

**Identifying the factors that  
influence Irish high-tech enterprises  
to choose one regional location over  
other Irish regions**

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## **Abstract**

The purpose of this current study is to identify the regional factors that influence the location choice of high-tech enterprises, establish the reasons why existing high-tech companies set up their enterprises where they do and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location.

For the purposes of this research, the methodology employed used a quantitative method, underpinned by a positivist research philosophy. Quantitative research was used to gather data and information relating to the factors that influence the location choice of high-technology businesses. This method was employed using an online survey. From a sample of 300 enterprises, 134 were selected for this research. These 134 enterprises were selected as they met all aspects of the research criteria. They all operated in the high-tech industry, were wholly-owned Irish enterprises based in Ireland, non-subsidiary and were founded between 2002 and 2005. The result was 86 replies yielding a response rate of 64%. The information gathered included general information about the respondents' businesses, the factors that influence the location choice of high-tech enterprises and the factors that prevent them from locating in a region. In addition, the perceptions of high-tech enterprises regarding Ireland's South-East region as a location choice were also obtained.

A number of key findings materialised from this study. Firstly, it was found that the largest sector in Ireland is the software development industry (54%) and that the majority of respondents are located in the Dublin region (47%). It was also discovered that aspects of the founder's background influenced the choice of location for the businesses. Furthermore, the current research findings showed that most founders set up in a location well-known to them and they had either set up where they lived in their youth (23%) or in a locality where they worked prior to starting their own business (23%). In relation to this finding, many founders had deep-seated attachments to family and friends or owned a house in the vicinity (32%) and these acted as factors influencing the businesses to remain in their current location.

Additional findings show that the availability of skilled labour, transport infrastructure, telecommunications infrastructure, airport access and the costs of running the business are very important factors to the founders when deciding where to locate their businesses. Interestingly, the findings show that factors discussed in the literature review such as proximity to educational facilities were deemed to be insignificant by the respondents (41%). This is contrary to researchers such as Saxenian (1985), Scott (1988) and Holstein (1992), who highlighted the importance of educational institutions.

With regard to locating the businesses in the South-East region of Ireland, the majority of the respondents said they would not choose to locate in the region (77%). The main reason stated for this is the lack of available skilled labour (50%). The transport infrastructure in the region was considered inadequate, as was the lack of an international airport. Moreover, the respondents rated the region as bad in relation to customer proximity. On the other hand, the majority of the respondents rated the South-East region as excellent as regards its attractiveness (23%).

From the beginning, this current study's aim was to identify the regional factors that influence the location choice of high-tech enterprises, establish the reasons why existing high-tech companies set up their enterprises where they are and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location. Therefore, this current research contributes to the expanding literature on high-technology enterprises and their location choice and, in particular, to regional development, entrepreneurial regions and enterprise development.

The research findings from this current study indicate that there are a number of specific factors which determine why high-technology firms choose to locate where they do and also that there are recurring factors, which prevent them from choosing specific locations. Additionally, this research also has implications for policy makers, entrepreneurs and academics.

## **Declaration**

I hereby declare that the material is completely my own work and has not been submitted as an exercise or degree at this or any other higher education institution. The author has single-handedly undertaken the work with the exception of where otherwise stated.

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Denise Hall

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# *Chapter 1*

## *Introduction*

# **Chapter One**

## ***Introduction***

### **1.1 Chapter Overview**

This current study undertakes research aimed at examining the regional factors that influence the location choice of high-tech enterprises in Ireland, a topic of research under-represented in literature. The purpose of this current research is to establish the reasons why existing high-tech enterprises set-up their businesses where they do and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location. By carrying out this current study this researcher seeks to determine the extent to which Irish high-technology enterprises are influenced in their location choice by regional factors.

This chapter begins with a description of the rationale for undertaking this current research. Following on from this, the study's research question and set of objectives are summarised. Subsequently, an outline of the chapters, of which this thesis is comprised, is presented. Finally, this researcher presents a synopsis of the limitations arising from this current research and concludes by highlighting the key benefits and contributions of this study.

### **1.2 Rationale for the Study**

In the past two decades, there have been dramatic changes in industrial transformation and restructuring in Ireland. This change has involved a steady movement away from an economy that consisted predominantly of a manufacturing industry towards a knowledge based economy. The International Council for Scientific and Technical Information (ICSTI) (1998) stated that knowledge is one of the main drivers of prosperity for a country and Ireland needs to develop and embrace it completely in order to become a

knowledge based economy. They continued to say that if Ireland embraces the knowledge economy, it would become a steady and thriving country. Moreover, through the effective use of knowledge, prospective high-technology enterprises such as communications and biotechnology can be developed. However, if Ireland is to continue to grow as a knowledge society it will need to produce, increase and appeal to indigenous enterprises that are research or technology based. Technology is a key driver for knowledge societies and the Irish economy must reposition itself in order to develop knowledge and innovation based indigenous enterprises. In order to do so, the focus needs to be redirected to the high-tech indigenous industry. In essence, the development of Ireland's high-tech indigenous sector is critical to the future success of the economy as any decline in its performance could destabilise Ireland's economic and social advancement (O'Hara, 2004).

Barry (2005) stated that Ireland is often thought of as a high-tech economy, yet only ten percent of the high-technology sector is indigenous firms compared to fifty-six percent being foreign-owned. However, there appears to be very few high-technology enterprises located in particular regions in Ireland, for example, the South-East. In addition, it is evident that there is an imbalance in Ireland regarding the concentration of indigenous high-tech industry location. For example, the highest concentrations of these enterprises are in the Dublin (Crone, 2002) and Cork (American University, 2003) regions.

Furthermore, the factors that influence the location decision of high-tech industry need to be examined. Needless to say, there has been an unprecedented increase in the attempt to determine the locational decisions of small high-technology firms. However, the vast majority of this research has been for the most part descriptive in nature, concerning itself with defining high-technology industry and examining location decisions on the basis of individual factors, for example, research and development expenditure. Moreover, with all of the available literature, there does not appear to be a definite discussion concerning the factors that influence the location decisions of the indigenous high-technology industry in Ireland or specifically in the South-East region.

The purpose of this current study is to examine the extent to which regional factors influence the location choice of high-tech enterprises, establish reasons why founders set-up their enterprises where they do and determine what factors would influence an owner/entrepreneur to relocate. This current research is distinctive in that it doesn't examine the location choice of indigenous high-technology firms on the basis of one particular factor per se. That is, as opposed to selecting one location choice factor to examine, a number of factors were considered. Therefore, this research aims to establish a detailed understanding of why existing high-tech enterprises set-up their businesses where they do and what factors influence an entrepreneur/owner manager to move from their original set-up location. This is the unique feature of this current study.

### **1.3 Research Question and Objectives**

Polonsky and Waller (2005) stated that the research question should be focused and allow specific information to be identified when undertaking a research study. In addition, Remenyi, Williams, Money and Swartz (1998) stated the final decision on a research question should not be made too early on in the research process. They continued to say that this can be a warning that the research may not progress well when the researcher considers at the start that the research question is finalised. They further suggested that the research question "should remain open at least until the literature review has been completed because this will reveal interesting research questions and problems that the researcher needs to consider" (p.64). This current study undertook the approach suggested by Remenyi et al and the final research question was decided toward the end of the literature review.

This current study's research question asks:

What factors influence the decisions of entrepreneurs/owner managers of indigenous high-tech enterprises to locate in particular regions?



The objectives of this current research are:

1. To identify the regional factors that encourage the location choice of high tech enterprises.
2. To establish the reasons why existing high tech companies set up their enterprises where they do.
3. To determine what factors would influence an entrepreneur/owner manager to move from their original set-up location.
4. To ascertain what factors encourage an entrepreneur/owner manager to remain in the location of original start-up.
5. To determine the regional factors that attract high-tech enterprises into a specific region.

This current research was conducted using quantitative research methods, with positivism as the philosophy underpinning this study. From an Enterprise Ireland listing of over 300 high potential start-ups (HPSUs) in Ireland, an online survey was sent to 134 businesses, to which there were eighty-six responses, yielding a total response rate of 64%. The objective of the survey was to identify the regional factors that influence the location choice of high-tech enterprises, establish the reasons why existing high-tech companies set up their enterprises where they are and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location. A detailed description of the research methodology employed can be viewed in Chapter Three.

#### **1.4 Structure of the Thesis**

Having established this study's research question and set of research objectives, the researcher undertook a review of relevant areas of literature. This review is contained in

Chapter Two. Chapter Two evaluates a selection of regional factors which are considered central in the choice of region in which high-tech enterprises decide to either locate or not to locate in. The literature reviewed in this chapter focuses on factors such as science parks, research and development, universities, clustering, policy, skilled labour, transport infrastructure, communications infrastructure low costs and proximity to home among others.

Chapter Three of this thesis examines the research methodology employed in performing this current study and justifies the technique used. This chapter details the statement of the research question and research objectives, the choice of research philosophy and the ultimate selection of data collection methods.

The results of the data analysis from this current research are contained in Chapter Four. This analysis consists of the findings from the electronic survey that was sent to the business owners/founders.

Chapter Five comprises the discussion regarding the primary research findings. Here, the major themes arising from the research are detailed; in particular the reasons that establishes why high-tech enterprises would or would not choose to locate in the South-East region of Ireland.

Finally chapter six contains the conclusions determined from the discussion and the overall study. Furthermore, the limitations and benefits of this research and recommendations for future research are presented.

## **1.5 Limitations of the Study**

As with any research there are a number of limitations associated with this current study. Firstly, there was the lack of an existing high-technology enterprise database. At the time of this research, there was no database existing in Ireland, separating industry sectors.

Therefore, a compiled list of Enterprise Ireland's high-potential start-up (HPSU) enterprises from 2002 through to 2005 was used. This researcher went through the list for each year and selected businesses to develop a database appropriate for this current study. This is a limitation for this study as it was anticipated that all of the enterprises, listed by Enterprise Ireland, would be consistent with the definition of high-tech selected for this research. However, the listings included many sectors which were not applicable to the chosen definition, for example, the food sector.

In addition, the sample comprised only of businesses from the Republic of Ireland that had a relationship with Enterprise Ireland. This is a further limitation as this excludes many high-tech enterprises that exist in Ireland, who have had no support from Enterprise Ireland. Therefore, a more extensive study may have been conducted had businesses been selected from the high-technology industry as a whole rather than only businesses immediately associated with Enterprise Ireland.

A further limitation associated with this current study is that enterprises from diverse high-tech industry sectors were not segregated for analysis. A number of business sectors were selected for this current study. These included aerospace/aircraft, biotechnology, chemicals, computers, electronics, engineering, electrical engineering manufacturing, plastics and rubber, pharmaceuticals, R&D and labs, software development, telecommunications, telecommunications manufacturing and scientific instrument manufacturing. However, this current research does not distinguish between these business sectors nor does this research conduct a comparative analysis between the different high-tech industry sectors. The decision to aggregate the industries perhaps has the effect of hiding important sectoral differences, which may lead to the impression that all sectors are subject to the same opinions regarding the businesses' location decision.

## **1.6 Benefits of the Study**

This current research contributes to the expanding literature on high-technology enterprises and their location decisions. In particular, it contributes to literature on the location factors that influence the location choice of high-technology firms in Ireland, in particular the South-East region, an area identified as currently under-researched, and under-performing as regards the location of high-technology industries. Moreover, this current research has implications for regional development and enterprise development. In addition, this current study will be of benefit to a variety of individuals and organisations including academics, entrepreneurs, and policy makers.

## **1.7 Chapter Summary**

This chapter introduced the reader to the current research topic. It outlined the rationale behind this current study and outlined the research question and set of research objectives. Additionally, a summary of the presentation of the thesis was presented and ultimately the limitations and benefits linked with this current research were discussed.

The following chapter embarks on the review of literature relevant to addressing this current study's research question and objectives.

# *Chapter 2*

## *Literature Review*

## **Chapter 2**

### ***Literature Review***

#### **2.1 Introduction**

The literature reviewed and presented in this thesis seeks to establish an understanding into the regional factors that influence the location choice of high-tech enterprises, ascertain the reasons why existing high-tech companies set up their enterprises where they are and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location. By performing this current study this researcher seeks to discover the extent to which Irish firms are influenced in the aforementioned decisions by investigating various influential factors.

This chapter evaluates a selection of factors, which are considered central in the choice of location in which high-tech enterprises decide to locate or not to locate in. The factors in literature which inform the study as to how high-technology enterprises decide on a location for their business include science parks, research and development, universities, clustering, policy, skilled labour, transport infrastructure, communications infrastructure, low costs and proximity to home among others.

