 (0.13)[b]**	**0.35 (0.13)[b]**	**0.34 (0.13)[b]**
Main Effects								
Science Park (SP)	--------	**2.10 (0.57)[a]**	**2.10 (0.58)[a]**	**2.10 (0.57)[a]**	**2.10 (0.57)[a]**	**2.10 (0.57)[a]**	**2.10 (0.57)[a]**	**2.10 (0.57)[a]**
Number of businesses	--------	--------	0.38 (0.55)	--------	--------	0.35 (0.50)	--------	--------
Habitual	--------	--------	--------	0.66 (0.67)	--------	--------	0.70 (0.87)	--------
Serial	--------	--------	--------	--------	0.34 (0.91)	--------	--------	0.35 (0.91)
Portfolio	--------	--------	--------	--------	0.37 (0.70)	--------	--------	0.38 (0.68)
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	**0.87 (0.09)[a]**	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**2.09 (2.17)[c]**	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**1.48 (0.32)[a]**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**1.75 (0.30)[a]**
Constant	**-12.89 (2.53)[a]**	**-10.96 (2.54)[a]**	**-11.06 (2.59)[a]**	**-10.94 (2.56)[a]**	**-11.02 (2.57)[a]**	**-11.79 (2.65)[a]**	**-11.78 (2.59)[a]**	**-11.55 (2.59)[a]**
F Test	**10.43[a]**	**10.95[a]**	**10.20[a]**	**10.19[a]**	**9.55[a]**	**9.67[a]**	**9.81[a]**	**9.88[a]**
Adjusted R^2	0.235	0.258	0.256	0.256	0.255	0.257	0.261	0.269
Change in Adjusted R^2	--------	0.023	0.021	0.021	0.020	0.022	0.026	0.034

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

7.3.4 The frequency of updating the websites

This dependent variable deals with the frequency of updating the websites. In the questionnaire respondents were asked, “How often is your website updated?” entrepreneurs were then presented with a table of four possible answers: daily, weekly, monthly, less often, where they could tick one of them. In order to gain better understanding of the model, it was decided a logit model would be appropriate here. Accordingly, those entrepreneurs who indicated that the websites were updated daily were coded as ‘1’ and those entrepreneurs who indicated that the websites were updated weekly, monthly or less often were coded as ‘0’. Logistic regression analysis is utilized when the dependent variables takes values of 0 or 1, the author performed the maximum likelihood estimates of the dichotomous dependent variable relating to “updating daily” and ” non updating daily”. A series of control variables relating to the propensity of updating the websites were included in Model 25 in Table 7.4. The model has a Nagelkerke R^2 of 0.117 and is significant at the 0.01 level.

In Model 26 the author have added the science park location variable to the same set of variables included in Model 25. Model 26 has a Nagelkerke R2 of 0.118 and this was significant at the 0.01 level. The science parks variable is not statistically significant at the 0.10 level, or better. This evidence does not supports hypothesis H4a with regard to the frequency of updating the website

Next, Model 26 was separately augmented with three different types of entrepreneurial experience one at a time in Models 27, 28 and 29. Each of these later three models was statistically significant at the 0.01 level.

Model 27 has a Nagelkerke R^2 of 0.118 and is significant at the 0.01 level. Entrepreneurs with more businesses when established or purchased were updating websites significantly more frequently than entrepreneurs with less businesses when established or purchased but this relationship is only weakly statistically significant at the 0.10 level. Thus, hypothesis H4b is weakly supported with regard to frequency of updating the websites.

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Table 7.4 Estimates of a logit model of the expectation of daily updating of a website.

	Model 25	Model 26	Model 27	Model 28	Model 29	Model 30	Model 31	Model 32
Control Variables								
Software	**0.74 (0.36)[b]**	**0.75 (0.36)[b]**	**0.75 (0.36)[b]**	**0.75 (0.36)[b]**	**0.75 (0.36)[b]**	**0.74 (0.36)[b]**	**0.76 (0.36)[b]**	**0.77 (0.36)[b]**
Computer Services	**0.79 (0.40)[b]**	**0.79 (0.40)[b]**	**0.79 (0.40)[b]**	**0.79 (0.40)[b]**	**0.79 (0.40)[b]**	**0.80 (0.40)[b]**	**0.79 (0.40)[b]**	**0.79 (0.40)[b]**
Business Services	0.22 (0.36)	0.26 (0.36)	0.26 (0.36)	0.28 (0.36)	0.28 (0.36)	0.27 (0.36)	0.27 (0.36)	0.28 (0.36)
Electronic & IT Hardware	-0.31 (0.40)	-0.29 (0.40)	-0.24 (0.40)	-0.25 (0.40)	-0.25 (0.41)	-0.24 (0.40)	-0.24 (0.40)	-0.24 (0.40)
Age of Business	**0.14 (0.05)[a]**	**0.14 (0.05)[a]**	**0.14 (0.05)[a]**	**0.14 (0.05)[a]**	**0.13 (0.05)[b]**	**0.13 (0.05)[b]**	**0.13 (0.05)[b]**	**0.13 (0.05)[b]**
Size	**0.26 (0.12)[b]**	**0.26 (0.12)[b]**	**0.26 (0.12)[b]**	**0.26 (0.12)[b]**	**0.26 (0.12)[b]**	**0.26 (0.12)[b]**	**0.26 (0.12)[b]**	**0.26 (0.12)[b]**
Own Savings	**0.49 (0.23)[b]**	**0.48 (0.23)[b]**	**0.48 (0.23)[b]**	**0.48 (0.23)[b]**	**0.48 (0.23)[b]**	**0.48 (0.23)[b]**	**0.48 (0.23)[b]**	**0.48 (0.23)[b]**
Gender	**0.76 (0.35)[b]**	**0.76 (0.35)[b]**	**0.76 (0.35)[b]**	**0.76 (0.35)[b]**	**0.77 (0.35)[b]**	**0.78 (0.35)[b]**	**0.78 (0.35)[b]**	**0.78 (0.35)[b]**
Age of Entrepreneur	**0.04 (0.02)[c]**	**0.04 (0.02)[c]**	**0.04 (0.02)[c]**	**0.04 (0.02)[c]**	**0.04 (0.02)[c]**	**0.04 (0.02)[c]**	**0.04 (0.02)[c]**	**0.04 (0.02)[c]**
Relative	0.54 (0.41)	0.52 (0.41)	0.52 (0.41)	0.50 (0.41)	0.50 (0.41)	0.52 (0.41)	0.52 (0.41)	0.53 (0.41)
Degree	0.16 (0.22)	0.15 (0.22)	0.15 (0.22)	0.14 (0.22)	0.14 (0.22)	0.14 (0.22)	0.14 (0.22)	0.14 (0.22)
Partners	**0.34 (0.10)[a]**	**0.34 (0.10)[a]**	**0.34 (0.10)[a]**	**0.33 (0.10)[a]**	**0.34 (0.10)[a]**	**0.34 (0.10)[a]**	**0.34 (0.10)[a]**	**0.34 (0.10)[a]**
Business Advice	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)
Main Effects								
Science Park (SP)	--------	0.31 (0.37)	0.31 (0.37)	0.32 (0.37)	0.32 (0.37)	0.31 (0.37)	0.31 (0.37)	0.32 (0.37)
Number of businesses	--------	--------	**0.05 (0.03)[c]**	--------	--------	**0.10 (0.05)[b]**	--------	--------
Habitual	--------	--------	--------	0.16 (0.25)	--------	--------	0.20 (0.34)	--------
Serial	--------	--------	--------	--------	0.04 (0.34)	--------	--------	0.03 (0.35)
Portfolio	--------	--------	--------	--------	**0.21 (0.03)[a]**	--------	--------	**0.22 (0.04)[a]**
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	0.12 (0.13)	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	0.44 (0.34)	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**0.50 (0.09)[a]**
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**0.58 (0.05)[a]**
Constant	**-6.11 (1.04)[a]**	**-5.97 (1.06)[a]**	**-5.85 (1.08)[a]**	**-5.92 (1.07)[a]**	**-5.88 (1.07)[a]**	**-6.09 (1.10)[a]**	**-6.24 (1.09)[a]**	**-6.14 (1.09)[a]**
Log likelihood	-260.07	-259.81	-259.55	-259.60	-259.45	-259.00	-258.31	-257.75
Likelihood Ratio	**68.65[a]**	**69.16[a]**	**69.68[a]**	**69.58[a]**	**69.88[a]**	**70.77[a]**	**72.15[a]**	**73.27[a]**
Nagelkerke R^2	0.117	0.118	0.118	0.118	0.119	0.120	0.123	0.125
Change in Nagelkerke R^2	--------	0.001	0.001	0.001	0.002	0.003	0.006	0.008

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. [a] $p < 0.10$; [b] $p < 0.05$; [c] $p < 0.01$

In Model 28 the Nagelkerke R^2 is 0.118 and this was the same measure of goodness of fit found in Model 27. Thus, the inclusion of the habitual entrepreneurs has no visible improvement on the model specification. The habitual entrepreneurs appeared with a positively signed coefficient but this was not statistically significant. This result does not support hypothesis H4c with regard to the frequency of updating the websites.

Model 29 replaces the habitual entrepreneurship variable with the two dummy variables for portfolio and serial entrepreneur, respectively. Model 29 has a Nagelkerke R^2 of 0.119 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly more likely than novice entrepreneurs to update websites frequently, this relationship is statistically significant at the 0.01 level. Thus, hypothesis H4d is supported with regard to the frequency of updating the websites.

The serial entrepreneurs variable appeared with a positively signed coefficient but this was not statistically significant at the 0.10 level or better. The results suggest that serial entrepreneurs were not more likely than novice entrepreneurs to update websites. The data is not consistent with regard to Hypothesis H4e and frequency or updating the websites.[20]

Independent variables relating to the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs were individually included in Models 30, 31 and 32, respectively. Models 30, 31 and 32 are each statistically significant at the 0.01 level.

In Model 30 the Nagelkerke R^2 is 0.120. The two way interaction effect is found to not be statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the other entrepreneurial experience and location scenarios. Thus, the evidence is not consistent with hypothesis H5a with regard to the frequency of updating the websites.

Model 31 has a Nagelkerke R^2 of 0.123. The habitual entrepreneurship and science park location interaction term is not statistically significant at the 0.10 level or

[20] Models 27, 28 and 29 were also re-run with the independent variable of science park location removed. The measures of entrepreneurial experience results in these re-run models remained very similar to those reported in Models 27, 28 and 29.

better. Thus, the evidence is not consistent with hypothesis H5b with regard to the frequency of updating the websites.

The last column of Table 7.4 presents the results for Model 32 where the habitual and science park two way interaction effect is replaced with two variables of interaction effects: between science park location and portfolio, and serial entrepreneurs, respectively. In Model 32 the Nagelkerke R^2 is 0.125 and is statistically significant at the 0.01 level.

The interaction effect of those firms located on a science park who are portfolio entrepreneurs appears with a positively signed coefficient and this is statistically significant at the 0.01 level which is what was expected. Thus, the evidence is consistent with regard to hypothesis H5c with regard to the frequency of updating the websites.

Similarly, the second interaction term in Model 32 of firms located on a science park and where they are serial entrepreneurs was also statistically significant at the 0.01 level. Thus, the evidence does support hypothesis H5d with regard to the frequency of updating the websites.

7.3.5 Turnover generated by on-line sales

In the survey, entrepreneurs were asked, "Currently, approximately what percentage of your turnover do you predict will be accounted for by on-line sales?" Respondents were then given an order of options: None, 1%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45% and 50% or more. Respondents ticked or circled one response and this was entered as a series of values 1 to 12. In this instance this is an ordered relationship, and accordingly ordered logit regression techniques have been utilized.

Control variables relating to the propensity to be generating more sales online were included in Model 33 in Table 7.5. The model has a Nagelkerke R^2 of 0.089 and is significant at the 0.01 level.

It was then necessary to augment the Model 33 with a dummy variable of science park or off-park location and these results are shown in Model 34 in Table 7.5. Model 34 is statistically significant at the 0.01 level and the Nagelkerke R^2 is 0.091. The Nagelkerke R^2 in Model 34 was 0.002 greater than that found in the base model of Model 33. The results shown in Model 34 indicate that entrepreneurs located on science parks were more likely to be profitable online compared to those located off-park and this evidence supports hypothesis H4a.

Next, the independent variables relating to the three different measures of experience are added to the independent variables included in Model 34 and these augmented models are shown in Models 35, 36 and 37. These three models are all statistically significant at the 0.01 level.

Model 35 has a Nagelkerke R^2 of 0.093. The inclusion of the number of businesses established or purchased has improved the goodness of fit of the model, this additional independent variable was found to be statistically significant at the 0.10 level. Thus, the results are weakly consistent with hypothesis H4b with regard to the turnover generated by online sales.

Model 36 has a Nagelkerke R^2 of 0.097. Here the measure of entrepreneurship experience which has been incorporated into the model is the habitual entrepreneurs dummy variable, the coefficient has a positive sign, but this is not statistically significant at the 0.10 level or better. Thus, habitual entrepreneurs were not more likely than novice entrepreneurs to gain profit from online sales. Hypothesis H4c is not supported with regard to the turnover generated by online sales.

In Model 37 entrepreneurial experience is captured by two dummy variables for being a portfolio and a serial entrepreneur, respectively. Model 37 has a Nagelkerke R^2 of 0.097 and is significant at the 0.01 level. Portfolio entrepreneurs were significantly more likely than novice entrepreneurs to be able to generate profit online. This relationship was strongly statistically significant at the 0.01 level. Thus, hypothesis H4d is supported with regard to the turnover generated by online sales.

However, in the case of the serial entrepreneurs variable this was not statistically significant at the 0.10 level or better. Thus, serial entrepreneurs were not more likely than novice entrepreneurs to report being profitable from online sales. The data is not consistent with regard to Hypothesis H4e and being profitable online.

The last three columns of Table 7.5 show the results for Models 38, 39 and 40 and these incorporate the two-way interaction effects between science park location, and the three measures of entrepreneurial experience of: years of experience, habitual entrepreneurship, and portfolio and serial (compared to novice) entrepreneurs. Models 38, 39 and 40 are each statistically significant at the 0.01 level.

Model 38 has a Nagelkerke R^2 of 0.117. The two way interaction effect is statistically significant at 0.05 level. This indicates that there is interaction between being located on a science park and the number of businesses which have been established or purchased against the turnover generated by online sales. Thus, the evidence is weakly consistent with hypothesis H5a with regard to the turnover generated by online sales.

Model 39 has a Nagelkerke R^2 of 0.132. The two way interaction effect of being an habitual entrepreneur and science park location has a positively signed coefficient and this is statistically significant at the 0.01 level. Thus the data is consistent with regard to hypothesis H5b with regard to the turnover generated by online sales.

Model 40 has a Nagelkerke R^2 of 0.139. This model looks at the third set of measures of entrepreneurial experience: between science park location and portfolio, and serial entrepreneurs. The interaction effect of those firms located on a science park who are portfolio entrepreneurs is statistically significant at the 0.01 level. Thus, firms located on a science park who are portfolio entrepreneurs are more likely to generate online sales and this supports hypothesis H5c.