Throughout this chapter, a number of areas pertaining to the research topic in the existing body of literature such as enterprise development, regional development, regional studies, entrepreneurial policy and entrepreneurial regions are examined. The chapter concludes with a summarised discussion of literature surrounding the research topic.

#### **2.2 Defining high-technology**

Literature has informed of the need for a clear definition for high-technology (Oakey and Cooper, 1991). Nonetheless, the exploration for a clear definition of high-technology is

widespread in the literature (The Office of Technology Assessment, 1982; Markusen, Hall and Glasmeier, 1986 and Oakey, Rothwell, and Cooper, 1988). For example, The Office of Technology Assessment (1982) described high-technology firms as those engaged in the design, development, and introduction of new products and/or innovative manufacturing processes through the systematic application of scientific and technical knowledge. However, contrary to this, Cordes, Joseph, Watson, and Hauger, (1986) stated, there are no definitive criteria for differentiating between firms that are high-technology and those that are not. In fact, Link (1987) remarked that “high-technology, by its inherent transience, almost defies definition” (p. 10).

There have been many different opinions as to what industry sectors can be classified as high-tech. For example, the Organisation for Economic Cooperation and Development (OECD, 1986) identified six industries as being high-tech. These are: aircraft (aerospace), office and computing equipment, communications equipment, drugs and medicines, scientific instruments, and electrical machinery. On the other hand, Fagerberg (2002) suggested that aerospace; computers, semiconductors, telecommunications, pharmaceuticals and instruments are industries, which are commonly classified as “high-tech”.

It has been suggested that high-technology indigenous firms or small and medium enterprises (SME's) can also be described as new technology based firms (NTBFs) (Rickne and Jacobsson, 1996; Autio, 1997). Nonetheless, it can be said that this term is moderately confusing forcing Storey and Tether (1998) to consider the question does 'new' relate to the firm, technology or both? The term Technology Based New Firm (TBNF) has been implemented to simplify this question posed by Storey and Tether (Autio, 2000). However, it is still very common though that terms such as high-tech firm and new technology based firm are used interchangeably. For the purposes of this current research, the term high-technology will be used.

Furthermore, Roberts (1991) referred to high-technology firms as being spin-offs from university settings that exploit advanced technology. However, Autio (1997) includes all

spin-offs, both from universities and from existing firms, exploiting advanced technical knowledge. Moreover, Cooper (1971) defined high-technology enterprises as new firms that place major emphasis on exploiting new technical knowledge. On the other hand, Bollinger, Hope and Utterback (1983) defined high-technology enterprises as new firms that are established in order to exploit a technological innovation independently of the "newness" of the innovation.

Having established an understanding of the term high-technology, it is necessary to explore the factors that are considered influential in a high-tech enterprises' choice of location.

### **2.3 Influencing factors in High-Tech Location choice**

Factors that influence the location choice of high-technology firms have been examined by many researchers in literature namely, Oakey, (1981); Kelly, (1986); Markusen et al (1986) and Hall, Breheny, McQuaid, and Hart (1987) who have reviewed various factors, such as science parks, universities, research and development and so on.

Small firms and indigenous high-technology enterprises are areas of research that need to be developed in order to search for a better understanding as to how they operate, and there have been multiple calls for research to be performed in this environment (for example: Down, 1999 and Matlay, 1999), and particularly in the Irish context (for example: Garavan & O' Cinneide, 1994 and O'Dwyer & Ryan, 2000). Many studies have been performed in recent years to identify the reasons why specific geographical locations are chosen by industrial firms. However, high-tech industries make choices, which are noticeably different from those made by traditional industries (Fulton and Shigley, 2001). For example, it has been suggested that as a result of initial product development and innovation, high-tech enterprises generally locate close to centres of research and science whereas this is not a consideration for traditional industries (Shefer and Bar-El, 1993).



Frequently, throughout literature the factors, which influence the location choice of a high-technology enterprise included a highly educated workforce, labour availability, neighbouring business and financial contacts, local home location, local universities and an excellent level of local knowledge (Hall and Markusen, 1985 and Oakey and Cooper, 1989).

Furthermore, Garnsey (1998) identified factors that are regularly acknowledged as providing circumstances for the location choice of high-technology enterprises in a particular region. These included:

- 1 A leading scientific university and associated research complex
- 2 A prestigious industrial or science park
- 3 A desirable social environment to attract and retain high calibre personnel
- 4 Provision of venture capital
- 5 Public support for innovative technology
- 6 A facilitating labour market providing the requisite skills (p.362)

Throughout literature, the availability of highly skilled labour is generally listed as the most essential determinant (Browning, 1980; Oakey, 1981; Premus, 1982; Malecki, 1979 and 1982; Rees and Stafford, 1986; Galbraith and De Noble, 1988). Another factor is quality of life. For example, it has been suggested that pleasant working and living environments or cultural amenities attract professional workers (Premus, 1982; Malecki, 1979 and 1982; Rees and Stafford, 1986). Technological infrastructure is also listed as a location determining factor. Furthermore, high speed transportation is discussed as being important in high-technology enterprise start-ups as are communication linkages such as access to high-speed internet connections. In addition, proximity to airports is also suggested as a factor influencing the location choice of high-tech enterprises (Premus, 1982; and Markusen, Hall and Glasmeier 1986).

In the following sections, literatures pertaining to important recurrent factors in the location choice of indigenous high-tech firms are examined.

## 2.4 Universities

Hall and Markusen (1985) stated that relationships between firms and universities are said to assist progress through technology transfer and is seen as an excellent factor providing for the nearby location of high-technology firms. They continued to say that the significance of local universities in Silicon Valley and Route 128 explains why the issue of the extent to which universities influence high-technology location has achieved sizeable research attention.

Evidence suggests that under various conditions a research university can play a fundamental role in generating economic growth for the region where it exists. Rogers and Larsen (1984) suggested that possibly the most prominent example of accomplishment of economic growth in a region relating to a university was the development of Silicon Valley. Another example is Route 128, another major US high-technology concentration in the Boston area, which was assisted chiefly by the Massachusetts Institute of Technology (MIT) (Roberts, 1991). In addition, Cambridge University in the United Kingdom is recognised for being the foundation of practically all of the high-technology companies in the Cambridge area (Segal, Wince and Wicksteed, 1985). Furthermore, descriptive studies of high-technology concentrations have highlighted the university's role in the creation and development of places such as Boston, Cambridge and Silicon Valley (Dorfman, 1983; Saxenian, 1985; Scott, 1994; Osborne, 1990 and Kelly, Weber, Friend, Atchison, DeGeorge, and Kelly, Weber, Friend, Atchison, DeGeorge, and Holstein, 1992). Nonetheless, there are also contradictory examples by researchers, who believe high-technology regions materialised without any university assistance (Breheny and McQuaid 1987). This concurs with Rogers and Larsen (1984) who stated that escalation in some US centres (Colorado Springs, Colorado, and Portland, Oregon) had been spur-of-the-moment and accomplished without any assistance from a major research university. Therefore, in relation to the role that universities play in location selection, existing evidence is not clear.

However, while quite a few studies found that proximity to universities is a chief factor in the location preference of high-technology firms there are arguments in opposition. For example, Howells (1984) revealed that pharmaceutical research laboratories in England don't regard a university as a relevant location factor. Nearly three-quarters of the surveyed laboratories consider the presence of a university not to be an important factor in selecting a location. According to Lyons (1995), proximity to a university was listed among the least essential site selection determinants, after a survey of the Denver-Boulder agglomeration in Colorado.

Furthermore, a survey conducted by Maleki and Bradbury (1992) proposed that the university effect is not uniformly crucial everywhere having found universities to rank in seventh place out of twenty two important location factors. This being the case it must be stressed that they did in fact state that, although not crucial everywhere, universities did have minor influences on the location choice of the high-tech industry. They continued to say that high-tech enterprises in larger cities are influenced on a greater scale than in smaller areas. A study that concurs with this statement was conducted by Shapiro and Harding (1982) which showed that a nearby university is only ranked sixteen out of seventeen possibilities in relation to important location choice factors. In addition, Lund (1986) stated that university proximity is the fifth location determinant out of the twenty factors. However, contrary to this, Premus (1982) reported that sixty percent of US firms surveyed regarded university presence an essential factor in location. The importance of the existence of a university on firm location was also reported by Malecki (1979 and 1982); Rees and Stafford (1986); Birch (1987) and Hall (1987).

Differences in sector characteristics may determine the extent to which particular industries can benefit from a closely located university. Industries showing noteworthy university impact in literature are electronics (Jaffe, 1989; Bania, Eberts and Fogarty, 1993), microelectronics (Robinson, 1985; Rees, 1991), biotechnology (Haug, 1991; Acs, Audretsch, and Feldman, 1994; Audretsch and Stephan 1996; Zucker, Darby and Brewer 1998), and aerospace (Acs et al. 1994). For chemicals and instruments, evidence is unclear because, on the one hand, Galbraith and De Noble (1988) and Haug (1991) found

that the presence of universities has an effect on the location decision of the chemicals industry but on the other hand, Acs, Audretsch and Feldman (1994) said that universities do not have an effect on location decisions; then again, Acs, Fitzroy and Smith (1994) found that universities do have an effect on the location decision of the scientific industry sector. However, Jaffe (1989) and Bania, Eberts, and Fogarty (1993) indicated that, in general, universities do not have an effect on an industry's choice of location.

Moreover, Castells and Hall (1994) and Saxenian (1994) recognised the role of universities in the growth of centres of high-technology. However, they both found that the precise role a university plays depends on the kinds of linkages it has with industry. There is some deliberation among those who consider that universities can play a part in industrial development (Monck, Porter, Quintas, Storey, and Wynarczyk, 1988) and those who query the link of the relationship involving universities and the growth of agglomerations of technology based firms (Oakey,1985). For example, Schweitzer, Connell and Schoenberg (2004) conducted research on the location of the biotechnology industry in the United States. They supported the suggestion that the force of a country's universities influences high-technology industries and this is shown in their results which found that most of the biotech firms are located nearby a university. This can also be seen from the following list of several of the high-technology clusters that have a university link. These include: Silicon Valley (Stanford), Route 128 (Harvard and Massachusetts Institute of Technology), The Research Triangle (Duke, University of North Carolina and North Carolina State University), The Princeton Corridor (Princeton), Silicon Hills (Austin, Texas), Optics Valley (Tucson, Arizona.) and The Golden Triangle (University of California, San Diego). This list of universities and high-tech enterprises surrounding them suggests how significant a nearby university can be as a resource, particularly as these are areas of renowned high-technology activity.

The effect of nearby universities is considered to be an issue that needs to be addressed in this current research in order to gain an understanding of how their existence influences indigenous high-technology firms' choice of location. This is because from existing

literature, this researcher surmised that the role universities play can be important to the high-tech industry. However, according to Jones-Evans and Pandya (1996), in the Republic of Ireland evidence suggests that many firms choose not to form close links with academia and there is a general apathy, on the part of universities, to form close links with industry, although this may be associated with the general lack of an enterprise culture within the Irish economy. This suggestion needs to be addressed in the current study.

## **2.5 Clustering/Agglomeration**

Porter (1990) stated that clusters are a factor widely acknowledged as being important in the location choice of high-tech enterprises. It was also argued that high-tech industrial clusters can be defined as “a regional network-based industrial system that promotes collective learning and flexible adjustment to changed conditions among specialist producers of complex, related technologies” (Saxenian, 1998, p. 3). There are also many further definitions for clusters. For example, Voyer (1997) stated that knowledge-based or high-technology industrial clusters are regional or urban concentrations of firms including manufacturers, suppliers and service providers, in one or more industrial sectors. He continued by saying that these firms are supported by an infrastructure made up of universities and colleges, research institutes, financing institutions, incubators, business services and advanced communications/transportation systems. Porter (1998) concurs with this and regarded clusters as geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (for example universities, standards agencies, and trade associations) in particular fields that compete but also co-operate.

Business clusters, particularly for high-tech firms, are a very much used concept at the moment. However, according to O’ Gorman, O’ Malley and Mooney (1997) a common conclusion to many studies is that Ireland should not focus on the development of clusters

and a search for another model of industrial development should continue. They suggested that the reason for this is that there has been relative success experienced by the Irish economy without the presence of clusters. The studies which suggested this relative success are varied. For example, O' Gorman, O' Malley and Mooney (1997) offered a diamond analysis of the Irish indigenous software industry to investigate the presence or extent of cluster activity. They commented that the Irish software industry was "not quite a fully developed cluster in the strict sense of the term" (p.54). Furthermore, a study by O' Malley and Von Egarat (2000) which assessed the clustering activity in Irish indigenous industries found limited evidence of clusters. However, Gallagher, Doyle and O' Leary (2002) found that there were clusters emerging in the software, electronics and telecommunications equipment industries. On the other hand, in the context of research to date and the lack of Irish cluster based data, research "of the 'Porter' type has yet to be conducted for Ireland" (Doyle and Fanning, 2004, p.276). This suggests that the thorough research which Porter conducted has yet to be completed in an Irish context.