The second interaction effect variable of firms located on a science park and where they are serial entrepreneurs is also found to be highly statistically significant at the 0.01 level. Thus, the evidence supports hypothesis H5d with regard to the turnover generated by online sales.

Table 7.5 Estimates of an ordered logit model of the expectation of turnover being generated by on-line sales.

	Model 33	Model 34	Model 35	Model 36	Model 37	Model 38	Model 39	Model 40
Control Variables								
Software	**2.29 (0.33)**^{a}	**2.28 (0.33)**^{a}	**2.30 (0.33)**^{a}	**2.28 (0.33)**^{a}	**2.27 (0.33)**^{a}	**2.29 (0.33)**^{a}	**2.28 (0.33)**^{a}	**2.28 (0.33)**^{a}
Computer Services	**1.17 (0.38)**^{a}	**1.16 (0.38)**^{a}	**1.15 (0.38)**^{a}	**1.16 (0.38)**^{a}	**1.15 (0.38)**^{a}	**1.19 (0.38)**^{a}	**1.16 (0.38)**^{a}	**1.16 (0.38)**^{a}
Business Services	0.44 (0.34)	0.36 (0.34)	0.42 (0.34)	0.36 (0.34)	0.36 (0.34)	0.37 (0.34)	0.37 (0.34)	0.37 (0.34)
Electronic & IT Hardware	**0.89 (0.36)**^{b}	**0.86 (0.36)**^{b}	**0.99 (0.36)**^{b}	**0.86 (0.36)**^{b}	**0.83 (0.36)**^{b}	**0.83 (0.36)**^{b}	**0.86 (0.36)**^{b}	**0.85 (0.36)**^{b}
Age of Business	**0.20 (0.05)**^{a}	**0.19 (0.05)**^{a}	**0.17 (0.05)**^{a}	**0.18 (0.05)**^{a}	**0.19 (0.05)**^{a}	**0.18 (0.05)**^{a}	**0.19 (0.05)**^{a}	**0.19 (0.05)**^{a}
Size	0.06 (0.15)	0.09 (0.15)	0.10 (0.15)	0.09 (0.15)	0.09 (0.15)	0.09 (0.15)	0.08 (0.15)	0.08 (0.15)
Own Savings	-0.15 (0.21)	-0.12 (0.21)	-0.11 (0.21)	-0.12 (0.21)	-0.13 (0.21)	-0.12 (0.21)	-0.12 (0.21)	-0.13 (0.21)
Gender	-0.27 (0.31)	-0.29 (0.31)	-0.31 (0.31)	-0.29 (0.31)	-0.30 (0.31)	-0.30 (0.31)	-0.29 (0.31)	-0.29 (0.31)
Age of Entrepreneur	**0.03 (0.01)**^{a}	**0.03 (0.01)**^{a}	**0.03 (0.01)**^{a}	**0.03 (0.01)**^{a}	**0.03 (0.01)**^{a}	**0.03 (0.01)**^{a}	**0.03 (0.01)**^{a}	**0.03 (0.01)**^{a}
Relative	-0.49 (0.41)	-0.44 (0.41)	-0.43 (0.41)	-0.43 (0.41)	-0.42 (0.41)	-0.44 (0.41)	-0.44 (0.41)	-0.44 (0.41)
Degree	0.18 (0.20)	0.17 (0.20)	0.20 (0.20)	0.17 (0.20)	0.17 (0.20)	0.19 (0.20)	0.17 (0.20)	0.18 (0.20)
Partners	**0.14 (0.07)**^{b}	**0.17 (0.07)**^{c}	**0.17 (0.09)**^{c}	**0.17 (0.09)**^{c}	**0.17 (0.09)**^{c}	**0.17 (0.09)**^{c}	**0.17 (0.09)**^{c}	**0.17 (0.09)**^{c}
Business Advice	**0.13 (0.05)**^{a}	**0.14 (0.05)**^{a}	**0.14 (0.05)**^{a}	**0.14 (0.05)**^{a}	**0.14 (0.05)**^{a}	**0.14 (0.05)**^{a}	**0.15 (0.05)**^{a}	**0.15 (0.05)**^{a}
Main Effects								
Science Park (SP)	--------	**0.32 (0.05)**^{a}	**0.36 (0.05)**^{a}	**0.32 (0.05)**^{a}	**0.32 (0.05)**^{a}	**0.32 (0.05)**^{a}	**0.33 (0.05)**^{a}	**0.33 (0.05)**^{a}
Number of businesses	--------	--------	**0.11 (0.06)**^{c}	--------	--------	**0.12 (0.06)**^{b}	--------	--------
Habitual	--------	--------	--------	0.33 (0.39)	--------	--------	0.34 (0.33)	--------
Serial	--------	--------	--------	--------	0.19 (0.32)	--------	--------	0.21 (0.32)
Portfolio	--------	--------	--------	--------	**0.35 (0.05)**^{a}	--------	--------	**0.39 (0.06)**^{a}
2 Way interactions								
SP* No. of businesses	--------	--------	--------	--------	--------	**0.23 (0.10)**^{b}	--------	--------
SP*Habitual	--------	--------	--------	--------	--------	--------	**0.63 (0.21)**^{a}	--------
SP*Serial	--------	--------	--------	--------	--------	--------	--------	**0.66 (0.16)**^{a}
SP*Portfolio	--------	---------	--------	--------	--------	--------	--------	**0.76 (0.19)**^{a}
Log likelihood	-643.71	-642.42	-640.79	-642.42	-642.30	-638.16	-641.28	-641.17
Likelihood Ratio	**125.54**^{a}	**128.11**^{a}	**131.38**^{a}	**128.11**^{a}	**128.34**^{a}	**136.62**^{a}	**130.40**^{a}	**130.60**^{a}
Nagelkerke R^2	0.089	0.091	0.093	0.097	0.097	0.117	0.132	0.139
Change in Nagelkerke R^2	--------	0.002	0.004	0.008	0.008	0.028	0.043	0.050

Notes: Excluded sector, training; novice is the excluded comparison for serial and portfolio. ^{a} $p < 0.10$; ^{b} $p < 0.05$; ^{c} $p < 0.01$

7.4 Discussion and implications

7.4.1 Key findings

The objective of this chapter is to make a contribution to better understanding the science parks and firms' adoption of e-commerce, as well as how entrepreneur's attitudes towards adoption of e-commerce differs by entrepreneurial experience, as well as a third set of findings related to two way interaction effects between science park location and entrepreneurial experience compared. The entrepreneurial experience variables including three sets of parts: the number of businesses which have been established or purchased, the habitual entrepreneurship and finally the portfolio and serial entrepreneurship.

This chapter focused upon five measures of e-commerce variables: (i) the age of websites, (ii) the cost of creating the websites, (iii) the cost of maintaining the websites, (iv) the frequency of updating the websites, (v) the turnover generated by online sales. For each of these five different sets of e-commerce measures the author examined whether the location on a science park and prior business ownership experience was systematically related with better e-commerce usage.

Several hypotheses were supported. Table 7.7 shows a summary of the dependent variables and hypotheses which were and were not statistically significant and consistent with the hypotheses, respectively. Table 7.6 shows a summary of independent variables included in the models of business performance.

Science parks

Firms located on science parks were more likely than firms located off-park to report having an older website; and, Firms located on science parks spent more money on creating and maintain the websites. However, there was no significant differences on the frequency of updating the websites between Firms located on science parks and firms located off science parks. Firms located on science parks were also more likely to be making a profit from the online sales. Thus, overall the results are consistent with and support hypothesis H4a.

Table 7.6 Summary of independent variables included in the models of e-commerce.

	Age of websites	Cost of creating websites	Cost of maintaining websites	Frequenc of updating websites	Turnover from online sales
Science Park (SP) (H4a)	a	a	a	+	a
Number of businesses (H4b)	b	+	+	c	c
Habitual (H4c)	+	+	+	+	+
Portfolio (H4d)	+	+	+	a	a
Serial (H4e)	-	+	+	+	+
2 Way interactions					
SP* No. of businesses (H5a)	+	a	a	+	b
SP*Habitual (H5b)	+	b	c	+	a
SP*Portfolio (H5c)	+	c	a	a	a
SP*Serial (H5d)	+	+	a	a	a

Table 7.7 Summary of supported and unsupported hypotheses.

	Age of websites	Cost of creating websites	Cost of maintaining websites	Frequency of updating websites	Turnover from online sales
H4a	✓	✓	✓	×	✓
H4b	w	×	×	w	w
H4c	×	×	×	×	×
H4d	×	×	×	✓	✓
H4e	×	×	×	×	×
H5a	×	✓	✓	×	w
H5b	×	w	w	×	✓
H5c	×	w	✓	✓	✓
H5d	×	×	✓	✓	✓

Note: ✓ = Supported , ×= Not supported, w= Weakly supported

The Number of Businesses Established or Purchased

The results showed that the number of businesses purchased or established was statistically and systematically linked to several of the e-commerce measures. More specifically, a greater number of businesses purchased or established was found to be weakly statistically associated with older age of websites. There was a positive increased expectation of a firm update their websites on a daily basis rather than weekly, monthly or less often. The firms with greater number of businesses established or purchased also report being able to generate more turnovers from online sales. There was a no relationship between the number of businesses purchased or established with the cost of creating the websites and the cost of maintaining the websites. Thus, overall the evidence weakly supports hypothesis H4b.

Habituals

Interestingly, the type of prior business ownership experience of being a habitual was found to have a much less association with the e-commerce measures. As zero of the five e-commerce measures was found to be statistically significant at 0.10 level or better. In other words, Habitual entrepreneurs' businesses compared to those owned by novice entrepreneurs had a younger age of websites as well as a less money spent on cost and maintaining the websites. Habitual entrepreneurs had a lower expectation of updating websites daily, as well as a less expectation of achieving a profit in online activities. Thus, the evidence do not support hypothesis H4c.

Portfolio and Serial

The findings were very comparable when the habitual entrepreneurs were split into the serial and portfolio variables. Being a portfolio entrepreneur was found to be statistically significant at the 0.01 level in the cases of two of the five measures of e-commerce. Indeed the only two cases where the portfolio dummy variables were statistically significant was for the expectation of update the websites on a daily basis, and generate more turnover online. Thus, H4d was not supported

In the same line with the results on the portfolio variable, being a serial entrepreneur was consistently found to be not statistically significant. This applied to all five models covering the spread of the e-commerce measures. In other words, serial founders are less productive when compared with novice founders. Thus, H4e were not supported.

Thus, overall there is no evidence to support hypothesis H4d and there is strong evidence to deny hypothesis H4e. The evidence suggests that portfolios and serial entrepreneurs in comparison with novice entrepreneurs are not able to draw upon some different sets of skills, experience and creativity to better use e-commerce and achieve outcomes.

Interaction Terms

The author augmented the models with interaction terms between science park location and the three sets of entrepreneurial experience. It was found that the results of the number of businesses purchased or established and the science park location interaction variables were mixed. The two way interaction effect is not statistically significant and shows that there is no interaction between being located on a science park and the number of businesses which have been established or purchased against the age of website and the frequency of updating the websites. Thus, the evidence is not consistent with hypothesis H5a with regard to the age of website and the frequency of updating the websites. However, the two way interaction effect is statistically significant at 0.01 level against the cost of creating the websites and the cost of maintaining the websites; and is statistically significant at 0.05 level against the turnover from online sales. Thus, overall the evidence is supporting the hypothesis H5a.

The second entrepreneurial experience term of habituals when incorporated into the models with the science park location as an interaction effect variables were found to be stark. The two way interaction variables were statistically significant at 0.01 level against the turnover generated from online sales; were statistically significant at 0.05 level against the cost of creating the websites; and were statistically significant at 0.10 level against the cost of creating the websites. However, this two way interaction variables has no statistically significant effects against the age of website and the frequency of updating the websites. Overall, this set of results supported hypothesis H5b.

The interaction effects also split habitual entrepreneurs into portfolio and also serial entrepreneurs and each of these two types of entrepreneurial experience was interacted with the science park location. The portfolio and science park interaction terms were statistically significant at the 0.05 level or better across four of the five models, with the exception of the model of age of websites. Thus, not only are businesses who are on science parks more likely to have better usage of e-commerce, and portfolio entrepreneurs possessing a highly likelihood of taking advantages of e-commerce than their novice entrepreneur counterparts, but combined together portfolio entrepreneurs located on science parks achieve superior e-commerce usage. These results consistently supported hypothesis H5c.

The serial entrepreneurs and science park location interaction variable was also found to be statistically significant at 0.01 level in three models—cost of maintaining the websites, the frequency of updating the websites and the turnover generated from online sales. Serial entrepreneurs as a separate independent variable was not significant against all five of e-commerce dependent variables. However, the serial entrepreneurs on science parks are able to leverage resources to compensate for their lack of experience and skills, and to boost the probability of spending more money on the websites maintenance, updating the websites on a daily basis and the generating more turnover from online sales. Accordingly, there is support for hypothesis H5d.

This is an interesting and important finding. The evidence shows that the science park location variable has played an important part in the entrepreneurs' attitudes towards the usage of e-commerce. When the habitual, portfolio and serial variables are as a separated independent variable, all three of them failed to have a statistically significant impact on the dependent variables of age of websites, the cost of creating the websites, the cost of maintaining the websites, the frequency of updating the websites and the turnover from online sales. Whereas, when the three separated independent variable was incorporated with science park location variable respectively, the habitual and science park interactive variable were significant at 0.10 level or better against three of five e-commerce variables, the portfolio and science park interactive variable were significant at 0.10 level or better against four of five e-commerce variables, the serial and science park interaction variable were significant at 0.01 level against four of three of five e-commerce variables.

Control Variables

Two entrepreneur control variables were consistently significant in models 1 to 8: age of business and age of entrepreneur. In other words, older business were more likely than younger firms to have an older websites. Entrepreneurs who were older were more likely to have a longer website establishment experience.

Five entrepreneur control variables were consistently statistically significant in models 9 to 16. Older business were more likely than younger firms to spend more money on creating the websites. Older entrepreneurs were more likely than younger entrepreneurs to spend more money on creating the websites. Entrepreneurs who had relatives in business were more likely to spend more money on creating website than other entrepreneurs. Entrepreneurs with higher degrees would tend to create a more expensive websites. Entrepreneurs who had been able to secure co-investors who invested at the time that the firm was started were more likely to spend more money to build websites than those who had not been able to attract co-investors.

Table 7.8 Summary of control variables included in the models of e-commerce.

	Age of websites	**Cost of creating websites**	**Cost of maintaining websites**	**Frequency of updating websites**	**Turnover from online sales**
Control Variables					
Software	+	c	a	b	a
Computer Services	+	+	+	b	a
Business Services	+	+	+	+	+
Electronic & IT Hardware	b	b	a	-	b
Age of Business	a	a	a	a	a
Size	+	+	+	b	+
Own Savings	+	+	+	b	-
Gender	+	-	+	b	-
Age of Entrepreneur	a	a	a	c	a
Relative	+	c	+	+	-
Degree	-	a	-	+	+
Partners	-	b	a	a	b
Business Advice	+	+	a	+	a

Four entrepreneur control variables were consistently found to be related to models 17-24. These were: age of business, age of entrepreneur, business partners and business advice. Older business were more likely than younger firms to spend more money to maintain the websites. Older Entrepreneurs were more likely to spend more money to maintain the websites. Entrepreneurs who had co-investors who invested at the time that the firm was started spend more money to maintain the websites than those who had not been able to attract co-investors. Entrepreneurs who had used more sources of advice were more likely to spend more money to maintain the websites.

Age of business, size of the business, the use of own savings, gender, age of entrepreneurs, and having business partners were consistently found to be statistically significant at the 0.10 level or better in models 25-32. In other words, older years of businesses, Larger sized businesses, entrepreneurs who had used their own savings at start-up, male entrepreneurs, older entrepreneurs and those businesses where the entrepreneurs had partners had a higher expectation of updating the websites on a daily basis.

Age of business, age of entrepreneur, business partners and using of business advice were consistently found to be related to models 33-40. More specifically, older business were more likely than younger firms to generate turnover from the websites. Older Entrepreneurs were more likely to generate turnover from the websites. Entrepreneurs who had co-investors who invested at the time that the firm was started generate more turnover from the websites than those who had not been able to attract co-investors. Entrepreneurs who had used more sources of advice were more likely to generate turnover from the websites.

Interestingly, the age of the entrepreneur and the age of business were found consistent positively related every five of e-commerce variables. In other words, the older the entrepreneur and the business is, the more likely they have a website and more possibly spend more money on the website and generate more turnover by online sales.

One the other hands, size of the business, using own savings, gender, relatives in business and higher degree did not have systematic and significant relationships with the measures of e-commerce. All of these entrepreneurial variables were not important in four of the five models of e-commerce.

7.4.2 Practitioner implications

To better understand Chinese entrepreneurs' attitudes towards the adoption of e-commerce, and the usage of e-commerce, this research studied Chinese novice, portfolio and serial entrepreneurs. It investigated the performance of small firms located on and off ZSP in Beijing China. The measures of usage of e-commerce which were examined in this chapter were the age of websties, the cost of creating the websites, the cost of maintaining the websites, the frequency of updating the websites and turnover generated by online sales. This study showed some important and interesting findings which are presented in the previous section of this chapter. According to these research results several practical implication than can be drawn out.

Firstly, compared with developed countries and regions, China still have no comprehensive regulation of e-commerce industry, part of the reason is slowness in the construction of China's market economy legal system, on the other hand, e-commerce as an emerging industry has a short history in our country's development.

The state departments should introduce a number of regulations such as standardized third-party payment and guiding network regulation to increase shopping activities on e-commerce.

Secondly, from the presented results showed, it is safe to say that businesses located on science park better recognised the benefits of e-commerce than business located off science park. Therefore the science park location is one of the most important variables in this study. From the interaction results of habituals and science parks, it is shown that habitual entrepreneurs are able to leverage resources on science parks to achieve a greater and better usage of e-commerce. Therefore, the policy makers should raise their awareness of this issue, try to promote the benefits of locating on science park, and introducing the facilities onsite, also relative incentives like reduce tax or reduced premise rent should be introduced to those experienced entrepreneurs who are willing to move to science park.

Thirdly, as a separated independent variable, habitual and serial were found to have a less association with the e-commerce measures. Being a habitual and serial entrepreneur was consistently found to be not statistically significant, this applied to all five models of the e-commerce measures. In other words, habitual and serial entrepreneurs' businesses compared to those owned by novice entrepreneurs had a relative same attitude towards the adoption of e-commerce. Whereas, when the habitual and serial variables incorporated with science park location variable, the case changed dramatically. The two way interaction variables of science park and habitual were statistically significant at 0.10 level or better against the turnover generated from online sales; the cost of creating the websites and the cost of creating the websites. The serial entrepreneurs and science park location interaction variable was also found to be statistically significant at 0.01 level in three models—cost of maintaining the websites, the frequency of updating the websites and the turnover generated from online sales. Part of the reason of this result is that science parks have the appropriate facilities and cultures to better use e-commerce. This should bring science park managers into attention, they should introduce relevant polices such as reduced tax or premise rent to encourage habitual and serial entrepreneurs to move into science park, in which way the facilities onsite will be reasonably used and consequently yield a better productive outcomes.

Fourthly, the results showed that the number of businesses purchased or established was statistically and systematically linked to several of the e-commerce measures. More specifically, a greater number of businesses purchased or established was found to be positively associated with age of websites, websites updating frequency and turnovers from online sales. This should raise the awareness of policy maker, appropriate policies should be introduced to encourage the entrepreneurs with greater number of business when established or purchased to embrace the e-commerce, as they have more ability and possibilities to take the advantages of e-commerce.

Fifthly, the degree of entrepreneurs' education did not have a statistically significant relationship with the measures of e-commerce, with the exception of the cost of creating the websites variable. It means the entrepreneurs with higher background of education only spend more money on creating the websites than entrepreneurs with lower degrees. They did not appear to be having a better understanding of e-commerce as they did not having an older website, did not spending more money to maintain the website, did not having the website updated more frequently and did not having more turnover generated by online sales. This evidence is against the author's expectation, as higher level of education normally involve with quicker and easier use of high technology. Knowledge provides individuals with increases in their cognitive abilities, leading to more productive and efficient potential activity (Schultz, 1959; Becker, 1964 and Mincer, 1974). Education frequently producing nonlinear effects in supporting the probability of becoming an entrepreneur, or in achieving success (Gimeno et al., 1997; Moffett et al., 2003). This is a very interesting finding which should raise the awareness of policy maker, they should introduce policies to promote the advantages e-commerce, let more entrepreneurs especially entrepreneurs with higher degree of education recognize the benefit of adoption of e-commerce, and introduce some incentives where appropriate.

7.5 Conclusion

The purpose of this chapter was to test a set of hypotheses with regard to the usage of websites and business location and entrepreneurial experience. It is served to close the literature gap on science parks and attitudes towards e-commerce usage by examining how entrepreneur's and their firms' performance differs by entrepreneurial experience and location of business. With respect to websites usage, five performance measures were explored (i) age of websites, (ii) the cost of creating the websites, (iii) the cost of maintaining the websites, (iv) the frequency of updating the websites and (v) turnover generated by online sales. The econometric technique used to test the nine hypotheses were ordinary lease squares, logistic regression techniques and ordered logit regression techniques.

From the discussions section we can see that the results of this chapter are mixed, six of nine hypotheses are proved to be supported. They are: H4a: Entrepreneurs located on a science park compared to those entrepreneurs who are located off-park will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales. H4b:Entrepreneurs with greater numbers of started or bought businesses will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales. H5a: Entrepreneurs located on a science park with experience of starting and purchasing greater numbers of businesses will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales. H5b: Habitual entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales. H5c: Portfolio entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales. H5d: Serial entrepreneurs located on a science park are more likely than novice entrepreneurs to have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

The hypotheses proved not to be supported are: H4c: Habitual entrepreneurs compared to novice entrepreneurs will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales. H4d: Portfolio entrepreneurs compared to novice entrepreneurs will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales. H4e: Serial entrepreneurs compared to novice entrepreneurs will have recognized the importance of websites sooner, will have devoted more time and money on e-commerce, and will be more successful in generating on-line sales.

According to the results discovered in this study, in order to promote the maximum development of e-commerce usage by small firms located on and off science park, five possible implications have been given out by the author. The science park variable and the interactive variables of science park and entrepreneurial experience should especially raise the awareness of policy maker, as these variables are the most influential variable which made a great contribution to the adoption and usage e-commerce.

Next chapter is the final chapter of this dissertation, which will present the review the researching background of the study and state the contribution of this study and then finally conclude the dissertation.

Chapter 8

Summary, Conclusion and Recommendations

8.1 Introduction

Entrepreneurship and SMEs are important research topics in China and the wider world. The growing importance of SMEs in China's economy is hard to ignore, and Chinese and foreign experts estimate that SMEs are now responsible for about 60% of China's industrial output and employ about 75% of the workforce of China's cities and towns (http://www.sme.gov.cn/, 2009). SMEs are responsible for creating most new urban jobs, and they are the main destination for workers dismissed from SOEs who later re-enter the workforce (Chen, 2006; Wu et al., 2008).

The purpose of this study is to better understand the characteristics of novice and habitual entrepreneurs in China, and to investigate the performance of, and the differences between, novice and habitual entrepreneurs. The methodology adopted was a quantitative approach that saw a total of 4000 questionnaires being distributed to SMEs located in Beijing, China. The collected data was analysed by software of statistical package for the social sciences and the software was also used to demonstrate the characteristics of novice and habitual entrepreneurs in China.

SMEs are a fundamental part of the national economy and play an important role in the growth of the economy. Furthermore, they are a significant and irreplaceable force in promoting China's economic and social development as an important part of the national economy (Acs and Audretsch, 1990, 2003; Stel et al. 2005), a basis to increase employment (Davidsson et al., 1995a, 1996; Wang, 2009), an important innovative force (Schumpeter, 1934; Caputo, et al., 2002), a means of balancing regional economic structures (Li, 2009; Gao, 2010), a major force in export (Li, 2009; Pang, 2012; Su, 2011; Yu and Jia, 2010) and an insurance of the healthy development of large enterprises (Yang and Zhang, 2004; Zhao, 2006). After reviewing the literature about habitual entrepreneurship, it is clear that there is not only a lack of research in China about it (Ucbasaran et al., 2008), but that the previous research concerning habitual entrepreneurship in China is very inadequate. To better understand habitual entrepreneurs and SMEs in China this research focused on the following: understanding entrepreneurs and the business characteristics of novice and habitual entrepreneurs in China; the characteristics of novice and habitual entrepreneurship and the innovation of firms; the relationship between novice and habitual entrepreneurs and firm performance in employment growth and sales revenue; and the characteristics associated with the use and non-use of e-commerce in China – focusing particularly upon novice and habitual entrepreneurship.

Human capital theory experience and the RBV provide the theoretical background that was used to compare the entrepreneurs' business ownership against the performance of their businesses in the areas of innovation, proximity to the science park and use of e-commerce. This research adopted a quantitative methodology by undertaking a survey between October 2008 and June 2009. In the nine-month timeframe, a total number of 4000 questionnaires were posted to the firms located both on and off ZSP. 2000 questionnaires were posted to the firms located on ZSP, and another 2000 were posted to firms located off ZSP. During the nine month period, the total number of questionnaires the author received back was 523, but 61 copies were unusable because of unfilled key questions and incompletely answered questionnaires. Therefore, the valid total number of usable questionnaires was 462. The 462 replies generated a 12% response rate, which is similar to same nature studies carried out in China.

8.2 Summary of literature review

8.2.1 Science parks

Chapter two presented a broad review of science-park theory, and it provided the definition of a science park before presenting a brief discussion on the origin of science parks. Subsequently, the objectives of science parks were reviewed. And finally, an examination of the worldwide performance of science parks was produced. It is hard to give a science park a clear and accurate definition, and there are several similar terms used to broadly describe similar developments. Examples include 'research park', 'technology park', 'business park' and 'innovation centre' (Monck et al., 1988),

The precise distinction between these various concepts is difficult to ascertain. In fact, distinctions are not always made: some authors use different terms to define different entities (Colombo and Delmastro, 2002; Fukugawa 2006), whereas others use the terms interchangeably (Luger and Goldstein, 1991; Kihlgren, 2003). The definition of a science park adopted in this research is the same definition that the

AURRP gives. They define a science park as ‘a property-based venture’ which has the following attributes:

1. Existing or planned land and buildings designed for private and public research and development facilities, technology and science based companies relating to support services.

2. A contractual and/or operational relationship with a university or other institution of higher education.

3. A role in promoting research and development by the university in partnership with industry, assisting in the growth of new ventures, and promoting economic development.

4. A role in aiding the transfer of technology and business skills between the university and industry tenants.

Regardless of the various definitions, science parks are expected to stimulate the growth of high-tech activities and to foster a transfer of technology from research to industry (Westhead and Batstone, 1998; Bergek and Norrman, 2008). They are often seen as constituent elements within wider ‘learning regions’ (Carluer, 1999; De Bernardy, 1999; Keeble et al., 1999; Simmie, 1997) that lead to the development of “profitable new products and processes”(Keeble and Wilkinson, 1999, p. 296). More specifically, science-park objectives can be divided into three main classes: (a) economic development objectives, (b) transfer-of-technology objectives and (c) local benefit objectives (Massey et al., 1992; Link and Scott, 2003).

The definition and objectives of a science park is stated in the above section, but it is difficult to assess the impact and effectiveness of a science park because of the diversity in stakeholders' objectives and expectations of the parks (Monck et al., 1988), and the difficulties in measuring the relevant performance criteria (Siegel et al., 2003). One well-established method for documenting the effect and assessing the impact of science parks is to compare the performance of technology-based firms located within science parks to the performance of similar firms located off-park (Westhead, 1997).

After the analysis of the definition and objectives of a science park, studies about the performance of science parks around the world are examined by region/country. Overall, chapter two reviewed the publications from seventeen different countries, or regions in five different continents, between the years 1968 and 2011. There are twenty-four papers from the developed world, including seven studies from the UK (Siegel, et al., 2003; Westhead and Batstone, 1998; Westhead, 1997; Westhead and Cowling, 1995; Westhead and Storey, 1994; Massey et al., 1992; Monck et al. 1988), five studies from the US (Roberts and Wainer, 1968; Appold, 2004; Link and Scott, 2006; Link and Scott, 2003; Luger and Goldstein, 1991), seven studies from Sweden (Ferguson and Olofsson, 2004; Dettwiler et al., 2006; Lindelöf and Löfsten, 2004; Lindelöf and Löfsten, 2003; Löfsten and Lindelvf, 2005; Löfsten and Lindelöf, 2002; Löfsten and Lindelöf, 2001), five other studies from Europe (Kihlgren,2003; Squicciarini 2007; Ratinho and Henriques, 2010; Bakouros et al., 2002; Colombo and Delmastro, 2002), eleven from Asia (Shin, 2000; Chan and Lau, 2003; Koh et al., 2005; Phillips and Yeung, 2003; Fukugawa, 2006; Yang et al., 2009; Chen et al., 2006) and four from China (Macdonald and Deng, 2004; Chen, 2006; Tan, 2006; Filatotchev et al., 2011).

There are six different research measures that have been covered in this review: HEI linkage, knowledge spill-over, growth of firm sales, growth of firm employment, firm innovation R&D, history and performance of science parks. This chapter served the purpose of reviewing the empirical studies of science parks, and giving a general idea of what has been achieved by science park researchers. From the review, it is clear that, when compared with developed countries, this specific type of research is limited in a transitional economy such as China.

8.2.2 Entrepreneurship theory

Human capital theory, the RBV and different types of entrepreneur are theories that affect entrepreneurial process and activities; these theories were reviewed in chapter three. It is difficult to label a typical entrepreneur, and it is hard to classify them too. Although it is tough to categorise entrepreneurs, different types have been identified with regard to the following variables: firm structure (Filley and Aldag, 1978), venture performance (Lafuente and Salas, 1989; Westhead and Wright, (1998a, 1998b, 1999)), managerial practice (Lorraine and Dussault, 1987), degree of innovation (Davidsson, 1988), start-up process (Dunkelberg and Cooper, 1982), perception of opportunities (Davidsson,1988, Robbie and Wright, 1996) and entrepreneurial teams (Carland and Carland, 1992).