Glass and Curry (2005) stated that operationally high-tech clusters seem to usually embrace networks of interdependent firms, linked by processes that add value. They continued to say that despite the fact that these organisations may be geographically nearby, and associated in a particular field, they can include companies that are either in competition with each other, or complementary, or even both. They further stated that clustering can use combined approaches to enable businesses and local regional interest groups to develop greater speed, quality, and innovation. In addition, experimental evidence by Glass and Curry suggested that successful high-tech clusters focus on regional alliances between universities, research institutes, consultants and private companies.

According to the Department of Trade and Industry (2001), clustering is one of the key drivers of economic growth in localities, cities and regions. However, according to the National Competitive Council's Annual Competitive Report (2005), the extent of

clustering is perceived to be low in Ireland. Therrien (2005) suggested that the problem for the lack of high-tech cluster formations in low-tech regions (such as Ireland's South-East region) is the low-tech specialisation pattern in these regions that is complex to transform. They continued to say that this relates to the fact that these regions are mainly subject to primary industries such as agriculture that don't require a high level of innovation intensity. On the other hand, urban areas have been shown to attract high-tech/high innovative enterprises. However, peripheral regions such as Ireland don't have a large amount of firms that may operate as a pull factor for an increase of agglomeration economies/cluster emergence. Nevertheless, Intel, Microsoft and Dell are examples of companies who do exist in this context in Ireland. The difficulty of attracting clusters to particular regions is also linked to the innovation intensity in these regions, as big companies perform research and development to a larger degree than small companies. Then again, peripheral regions with ambitions to change their profile into a high-tech one face a problem of reaching a critical number of firms that could develop a cluster (Stoerring and Christensen, 2004). In relation to clusters, all of the aforementioned factors are interconnected and very often a deficiency in one of them may explain why the others cannot be developed in the region.

Moreover, an indigenous high-tech sector is very important for clusters to develop. This is in line with Voyer (1997) who agreed with Porter's (1990) views that an indigenous sector is required if a high-tech cluster is to enlarge or develop to its full potential by stating that "if reliance on foreign multinationals is too complete, the nation will not be the home base for any industry ... at some stage in the development process, the focus should shift to indigenous firms" (p. 679)

Literature has suggested that clusters of innovative technology-based firms also have a capacity to transform and revitalise local economies, providing economic competitiveness, wealth creation, and jobs (OECD 1986; DTI 1998; Tether and Storey 1998). For example, Keeble and Wilkinson (2000) coordinated a study on high-technology clusters in Europe and while they proposed no definition of high-tech clusters

they presented a comprehensive overview of clusters in terms of high-technology and how they can contribute to a region. They explored clustering in terms of different concepts like innovative milieu, learning regions and regional collective learning.

According to Rothwell and Dodgson (1991), many regions in developed countries are attaching their expectations for industrial potential and progress on the growth and development of agglomerations of high-technology enterprises. Therefore, it is important to understand how these clusters of high-tech enterprises are formed. For example, Oakey and Cooper (1991) believed that the growth of high-tech agglomerations can be influenced in various ways, including concentrations of high-quality employees which may act as an enticement for firms in search of an appropriate location. Stiglitz (1999) draws attention to the fact that industries in the “new economy” are linked to an extent by the internet to one another, to firms that manufacture their inputs, and to their customers. Therefore, he suggested there isn’t a need for them to form themselves in clusters. Consequently, it may be assumed from Oakey and Cooper (1991) and Stiglitz (1999) that high-tech enterprise clusters are enabled through highly skilled employees, communications infrastructure and customers nearby. However, Swann and Prevezer (1996) stated that high-technology clusters can occur anywhere “throughout the world” and do not need any specific regional factors to influence their emergence.

## **2.6 Skilled Labour**

Literature has proposed that the availability of skilled labour in a particular region may wield some persuasion on the location of high-tech firms. In an Irish context, O’ Malley and O’ Gorman (2001) discussed the importance of the availability and quality of a skilled workforce. Pottier (1987) suggested that if skilled labour is a key requirement of a firm, then it will have a centralising result on business location. Whilst Oakey et al (1990 and 1998) stated that of those businesses with highly skilled labour requirements some firms are able to function in rather isolated locations. However, this is contrary to Markusen, Hall and Glasmeier (1986) and Harding (1989) who suggested that many



employers find it hard to employ, reassign and relocate highly skilled workers to remote locations. The suggestion that a skilled labour force is not a necessity for all high-tech firms was emphasised by Panne and Dolfsman (2002) who described skilled labour as being largely irrelevant after they reached the conclusion that there was no statistical relationship between average educational level and innovation concentration on a regional basis in their study.

On the other hand, literature has also discussed the challenges surrounding the requirement of a skilled labour force. For example, Saxenian (1981) suggested that it is beneficial to be able to obtain labour without a lot of extra training but disadvantages may increase as wage increases come about if the supply is not ample to meet the rising demand for skilled employees. Additionally, Moore and Sedaghat (1991) stated that a shortage of skilled labour possibly would hamper the growth of high-technology enterprises.

It can be assumed that skilled labour will be attracted to a region that satisfies their needs. Frenkel, Shefer and Roper (2001) stated that for high-tech firms “a more urban or metropolitan location may offer substantial advantages in terms of a large pool of skilled labour” (p.14). Furthermore, Frenkel (2001) provided an insight into what type of region attracts skilled labour by stating “a high quality of life, manifested in cultural and educational activities which are more prevalent in the large metropolitan areas” (p.3). This statement concurs with other researchers such as Malecki 1979; Thwaites 1982; and Bushwell, 1983 who were of the same opinion. A further example is Schmenner (1982) who stated that good facilities in a particular location attract highly skilled labour.

Literature also discussed the type of employees depicted by the high-technology as highly skilled. Florida (2002) described them as being “creative professionals,” individuals with “a high degree of formal education and thus a high level of human capital” (p.5). In addition, Moore and Sedaghat (1991) stated that within the highly skilled labour supply scientists, engineers and other professionals play a crucial role in the growth of high-tech firms. An interesting finding in a study by Scott (1994) showed that highly skilled workers are prepared to commute for about forty-five minutes whilst unskilled workers

were prepared to commute a much shorter distance. Furthermore, Premus (1982) in his study of 691 high-tech firms found that proximity to and the cost of technical and skilled labour was an important factor at both the regional and site level choice.

## **2.7 Multinational Enterprises (MNE's)**

Voyer (1997) suggested that further research into how multinational firms can be used to foster the development of an indigenous high-technology sector needs to be performed. Foreign owned MNE's played an important role in the economic development of Ireland according to various development agencies, including FORFAS (1998). However, there are suggestions that these foreign owned companies dominate the high-tech sectors such as chemicals and metals and engineering, while Irish-owned companies dominate sectors such as food, wood and paper. For example, according to the Ministry of Finance (1999) it seems high-tech; high-value added industries are owned by foreign interests, while low-tech, low productivity industries, to a large extent, are owned by Irish owners.

Stevensson (1996) was of the opinion that the dominance of foreign firms generated few linkages to the local economy in general, whereas 'today' there seems to be an increasing interdependency between the multinationals and the local economy, as the multinationals have contributed to the development of an indigenous high-tech industry. In an interview conducted by Stevensson (1996) with 36 managers or owners in the software sector, a majority of the founders worked in an MNE either immediately, or at some stage, prior to the start-up. About half of them had also worked abroad in software firms or in a related sector at some time before starting the company. Therefore, the suggestion here may be that the pool of labour with working experience from MNE's represents a valuable resource for the indigenous high-technology industry.

On the other hand, it has been suggested that the existence of multinationals can also have harmful effects on the survival of indigenous firms. Aitken and Harrison (1999) disputed that foreign firms producing at lower marginal costs than indigenous firms are

encouraged to enhance output and draw demand away from indigenous firms. They continued to say that this will cause host country rivals to cut production and, therefore, reduce their probability of survival. This researcher is of the opinion that the suggestion from Aitken and Harrison (1999) is that this could perhaps prevent indigenous high-technology firms from start-up decisions in particular locations. For example, if a prospective high-tech indigenous start-up is of the opinion that a particular region consists of a majority of MNE's who can produce on a larger scale than they can, the suggestion is they may reject the region as a location choice.

## **2.8 Research & Development**

Keeble, Lawson, Moore and Wilkinson (1999) advised that investing in research and development activity is a dynamic force behind developing a high-tech region. Markusen, Hall, and Glasmeier (1986), Oakey, Rothwell, and Cooper (1988) and Saxenian (1990) concur with this statement and indicated that existing prominent high-technology regions have developed for the most part due to a good Research and Development make-up and technological expertise in the region.

As this current study is focused on Ireland, it is important to understand what attempts have been made in the country towards improvements in research and development. Table 2.1 which was produced by the Commission of the European Communities (2003) illustrates the efforts made by Ireland towards the Barcelona Objective and therefore research and development efforts in the country at a national level. This table will provide the reader with an insight into how Ireland is dealing with improving research and development practice.

<b>Ireland</b>	<p>GERD/GDP:2.8% by 2006</p> <p>Business financed R&amp;D/GDP:2% by 2006</p> <p>National and regional targets for 2010 are in preparation</p>	<p>The National Development Plan (2000-2006) provides for increased public investment in science, technology and innovation. It aims at reinforcing the basic R&amp;D capability in public institutions, supporting applied research activities in industry, and strengthening collaboration between public institutions and industry. Emphasis is set on developing framework conditions that better link research with commercial reality.</p> <p>Span of instruments/actions/policies initiated or planned:</p> <ul style="list-style-type: none"> <li>- Increase public support to industrial R&amp;D</li> <li>- Network enterprises with the wider S&amp;T infrastructure</li> <li>- Support the development of strategic technologies, in particular in the areas of ICT and biotechnology, through the Science Foundation Ireland</li> <li>- Investigate possible R&amp;D tax credit schemes</li> </ul>	<p>The Department of Enterprise, Trade and Employment has overall coordinating responsibility for RTD&amp;I measures in the National Development Plan. Its “High Level Cross Departmental Group” is responsible for defining actions contributing to ERA’s objectives.</p>
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Table 2.1 Efforts made in Ireland towards the Barcelona objective  
(Source: Commission of the European Communities, 2003)

Landabaso (2000) noted that by looking at business expenditure on R&D as a percentage of GDP, inter-regional differences in the U.S. are lower than in Europe. He stated “by U.S. standards the top 25 European regions hardly reach the levels of the 10th U.S. state in the ranking and would be placed in the middle to upper middle U.S. states ranking. On the other hand, only the best placed five regions of the bottom 25 EU regions would reach the levels of the bottom five U.S. states” (p.32). This statement suggests that Europe is behind the United States in terms of research and development investment; which is a vital element in high-technology industry. However, prior to this research by Landabaso (2000), the European Union Commission White Paper (1993) realised this having stated that the chief issue with countries such as Ireland is the capability to use the abilities of research and development (R&D), though Landabaso’s research suggests that the issue hasn’t been dealt with as yet.

## 2.9 Networks

According to Forfas (2002), the terms clusters and networks are often used interchangeably. It is further stated in literature that this is due to the fact that they hold various connections. However, both terms should be differentiated. The crucial differences between both are pointed out by O'Doherty (1998), who referred to networks as having a somewhat restricted membership and a specific set of objectives while clusters are open in terms of both membership and goals.

Rosenfeld (1995) cited in Cooke (1998) defined networks as: "...a group of firms with restricted membership and specific, even contractual business objectives likely to result in mutual gains. Network members choose each other; agree explicitly to cooperate in some way (common goals) and to depend on each other to some extent. Networks can develop within clusters especially where a wide range of business transactions conducted over a substantial period of time had developed the reputation of the partners and helped build up trust in their reliability and willingness to exchange as well as deliver products or process knowledge." (p.13)

Networking is seen to have many advantages for high-tech enterprises. For example, Teece (1992) stated that technology based firms can significantly improve their survival chances and competitiveness through networking. Literature has also stated that there has been an increase into the effects of networking in regional localities. For example, networks can be seen to be an important means to foster economic development, in particular where SME's form a principal element of the enterprise arrangement (Staropli, 1998).