Classified by business ownership experience, Ucbasaran et al, (2008) categorised entrepreneurs into three different types: novice, serial and portfolio. Novice entrepreneurs are those who have no previous business ownership experience. Serial entrepreneurs are those who have business closure experience and currently have a business ownership. Portfolio entrepreneurs are identified by their ownership of multiple businesses simultaneously.

Human capital theory suggests that knowledge provides individuals with increases in their cognitive ability, leading to more productive and efficient potential activity (Schultz, 1959; Becker, 1964; Mincer, 1974). Therefore, if profitable opportunities for new economic activities exist, individuals with higher quality human capital should be better at perceiving them. Once engaged in the entrepreneurial process, such individuals should also have a superior ability to successfully exploit such opportunities.

Human and physical resources are valuable to business. To this end, the study of the relationship between business performance and firm resources formed the RBV, which is recognised as the most influential framework for understanding strategic management (Barney et al., 2001; Peng, 2001). In chapter three, the four key attributes that a resource must have in order to yield a sustainable competitive advantage were demonstrated. Barney (1991) proposes that advantage-creating resources must meet four conditions: value, rareness, inimitability and non-substitutability.

8.3 Summary of empirical findings and interpretation

In this section the key findings of the study are summarised and reflected upon. The following discussion is organised around three themes. The first is the innovation outcome differences between the habitual and novice and then serial and portfolio entrepreneurs, the second is the exporting, employment growth and profitability differences between the habitual and novice and then serial and portfolio entrepreneurs, the last is the e-commerce related performance differences between the habitual and novice and then serial and portfolio entrepreneurs. There were a number of significant relationships between the control variables and the dependent variables relating to performance, these findings are also reported below.

8.3.1 Innovation

Chapter five analyses science parks and the entrepreneurs' experience at influencing innovation outcomes in context of Beijing, China. This chapter focused on three composite measures of innovation outcome: 'one or more novel innovations', 'a novel innovation in products/services and/or processes' and 'one or more novel innovations in work, markets, supply, administration and distribution'. For each of these three innovation outcomes, the author examined whether the location on a science park and prior experience of business ownership had an association with novel innovation outcomes. Resultantly, several hypotheses were supported.

Firms located on science parks were more likely to report each of the three composite measures of innovation outcome than firms that were located off-park. These results are consistent with, and support, hypothesis H1. Thus, this evidence suggests that, as far as these performance outcomes are concerned, science parks can outperform off-park firms.

Prior business ownership experience found much stronger associations with the three innovation outcomes. In particular, habitual entrepreneurs, (and within that type portfolio, but not serial entrepreneurs) were found to be more likely to report the three innovation outcomes. Thus, hypotheses H2b and H2d were supported. The evidence suggests that portfolio (but not serial) entrepreneurs, in comparison with novice entrepreneurs, are able to draw upon different sets of skills, experience and creativity to better achieve innovation outcomes. This evidence suggests that the policy makers in China could consider channeling more resources towards portfolio entrepreneurs. Alternatively, policy makers need to decide whether to instead devote resources to other types of entrepreneurs to help them become portfolio entrepreneurs.

The type of entrepreneurial experience and science park location interaction effect variables were significant in all three sets of innovation outcomes, and this set of results supported hypothesis H3b. Thus, habitual entrepreneurs are able to leverage resources on science parks to attain a greater likelihood of achieving innovation outcomes.

The portfolio and science park location interaction variables were each found to be related to the three innovation outcomes, which supported hypothesis H3d. Thus, portfolio entrepreneurs located on science parks consistently seemed to be better at leveraging resources to boost the likelihood of achieving innovation outcomes.

Two entrepreneur control variables were consistently significant in all of the models. Entrepreneurs with degrees were significantly more likely than those entrepreneurs without degrees to have ‘one or more novel innovations’, ‘a novel innovation in products/services and/or processes’, and ‘one or more novel innovations in work, markets, supply, administration and distribution’. Entrepreneurs who used greater numbers of sources of business advice were found to be more likely to have ‘one or more novel innovations’, ‘a novel innovation in products/services and/or processes’, and ‘one or more novel innovations in work, markets, supply, administration and distribution’. The use of own savings was positively related to ‘a novel innovation in products/services and/or processes’ and this was statistically significant at the 0.05 level, but it was not statistically significant for our other two dependent measures.

Two firm control variables were consistently significant in models 1 to 24. Larger (Size) firms were more likely to report ‘one or more novel innovations’, ‘a novel innovation in products/services and/or processes’, and ‘one or more novel innovations in work, markets, supply, administration and distribution’. Older (Age of Business) firms were more likely to report ‘one or more novel innovations’, ‘a novel innovation in products/services and/or processes’, and ‘one or more novel innovations in work, markets, supply, administration and distribution’.

A third set of control variables relating to sector were also found to be significant but there were some differences across the three innovation outcomes. In models 1 to 16 respondents engaged in software industry, and also the computer services industry – compared to the training sector were more likely to report ‘one or more novel innovations’, and ‘a novel innovation in products/services and/or processes’. Whilst in models 17 to 24 respondents engaged in software industry, and also the computer services industry – compared to the training sector were more likely to report and ‘one or more novel innovations in work, markets, supply, administration and distribution’.

8.3.2 Exporting, employment growth and profitability

Chapter six has focused upon three sets of firm performance: (i) exporting, (ii) the annualised three-year rate of employment growth and the rate of employment growth over the previous twelve months, and (iii) firm profitability one year ago, two years ago and three years ago. For each of these three different sets of performance measures, which cover a total of six performance measures, I examined whether location on a science park and prior business ownership experience was systematically related with superior firm performance.

Firms located on science parks were more likely to report being an exporter of goods than firms located off-park. Moreover, they also had a higher annualised three-year rate of employment growth, and a higher twelve-month rate of employment growth. The evidence regarding the three sets of profitability was mixed, but overall the results are consistent with, and support, hypothesis H1.

Overall, the evidence supports hypothesis H2a, but this is tempered against the finding that this relationship did not hold for exporting activity, the three-year annual rate of employment growth or any profit, break even and loss two years ago.

Habitual entrepreneurs had a higher expectation of being an exporter as well as a higher expectation of achieving a profit in all three time periods. Additionally, they had a lower expectation of having a loss in all three time periods. Therefore, the evidence strongly supports hypothesis H2b. When the habitual entrepreneurs were split into the serial and portfolio classifications, the results were stark: being a portfolio entrepreneur was found to be statistically significant at level 0.10 in ten cases of the twelve measures of business performance.

In contrast to the results for the portfolio variable, being a serial entrepreneur was found to be statistically related to only two of the measures of business performance: exporting and the three-year annualised rate of employment growth. In other words, serial founders are less productive when compared with portfolios. Thus, there is strong evidence to support hypothesis H2c, but weak support for hypothesis H2d. The evidence suggests that portfolio, but not serial, entrepreneurs are able to draw upon different sets of skills, experience and creativity in comparison with novice entrepreneurs to better achieve business performance outcomes.

The research indicated that portfolio entrepreneurs are performing better than serial entrepreneurs, and serial entrepreneur are performing better than novice entrepreneurs. We would expect that portfolio and serial entrepreneurs would have a greater business network, and are thus associated with more resources and skills that could lead to higher business performance.

When habitual entrepreneurs incorporated into the models with the science park location as an interaction effect variables were found to be statistically significant in all of the models – with the exceptions of each of the three models of the expectation of breaking even. This set of results supported hypothesis H3b, and thus habitual entrepreneurs are observed to be able to leverage resources on science parks to achieve a greater likelihood of exporting, employment growth over one year and also three years. Furthermore, there was a higher expectation of habitual entrepreneurs making a profit in all three time periods. The portfolio and science park interaction terms were statistically significant at the 0.01 level across nine of the twelve models. Thus, not only are businesses located on science parks more likely to have superior performance, when combined with portfolio entrepreneurs who possess a high likelihood of achieving better performances than their novice entrepreneur counterparts, both parties achieve superior business performance. These results consistently support hypothesis H3c. The serial entrepreneurs and science park location interaction variables were also found to be statistically significant in nine models, which supports hypothesis H3d.

Whilst serial entrepreneurs, as a separate independent variable, were not related to profit outcome, on science parks they are able to leverage resources to compensate for their lack of experience and skills, which boosts the probability of achieving a profitable outcome in the last, last two and last three years. Therefore, the role of the science park cannot be ignored.

Male entrepreneurs' firms were less likely than those owned by women to be an exporter. Entrepreneurs who had used more sources of advice were more likely to be an exporter. Entrepreneurs who had used their own savings when the business was established or purchased were less likely than those who did not use their savings to be an exporter. Larger firms enjoyed a higher likelihood of being an exporter.

Entrepreneurs who had used their own savings when the business was established or purchased enjoyed a higher level of annualized 3 year rate of employment growth than those who did not use their savings. Entrepreneurs who had been able to secure co-investors who invested at the time that the firm was started enjoyed a higher level of annualized 3 year rate of employment growth than those who had not been able to attract co-investors. The larger sized firms and younger aged firms had a higher level of annualized 3 year rate of employment growth. Entrepreneurs who had used more sources of advice were more likely to have a higher level of annualized 3 year rate of employment growth.

Three entrepreneur control variables were consistently found to be related to the annual rate of growth in the last year and these were size, age of the business and the use of business advice. There was a positive relationship between firm size and also the number of sources of business advice and the rate of employment growth in the last year. There was a negative relationship between firm age and this measure of employment growth.

For the three time periods which modeled the expectation of making a profit the results found that size of the business, the use of own savings, gender, possessing a degree, and using business advice were consistently found to be statistically significant at the 0.10 level or better. Larger sized businesses, entrepreneurs who had used their own savings at start-up, and entrepreneurs who had used more sources of advice had a greater expectation of making a profit. Also, women compared to men were more likely to make a profit. For two time periods – one year ago, and three years ago those businesses where the entrepreneurs had partners had a higher expectation of making a profit.

The results of the logit models of making a loss were also consistent with the results from the models which had focused upon making a profit. Thus, smaller sized businesses, entrepreneurs who had not used their own savings at start up, male entrepreneurs, and those entrepreneurs who had used fewer sources of advice were more likely to make a loss.

Having relatives in business was not important in nine of the sets of models of business performance. However, having relatives in business was a handicap to making a profit three years ago, and it also increased the expectation of making a loss three years ago.

8.3.3 E-commerce

Chapter seven intended to test a set of hypotheses with regard to the use of websites, business location and entrepreneurial experience. With respect to website usage, five performance measures were explored: (i) the age of the websites, (ii) the cost of creating the websites, (iii) the cost of maintaining the websites, (iv) the frequency of updating the websites and (v) the turnover generated by online sales. The econometric techniques used to test the nine hypotheses were ordinary lease square, logistic regression techniques and ordered logit regression techniques.

Firms located on science parks were more likely than firms located off park to report having an older website. Additionally, firms located on science parks spent more money on creating and maintain websites. However, there was no significant difference regarding the frequency of updating the websites between firms located on science parks and firms located off science parks. Firms located on science parks were also more likely to make a profit from online sales. Thus, the results are consistent with, and support, hypothesis H4a.

The results showed that the number of businesses purchased or established was statistically and systematically linked to several of the e-commerce measures. More specifically, a greater number of businesses purchased or established was found to be weakly statistically associated with older age of websites. There was a positive increased expectation on a firm to update their websites on a daily basis rather than weekly, monthly or less frequent schedule. The firms with a greater number of established or purchased businesses also reported being able to generate more turnover from online sales. There was no relationship between the number of purchased or established businesses with the cost of creating and maintaining the websites. Thus, the evidence only weakly supports hypothesis H4b.

Results showed that habitual entrepreneurs had a lower expectation of updating websites daily as well as a lower expectation of making profit from online activities. Thus, the evidence does not support hypothesis H4c. The findings were comparable to when the habitual entrepreneurs were split into the serial and portfolio variables. The evidence suggests that portfolio and serial entrepreneurs are not able to draw upon different sets of skills, experience and creativity to use e-commerce better and achieve better outcomes in comparison with novice entrepreneurs. Therefore, there is no evidence to support hypothesis H4d, and there is strong evidence to deny hypothesis H4e.

It was found that the results of the number of businesses purchased or established and the science park location interaction variables were mixed. The two way interaction effect is statistically significant at the 0.01 level against the cost of creating websites and the cost of maintaining them. Furthermore, it is statistically significant at the 0.05 level against the turnover from online sales. Thus, the evidence is in support of hypothesis H5a.

The experienced habitual entrepreneurs when incorporated into the models with the science park location as an interaction effect variable, were found to be stark. Overall, this set of results supported hypothesis H5b.

The interaction effect also split habitual entrepreneurs into portfolio and serial categories, and each of these two types interacted with the science park location. The portfolio and science park interaction terms were statistically significant at the 0.05 level or better across four of the five models, with the exception of the age of websites model. Therefore, portfolio entrepreneurs possess a higher likelihood of taking advantage of e-commerce than their novice counterparts. Moreover, when combined together, portfolio entrepreneurs located on science parks achieve superior e-commerce usage as well. These results consistently support hypothesis H5c.

The serial entrepreneurs and science park location interaction variables were also found to be statistically significant at the 0.01 level in three models. Serial entrepreneurs, as a separate, independent variable, were not significant against the five e-commerce dependent variables. However, serial entrepreneurs on science parks are able to leverage resources to compensate for their lack of experience and skills, which boosts the probability of spending more money on the websites' daily maintenance and thus the probability of generating more turnover from online sales. Accordingly, this supports hypothesis H5d.

The age of the entrepreneur and the age of business were found consistent positively related every five of e-commerce variables. In other words, the older the entrepreneur and the business is, the more likely they have a website and more possibly spend more money on the website and generate more turnover by online sales.

One the other hands, size of the business, using own savings, gender, relatives in business and higher degree did not have systematic and significant relationships with the measures of e-commerce. All of these entrepreneurial variables were not important in four of the five models of e-commerce.

8.3.4 Findings relating to Human Capital of the entrepreneurs

Several human capital characteristics were found to be significantly related to the three sets of performance measures explored above and are highlighted here. Findings relating to human capital in this study confirm the need to distinguish between various types of human capital. Most notably, general and specific human capital may have different associations with entrepreneurial performance.

Entrepreneurs with degrees were significantly more likely than those entrepreneurs without degrees to have 'one or more novel innovations', 'a novel innovation in products/services and/or processes', and 'one or more novel innovations in work, markets, supply, administration and distribution'. This evidence suggests that formal education and more information used can assist in the accumulation of explicit knowledge that may provide useful skills to entrepreneurs.

Male entrepreneurs' firms were less likely than those owned by women to be an exporter. Entrepreneurs who had been able to secure co-investors who invested at the time that the firm was started enjoyed a higher level of annualized 3 year rate of employment growth than those who had not been able to attract co-investors. Also, women compared to men were more likely to make a profit. For two time periods – one year ago, and three years ago those businesses where the entrepreneurs had partners had a higher expectation of making a profit. For the three time periods which modeled the expectation of making a profit the results found that, gender, possessing a degree, were consistently found to be statistically significant at the 0.10 level or better. Having relatives in business was not important in nine of the sets of models of business performance. However, having relatives in business was a handicap to making a profit three years ago, and it also increased the expectation of making a loss three years ago.

Interestingly, the age of the entrepreneur was found consistent positively related every five of e-commerce variables. In other words, the older the entrepreneur, the more likely they have a website and more possibly spend more money on the website and generate more turnover by online sales.

One the other hands, gender, relatives in business and higher degree did not have systematic and significant relationships with the measures of e-commerce. All of these entrepreneurial variables were not important in four of the five models of e-commerce.

The degree of entrepreneurs' education did not have a statistically significant relationship with the measures of e-commerce, with the exception of the cost of creating the websites variable. This evidence is against the author's expectation, as higher level of education normally involve with quicker and easier use of high technology. Knowledge provides individuals with increases in their cognitive abilities, leading to more productive and efficient potential activity (Schultz, 1959; Becker, 1964 and Mincer, 1974). This is a very interesting finding which should raise the awareness of policy maker, they should introduce policies to promote the advantages e-commerce, let more entrepreneurs especially entrepreneurs with higher degree of education recognize the benefit of adoption of e-commerce, and introduce some incentives where appropriate.

Overall, the presented evidence suggests a need to distinguish between different dimensions of human capital, as these various dimensions do not appear to consistently relate to different aspects of the entrepreneurial performance in the same way, as Becker (1993) pointed out, human capital can include attributes that have a positive or negative influence on outcomes.

8.4 Recommendations for policy measures

Government involvement to support entrepreneurs and / or their businesses is widespread, particularly in developed countries (Bridge et al., 1998; Deakins, 1999; Storey, 2003). Entrepreneurs and their businesses offer wider economic, social and other benefits and, therefore, government intervention is warranted to maximise these benefits (Bridge et al., 1998).

A key issue in policy development and implementation relates to the identification of the objectives of a particular policy initiative (Storey, 2000). In the absence of clearly specified objectives, the appropriate policy initiative and its subsequent evaluation cannot be established. If the objective of policy-makers is to maximise the returns to their investment (Bridge et al., 1998), they may potentially benefit from targeting their financial resources to 'winning businesses' (Storey, 1994) or 'winning entrepreneurs'. One of the purposes of this study was to explore whether a type of 'winning' or greater performing entrepreneur could be identified.

Based on human capital theory, it was expected that experienced (habitual) entrepreneurs would outperform inexperienced novice entrepreneurs and would therefore qualify as 'winning entrepreneurs'. However, if habitual entrepreneurs businesses generally under-perform, there is a policy choice either to divert rare resources away from these entrepreneurs; or develop policies that ensure the survival and development of businesses owned by them.

According to the results generated from this study, several possible implications have been given by the author to promote the maximum development of small firms located on and off science parks by effectively and efficiently applying limited resources. There are some very interesting and important points that need to be emphasised particularly.

First, science park location is the key variable in this research. From the results presented earlier, it is safe to say that businesses located on a science park produce better performance than businesses located off science parks. Compared to developed western countries, science parks in China are still in their initial stages and have a great deal to learn from the US and Europe. The governors of the parks should raise the quality of their service in both ‘software’ (i.e., business consultants) and ‘hardware’ (i.e., office buildings or Internet connections) to attract more small businesses to locate their firms inside the parks.

Second, the type of prior business ownership experience, namely, being a portfolio entrepreneur, was found to have a much stronger association with the business performance measures. Portfolio entrepreneurs achieved a higher three-year annualised rate of employment growth as well as a higher annual rate of employment growth. Portfolio entrepreneurs had a higher probability of being an exporter, and a lower probability of having a loss in all three time periods. In order to maximise the return on their investments, policymakers should introduce incentives to encourage the development of existing entrepreneurs' firms rather than providing support for new firms (Westhead et al., 2004).

Third, the serial entrepreneurs and science park location interaction variables are an interesting and important finding. The serial entrepreneurs variable, on its own, was not statistically significant at making a profit over the last, second last and third last years. However, when the science park and serial entrepreneurs interaction variables connected, the three models mentioned above were statistically significant at the 0.10, 0.10 and 0.01 levels. As a result, although serial entrepreneurs could not produce higher business performance alone, the combination of serial entrepreneurs and science parks variable are making chemical reactions, when serial entrepreneurs are located on science parks they make a significant improvement to the ability to achieve an enhanced result in three to improve the ability of achieving an enhanced result in three models. This fact should raise the policymakers' awareness to attract off-park serial entrepreneurs to remove their business to science park.

Fourth, this study shows that business with more advice outperform those with limited advice. Therefore, in order to stimulate firm efficiency, it is suggested that more business advice and help should be brought to firms – especially novice firms on science parks. Westhead et al. (2005) presented results that showed that portfolio and serial entrepreneurs processed significantly more information than novice entrepreneurs. Taking their findings with the findings presented in this chapter into account, policymakers and practitioners should take every effort to ensure that inexperienced novice entrepreneurs have access to a wider range of information.

Fifth, as shown in the study, habitual entrepreneurs are those who have previous business ownership experience, which means that they are far more experienced in the entrepreneurial process and could generate more profit than novice founders. In order to maximise the return on their investments, policymakers and practitioners may seek to encourage the development of existing entrepreneurs' firms instead of solely providing additional support to increase the supply of nascent entrepreneurs, novice entrepreneurs and new firms (Global Entrepreneurship Monitor (GEM), 2004; Westhead et al., 2004, 2005c).

Last, but not least, the research also shows another interesting result: female entrepreneurs outperform male entrepreneurs. The research presented that females are not only more likely to be exporters, but are also more likely to make greater profit when compared to their male counterparts. Female entrepreneurs are as effective as their male counterparts when it comes tothe ability to make profit (Watson, 2002, Westhead, 2003), but in most countries there is significantly less women participating in entrepreneurial activities (Levent et al., 2003). This should be appreciated by policymakers and result in further assistance and incentives to attract more female entrepreneurs to achieve their potential and generate additional economic growth.

8.5 Limitations of the study and implications for future studies

There is a lack of previous research that has adopted a large-scale sampling technique to look at the performance of entrepreneurial ventures on and off science parks and the types of entrepreneurial experience entrepreneurs in China. This chapter has contributed to the debate on science parks and prior entrepreneurial experience in the emerging nation of China. In particular, this was the first study to make a distinction between experienced serial and portfolio entrepreneurs in comparison to novice entrepreneurs with no prior business experience in Chinese business context.

However, this study has a number of limitations, some of which originated from constraints on time and money, others from hindsight and the limited availability of public data on entrepreneurs and their businesses. Some of these limitations provide future research opportunities. Both the limitations of this study and areas for future research will be discussed in this section.

The study only used data gathered from one city in China to analyse the results relating to small business performance and entrepreneurial experience. However, as Beijing is the capital of China, and ZSP is the biggest science park in China, this study however can be accepted as a true representation of the situation of small businesses and entrepreneurs in China. Future studies are recommended to take other major cities, like Shanghai and Guangzhou, as research targets.

The primary data used in this study was gathered through responses from small business entrepreneurs via questionnaire. Given the amount of questionnaires that returned unfilled or partially filled, a further in-depth interview is recommended in order to gain more detailed information of entrepreneurs and small businesses for future study.

As this study showed that habitual entrepreneurs outperform novice entrepreneurs, and that portfolio entrepreneurs outperform serial entrepreneurs, further research would be needed to fully understand the differences between serial and portfolio entrepreneurs.

A further study should consider more business sectors than the five sector variables of software, computer services, business services, electronic and information hardware, and manufacturing and education. Examples of other representative sectors could include the retail and food and beverage sectors.

The data collected for the purpose of this study rely on the responses from a single entrepreneur and therefore, can be viewed as to some extent subjective. If possible, a second party would verify at least part of the information collected about the entrepreneur and the surveyed business. For example, in many cases entrepreneurs use partners to establish or purchase their ventures, each owner may view two similar businesses very differently. Data collected from partners could have been used to verify information relating to the business if time and resources had been available.

Another limitation of this study was that it relied largely on data from a survey. While surveys offer a number of advantages, they can be limited in terms of their ability to capture details relating to the 'why' and 'how' aspects of a phenomenon. Future studies may benefit from the use of in-depth case studies (Ucbasaran et al., 2003b).

For the future research, there is need of more considerations on the definition of habitual entrepreneurs, as they are those who have two or more business ownership experience at the same time. There must be a case that, habitual entrepreneurs can be sub-divided into successful habituals and unsuccessful habituals, where successful habitual entrepreneur reported that the number of business which had failed (had closed/sold or had faced bankruptcy, liquidation or receivership) was less than those which had been sold / closed because there was a better opportunity to make a profit. On the other hand unsuccessful habitual entrepreneur reported that the number of business which had failed (had closed/sold a business because the under-performance or had faced bankruptcy, liquidation or receivership) was greater than those which had been sold / closed because there was a better opportunity to make a profit.

Another definition of a habitual entrepreneur could be one who has owned three or more successful businesses. As the potential problems with defining a habitual entrepreneur in terms of two business ownership experiences is that it does not control for luck and external factors. An entrepreneur may have been successful due to factors outside his/her managing the first time creating an initial stock of wealth for another business. This second business may therefore be 'protected' by a shield of financial resources. Therefore, to be considered a successful habitual entrepreneur, one may benefit from using a measure of three successful businesses.

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Appendix

Appendix 1: Review of studies on science parks.

Authors	Country (Publication year)	Period analyzed	Number of observation	Response rate	Performance measure	Key findings	Theory used
Monck, Porter, Quintas, Storey, and Wynarczyk	UK (1988)	1986	183 on park 101 off park		The founder of firms, the technology transfer of firms, the firms performance and impact, the property of management of science park, the management and financing of firms and the employment of firms and the annual turnover of firms	There is no superior performance in terms of employment creation, science park businesses have a minimal local displacement fact, the proportion of firms on science parks with links with HEIs is comparatively high.	
Massey, Quintas and Wield	UK (1992)	1986,1990	39 science parks, and 1012 tenant in the parks		Employment, patent, sources of finance, links with HEIs	There is a fundamental nee, for reasons both social and economic, massively to broaden access to science and the technology. This does not mea, simply shifting resource with in the anyway restricted budget of the educational system, the issue is much more one of democratising the whole notion of scientific endeavor.	

Westhead and Storey	UK (1994)	1986,1990	1986: 59 on parks 50 off parks 1992: 71 on parks 71 off parks	65%	Inputs and outputs of R&D, employment, links with HEIs financing of firms, management and markets of firms, science park location	The science park provides a prestige site. The accommodation provided on science parks is generally of an extremely high standard. The par is normally very close an HEI, location on a science park for an independent business does not seem to be a factor influencing its survival or non-survival, businesses located on science parks in 1986 and survived to 1992 on average exhibited faster rates of growth than comparable businesses.in terms of the qualifications of the founders science park firms clearly differ from off-park firms.	
Westhead and Cowling	UK (1995)	1986-1992	46 on park 31 off park		Employment over 6 year period	Over the six year period, the mean employment increase in both groups of firms was virtually identical (15.5 employees compared with 16.4 employees).	
Westhead	UK (1997)	1986-1992	1986: 183 on park 101 off park	Interview survey 1992/93: On park 65% Off park 71%	R&D inputs and outputs	Results from both samples suggest Science Park firms do not directly invest more in R&D than off-Park firms nor do they record significantly higher levels of technology diffusion.	Resource based view of firm. Literature on the relationship of firms' location and its ability to

							innovate.
Westhead and Batstone	UK (1998)	1986-1992	47 on-park firms and 48 off-park firms		Factors which influenced owner-managers to locate their ventures on a science park or an off-park, Use of science park facilities, Future property needs	This study suggests that supportive property-based science park initiatives which make a contribution to new firm formation and urban regeneration were valued by technology-based tenant firms. By providing small units with flexible lease terms, many science parks had removed a significant barrier to business start-up and growth. To overcome some of the liabilities of small size and youthfulness , many NTBFs had either been established on science parks or had relocated shortly after start-up on to a supportive science park environment because of the `prestige and overall image of the site' and the `prestige of being linked to the HEI/centre of research' .	Resource based view of firm, Behavioral location theory,
Siegel, Westhead and Wright	UK (2003)	1992	89 on park 88 off park		the number of new products / services, the number of patents applied for or awarded, the number of copyrights, the R&D expenditures, the number of scientists	Results suggest that firms located on university science parks have slightly higher research productivity than observationally equivalent firms not located on university science parks.	Human capital

					and engineers		
Felsenstein	Israel (1994)		142 high-technology firms in Israel located both on and off-park.	firms on science park: 66%		The results indicate that, first, seedbed effects, as indicated by level of interaction with a local university and the entrepreneur's educational background, are not necessarily related to the firm's innovative level; second, science park location is shown to have only a weak and indirect relationship with innovation level.	
Luger and Goldstein	US (1991)	1989	72 research parks	62%	Parks effect on regional economic development, including job creation, new business formation, and average wage and salary level	The economic benefits for the case-studied parks appear to be positive, in addition to the employment and income benefits, the research parks have helped to enhance the research capacities of their affiliated universities and to increase the rate of technology development, transfer, and diffusion.	
Link and Scott	US (2003)	2001	29 universities	33%	Impact of Science Parks on the Academic Missions of Universities	Statistical analyses show there is a direct relationship between the proximity of the science park to the university and the probability that the academic curriculum will shift from basic toward applied research.	
Link and Scott	US (2006)	1950-2002	81 parks and additional 27 parks in the planning stage		Employment age of the park miles from park to university	Parks closer to the university, operated by a private organization, and with a specific technology focus — information technology in particular — grow faster than the average of 8.4% per year.	
Appold	US (2004)	1960-1985	A study of 3024 US	The	This study examines the	The analysis indicates that research parks were	Research

			counties between 1960 and 1985	number of industrial research laboratories in 1960 was compiled by locality from the 1960 edition of Industrial Research Laboratories of the United States (1960) and then aggregated. The number of research laboratories in each county in	effectiveness of research parks in attracting research activity to localities. It compares the number of industrial research laboratories in 1985 in localities against the number of which in the mid-1960s.	not effective local development tools but instead benefitted from the growth of research activity.	parks, are a form of industrial recruitment. They are similar to other property-based interventions such as development and enterprise zones. While enterprise zones have been shown to be largely ineffective (Bondonio and Engberg, 2000), the efficacy of research parks as local