De Vol and Wong (1999) cited in Landabaso (2000) offered a list of factors that influence the development of the high-technology industry with networking mentioned as a factor. Furthermore, Landabaso commented that networking plays a "crucial role" by stating "public action in the form of the creation of an environment conducive to increased networking among regional actors becomes critical" (p.30). According to many

researchers (Keeble, Lawson, Moore and Wilkinson, 1999 and Freel, 2003) networking has a lengthy tradition and by and large it is acknowledged as being a chief growth and development opportunity for SME's in technology. However, on the other hand networking can have disadvantages. In a study conducted by Oakey (1993) it was found that close networking relationships had an inhibiting effect when high-tech businesses entered the growth stage. Oakey's study found that a disadvantage of networking for small firms in the high-tech industry is that a strong contribution to innovation and growth to their customers was unlikely due to the complexity and costs involved. This suggests that when small high-tech enterprises set-up, they are limited in their abilities to network effectively.

## **2.10 Proximity to Home**

Literature suggests that when a founder is debating the setting up of a high-tech business, he/she will be inclined to be established in a location, possibly that of previous employment or the family residence and factors have to be creditable to take him/her away from the location. This is because in a location such as nearby the family home, there may be considerable familiarity of the business support offered and business connections (Frenkel, 2001 and Yang, 2004). This suggests that the influence and involvedness of personal factors may be influential enough to wield a major influence in the location decision of high-tech enterprises. Frenkel (2001) informed that indigenous high-technology entrepreneurs are inclined to set up their businesses near where they live for reasons of convenience. He continued to say that setting-up close to home generally typifies small firms of local entrepreneurs but their substance will lessen significantly as the enterprises develop and have other locational considerations. Yang (2004) concurs with Frenkel stating that the key decision maker's own preference and personal interests were found by to be very important factors influencing the location decision process and were particularly apparent in indigenous companies.

## 2.11 Science Parks

The relevant literature is full of a wide range of terms like ‘Science Park’, ‘Technology Park’, ‘Research Centre’, ‘Technopole’, and ‘Research Park’ and a number of other terms that have to do with business support (Kung, 1997). The suggestion is that the terms ‘science park’ and ‘technopole’ are used for the most part in Europe, whereas the phrase ‘Research Park’ is chosen in the United States and Canada. Therefore, for the purposes of this current study the term science park will be adhered to.

Science parks have been defined by Luger and Goldstein (1991) as “organizational entities that sell or lease spatially contiguous land and/or buildings to businesses or other organizations whose principal activities are basic or applied research or development of new products or processes” (p. 5). However, this definition eliminates high-tech centres such as Silicon Valley, industrial parks, and office parks. On the other hand, the Association of University Related Research Parks (AURRP, 1997) informed that the term technology park is more clear-cut, given that the primary notion is growth, transfer, or profitability of technologies as opposed to conducting essential science research. Despite the slight differences that may exist among these different names, all terms describe an economic and technological development complex that aims to encourage the development and application of high-technology to industry (Nur, 2004). She continued to say that most science parks’ focal points are on information technology including electronics and computers, telecommunications, biotechnology and new materials. The suggestion here is that science parks in general focus on the high-tech industry.

Most science parks are associated with one or more universities and are focused on attracting research and development (R&D) firms. According to Massey et al. (1992), science parks are expected to increase knowledge transfer from a university in order to encourage the formation of new firms and development of existing ones. However, Westhead and Storey (1994) stated that a science park location does not extensively persuade the growth and survival of a high-tech firm but the existence of a science park is likely to encourage the formation of high-tech enterprises, which would otherwise not

have been established. They continue to suggest that this represents an 'economic' attraction for the clustering of technology based firms, which enhances local improvement and development.

Literature has also identified differences between high-tech firms located in science parks and those located outside a science park in the same region. For example, Ferguson (1999) found that firms in Swedish science parks tended to be younger and smaller than firms outside the park. Braun, Bradley and McHone (1992) found that firms located in a science park are more likely to create further firms than those outside of a park. However, Felsenstein, (1994) found that there is not much proof that firms in science parks conduct a greater amount of research or have better connections to universities than firms not in the parks. He stated that Science parks may function as "islands of innovation" and be made up of a lot of firms that do not have a lot of connections to one another. Braun, Bradley and McHone (1992) also discussed the shortage of connections between firms in science parks and local firms outside the park. Therefore, it can be said that literature appears to suggest that science parks do not attribute greatly to a region's economic development. In relation to this point, Luger and Goldstein (1991) conducted research which aimed to contradict this argument. They choose counties in the United States, which were similar i.e. some having science parks and others not having science parks. They looked at the growth of employment before and after a science park was developed and found thirty two out of forty five science parks were in counties that grew faster in employment terms when a science park was established. Ferguson and Olofsson (2004) also looked at the location of high-tech enterprises located on and off science parks and concluded that firms that located in a science park survived much longer than those who were located off of the park. They continued to say that science parks possibly offer a positive location choice for high-tech enterprises.

Castells and Hall (1994) proposed motives as to why a region would introduce a science park, in order for the region to develop economically. The first is "reindustrialisation", which consists of replacing old jobs in old industries with new jobs in new industries. For example, in the South-East of Ireland this may involve replacing the farming



industry, which is in decline, with high-tech industry. The second motive offered is to aid the region in getting into the newer high-growth industries such as high-technology. The third motive proposed is to help the relationship between firms and industries through “synergy”. This suggests that firms and industry would work together in a science park in order to create a stronger industry as a whole. According to Castells and Hall (1994), synergy provides “new and valuable information through human interaction” (p. 224).

There is further evidence showing the positive and negative impacts a science park provides for economic development and also for high-technology firms residing on and off the park. For example, researchers such as Luger and Goldstein (1991) and Musbach (1997) believed that these parks can encourage economic growth and development. However, Felsenstein (1994) and Braun, Bradley and McHone (1992) are just two examples of researchers who do not concur with this statement. Furthermore, Durso (1996) called attention to the fact that a research park alone will not encourage economic development. Contrary to this AURRP (1997) stated that science parks do provide for high growth industry and create employment. However, authors such as Musbach (1997) do not agree with this and stated that science parks have not met the expectations of developers and local government. The reason offered for this was that many regions have envisioned becoming the next Silicon Valley, and some of them embraced the high-tech industry sector unsuccessfully.

According to Monck, Quintas, Porter, Storey and Wynarczyk (1988), it is easier said than done to evaluate how successful science parks can be because of the varying intentions of each associate in the park. This suggests that science parks have different levels of significance to each enterprise located within them.

## **2.12 Spin-offs**

Spin-offs are an essential foundation of new firm creation in high-technology sectors. For the most part this can be attributed to areas of existing high-technology industrial

concentration (Markusen, Hall and Glasmeier (1986) and Oakey, Rothwell, and Cooper, 1988).

Cooper (1971) developed a model that suggested the prospect for new firm formation by indigenous entrepreneurs through direct spin-offs in a region is influenced by the organisational make-up of existing businesses in the region. Various locations generate more new high-technology firms than others such as Silicon Valley (Rogers and Larsen, 1984) and Route 128 and the Cambridge area (Keeble and Wilkinson, 2000). These areas have all revealed major levels of high-tech enterprise creation. This can, to some extent, be attributed to the rate of spin outs from diverse types of establishments. To review the potential of the South-East region of Ireland for example, as an area for developing high-technology indigenous firms, it would therefore be necessary to consider the type of organisations in the region and the sectors to which they belong.

There has been a variety of literature that has materialised focusing chiefly on why and how a spin-off occurs and many 'spin-off' theories have evolved. The main finding from research carried out by Dahl, Pedersen, and Dalum (2003) found that spin-offs "have been the central mechanism in the evolution of a high-tech cluster" (p.17). They continued to say that spin-offs are typically found to come from academic institutions. Literature also implies that the main benefits of spin-offs are that they can effect the creation of jobs, new relationships and overall economic development (Dahl, Pedersen, and Dalum, 2003) They create advantages to the region where they are developed but the region has to provide the ability for them to develop (Markusen, Hall and Glasmeier, 1986).

### **2.13 Support**

Capital is a critical resource for high-technology firms. Many founders choose to rely on their own finance through the investment of personal funds, though others will require some form of external capital to finance their venture (Oakey, 1984 and Oakey, Rothwell,

and Cooper 1988). The simplicity or complexity with which finance is accessed impacts a firm's growth but at worst whether or not the firm is established at all. According to Oakey et al (1984), venture capital availability is noted as a factor that was important in the development of high-technology based firms in Silicon Valley. Wilson (1992) also discussed the impact of venture finance in the development of high-technology industry in the United Kingdom. He continued by saying that in developed economies bank branches, which focus on the provision of finance to high-technology firms are not widespread.

Stiglitz and Weiss (1981) argued that innovative firms face difficulties in securing required finance. According to Cordes, Hertzfeld and Vonortas (1999), there is widespread belief that these difficulties are increased for high tech firms. They continued to say this is because these firms place significance on "growth opportunities and scientific and technological knowledge, thus having little collateral value to offer in exchange for external funding" (p.29). In fact, Fitzgerald and Breathnach (1994) suggested that a lack of finance is one of the major problems faced by the Irish high-tech sector. Furthermore, high-technology firms, in particular SME's, have the main drawback of access to financial resources. This has been documented by The Science Technology and Innovation Advisory Council (STIAC) Report (1995) which discussed the dependence of small technology based firms in Ireland on financial resources and how important financing is to them, particularly in the improvement of indigenous seed and venture capital funds. With regard to the STIAC Report, stressing the importance of venture capital funds, De Vol (1999) stated that the ability to access venture capital is significant in establishing and developing indigenous high-technology firms and clusters. If a region does not have excellent venture capital elements in position there is a risk of not developing into an effective and efficient high-technology area.

Additionally, the life cycle or stage model embraces the issue that stages in a high-technology firm's development correspond to changes in the financial make-up and availability of finance. Roberts (1991) remarked that:

“The new technology-based firm evolves through a succession of several stages of corporate growth and parallel development of its financial needs. The time during which a company can be classified in a particular phase varies widely among firms and the dividing line between phases is at best fuzzy. Yet, the relative stage of evolution does strongly influence the type and amount both of capital required and especially of capital available” (p.125).

Previous research has identified that the financial requirements of a high-tech firm are very much dependent on the industry type (Oakey, 1995 and Roberts, 1991). As a rule, new high-technology firms present a greater risk to business related borrowers. This is simply due to the fact of lack of information regarding the high-technology market they are operating in.

In Ireland, many different groups aim to provide financial support and/or advice for indigenous high-technology firms. These include the European Union, National Government, Enterprise Ireland and the County Enterprise Boards. In this researchers opinion, for a region such as the South-East of Ireland to establish and develop high-technology industry, a support structure with continuation needs to be encouraged through each of the above mentioned supporters. This may aid the South-East region in becoming a more attractive location choice for high-tech industry.

## **2.14 Transport Infrastructure**

Frenkel (2001) stated that literature suggests that regional infrastructure is of great importance to high-technology enterprises. The emphasis on the importance of a good transport infrastructure is also discussed by Wince-Smith (2003) who stated “a strong physical and information infrastructure is a baseline requirement for a prosperous regional economy. Roads, highways, airports, railroads, water, and power support the efficient movement of people, goods and services. The ability to communicate effectively and reliably impacts all businesses. Neglecting these assets not only hinders regional

business growth but also erodes the quality of life of its citizens” (p.5). In an Irish context, FORFAS (1998) stated that the high levels of economic and industrial growth in Ireland in recent years have placed unexpected pressure on all aspects of the infrastructure, particularly on the transportation system including road, rail, ports and airports. This suggests that as the economy is becoming more successful with more industries being developed, the transportation system has been affected e.g. more heavy goods vehicles travelling on the country’s roads.

However, Lawless and Gore (1999) argued that transport, in particular public transport, is of minimal significance in influencing business location decisions, with only 7% of their Sheffield case study sample of 300 enterprises indicating that public transport was a main 'push' factor in location decision making. On the other hand, the OECD (2002) suggested that ease of access is one of the wider benefits from transport infrastructure investment, and that enhancement in ease of access may enhance the market size for labour. This finding concurs with Trinder (2001), who discussed that this can be attributed to lessening of time in job hunts, cost and ease of access such as convenience, comfort and dependability of travel. Trinder (2001) also stated that even though other factors such as policies have consequence, transport efficiency does influence the location choice of both firms and workers. In addition, Trinder (2002) argued that workers may be encouraged to transfer into a region with a good transport infrastructure in order to benefit from lesser house prices made achievable by an efficient commuting area, and may also be attracted by a better living environment that the transport development brings. Trinder’s (2002) opinion concurs with the Standing Advisory Committee on Trunk Road Assessment (SACTRA, 1999), who stated that transport operates as a contribution to journey time and further social activities. It was suggested by the East of England Development Agency (EEDA, 2000) that infrastructure investment may change the supposed ease of access of places, thus exerting a pull on inward investment, in spite of any transformations in the existent ease of access.