				1985 was compiled from the 1985 edition of the same source (Industrial Research Laboratories of the United States, 1985).			economic development tools is only rarely empirically investigated.
Lo ̈fsten and Lindelo ̈f	Sweden(2001)	1994-1996	263 NTBFs in Sweden, 163 on-park, 100 off-park		Growth of sales and growth of employment, and profitability.	The findings suggest that the parks milieu appear to have a positive impact on their firms growths as measured in terms of sales and jobs. However, there was no evidence of a direct relationship between science park location and profitability.	Resource based view of the firm
Lo ̈fsten and Lindelo ̈f	Sweden (2002)	1999	273 NTBFs in Sweden, 134 on-park, 139 off-park	on-park: 52.1% off-park: 48.0%	Employment growth, sales growth and profitability.	The study showed some differences between the experience of firms on- and off-park in respect to innovation and marketing issues. Firms located in Science Parks were significantly more likely to have a	Resource based view of the firm

						link with a local university than off-park firms.	
Lo ̈fsten and Lindelo ̈f	Sweden (2005)	1999	134 new NTBFs on Science Parks in Sweden, USOs from the academy (74 small firms) and CSOs from the private sector (60 small firms).	50.6%	Employment growth, sales growth and profitability, product innovation.	The results show that the proportion of USOs and CSOs on Science Parks with links with universities is comparatively high. Seventy percent of USOs cooperates with universities and 59 percent of the CSOs. This is surprisingly high percentages of the CSOs. One finding from this research is that USOs are not able to channel investments into greater R&D outputs (Patents) than comparable firms.	Resource based view of the firm
Lindelo ̈f and Lo ̈fsten	Sweden (2003)	1999	273 NTBFs in Sweden, 134 on-park, 139 off-park	on-park: 52.1% off-park: 48.0%	Employment growth, sales growth and profitability.	1. The analysis showed some differences between the experience of firms on-Park and off- Park in respect of motivations of location and strategy issues. 2. No statistically significant differences between Science Park NTBFs and off-Park NTBFs were recorded with regard to patents/products launched in the last three years 3. On-Park firms collaborate less than off-Park	

						firms and their technological and economic performance do not significantly differ from the latter. 4. No single university will provide the full range of scientific or management skills required by the park NTBFs.	
Lindelo ̈f and Lo ̈fsten	Sweden (2004)	1999	273 NTBFs in Sweden, 134 on-park, 139 off-park	on-park: 52.1% off-park: 48.0%	Employment growth, sales growth and profitability	The level of interaction in the innovation process between firms located on Science Parks and local universities is generally low, but it is higher than the level of interaction exhibited by firms that are not Science Park firms.	Resource based view of the firm
Dettwiler, Lindelo ̈f and Lo ̈fsten	Sweden (2006)	1999	273 NTBFs in Sweden, 134 on-park, 139 off-park	on-park: 52.1% off-park: 48.0%	Employment growth, sales growth and profitability	1. The proximity to university is especially significant among NTBFs inside parks. 2. Infrastructure has high significance in both groups whereas significance of facilities cost differs in range of significance.	Facilities management
Ferguson and Olofsson	Sweden (2004)	1995,2002	66 NTBFs in Sweden, 30 on-park, 36 off-park	58%	Employment growth, sales growth	Results shows that 1. Firms located on science parks have significantly higher survival rates than off-park firms. 2. There are insignificant differences in sales and employment. 3. The image benefit associated with a science	

						park location is not helpful in explaining growth, whereas a location benefit associated with cooperation with universities is positively associated with growth.	
Colombo and Delmastro	Italy (2002)	2000	45 Italian NTBFs located on technology incubator within a park and 45 off-incubator firms.	On incubator : 19%	Personal characteristics of founders of NTBFs, the motivations of the self-employment choice, the growth and innovative performances of firms, propensity towards networking, and access to public subsidies.	Results confirm that input and output measuresof innovative activity are only marginally different between on- and off-incubator firms. In addition, on-incubator firms show higher growth rates than their off-incubator counterparts. They also perform better in terms of adoption of advanced technologies, aptitude to participating in international R&D programs, and establishment of collaborative arrangements, especially with universities. Lastly, they find it easier to get access to public subsidies.	Human capital. Resource based view of the firm.
Chen, Wu and Lin	Taiwan (2006)	1991-1999	6 high-tech industries		Number of employees, working capital, R&D expenditure, land area, annual sales and the number of patents.	The results indicate that precision equipment, semiconductor, and photo-electronics industries performed well at the increase of total factor productivity over the period of 1991–1999, compared to other three industries.	

Yang, Motohashi and Chen	Taiwan (2009)	2005	247 firms, 57 of them within the park		Innovation, employment	Findings show that the elasticity of R&D with respect to outputs of NTBFs located within HSIP is significantly higher than that of other firms. These findings further reveal that NTBFs located in the science park invest more efficiently.	
Fukugawa	Japan (2006)	2001-2003	74 firms on and off science park.		Innovation, Education degree of manager	Results show that on-park NTBFs exhibit a higher propensity to engage in joint research with research institutes. Furthermore, no significant difference was found between science parksand other types of property-based initiatives with regard to the degree of encouragement provided to tenants to establish localized HEI linkage.	Human capital
Phillips and Yeung	Singapore (2003)	2000	34 firms in park		R&D activities among tenants in the Singapore Science Park	This paper presents some empirical findings on the role of the Singapore Science Park as a place for R&D activities. First, there is a stark difference between firms that are actively involved in R&D and those that are not. Of those that are involved in R&D, most tend to focus on the 'development' aspect. There are positive relationships between some firm-specific variables (for example, size of RSEs and expenditure on R&D, duration of	

						stay in the Park, and national origins) and major developments. Secondly, foreign (non-local) firms are most likely to be involved in a variety of activities other than R&D.	
Koh, Koh' and Tschang	Singapore (2005)		3 science parks/technology districts, namely, Silicon Valley, Cambridge Science Park, and Hsinchu Science Park.		Three aspects of a science park's development: Growth mechanisms, level of technological capabilities, and nature of its integration with national or global markets.	This paper only examine the growth of science park itself, it did not consider the firms located in the park. Finally, this study applied the framework to Singapore's earlier and recent science park strategies to assess its development and to identify the challenges ahead.	
Chan and Lau	Hong Kong (2005)	2003	6 technology start-ups in the Hong Kong Science Park		pooling resources in the science park, consulting service, public image, networking, clustering geographic proximity, costing and funding	It is found that the benefits required by technology founders at different stages of development are varied and therefore, the general merits that are claimed by incubators as useful to technology start-ups are debatable. It is also found that sharing basic structural resources, e.g. administrative support, office equipment, etc. are generally applied to all technology firms within the incubator programme.	
Bakouros, Mardas and Varsakelis	Greece (2002)	2000	17 firms located in the three Greek science parks.	70%	Reasons for the establishment in the SP, Formal and informal links with	The findings indicate that the picture of the three science parks of Greece is not the same in terms of the links between university and	

					HEI and synergies between the firms located in the park.	industry. Informal links have been developed between the firms and the local university, however, only the firms located at one science park have developed formal links, while the formal links of the companies of the other two parks are at the infant level at this time. Synergies between the on-park companies are limited only in commercial transactions and social interactions. The research type synergies are completely absent in all three parks.	
Ratinho and Henriques	Portugal (2010)	2005-2006	7 Science Parks 4 Business Incubator		University links, Suitability of management.	This study suggests a modest contribution of SPs and BIs to economic growth in Portugal.	
Phillimore	Australia (1999)	1998	38 companies related to local collaboration, 52 about all collaborative.	65% 90%	Links between Park companies and universities, Interaction between companies on WATP	It finds that there is more interaction occurring than might be estimated using the traditional evaluative model and identifies several different categories of company which exist at the Park, in terms of their interactive behavior.	
Filatotchev, Liu, lu and Wright	China (2011)	2000-2003	1 science park in Beijing	100%	Investigates the impact of returnee entrepreneurs and their knowledge spillovers on innovation in high-tech firms in Beijing Zhongguancun Science Park (ZSP) China.	The results show that returnee density and internal skill intensity are significantly associated with innovation. The authors have found that returnee entrepreneurs are an important source of external knowledge spillovers, and that returnee presence	

						facilitates knowledge spillovers to non-returnee SMEs.	
Tan	China (2006)		1 science park in Beijing		Evolution of the cluster in the Beijing ZGC Science Park. the origin of the cluster and the convergence of clustered firms.	The ZGC Park has played a crucial role in facilitating technology transfer and innovation since its inception. However, within a relatively short time, the ZGC cluster has started to show signs of premature aging and decline, especially when compared with other successful clusters such as Silicon Valley, which served as its role model.	
Chen	China (2005)		3 science parks in china		History and performance of science parks	A clear finding is that the science parks have benefited the cites that host them. Science parks in China are progressing steadily from reliance on foreign firms and FDI.	
Macdonald and Deng	China (2004)	1988-1999	17498 high technology firms on park and 4566 high technology firms off park.		Employment, annual production, net profit, tax paid, export income.	This paper considers the creation of the Silicon Valley model, and then speculates on the implications for China of its uncritical acceptance in science parks. There is little evidence that science parks work as their supporters say, and growing evidence that they do not. There may be benefits, but perhaps for those who can lay claim to a role in a particular model of innovation, rather than for the firms that occupy the science parks.	
Squicciarin	Finland	1970-2002	252 firms in parks	33%	Compare the patenting activity	Results show that both firms' size and patents	

i	(2007)				that a sample of firms exhibits before locating inside the SP with the innovative output they show after becoming Parks' tenants.	in portfolio positively affect the firms' likelihood to patent. We also find that the years spent elsewhere, before joining the Parks, negatively influence firms' performance.	
Shin	Korea (2000)	1998	1 science park		Environment and spaces of DSP, research and educational activities, linkages between the DSP institutions and local industries, synergistic effects among research institutions, employment of local people, contribution to the improvement of local cultural and educational activities	It can be concluded that the plan for the DSP was successfully implemented and the guidelines contained in the original plan were well observed. Some problems that emerged in the earlier stages, such as a lack of local economic benefits and political input, are now being corrected. The DSP does provide adequate working and residential environments for those who work for the research and educational institutions that contribute to the advancement of the nation's scientific and technological research.	
Kihlgren	Russia (2003)	1992-1998	2 technology parks and 2 innovation centers		1. The creation of new enterprises in order to generate new jobs and wealth. 2. The transfer of	Science parks in St. Petersburg have been rather successful in securing financing for their tenants, but deficient in providing	

			operative in St. Petersburg		technology from academic institutions to industry. 3. The commercial exploitation of existing or newly developed technologies. 4. The realization of income for the founders and the increase in the value of the premises.	management assistance. The transfer of technology to industry has been weak due to the limited demand for high-tech products.	
Shearmur and Doloreux	Canada (1999)	1971-1997	17 science parks in Canada		High-tech employment (whether in the manufacturing or service sectors) in the regions in which they are located	It is found that there is no link between the opening of a science park and employment growth in high-tech sectors.	

Appendix 2: Reported definitions and prevalence of habitual entrepreneurship.

STUDY	DEFINITIONS OPERATIONALIZED	NATIONAL CONTEXT	REPORTED PREVALENCE		
			Habitual	Serial	Portfolio
Cross (1981)	Habitual entrepreneur: previous experience of founding a new company.	Scotland	11.5 %		
Storey (1982)	Habitual entrepreneur: previous business ownership experience.	Cleveland, England	32.0 %		
MacMillan (1986)	Habitual entrepreneur: individual who has had experience from multiple business start-ups and simultaneously is involved in at least two businesses.				
Ronstadt (1988)	Among persons with a career as independent founding entrepreneurs, those who had created more than one venture (practicing/ex-entrepreneurs).	USA	39.9 %		
Westhead (1988)	Habitual entrepreneur: previous experience of founding an independent business.	Wales	34.2 %		
Kolvereid et al., (1991)	Persons that had created and still owned at least two businesses.	Norway New Zealand Great Britain			34 % 18 % 13 %
Schollhammer (1991)	Multiple entrepreneurs: persons involved in the formation of and having an equity stake and managerial responsibility in two or more ventures, where each venture had independent	USA Southern	51 %		

STUDY	DEFINITIONS OPERATIONALIZED	NATIONAL CONTEXT	REPORTED PREVALENCE		
			Habitual	Serial	Portfolio
	legal identity.	California			
Birley and Westhead (1993)	Habitual founders: founders that had established at least one other business prior to the start-up of the current new independent venture. Novice founders: individuals with no previous experience of founding a business.	Great Britain	37.3 %		12 %[1]
Kolvereid and Bullvåg (1993)	Experienced business starters: founders that had established at least one business prior to the current one. Successful multiple business starters: experienced business starters who still owned the most recent of the prior established businesses (here: portfolio starters).	Norway	47.2 %		31 %
Starr et al., (1993)	Experienced entrepreneurs: individuals with a track record of forming, managing and owning equity stake in at least two new ventures which eventually went public.				
Scott and Rosa (1997)	Multiple business owners: persons who have an ownership share in more than one independent business.	Scotland			14 %
Alsos and Kolvereid (1998)	Novice founder: Founder who has not started previous businesses Serial founder: Founder who has started at least one previous business, but this (these) business(es) has (have) been sold or closed down.	Norway	35.8 %	20.1 %	15.7 %

[1] Calculated from information provided in Birley and Westhead (1993).

STUDY	DEFINITIONS OPERATIONALIZED	NATIONAL CONTEXT	REPORTED PREVALENCE		
			Habitual	Serial	Portfolio
	Parallel founder: Founder who has started at least one previous business, and have retained a previous business				
Taylor (1999)	Habitual entrepreneur: previous business ownership experience.	England	41.8 %	18.5 %	23.3 %
		Australia	49.2 %	23.8 %	25.4 %
		Malaysia	38.6 %	4.8 %	33.7 %
Westhead and Wright (1998b)	Serial founder: individual who sold their original business but at a later date established or purchased another business. Portfolio founder: individual who retained the original business he/she established but at a later date established or purchased another business. Habitual founder: serial or portfolio founder.	Great Britain	37.4 %	25.3 %	12 %
Carter (1998)	Portfolio owners: farm owners who owned one or more additional firms. Diversified activities at farms: farms with other business activities, or other businesses own by the farmer or located at the farm.	England			21 %
Spilling (2000)	Multiple entrepreneurs: managers that had been involved in two or more start-ups.	Norway	28 % of		13 % of

STUDY	DEFINITIONS OPERATIONALIZED	NATIONAL CONTEXT	REPORTED PREVALENCE		
			Habitual	Serial	Portfolio
	Portfolio owners: managers who had owner interests in two or more companies.		managers		managers [2]
Iacobucci (2002)	Business group: set of companies, which were legally distinct and controlled by the same entrepreneur (or by members of the same family).	Italy			25 % of firms
Alsos et al., (2003)	Portfolio farm households: farm households (husband and/or wife) owning or managing another business in addition to the farm business	Norway			30.9 %
Pasanen (2003)	Portfolio owners: individuals who owned more than one business at a time. Serial owners: individuals who owned one business after another but effectively only one business at a time. Multiple entrepreneurs: SME owner-managers who were serial and portfolio owners simultaneously.	Finland	50 %	10 %	40 %
Westhead et al., (2003a)	Habitual entrepreneurs: individuals with prior minority or majority business ownership experience either as business founder, inheritor or purchaser of an independent business who currently owned a minority or majority equity stake in an independent business that was	Scotland	43.5 %	24.9 %	18.6 %

[2] This represents 21 % of owner-managers.

STUDY	DEFINITIONS OPERATIONALIZED	NATIONAL CONTEXT	REPORTED PREVALENCE		
			Habitual	Serial	Portfolio
	either new, purchased or inherited. Serial entrepreneurs: individuals who had sold/closed a business which they had a minority or majority ownership stake in, and they currently had a minority or majority ownership stake in a single independent business that was either new, purchased or inherited. Portfolio entrepreneurs: individuals who currently had minority or majority ownership stakes in two or more independent businesses that were either new, purchased and/or inherited.				
Haynes (2003)	Prior entrepreneurial experience: prior experience from launching a new venture.	USA	29.2 %		
Alsos et al., (2006)	Novice entrepreneur: entrepreneur with no current or previous owner-management position in another business Serial entrepreneur: entrepreneur with previous but no current owner-management position in another business Portfolio entrepreneur: entrepreneur with current owner-management position in another business	Norway	21.5 %	13.7 %	17.8 %
Ucbasaran et al., (2006)	Novice entrepreneurs: individuals with no prior (majority or minority) business ownership experience, either as a business founder or a purchaser of an independent business, who currently owned a minority or majority equity stake in an independent business that was either new or purchased.	Great Britain	51.8%	22.2%	29.6%

STUDY	DEFINITIONS OPERATIONALIZED	NATIONAL CONTEXT	REPORTED PREVALENCE		
			Habitual	Serial	Portfolio
	Habitual entrepreneurs: individuals who held or had held a minority or majority ownership stake in two or more businesses, at least one of which was established or purchased. Serial entrepreneurs: individuals who had sold or closed at least one business in which they had a minority or majority ownership stake, and currently had a minority or majority ownership stake in a single independent business. Portfolio entrepreneurs: individuals who currently had a minority or majority ownership stake in two or more independent businesses.				

(Source: Ucbasaran et al., 2008)

Appendix 3: Descriptive statistics and correlation matrix.

	Mean	S. D.	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Age of Business	7.74	2.64	1.0	----	----	----	----	----	----	----	----
2. Size	40.57	45.42	0.37***	1.0	----	----	----	----	----	----	----
3.Own Savings	0.61	0.49	-0.18***	-0.23***	1.0	----	----	----	----	----	----
4. Gender	0.90	0.31	0.01	-0.04	-0.06	1.0	----	----	----	----	----
5.Age Entrepreneur	42.00	8.39	0.41***	0.34***	-0.23***	-0.05	1.0	----	----	----	----
6. Relative	0.11	0.31	-0.11**	-0.09*	0.08*	0.12**	-0.14***	1.0	----	----	----
7. Degree	5.75	0.44	-0.21***	-0.20***	0.11**	-0.04	-0.41***	0.15***	1.0	----	----
8. Partners	2.77	1.30	0.29***	0.19***	-0.17***	-0.09**	0.34***	-0.33***	-0.07	1.0	----
9. Business Advice	6.90	2.57	0.12**	0.18***	-0.15***	0.02	0.10**	-0.02	-0.12**	-0.02	1.0
10. Science Park	0.52	0.50	0.04	-0.09*	0.05	0.05	0.01	-0.04	-0.04	-0.12***	-0.11**
11. No. of businesses	2.88	1.89	0.39***	0.16*	0.01	0.01	0.36***	-0.06	-0.19***	0.23***	0.04
12. Habitual	0.64	0.48	0.23***	0.01	-0.05	0.06	0.43***	-0.02	-0.15***	0.20***	-0.08*
13. Serial	0.16	0.36	-0.12***	-0.14***	0.05	0.09*	0.04	-0.03	-0.09**	0.07	-0.12**
14. Portfolio	0.48	0.50	0.31***	0.11**	-0.09*	-0.01	0.39***	0.02	-0.07	0.13***	0.01

Notes: Notes: Correlation matrix relates to a sample of 462 respondents. VIF is the variance inflation factor. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Appendix 3: Descriptive statistics and correlation matrix.

	10.	11.	12.	13.	14.
1. Age of Business	----	----	----	----	----
2. Size	----	----	----	----	----
3.Own Savings	----	----	----	----	----
4. Gender	----	----	----	----	----
5.Age Entrepreneur	----	----	----	----	----
6. Relative	----	----	----	----	----
7. Degree	----	----	----	----	----
8. Partners	----	----	----	----	----
9. Business Advice	----	----	----	----	----
10. Science Park	1.0	----	----	----	----
11. No. of businesses	-0.08	1.0	----	----	----
12. Habitual	-0.02	0.65***	1.0	----	----
13. Serial	-0.01	0.08	0.32***	1.0	----
14. Portfolio	-0.01	0.66***	0.63***	-0.41***	1.0

Notes: Notes: Correlation matrix relates to a sample of 462 respondents. VIF is the variance inflation factor. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Appendix 4: Research questionnaire in English language.

SURVEY OF BUSINESS OWNERS

This questionnaire should be completed by the key individual who is the most influential in the business. He or she could be
the principal owner of the business. Your individual confidentiality will be strictly maintained. We appreciate your co-operation.

Would you like to receive a copy of the summary report for this survey?

Yes	**No**

Section 1: General Background of the Principal Owner

1. Please indicate whether you are:

Male	Female

2. What is your age?

3. Which of the following educational qualifications do you have? (Please circle appropriate boxes)

Primary school	Yes	No
Junior High School	Yes	No
Senior High School	Yes	No
College Diploma	Yes	No
Bachelors degree	Yes	No
Masters degree	Yes	No
PhD degree	Yes	No
Others (Please specify)	Yes	No

4. What was the occupation of your parents (i.e. the main income earner) during your childhood?

Business Owner		Manager		Military		Farmer	
Professional		Skilled employee		Manual		Unemployed	

5. What was your job status prior to establishing/purchasing/inheriting this business? Please tick

Managerial		Professional		Manual		Unemployed	
State Civil Service		Military		Student		Farmer	

6. How many different organisations have you worked for full time?

7. What is your position in the business? (Please tick all appropriate boxes)…

Founder of the business		Principal Owner		Managing director		Chairman		Other, Please Specify…	

8. How did you gain an ownership stake in this business?

Established the business	☐	Inherited the business	☐	Purchased or acquired an equity stake in the business	☐

9. Did you start, purchase or inherit this business alone or with other equity partners?

Alone	☐	*With others*	☐	If with others, how many equity partners did you have?	☐

10. Please indicate the <u>number</u> of businesses you have owned by filling in the table below

Number of businesses:	Number of businesses with a **majority** equity stake (i.e. 50% or more ordinary shares)	Number of businesses with a **minority** equity stake (i.e. less than 50% ordinary shares)
TOTAL NUMBER OF BUSINESSES EVER		
❖ Established		
❖ Inherited		
❖ Purchased		
NUMBER OF **CURRENT** BUSINESSES		
❖ Established		
❖ Inherited		
❖ Purchased		
NUMBER OF BUSINESSES **'EXITED'** through		
❖ Closure		
❖ Sale of business		
❖ Other forms of exit		

<u>Section 2: Adoption of Electronic commerce</u>

11. Does your firm have a website?

Yes	No

12. If yes, please provide your URL: ______________________

13. The year it was created: ______________________

14. Approximately, how much did it cost to create the website? ______________

15. Approximately, how much does it cost to maintain the website annually? __________

16. How often is your website updated?

Daily	Weekly	Monthly	Less Often

17. Currently, approximately what percentage of your turnover do you predict will be accounted for by on-line sales? Please tick appropriate box.

None	1%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50% or more

18. What are the main barriers of the adoption of E commerce? Please indicate your agreement with the next set of statements using the following rating scale.

Please tick one box in each row.	Not important	Slightly Important	Moderately Important	Important	Very Important
Top management is not enthusiastic about the adoption of electronic commerce	1	2	3	4	5
Our industry is not suitable for us to adopt electronic commerce	1	2	3	4	5
Learning to operate electronic commerce would not be easy for me	1	2	3	4	5
It would not be easy for my employees to become skilful at using electronic commerce	1	2	3	4	5
Our organization does not have enough finance to adopt electronic commerce	1	2	3	4	5
Electronic commerce would not be consistent with our existing technology infrastructure	1	2	3	4	5
Our partner(s) does not use electronic commerce	1	2	3	4	5
Other, please specify					

19. How important were the following reasons for using E commerce? Please tick one box in each row.

	Not important	Slightly Important	Moderately Important	Import ant	Very Importa nt
For generating on-line sales	1	2	3	4	5
To strengthen our competive advantage	1	2	3	4	5
To increase sale	1	2	3	4	5
To improve our reputation					
To communicate with existing customers in local markets	1	2	3	4	5
To communicate with existing customers in China markets	1	2	3	4	5
To communicate with existing customers in international markets	1	2	3	4	5
To target new customers in local markets	1	2	3	4	5
To target new customers in China's markets	1	2	3	4	5
To target new customers in international markets	1	2	3	4	5
Other, Please specify					

20. To what extent do you agree the following statements? Please tick one box in each row.

	Totally agree	**Partially agree**	**Neither agree nor disagree**	**Partially disagree**	**Totally disagree**
E-Commerce is non-essential in the development of the company	1	2	3	4	5
E-Commerce is an inevitable choice in the development of company	1	2	3	4	5
E-Commerce is an important marketing strategy	1	2	3	4	5
E-Commerce is an important means to look for business opportunities	1	2	3	4	5
E-Commerce is an important aspect of technological innovation	1	2	3	4	5
E-Commerce is an important demonstration of company quality	1	2	3	4	5
E-Commerce is an important platform for customer contact	1	2	3	4	5

Section 3： General Background of Company

21. What is the main product produced or service provided by this business?

22. Is this business a family owned business (i.e. more than 50% of voting shares are owned by a single family related by blood or marriage)?

Yes	No

23. When was the business established?

24. What is the legal status of this business? Please tick as appropriate

A sole proprietorship	A partnership	An unlimited company	A private limited company	Others

25. Currently, how many equity partners does this business have?

26. What percentage of your sales in the last year was accounted for by your Top 5 Customers? Please tick one box.

Less than 10%	10-24%	25-49%	50-75%	More than 75%
1	2	3	4	5

Section 4：Growth and Innovation

27. How many people are/have been employed in this business (including the owners)?

	3 Years Ago	**1 Year Ago**	**Currently**
Full-time			
Part-time (less than 30 hours per week)			
Casual			

28. What percentage of your gross sales were exported outside of the China over the last year. If zero exports please write NIL

%

29. Do you intend to establish/purchase an additional business in the future?

Yes	No

30. In the last 3 years, has your firm undertaken any form of innovation as regards the following?

Please circle the appropriate response on each line**:**

	Innovation Not Tried	Innovation Tried and Failed	Innovation New to Firm but not new to industry	Innovation New to industry
In products or services	1	2	3	4
In production processes (including storage)	1	2	3	4
In work practices, or workforce organisation	1	2	3	4
In supply and supplier relations	1	2	3	4
In markets and marketing	1	2	3	4
In administration and office systems	1	2	3	4
In products or services distribution	1	2	3	4
Others (Please specify)	1	2	3	4

31. Approximately what percentage of your firm's annual turnover was spent on research and development (R&D) and innovation related activities (e.g. marketing, design, better production capabilities) during the last 3 years? If zero, please indicate nil.

3 Years Ago __________ 1 Year Ago __________ Currently __________

32. Approximately how many of your employees are/have been engaged in R&D? If zero, please indicate nil.

	3 Years Ago	**1 Year Ago**	**Currently**
Number of people engaged in R&D			

Section 5：Information and Environment

33. Have you used any of the following sources of information? Please also indicate how useful they were.

	Used source?		No positive impact	Slight impact	Moderate impact	Important impact	Critical impact
Accountant	Yes	No	1	2	3	4	5
Solicitor	Yes	No	1	2	3	4	5
Bank	Yes	No	1	2	3	4	5
Customers	Yes	No	1	2	3	4	5
Business Associates	Yes	No	1	2	3	4	5
Friends/Relatives	Yes	No	1	2	3	4	5
Suppliers	Yes	No	1	2	3	4	5
Consultants	Yes	No	1	2	3	4	5
Association of Beijing SMEs	Yes	No	1	2	3	4	5
Beijing SMEs Service Center	Yes	No	1	2	3	4	5
Beijing SMEs Website (www.bjsme.gov.cn)	Yes	No	1	2	3	4	5
China SMEs Website (www.sme.gov.cn)	Yes	No	1	2	3	4	5
China International SMEs Fair	Yes	No	1	2	3	4	5
Other please specify：…………………	Yes	No	1	2	3	4	5

34. How do you evaluate the external environment in which your company operating in? (where '1' suggests you totally agree with the statement on your left hand side, '3' suggests both statements are equally characteristic of your businesses external environment, '5' suggests you totally agree the statement on your right hand side)

Very safe, little threat to the survival and well-being of the business	1 2 3 4 5	Very risky, a false step can lead to the businesses undoing
Rich in investment and marking opportunities	1 2 3 4 5	Very stressful, exacting, hostile, very hard to keep afloat
An environment that my firm can control and manipulate to its own advantage, such as a dominant business ahs in an industry with little competition and few hindrances	1 2 3 4 5	A dominating environment in which my business initiatives count for very little against the tremendous competitive, political or technological forces

35 Please circle the number on each row that best approximates the actual conditions in your business principal industry (in term of sales). (where '1' suggests you totally agree with the statement on your left hand side, '3' suggests both statements are equally characteristic of your businesses external environment, '5' suggests you totally agree the statement on your right hand side)

Our business unit rarely has to change its marketing practices to keep up with the market and competitors	1 2 3 4 5	Our business unit must frequently change its marketing practices (e.g. semi-annually)
The rate of product/service obsolescence in our principal industry is very slow	1 2 3 4 5	The rate of product/ service obsolescence in our principal industry is very fast
Actions of competitors are quite easy to predict	1 2 3 4 5	Actions of competitors are unpredictable
Demand and consumer tastes are fairly easy to forecast	1 2 3 4 5	Demand and consumer tastes are almost unpredictable
The production/service technology is not subject to very much change and is well established	1 2 3 4 5	The modes of production/service changes often and in a major way

36. Please indicate to what extent the following strategies are important in the development of your company?

	Extremely not important	Not important	moderate	important	Very important
Improve product/service quality and type through research and design.	1	2	3	4	5
Enhance staff training to improve work efficacy and service level.	1	2	3	4	5
Reduce company operating cost, improve effectiveness.	1	2	3	4	5
Strengthen the advertising investment, develop new customers and new suppliers.	1	2	3	4	5
Promote company image, enhance company prestige.	1	2	3	4	5
Establish partnership and friendship through association.	1	2	3	4	5
Other, please specify__________________	1	2	3	4	5

Section 6: Premise and Facilities

37. Is your office located on a science park?

Yes	No

38. Before you chose this site, were any other sites seriously considered?

Yes	No

39. Could you identify which of the following factors were of major importance in influencing your decision to locate the firm to their current location?