Literature also supports the case that certain categories of transport infrastructure growth form a basis for businesses to relocate out of an area, particularly small firms. For example, the Scottish Executive (2000) highlighted that many local businesses in

Edinburgh place responsibility on the new style bus lanes for a reduction in income, chiefly owing to parking limitations. However, one characteristic of inquiring from firms how significant transport is to their location choice is perhaps that the answers may mix-up local factors from more noteworthy regional factors (Hall, Breheny, McQuaid and Hart, 1987; McQuaid and Greig, 2002).

## **2.15 Communications Infrastructure**

Frenkel (2001) described a regions telecommunications infrastructure as being among the most important fundamentals supporting the growth of innovation. He continued by saying that it allows firms trouble-free access to information and has an encouraging persuasion on economic efficiency and success. This statement is supported by theoretical and empirical studies (see Brown (1981) and Freeman (1987, 1991)). It can be said that because a first-rate telecommunications infrastructure is found more often in urban areas, the assumption is that it adds to the appeal of these regions. However, progress in the telecommunication infrastructure might enable a business to locate away from urban areas as an alternative location choice (Shefer and Frenkel, 1986). For example, rural regions such as the South-East of Ireland.

Investment in the telecommunications infrastructure in a region can bring about economic growth in a number of ways. The economic profits from telecommunications infrastructure investment are much greater than the returns just on the telecommunication investment itself. For example, where the provision of broadband is basic, relations between businesses are restricted, business communication costs are high but as the broadband structure advances, the costs of doing business fall. Therefore, telecommunications infrastructure investment and the obtained services can provide important benefits to the location decisions of high-tech enterprises. This is line with Leff (1984), who suggested that an adequate telecommunications infrastructure reduces the costs of the attainment of information thereby permitting more high-tech enterprises the option of locating in rural areas.

A further significant trait of telecommunication technologies, which is not present in other types of infrastructure are 'network externalities'. For example, Roller and Waverman (1996) stated "the more users, the more value is derived by those users. Given that these network externalities are not equally present in public infrastructure in general, one might expect that telecommunication infrastructure investments lead to higher growth effects than what has been found for the other types of infrastructures" (p.4).

Yang (2004) stated that business functioning costs such as telecommunications are a key concern for businesses. However, it has been suggested that if the usual advantages of urban location choice by high-tech enterprises can be substituted by distant forms of communication, problems may arise. For example, the need for low-cost locations may scatter economic activity with the effect being a decline in city centre location of businesses, with development continuing to spread to the urban periphery, minor urban areas, and perhaps rural areas (Atkinson, 1998; Atkinson 1998 and OTA, 1995). On the other hand, in the opinion of this researcher the literature opposing low cost location choice can have a positive effect for the high-tech industry. That is, if a location is considered to have the advantage of being 'low cost' the industry will spread throughout rural Irish regions provided that a satisfactory provision of telecoms services exists.

## **2.16 Airport Access**

An important factor for the high-technology industry is access to quality air transport. Air services have a crucial role in reducing journey times, convenience and for that reason advancing economic effectiveness and efficiency. The main reason why a business decides to locate near an airport is for the fast delivery of products and for international company trips. Another important reason for high-technology businesses locating near an airport is for the type of service offered. For example, direct flights to particular locations at suitable times and an adequate international flight service. High-technology businesses are profoundly reliant on air freight and air services (Smyth, 2003). However, research has indicated that the most important factor relating to a company wanting to

locate near an airport is the extent to which the company is involved with international operations or connections (Smyth, 2003). He stated further to the requirements for rapid delivery by air, business travel is also a critical factor in many companies' decision to locate near an airport.

The Aviation White Paper (2003) stated that regional airports can have important advantages for local and regional economies, encouraging economic revival, encouraging inward investment and add to a competitive climate in a region. On the other hand, it has been suggested that the economic benefits of airports have been overstated. Friends of the Earth (2006) have suggested that factors such as the economic cost of environmental damage such as noise pollution and additional traffic congestion have been ignored.

## **2.17 Public Policy**

Government policies assist the fundamental role of renewing the economy in association with indigenous industry. According to Hall (1981), government policies can be fundamental for certain kinds of industry at certain stages in their development. Policy makers in European countries constantly try to create the environment for the development and establishment of new companies with these policies aimed mostly at high-technology firms. In doing so, they have encouragement from the results of earlier research. For example, Almus and Nerlinger (1999) demonstrated that innovative high-technology based firms have a considerably higher endurance and development rate than other sectors (Bürgel et al, 1998).

Unlike Route 128, Silicon Valley or the Cambridge phenomenon, recently emerging high-technology centres in the US, Europe and Asia are strongly supported by regional economic development policies (see for example, Osborne 1990 and Kelly et al, 1992). However, according to Cooke (2001), many regional and national governments' and authorities' policies are aimed at imitating the success of famous clusters such as Silicon



Valley in the belief that their local areas may also capture the benefits of high-technology firm formation and expected economic growth.

In an Irish context, the OECD (2004) stated that there continues to be a well-built focus on the function of science and technology in sustaining economic growth and enlargement in Ireland. Ireland has been particularly thriving in being a magnet for foreign investment. However, industrial policy has now changed to centre support on high value and knowledge driven industry, both from abroad and in the indigenous industry. This is underpinned by investment in education, particularly higher education. For example in relation to policy initiatives for academic-industry collaboration, throughout the last ten years or so, the Irish government has developed a number of specific policy initiatives such as industrial liaison offices and incubators for campus companies (Jones-Evans and Pandya, 1996). However, the OECD (2004) continued to say that even though this can be considered a success many of these enterprises will remain small in size.

Wallsten (2000) discussed two different policy measures that have been undertaken to create regional high-technology development. These include “public venture capital” funds in order to encourage entrepreneurship and the construction of science parks to attract high-technology firms. He continued by stating that most science parks receive some form of public subsidy. This concurs with Goldstein and Luger (1991) who stated that “many parks .... may receive various types of government subsidies including land, buildings, services and infrastructure, and property tax reductions. Less direct government subsidies to science/technology parks can be through the provision of specially designed economic development, education, and job training programmes, at the state level, and through favourable land-use policies which favour expansion, at the local level” (p. 147). However, according to Wallsten (2000), “in order to generate economic growth, a science park would have to support firm development that would not have occurred without the park” (p.5).

According to Barkley et al (1999), the federal government in the United States does not have a public venture capital programme, although many of the states in the U.S. do. A federal programme funding small, high-technology firms in the United States is the Small Business Innovation Research (SBIR) Programme. This is not proposed for regional development, but there are several states and regions that believe it is a key development tool. Many countries in the European Union also consider programmes like SBIR help to clarify the development of regional technology centres.

According to Birley and Westhead (1990) developing a well-built indigenous small firm sector has become progressively more significant as a priority of industrial policy in Ireland. Public policy has played an important role in attracting MNEs to Ireland and there has also been increased indigenous development of high-tech industries. In essence, there is generally a positive political environment towards high-tech business development in Ireland. For example, the main factors that have improved growth in the high-tech industry in Ireland include: EU membership, MNEs, tax incentives, infrastructure and its attractive location inside the EU.

The policy measures that have taken place include the following according to the European Trend Chart on Innovation (2000) in their discussion of innovation policy in Europe:

*Tax Incentives:* Favourable tax schemes in order to attract multinational companies and later incentives for private investments in new start-ups.

*Funds:* Funding is available through European, National and Regional sources with a special initiative to support high potential start-ups.

*Facilitating agencies and organisations:* Enterprise Ireland, local development agencies, County Enterprise Boards and several industrial parks.

*Technology Transfer Organisations:* Programmes in Advanced Technology (PAT) and University Industry Programmes.

*Innovation Centres:* Several small innovation centres have been developed over the last few years.

*Planning/Infrastructure:* Substantial investments in telecommunication and transport infrastructure partly financed by EU funds.

Garavan, Cinneide and Fleming (1997) summarised that the Irish environment for enterprise development needs to look at various policy issues in order for Ireland to provide a suitable environment for high-technology indigenous firms. These include: “a strong financial community”, where high-tech enterprises can have financial support regarding loans and venture capital. They continued by stating that there needs to be “a strong enterprise culture” where support is offered continuously to the firm. They also point out the need for more opportunities in the Irish education system such as “post-graduate research” and “greater collaboration between industry and education”. In earlier literature, Fontes (1995) recommended that policies need to focus on areas such as the fundamentals involved in establishing small technology based firms. These suggested fundamentals included such things as the firms creating opportunities for themselves such as further job offerings. Contrary to this, Von Einem (1991) stated that high-technology firms provide only restricted job prospects and these will only be recognised in the long term. He further suggested that the repercussion of this is that if policies are going to have considerable results then they should not focus on a few prominent high-technology activities. Instead, they ought to be focussed on prospective founders of new firms, young firms starting up and large firms which use small firms as sub-contractors.

## **2.18 Location Theory**

According to Markusen, Hall and Glasmeier (1986) regrettably a theory of location for high-technology industry does not exist. They stated “fragments must be culled from disparate parts of location theory and other scholarships on innovation in order to begin to build a satisfactory set of explanations” (p. 132). They continued to inform that location theory really began with Von Thunen in 1826, who was the first to develop an investigative model of the link between markets, production, and distance.

There have been several theoretical approaches to the location of industrial activity over the last one hundred years. Alfred Weber is probably the best known researcher from the early twentieth century regarding industrial location. His approach is often referred to as 'traditional' or 'classical' with regard to location theory. Weber's (1929) theory is based around factor costs concerned with industrial location, some of which caused clusters to develop and some of which have a tendency to lead to a pattern of dispersion. Weber deemed the most influential factor was transport and the costs associated with it, and that industry would locate at the least cost location. Weber also became conscious of labour costs and recognised that these may also influence location. According to Weber, three main factors persuade industrial location; transport costs, labour costs and agglomeration economies. He stated that the location of firms is determined by attempts to minimise the costs of labour transport and materials. On the other hand, Smith (1981) expressed Weber's handling of labour and agglomerations as being "clumsy", however he also recognised that Weber's ideas were significant. Wood (1969) remarked that by the late 1960's the fundamental nature of location theory was not a great deal unlike what had been said by Weber. Weber has been criticised by many authors such as Smith (1981), who noted that there needed to be enhancement in the indices used in his analysis.

Hotelling (1929) developed another approach which became known as the market area approach or location interdependence approach. This was with reference to the location of activity at or near the point of highest consumption. Losch (1954) supported the idea that it is more practical to consider location being the point of maximum profit rather than the location of least cost.

Traditional theories of firm location suggest that high-technology firms would locate where population is large, that is, where workers are. However, Ernst and Young (1998) do not wholly agree with this having stated that high-tech enterprises' reliance is on information and exceptionally skilled labour. This suggestion leads to considering that high-technology firms would locate near colleges and universities where these skilled workers are and stem from as opposed to simply locating near regions of high density population.

Schweitzer, Connell and Schoenberg (2004) use a point of view on the location decision of high-technology firms called the ‘entrepreneurial’ view. This is the view of the ‘scientist-entrepreneur’. This view considers that the key to the entrepreneur’s enthusiasm to start a spin-off firm are made up of elements such as encouraging university policies and the accessibility of capital. Furthermore, Schweitzer, Connell and Schoenberg also considered a view which is termed the ‘County Manager’ view which is used by regions trying to attract high-technology firms, for example rural regions such as the South-East of Ireland. The suggestion is “various policy instruments at the disposal of government” would assist in attracting high-tech start-ups. Examples they provided include “property tax forgiveness and concessions to subsidise construction costs, relaxation of planning or environmental regulations, and construction of highways, rail lines, internet links, and other utility service” (p. 5).

A Theoretical Framework of Location Factors was produced by Zeng (2005) who organised the main factors of high-technology location decisions into the following:

<b>Classification</b>	<b>Main Concepts / Factors</b>
<b>Geography</b>	Transport cost; Proximity to Supplier and Market; Resource Endowment; Ecological Conditions;
<b>Institution</b>	Institutional Thickness; Institutional Capacity; Institutional Quality
<b>Innovation</b>	Linkage; Technology Spillover; Intermediaries Development

Table 2.2 Main factors affecting high-tech location (Source: Zeng, 2005, p.6)

On the other hand, according to Salvesen and Renski (2003) “traditional economic theory views the firm as an optimising agent that selects a location to maximise profits” (p. 5). This can be regarded as an uncomplicated method but it is a view still upheld when trying to understand why firms locate where they do. “Most of the early work on industrial location focused primarily on the minimisation of transport costs” (Blair and Premus,

1987 as cited in Salvesen and Renski, 2003, p. 5) This view is contrary to suggestions made by Cyert and March (1963), who discussed decision making as playing a role in location decisions and believed that individual preference for a certain location does indeed play an important role. This view would draw the presence of the firm away from the locations which were least costly. Other researchers concur that least cost is not always the most important factor. In fact, Smith (1966) believed that several founders would not go through the hardship to discover the least cost location.

The theory of “psychic income” is a well-known idea within research relating to business choice of location. It explores the fact that firm founders may miss out on a degree of economic efficiency to take full advantage of his or her individual psychic income from a more attractive location (Greenhut and Colberg 1962). Losch (1954) had also accepted that personal satisfaction also plays a part in the choice of firms to situate, if the choice does not have the outcome of a less significant location preference being made. This suggests that the founder may have an option of two locations which are both appropriate though one may have an enhanced opportunity for this individual to take full advantage of their own benefits and therefore this location will move the balance to decide on this location. For example, a golf club may be nearer one of the locations and the founder may be prone to playing a round or two of golf.

Information also played an important role throughout location theory. The availability of information can be the initiating point of any firm starting up. For example, Pred (1972) provided a behavioural matrix where one axis represented the available information and the other the capacity to use it. This matrix assumed that most locational decisions are not the best possible, but adequate.

There have been many theories relating to where industry locates throughout the years such as Von Thunen (1826); Launhardt (1882); Weber (1929); Hoover, (1948) and Losch (1954) in the 20<sup>th</sup> century. However, it is also felt that the traditional theories are rapidly only being recognised as the underlying factors. Since the late twentieth century, there are now more prevalent factors influencing high-tech firms when making location

decisions such as proximity to universities, research and development and regional policy (McCann and Sheppard, 2003).

## **2.19 Conclusion**

This chapter evaluated previous literature on topics relating to enterprise development and entrepreneurial regions. It can be seen from this literature review that where an indigenous high-technology firms chooses to locate, or not to locate, in a region is dependant on many different factors. Therefore, it would seem that the literature suggests that there are many factors that if not either in existence or not developed to their full potential that effect the location choice of high-technology indigenous firms. On the other hand, this researcher considers Malecki's (1991) opinion, who stated "it is not at all clear that high-tech is a dependable base or one which can be created in regions which lack agglomeration economies and other dynamics common to high-tech centres" (p.55).

In summary, in this chapter the researcher discussed factors throughout literature that are considered by firms when deciding where to locate or relocate their business. In the literature, the discussion pertaining to factors in the location choice of high-technology firms included science parks, universities, public policy, research and development, support, skilled labour and clustering. This researcher also examined location theory from various authors throughout the twentieth and twenty-first centuries.

However, whilst previous research has identified these factors as impacting on the location choice of high-tech enterprises in other settings, no research to date has focused on understanding the situation in Ireland. This researcher aims to centre this research on determining if these factors are evident in Ireland. However, if they are not, it will be established if they are the sole factors attributing to the lack of high-technology industry in the country. The factors which support 'booming' high-tech development attributing to the location choice of high-tech enterprises in Ireland and if they are apparent in the South-East region as attributing factors will also be examined. Furthermore, this

researcher will also determine if the suggested factors in the literature are a cause of any decisions made by entrepreneurs to locate away from particular regions such as the South-East.

This review of literature has inevitably led the researcher to focus on identifying the regional factors that encourage the creation of high-tech enterprises, establish the reasons why existing high-tech companies set up their enterprises where they are and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location.

The following chapter will clarify the research methodology that the researcher embarked on for this current research.



# *Chapter 3*

## *Methodology*

## **Chapter Three**

### ***'Research Methodology'***

#### **3.1 Chapter Overview**

This chapter informs the reader of the methods used in performing this current research. It details the research problem, defines the research question and objectives, investigates research philosophies and discusses the selection of data collection methods. The research process is also explored, placing emphasis particularly on the 'Research Process Onion' which was developed by Saunders, Lewis and Thornhill (2003). Once the research philosophies have been examined, the underlying differences between quantitative and qualitative research are investigated.

The selection of the sample is followed by the identification of an appropriate research tool proposed for use in answering the research questions and objectives of the current research. This researcher's choice of web surveys as a method and the medium through which they were administered is also explained. In addition, the advantages and disadvantages of other survey methods, which were not chosen by this researcher such as telephone and postal mail, are also discussed. In conclusion, the limitations to the chosen method of a web survey questionnaire are also presented.

#### **3.2 Research problem**

This purpose of this current study is to examine the extent to which regional factors influence the location decisions of high-tech enterprises, establish reasons why founders set-up their enterprises where they do and determine what factors would influence an owner/entrepreneur to relocate. Kane (1984) stated that the research idea or problem is "the most difficult hurdle to overcome when doing research" (p.15). Furthermore, Hughes and Tight (1996) declared that "choosing your research topic is probably the

most important single decision you have to make in doing research” (p.22). According to Bechhofer and Paterson (2000), the ideas for research can be developed in various ways, for example, from social issues a researcher would like to understand, or subject matters they have modest knowledge about. The idea for this current study is outlined in the following paragraphs.

It is evident that there is an imbalance in Ireland regarding the concentration of indigenous high-tech industry location. For example, the highest concentrations of these enterprises are in the Dublin (Crone, 2002) and Cork (American University, 2003) regions. However, there appears to be very few high-technology enterprises located in particular regions in Ireland, for example, the South-East. In fact, it appears that some key regions such as the South-East are not showing the strong growth in high-tech sectors achieved by other regions. This is consistent with the fact that the South East is generally considered to be an economically underperforming region compared to the other regions in Ireland (Dee, 2004; O’Gorman and Dee, 2004; Walsh, 2005; O’Gorman, 2005a; O’Gorman, 2005b)

Therefore, it is important to attract high-tech industry into the South-East as it will foster an excellent environment for future economic development in that region. In addition, Ireland is often thought of as a high-tech economy yet only ten percent of the high-technology sectors are indigenous firms compared to fifty-six percent being foreign-owned (Barry, 2005). There is a need to focus on the high-tech industry as it is based on technology innovation, which is the key to developing and sustaining existing businesses in a region. The high-tech industry also encourages strong growth potential and enhances the environment for business in a region (Enterprise Ireland, 2001).

Moreover, as a knowledge society is the focus of many successful economies this researcher was interested in discovering the attempts being made by Ireland to embrace it through for example, the knowledge-intensive investment in the high-tech industry, needed to sustain Ireland’s economic performance into the future. These issues were a concern to this researcher as they are perhaps hampering Ireland’s economic success, and

therefore, the reason for the focus of this current study being to understand why high-tech firms do or do not choose to locate in Irish regions, particularly the South-East.

The research reviewed in the literature tended to focus on the influence of factors such as science parks, multinational enterprises (MNEs), research and development, and collaboration. However, there was modest evidence of research performed on the extent to which Irish firms are influenced by regional factors in their location decisions. Therefore, there was a need for research into the area from an Irish perspective. Also, the majority of the literature had only considered individual factors. For example, researchers have selected one location choice factor such as research and development expenditure to examine. For that reason, this researcher wished to expand the literature by focusing on an array of factors influencing the location decision of the high-tech industry sector as opposed to just highlighting one issue.

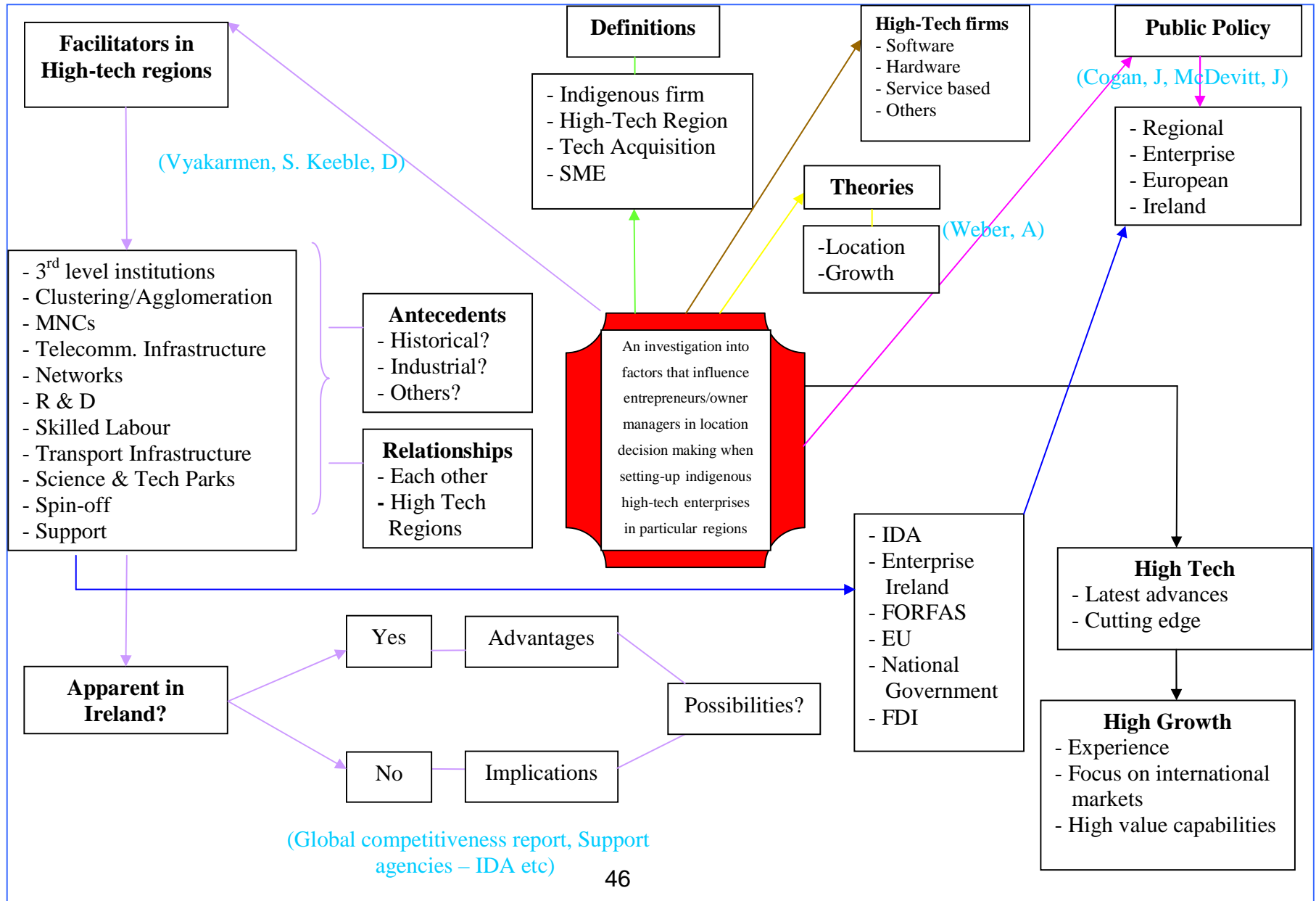
As part of developing the research question and research objectives for this current study this researcher developed a conceptual framework (Figure 3.1). Miles and Huberman (1984) defined the conceptual framework as a visual or written product, one that “explains, either graphically or in narrative form, the main things to be studied, the key factors, concepts, or variables and the presumed relationships among them” (p. 18). They further described the framework as the system of concepts, assumptions, expectations, beliefs, and theories that supports and informs a research study. However, it should be noted that although conceptual frameworks provide restrictions on areas that should be looked at they do not need to completely limit the researcher from considering further avenues (Miles and Huberman, 1984). Therefore, it can be said that the conceptual framework illustrates the literature and concepts underlying this current study. It is also used as a guide for developing the research question and research objectives.

Once the research problem had been established this researcher was able to ascertain the research objectives of the study which would support answering the research problem. This is in line with Polonsky and Waller’s (2005) suggestion that once the research topic is selected, the next step of the process is to determine the research objectives.

Figure 3.1

Conceptual Framework

Source: Current Research



### **3.3 Research Question**

Bryman (2004) suggested that research questions are “crucial”. He continued by saying that they should be clear, researchable, have some connection with existing theory and research, should be linked to one another, should have the prospect of being able to make an original contribution to the topic and should be neither too small or too large. Remenyi, Williams, Money and Swartz (1998) stated “it is the literature review that should reveal problems or areas of incomplete knowledge in the field of interest” and that “establishing a research question without appropriate evidence from the literature review is a risky approach” (p.67).