	Not important	Slightly Important	Moderately Important	Important	Very Important
Key founder lived locally.	1	2	3	4	5
Key founder worked previously in locality.	1	2	3	4	5
Key founder worked at local HEI/centre of research	1	2	3	4	5
Firm was already based in the area.	1	2	3	4	5
Cost of premises	1	2	3	4	5
Access to facilities of HEI/centre of research	1	2	3	4	5
Prestige and overall image of site	1	2	3	4	5
Prestige of being linked to the HEI/centre of research	1	2	3	4	5
Land adjacent to these premises for expansion	1	2	3	4	5
Availability of additional premises at this location	1	2	3	4	5
Prevision of on-site management and common services	1	2	3	4	5
Car parking facilities	1	2	3	4	5
Friendly atmosphere amongst tenants on site	1	2	3	4	5
Availability of skilled labour in area	1	2	3	4	5
Good transport and communication links	1	2	3	4	5
Access to markets	1	2	3	4	5
Access to materials and components	1	2	3	4	5
Proximity to firms in similar industrial sectors /using same technology	1	2	3	4	5
Scope for attracting graduate HEI staff	1	2	3	4	5
Other, Please specify	1	2	3	4	5

Section 7: Finance

40. Approximately, what proportion of the initial capital/finance for this business came from the following sources? Please indicate the percentage and then circle the number which indicates how easy it was to obtain these funds).

	Percentage Proportion	Very difficult	Difficult	Neither difficult nor easy	Easy	Very easy
My personal savings	%	1	2	3	4	5
'Internal finance' (i.e. funds from other businesses you own)	%	1	2	3	4	5
Contributions from family and friends	%	1	2	3	4	5
Contributions by cofounders / partners	%	1	2	3	4	5
Trade credit	%	1	2	3	4	5
Mortgage on home	%	1	2	3	4	5
Bank loans	%	1	2	3	4	5
Venture capitalists	%	1	2	3	4	5
Private investors	%	1	2	3	4	5
Grants from government agencies	%	1	2	3	4	5
TOTAL	**100%**					

41. Have you been seeking finance in the past three years?

Yes	No

If 'Yes' Approximately what proportion of this did you obtain? %

42. Is there any Foreign Direct Investment (FDI) in your business?

Yes	No

If 'Yes', what percentage of your capital is from FDI? %

43. For the last three financial years, has the business operated at?

	A loss	Break even	A profit
3 years ago			
1 year ago			
Current			

THANK YOU FOR YOUR TIME, SUPPORT AND INSIGHTS

If you have other comments, please share them with us.

Appendix 5: Research questionnaire in Chinese language.

中国企业家对电子商务的认识与应用

调 查 问 卷

尊敬的各位企业家：

本次调查只用于学术研究，您的个人以及企业信息将会被严格保管，不会向外界透露，请您如实填写。本问卷绝大部分是选择题，请在您认为适当的选项上画“√”即可;少量题为填空题，请在空格内填写适当的内容。如果您想了解这次调查的结果，请写信至 **liangzhan2005@gmail.com** 我们将把总结报告反馈给您，作为您接受这次调查的回报。对您的大力支持与良好合作，我们表示衷心的感谢!

————————————————————————————————————

第一部分：企业家个人信息

1. 您的性别是

男	女

2. 您的年龄是

3. 您获得何种学历?

小学	初中	高中	大学专科
大学本科	研究生	博士生	其他，请说明

4. 在您的童年时您父母（主要家庭收入者）的职业是什么?

企业主/经理	国家公务员	农民	工人
教、科、文、卫 专业技术人员	军人	无业	其他，请指出 ---------------------

5. 在建立、继承或收购本企业之前您的工作状态是？

企业主/经理	国家公务员	农民	工人
教、科、文、卫 专业技术人员	军人	学生	其他，请指出 ----------------------

6. 您曾经工作过的企业数量是？

7. 您在企业中的职位是？

董事长	总经理	股东	企业创建者	其它 请说明

8. 您以何种形式拥有本企业？

创建了企业	继承了企业	收购企业的股权

9. 您是独自或与其它伙伴共同创建，继承或收购本企业？

独自	与其他人合作	如果与其他人合作，请问您有多少合伙人？ --------

10. 请填写下面的表格，说明您曾经拥有过多少家企业。

您所拥有企业的变动情况	其中拥有该企业 **50%**以上的股权的企业数量	其中拥有该企业 **50%**以下的股权的企业数量
您曾经所有拥有过的企业总数		
❖ 其中建立的企业数量		
❖ 其中继承的企业数量		
❖ 其中收购的企业数量		
您现在拥有的企业总数		
❖ 其中建立的企业数量		
❖ 其中继承的企业数量		
❖ 其中收购的企业数量		
您已经退出的企业总数		
❖ 其中倒闭的企业数量		
❖ 其中卖出的企业数量		
❖ 其中以其他形式的退出的企业数量		

第二部分：企业电子商务的应用情况

11. 贵公司是否设有自己的网站？

是	否

12. 请填写贵公司网站地址

http://

13. 贵公司网站建立的时间是哪一年?

14. 创建网站的费用大约是多少元人民币？

元

15. 每一年维护网站的费用是多少元人民币？

元

16. 贵公司网站内容更新的频率是

每天	每周	每月	较少更新

17. 贵公司的网络在线销售营业额占总营业额的百分比大约是多少？

没有	1%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%或更多

18. **贵公司如未使用电子商务，主要障碍有哪些？请在下列选项中标出您对每一项障碍的认同程度。**

未使用电子商务的主要障碍	不重要的障碍	有点重要的障碍	中等程度的障碍	重要的障碍	非常重要的障碍
高层管理人员并不热衷于运用电子商务	1	2	3	4	5
我们的行业并不适合运用电子商务	1	2	3	4	5
学习操作电子商务对我来说有一定难度	1	2	3	4	5
对于我的雇员来说，熟练的运用电子商务有一定的难度	1	2	3	4	5
我们没有足够的经费用于应用电子商务	1	2	3	4	5
电子商务不符合我们现有的技术基础设施	1	2	3	4	5
我们的合作伙伴并不运用电子商务	1	2	3	4	5
其它，请注明	1	2	3	4	5

19. **在使用电子商务的下列目的中，您认为它们的重要程度如何？请在每一行勾选一个选项。**

	不重要	有些重要	中等重要	重要	非常重要
形成在线销售	1	2	3	4	5
加强公司的竞争优势	1	2	3	4	5
增加销售额	1	2	3	4	5
提高公司声誉	1	2	3	4	5
在当地市场，与现有客户进行交易	1	2	3	4	5
在中国市场，与现有客户进行交易	1	2	3	4	5
在国际市场，与现有客户进行交易	1	2	3	4	5
在当地市场，寻求发展新客户	1	2	3	4	5
在中国市场，寻求发展新客户	1	2	3	4	5
在国际市场，寻求发展新客户	1	2	3	4	5
其它，请注明	1	2	3	4	5

20. 您在多大程度上同意或不同意以下观点，请在各行观点后只选择一项。

	完全同意	部分同意	中立	部分不同意	完全不同意
电子商务在企业发展中可有可无	1	2	3	4	5
电子商务是企业发展的必然选择	1	2	3	4	5
电子商务是市场营销的重要策略	1	2	3	4	5
电子商务是寻找商机的重要手段	1	2	3	4	5
电子商务是技术革新的重要内容	1	2	3	4	5
电子商务是企业素质的重要表现	1	2	3	4	5
电子商务是联系客户的重要平台	1	2	3	4	5

第三部分：企业基本信息

21. 贵公司提供的主要服务或产品是？

22. 贵公司是家族企业吗 (例如，一个由血缘或婚姻组建起来的家族拥有超过 50% 的本公司股权)?

是	否

23. 请指出贵公司的创建年份

24. 贵公司的性质是? 请选择最合适的一项

独资企业	合资企业	无限公司	有限公司	其他请说明

25. 现在，贵公司有多少合伙人?

26. 在过去一年您的最大的 5 个客户的销售额占您的总销售额的百分比是

少于 10%	10-24%	25-49%	50-75%	多于 75%
1	2	3	4	5

第四部分：企业发展与创新

27. 贵公司拥有多少员工 (包括企业所有者)?

	三年前	一年前	现在
全职员工			
兼职员工			
临时员工			

28. 过去一年，贵公司的总销售额的百分之多少是出口国外的? 如果为零，请注明“0”

%

29. 您打算在将来建立、继承或收购另外一家公司吗?

是	否

30. 在过去的三年中，贵公司是否在以下领域中开展过任何形式的创新？请在每行中选择适当的选项。

	从未试过	尝试过但失败了	在公司内部开展过创新，但没有在行业中尝试	在行业中开展过创新
在产品或服务中	1	2	3	4
在生产过程中（包括储存）	1	2	3	4
在工作实践中，或者劳动力组织中	1	2	3	4
在供应环节和供应商关系中	1	2	3	4
在市场和营销中	1	2	3	4
在行政管理和办公系统中	1	2	3	4
在产品或者服务的运送中	1	2	3	4
其它（请标明）	1	2	3	4

31. 在过去的三年中，贵公司用于研究与发展（R&D）和创新相关的活动（如营销，设计，更好的生产能力）的费用占贵公司的年营业额的百分比大约是多少？如果为零，请注明“0”

	三年前	一年前	现如今
百分比	%	%	%

32. 贵公司一直从事研发的人员数量有多少？如果为零，请注明“0”

	三年前	一年前	现如今
从事研发的人员数量			

第五部分：企业信息与环境

33. 您曾使用过下列何种信息来源？并请选择他们对发现及评估商业机会有多大作用？

	是否使用过？		没有产生积极作用	有一点作用	中等作用	重要作用	关键作用
会计师	是	否	1	2	3	4	5
律师	是	否	1	2	3	4	5
银行	是	否	1	2	3	4	5
顾客	是	否	1	2	3	4	5
商业协会	是	否	1	2	3	4	5
朋友亲戚	是	否	1	2	3	4	5
供货商	是	否	1	2	3	4	5
商业顾问	是	否	1	2	3	4	5
北京电子商务协会	是	否	1	2	3	4	5
北京中小企业服务之窗	是	否	1	2	3	4	5
北京中小企业网站 (www.bjsme.gov.cn)	是	否	1	2	3	4	5
中国中小企业网站 (www.sme.gov.cn)	是	否	1	2	3	4	5
北京中小企业协会	是	否	1	2	3	4	5
其他，请说明：……………………….	是	否	1	2	3	4	5

34. 您如何评价您企业所在的外部环境？（评分“3”表明对于您企业所在主要行业环境的两侧的描述是相等的）

非常安全，几乎没有威胁到生存和企业的成长。	1 2 3 4 5	非常危险的，一步错招就可以导致企业的失败。
丰富的投资机会。	1 2 3 4 5	非常紧张的，艰难的，不友善的，很难免于经济困难（负债）。
我公司在一种可以控制和操纵自己的优势的环境内发展，如主导着业界内的业务，几乎没有竞争和障碍。	1 2 3 4 5	企业维持在拥有巨大竞争的环境中，且技术创新的压力很大。

35. 请圈出在您企业所在的主要行业环境中最接近实际情况的数字。（评分“3”表明对于您企业所在的主要行业环境的两侧的描述是相等的）

我们的单位很少改变其营销方法来跟上市场和竞争对手。	1 2 3 4 5	我们的单位必须经常改变其营销做法（例如半年）。
在我们所在的行业中，产品/服务的淘汰过时速度是十分缓慢的。	1 2 3 4 5	在我们所在的行业中，产品/服务的淘汰过时速度是十分快速的。
竞争对手的行动很容易预测。	1 2 3 4 5	竞争对手的行动是不可预测的。
需求和消费者的口味是比较容易预测的。	1 2 3 4 5	需求和消费者的口味几乎是不可预测的。
生产产品/服务的技术已经很好的确立了并不需要大的变化。	1 2 3 4 5	生产产品/服务的技术没有很好的确立，需要大的快速的变化。

36. 请指出贵公司还应用了下列哪些策略来发展。并请指出它们对公司发展的重要程度。

	根本不重要	**不重要**	**无所谓**	**重要**	**非常重要**
通过自主研发，提高产品/服务种类与质量。	1	2	3	4	5
加强员工培训，提高工作效率与服务水平。	1	2	3	4	5
减少企业运营成本，提高企业效益。	1	2	3	4	5
加强广告投入，发展新客户和新供货商。	1	2	3	4	5
宣传企业形象，提高企业威望。	1	2	3	4	5
通过协作会、联谊会，建立合作伙伴关系。	1	2	3	4	5
其他，请说明	1	2	3	4	5

第六部分：办公地点与设备

37. 贵公司的办公室是否设在科技园区？

是	否

38. 在您选择这个科技园区的之前，是否认真考虑过其它科技园区？

是	否

39. 请您指出下列因素对于您选择公司办公地点的影响程度

	非常不重要	不重要	无所谓重要不重要	重要	十分重要
主要创始人居住在当地	1	2	3	4	5
主要创始人之前工作在当地	1	2	3	4	5
主要创始人之前工作在当地的研究中心/高校	1	2	3	4	5
公司的基础已在该地区	1	2	3	4	5
房产（如经营场所）的成本	1	2	3	4	5
接近当地研究中心/高校的设施	1	2	3	4	5
科技园区的威望以及整体形象	1	2	3	4	5
与研究中心/高校挂钩后的公司威望	1	2	3	4	5
毗邻这些房产的土地的扩大延展	1	2	3	4	5
在此位置，额外的房舍的可用性	1	2	3	4	5
预知的科技园区管理和基础服务	1	2	3	4	5
停车场及相关设施	1	2	3	4	5
该地点与其它租户之间的友好氛围	1	2	3	4	5
该地区有拥有熟练技术的劳动力	1	2	3	4	5
良好的运输和通讯	1	2	3	4	5
便于接近市场	1	2	3	4	5
便于接近原材料以及元部件	1	2	3	4	5
邻近企业正在使用相同的技术或者属于同一产业	1	2	3	4	5
吸引高校研究人员的前景	1	2	3	4	5
其它，请注明	1	2	3	4	5

第七部分：公司财务

40 大约多大比例的贵公司的初始资金来自下列来源， 请指出百分比，并请选择获得这些资金的容易程度。

	百分比	非常困难	困难	中等	容易	非常容易
我个人积蓄	%	1	2	3	4	5
'内部资金' (即来自你所拥有的其他企业的资金)	%	1	2	3	4	5
家人和朋友	%	1	2	3	4	5
合伙人	%	1	2	3	4	5
商业信贷	%	1	2	3	4	5
房屋抵押	%	1	2	3	4	5
银行贷款	%	1	2	3	4	5
风险投资	%	1	2	3	4	5
私人投资者	%	1	2	3	4	5
政府赠款	%	1	2	3	4	5
总计	**100%**					

41. 在过去的三年中，您是否一直寻求资金？

是	否

如果答案是 “是”，您获取的资金比例大约是多少？ %

42. 在您的企业，是否有任何外国直接投资？

是	否

如果答案是“是”，外国直接投资在您的资本中占有多大的比例？ %

43. 在过去的 3 年中，贵公司的经营状况是？

	亏损	平衡	盈利
三年前			
一年前			
现如今			

感谢您的宝贵时间与大力支持，

欢迎保持联系，建立友好合作，

如果您有任何意见与建议，请写信给我们一起分享！