Blaikie (2003) suggested that in order to facilitate achieving research objectives, researchers have to create research questions with the aim of identifying the nature and capabilities of a research project. Throughout the process of selecting a research question, it was evident from the literature that research questions can be of many different types including: ‘What’ questions which try to find descriptive answers. In this current research, a ‘what’ type question is used, with this study’s research question being:

What factors influence the decisions of entrepreneurs/owner managers of indigenous high-tech enterprises to locate in particular regions?

### **3.4 Research Objectives**

Polansky and Waller (2005) stated that the research objectives demonstrate what the researcher will inspect and what subjects a study will cover. The research objectives of this current study are the detailed elements of the research problem that this researcher will use to answer the overall research question.

According to Blaikie (2003), social research can have many objectives. He continued to say that “it can explore, describe, understand, explain, predict, change, evaluate or assess aspects of social phenomena” (p.11).

The research objectives of the current study are:

1. To identify the regional factors that encourage the creation of high tech enterprises.
2. To establish the reasons why existing high tech companies set up their enterprises where they are.
3. To determine what factors would influence an entrepreneur/owner manager to move from their original set-up location.
4. To ascertain what factors encourage an entrepreneur/owner manager to remain in the location of original start-up.
5. To determine the regional factor's that attract high-tech enterprises into a specific region.

In order to address both the research question and research objectives an appropriate research design is required.

### **3.5 The research process/research design**

There are many different descriptions of the research process or research design as it is often referred to (Sarantakos, 1993; Bouma, 1996; Bechhofer and Paterson, 2000 and Bradshaw and Stratford, 2000). Each researcher has their own interpretation of what the process consists of. For example, Yin (1989) stated “a research design is the logic that links the data to be collected to the initial questions of a study” (p.27). This concurs with Cooper and Schindler (1998) who described the research process as a selection tool for the resources and variety of information used to answer the research question, a structure

for detailing the link between the study's variables and a "blueprint" that summarises each method from the theory to the study of data. Saunders et al (2003) defined the research design as an 'onion' like process that supports the researcher to "depict the issues underlying the choice of data collection methods" (p.82) (Figure 3.2). In relation to the 'process onion' method, they suggested that a research design should commence with looking at the outside layer which is choosing a research philosophy. They continued to say that once this is done each layer should be shed until the fifth layer is arrived at which is defining data collection methods. Remenyi et al (2000) concur with this idea regarding the research process and they also recommended this approach. Therefore, in accordance with Saunders et al's (2003) research process onion this researcher will look at the research philosophies before continuing with the selection of data collection methods.



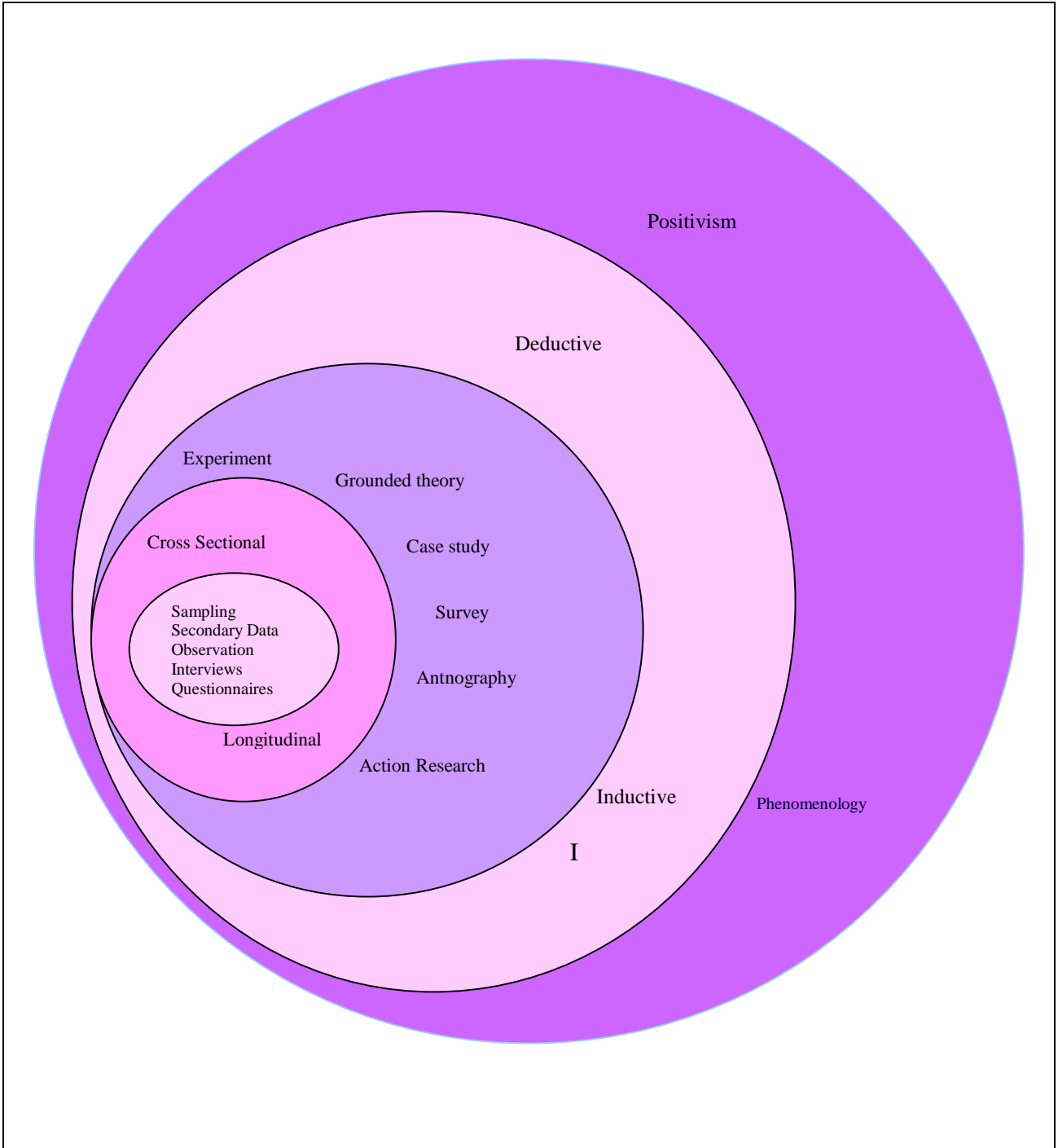


Figure 3.2 The research process 'onion' (Source: Saunders et al., 2003, p.83)

### **3.6 Research Philosophies/approaches**

Walsham (1995) as cited in Robson (2002) suggested that it is essential to define the philosophical position of the researcher. However, Easterby-Smith, Thorpe and Lowe (1991) suggested that there may be some uncertainty as to the role research philosophy plays within the overall research methodology; though they continued by saying it still should be investigated. In fact, they stated “the relationship between data and theory is an issue that has been hotly debated by philosophers for centuries. Failure to think through philosophical issues such as this, while not necessarily fatal, can seriously affect the quality of management research” (p.21). Furthermore, Easterby-Smith et al (1991) offered three reasons as to why research philosophy can be helpful. These included shedding a light on the research design, assisting the researcher to identify what designs may and may not work and aiding the researcher to discover and even construct designs that are perhaps outside his or her prior knowledge.

It has been suggested in the literature that philosophical issues contribute to the research design process. For example, Merriam (1998) stated “choosing a research design requires understanding the philosophical foundations underlying the type of research and your personality, attributes and skills, and becoming informed as to the design choices available to you in your paradigm” (p.1). It is also proposed in the literature that looking at fundamental daily personal ideas supports the understanding of philosophical subjects (Proctor, 1998).

According to Neuman (2006), the various approaches to methodology recommend that good quality social research entails, rationalises the undertaking of research, relays principles to research, and directs ethical conduct. These approaches are broad frameworks within which the researcher conducts studies. He continued, by stating that there are three approaches that may be employed by researchers, namely positivist social science, interpretive social science and critical social science. Furthermore, Neuman compared these approaches in relation to a number of elements for research. For example, the reason for undertaking the research and the place values hold in the

research. In terms of the reason for conducting research and of the place for values of the three approaches suggested by Neuman, Bammer (2005) provided the following description.

“In terms of the reason for conducting research:

- Positivism seeks to discover natural laws so that people can predict and control events;
- Interpretive social science aims to understand and describe meaningful social action; and
- Critical social science endeavors to smash myths and empower people to change society radically.

In terms of the place for values:

- Positivism sees science as value free, with values having no place except when choosing a topic;
- Interpretive social science considers values as an integral part of social life—no group’s values are wrong, only different; and
- Critical social science posits that all science must begin with a value position, and that some positions are right, and some are wrong” (p.13).

### **3.6.1 Positivism versus anti positivism**

Saunders et al (2003) identified three distinct research paradigms, namely; Positivism, Realism and Interpretivism, while authors such as Proctor (1998) divided the research philosophies into two paradigms, specifically ‘positivist’ and ‘non-positivist’.

Neuman (2006) defines positivism as a “method for combining deductive logic with precise empirical observations of individual behaviour in order to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity” (p. 82). It is important with regard to this paradigm that the researcher is not attached to the research topic. This is in accordance with Remenyi et al (1998) who stated “underlying positivism is the assumption that the researcher is independent of and neither affects nor is affected by the subject of the research” (p.33). Therefore, in the

opinion of the author of this thesis positivism can be described as essentially centring on human behaviour. May (2001), for example stated that positivism portrays human behaviour in terms of cause and effect. This suggests that human behaviour plays a central role in the positivist paradigm. The key features of this approach are shown in Table 3.1.

Positivism lies directly with quantitative research. Researchers such as Remenyi et al (1998) and Bryman (2004) stated that quantitative research permits researchers to make themselves aware of the problem or idea to be researched. They continued to say that importance should be placed on the details and reasons for the actions of a research study, with the information organised in numbers which are valid and quantifiable. Smith (1983) as cited in Kim (2003) stated that in the positivistic approach, public data is considered valid. Furthermore, he stated that this is because others can reproduce the findings using similar tools and methods while reducing the consequences arising from the researcher's own values and bias.

In contrast, 'anti-positivism' is connected to qualitative research which is particularly linked with philosophies such as interpretivism, ethnography and phenomenology. Cohen and Manion (1989) define phenomenology as a theoretical point of view that supports the study of direct events taken at face value. They continued to say that the behaviour seen is determined by experience rather than by external, physically described realities. Furthermore, Remenyi et al (1998) described phenomenology as the descriptive/interpretive approach. They stated the reason for this is that each event researched is an exclusive occurrence in its own right (Remenyi et al, 1998). On the other hand, however, Wheatley (1992) stated that nothing can be studied separately from the observer and the feat of observing influences the result of what is being observed.

Table 3.1 compares and contrasts both paradigms.

	<b>Positivist Paradigm</b>	<b>Phenomenological Paradigm</b>
<b>Basic Beliefs</b>	The world is external and objective. The observer is independent. Science is value-free.	The world is socially constructed and subjective. The observer is part of what is observed. Science is driven by human interests.
<b>Researcher Should</b>	Focus on facts. Look for causality and fundamental laws. Reduce phenomena to simplest elements. Formulate hypotheses and then test them	Focus on meanings. Try to understand what's happening. Look at the totality of each situation. Develop ideas through induction from data.
<b>Preferred Methods Include</b>	Taking large samples.	Small samples investigated in depth or over time.
<b>Advantages</b>	Can provide wide coverage of the range of situations Fast and Economical May have considerable relevance to policy decisions	The ability to look at change processes over time Understand peoples' meanings Adjust new issues and ideas as they emerge Contribute to the evolution of new theories

Table 3.1 Summary of Positivist and Phenomenological Characteristics  
(Adapted from Easterby-Smith et al 1991, p.27 and 32)

### 3.6.2 Selection of Research Philosophies

Remenyi et al (1998) stated that “whatever research paradigm is chosen the ability to develop a convincing argument in support of the research findings is paramount” (p.37). The research philosophy selected for this current study was the positivist approach as it was deemed to be the most appropriate for the research to be conducted. The data for this research needed to be quantifiable in order to ascertain variations between the respondents’ enterprises. According to Remenyi et al (1998) “positivism emphasises quantifiable observations that lend themselves to statistical analysis” (p.33).

Furthermore, the positive approach provided information that was helpful in answering the research question. This information gave an insight into the factors that encourage where high-tech enterprises locate, allowing for reasons to be established as to why existing high-tech companies set up their enterprises where they are. The positivist approach also enabled this researcher to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location.

### **3.7 Quantitative versus Qualitative Research**

The next stage in the design process was to select a suitable data gathering technique Babbie (1992) stated that the two central sets of data gathering methods or techniques are those that are quantitative and are qualitative. Quantitative research is defined by Saunders, Lewis and Thornhill (2003) as “meanings derived from numbers with the collection resulting in numerical and standardized data. The analysis is then conducted through the use of diagrams and statistics” (p.378). Therefore, it can be said that quantitative methods are intended to gather information for numerical analysis. In contrast, qualitative research gathers evidence by means other than numerical data and generally consists of documented information, for example interview transcriptions. Cresswell (1994) defined the qualitative method as “an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyses words, reports detailed views of informants, and conducts the study in a neutral setting” (p.4). Therefore, there are many differences between the quantitative and qualitative research methods some of which have been identified by Neill (2006) and are illustrated in Table 3.2. In relation to this current research the pros and cons of each method were considered before selecting an appropriate method.

Qualitative	Quantitative
All research ultimately has a qualitative grounding	There's no such thing as qualitative data. Everything is either 1 or 0
The aim of qualitative analysis is a complete, detailed description.	In quantitative research we classify features, count them, and construct statistical models in an attempt to explain what is observed.
Recommended during earlier phases of research projects.	Recommended during latter phases of research projects.
Researcher may only know roughly in advance what he/she is looking for.	Researcher knows clearly in advance what he/she is looking for.
The design emerges as the study unfolds.	All aspects of the study are carefully designed before data is collected.
Researcher is the data gathering instrument.	Researcher uses tools, such as questionnaires or equipment to collect numerical data.
Data is in the form of words, pictures or objects.	Data is in the form of numbers and statistics.
Qualitative data is more 'rich', time consuming, and less able to be generalized.	Quantitative data is more efficient, able to test hypotheses, but may miss contextual detail.
Researcher tends to become subjectively immersed in the subject matter.	Researcher tends to remain objectively separated from the subject matter.

Table 3.2 Quantitative versus Qualitative (Adapted from Neill, 2006)

Literature has repeatedly discussed the distinctions between qualitative and quantitative approaches. For example, according to Strauss (1990), quantitative research focuses on arithmetic approaches whereas qualitative methods are based on content analysis, comparative analysis, grounded theory, and understanding. Furthermore, Emory and Cooper (1991) stated that qualitative research is a creative process that depends on the

conceptual abilities of the researcher whereas in contrast, quantitative analysis is restricted by statistical rules and formulas. In addition, Jarratt (1996) suggested that qualitative research methods frequently probe deeper but are less structured than quantitative techniques and thus are useful when the research is exploratory in nature. Moreover, Campbell (1999) stated that the results of qualitative research are normally presented in words, contrasting to the results of quantitative research, which are usually shown as numbers.

Bell (1993) informed that there is no ideal choice of data gathering technique by stating that each technique has its strengths and weaknesses and that each is appropriate for practical situations. This suggests that either approach is justifiable and that it is the circumstance that plays a key role in choosing the technique that the researcher is going to use. In the case of the current research the quantitative method was selected as being the most appropriate data gathering technique. This technique was chosen particularly because this current study needs to focus on the collection and analysis of numerical data in order to answer the research question and objectives.

In brief, this section demonstrated the distinctions between the quantitative and qualitative research approaches. The next section will describe the research criteria for the current research.

### **3.8 Research Criteria**

For this current study, a number of research criteria were drawn up to ensure that a suitable research sample and ultimately suitable research subjects were selected for the research. These include:

1. The businesses needed to operate in a high-technology industry (as defined in Chapter 2).
2. The entrepreneurs' businesses had to be based in Ireland.



3. The businesses that were to be selected were required to be wholly-owned Irish enterprises.
4. The businesses sought for the current study needed to be non-subsidiary.
5. The businesses needed to be supported by Enterprise Ireland between the years 2002 and 2005. This provided this researcher with businesses that are relatively new start-ups with the advantage being that the founder's memory of their location decision is still clear in their mind. Thus, the current study will be better informed.

### **3.9 Sample selection**

Once the research criterion had been defined, the sampling process began. Fridah (2004) informed that the purpose of sampling is to establish parameters or characteristics of the entire population. There are numerous definitions in literature for a sample. For example, Neuman (2006) defined a sample as “a small set of cases a researcher selects from a large pool and generalises to the population” (p. 219). Furthermore, Bryman (2004) described a sample as the “segment of a population that is selected for investigation” (p.87). In relation to this statement, it is important to distinguish between a sample and a population. Fink (1995) differentiated between the two. He stated that “a sample is a portion or subset of a larger group called a population whereas the population is the universe to be sampled” (p.1).

To facilitate this current research, a sample of high-technology businesses was needed. Also, in order to answer the research question, this researcher needed to focus on a distinct group of high-technology wholly-owned Irish companies. However, an existing database was unavailable to offer a complete sampling resource for this current research. After contacting several different organisations including the IDA, Chamber of Commerce and the central statistics office, a compiled list of Enterprise Ireland's high-potential start-up (HPSU) enterprises from 2002 through to 2005 were used. This researcher went through the list for each year and selected businesses to develop a database appropriate for this current study. While certain information was supplied on

these HPSU lists such as company name and what their business involved, this researcher was unable to gather complete information such as contact details. On this basis this researcher decided to create a database to include as much information as possible for each business ensuring each business on this newly formed database met the chosen research criterion.

### **3.10 Selection of research method**

Once the sample had been selected this researcher had to choose the research methodology that was to be used to perform the research on the elected sample. As previously stated by this researcher the approach selected for this current research was positivist and quantitative.

#### **3.10.1 Various survey methods**

This researcher examined the advantages and disadvantages associated with quantitative research methods and selected the survey method as the tool for this current study as it was considered to be the most proficient. A survey is defined as “the collection of a large quantity of evidence, usually numeric, or evidence that will be converted into numbers” (Remenyi et al, 1998, p.290). According to Polonsky and Waller (2005) surveys can be used to gather information on “such things as attitudes, intentions, awareness, behaviours and motivations” (p.113).

There are a variety of methods that can be used to administer and manage surveys. For example, they can be administered through telephone, electronically and by mail. Each survey method was considered individually based on their advantages and disadvantages for this current research (See Table 3.3) in order to select the most appropriate research method tool.

This researcher chose an online survey as it was the most suitable tool for which to administer the survey for this current study. The reason for this is that this method has the advantage of being cheaper, faster (distribution) and more flexible than the other available methods. Furthermore, the respondents were considered to be computer literate and therefore the method was appropriate as it would be easy for respondents to navigate around the survey website.

Table 3.3 compares the different survey methods that were considered by this researcher. To interpret the table the terms \*\*\*=High; \*\*=Medium; and \*=Low need to be clarified. For example, the criteria cost for the in-home interview survey method is classified as \*\*\*=High. This suggests that this method is costly to use. In addition, the criteria control of data collection is classified as \*\*=Medium for the telephone survey method. This suggests that with this method the researcher has neither full nor lack of control of the data collected. Furthermore, in the table the internet/web method corresponding to the criteria cost is described as \*=Low. This suggests that the cost of using the internet/web as a survey method is low. In essence these three terms relate to the criteria involved in each survey method and their ranking in terms of value. It should also be noted that the internet/web method is that which relates to this current study which is also called an online survey.

Criteria	Telephone	In-home interviews	Central location interview	Computer assisted personal	Mail surveys	Mail panels	E-Mail	Internet Web
Flexibility of data collection	***	***	***	***	*	*	*	***
Diversity of questions	*	***	***	***	**	**	**	***
Use of physical stimuli	*	***	***	***	**	**	*	**
Sample control	***	***	**	**	*	***	*	**
Control of data collection	**	***	***	***	*	*	*	*
Control of field force	**	*	**	**	***	***	***	***
Quantity of data	*	***	**	**	**	***	**	**
Response rate	**	***	***	***	*	**	*	*
Perceived anonymity of respondent	**	*	*	*	***	***	**	***
Social desirability	**	***	***	***	*	*	**	*
Obtaining sensitive information	***	*	*	*	***	***	**	***
Potential for interviewer bias	**	***	***	*	None	None	None	None
Speed	***	**	***	***	*	**	***	***
Cost	**	***	***	***	*	**	*	*

\*\*\*=High; \*\*=Medium; \*=Low.

Table 3.3 Comparison of survey methods

(Source: Malhotra et al, 2002 cited in Polonsky and Waller, 2005, p.115)

### 3.10.2 Survey

This researcher looked at the various advantages and disadvantages related to the various survey research methods (Table 3.3) and decided that the most appropriate method to gather information from participants, was an online survey. Schonlau, Fricker, and Elliott (2002) who suggested the key things to look at in selecting a survey include cost and timeliness. When deciding on what method to choose for the current study, this researcher also considered these issues which were considered to be fast and low for online surveys (Table 3.3 Internet/Web).

Hutton (1990) as cited in Blaxter, Hughes and Tight (2001) defined survey research as the method of collecting information by asking pre-formulated questions in a rigid order in a well thought-out questionnaire to a sample of individuals drawn that are representative of a defined population. Therefore, it can be said that a survey is a procedure in which a set of questions are offered to the group of respondents, the sample in the case of the current research. According to Remenyi et al (1998) the main purpose of a survey “is to obtain information that cannot be easily observed or that is not already available in written or computerised form” (p.150).

A web questionnaire was the tool used to administer the survey for this current research. This researcher decided upon administering the survey through the internet using e-mail as the invitation. This method was found to be the most economic, cost effective, timely and convenient method for the purposes of this current research. This is in line with Malhotra et al (2002) who stated that web surveys are easy on the pocket, can be greatly targeted, are not as invasive as other methods and even can be more attention-grabbing to respondents, and respondents can complete the questionnaire in their own time with a speedy turnaround rate.

Respondents to web questionnaires need to be directed to the website which has the questionnaire through a tool such as email. E-mail and internet surveys are somewhat new and have only become prominent in the last ten years (Walonick, 2004). However,

according to Bryman (2004) the amount of surveys conducted online has increased significantly. An electronic survey involves “electronic media to access respondents to ask questions via email or web sites on the internet” (Malhotra et al cited in Polansky and Waller 2005, p.113). Electronic surveys have taken on a range of forms from straightforward email surveys to complicated web survey structures. There are three main types of electronic survey which include disk-by-mail format, e-mail and World Wide Web (WWW).

According to Couper & Nichols (1998), the early design of electronic surveys was the disk-by-mail format. This involved a disk containing the survey being posted to respondents, who are told to open the file, complete the survey, and post the disk back to the researcher. The second type of electronic survey is the e-mail survey. These surveys are characteristically contained in an e-mail message or as an attached file (Sproull, 1986; Ramos Sedivi & Sweet, 1998 and Bradley, 1999). Respondents are asked to respond to the email and specify their responses in the reply message or as part of the attached file. The third type of electronic survey is placed on the World Wide Web (WWW). In this case respondents are typically sent an e-mail message with a link to the URL address for the survey. However, for this current research, an email message with a link to the URL address for the survey was the selected tool.

The advantages of web surveys are varied. Web surveys by electronic mail are prompt and economical, permit flexible design and can use visual images, or even audio or video in some Internet versions (Neuman, 2006). Another very useful attribute of a web survey is that its design can incorporate filter questions whereby the questions skip automatically to the next appropriate question. For example ‘if yes, go to question 5, if no go to question 8’. Also, “respondents’ answers can be automatically programmed to download into a database, thus eliminating the daunting coding of a large number of questionnaires” (Bryman 2004, p.481).

Remarking on the efficiency of electronic mail and web based surveys in contrast to earlier methods, Dillman (2000) stated “these efficiencies include the nearly complete elimination of paper, postage, mail out and data entry costs (they) also provide a potential

for overcoming international boundaries as significant barriers.....the time required for survey implementation can be reduced from weeks to days, or even hours” (p.352). The results and facts from the survey undertaken can then be used to describe, explain and for hypothesis testing. However, the ultimate result of a well-constructed survey is reliable and valid data. But in order to achieve these results an orderly process should be followed. Such a process was considered by Hair, Babin, Money and Samouel (2003) who offered a step-by-step process for designing a survey. This process was considered when designing the survey for this current research. These steps in the process offered by Hair et al (2003) included:

Step 1: Initial considerations

Step 2: Clarification of concepts

Step 3: Typology of a questionnaire

Step 4: Pre-testing a questionnaire

Step 5: Administering a questionnaire

They continued by saying that if such a process is followed, the survey employed will be more effective and the researcher will have the ability to gain relevant results to analyse.

### **3.10.3 Survey Content**

The focus of the current research is to examine the extent to which regional factors influence the location decisions of high-tech enterprises, establish reasons why founders set-up their enterprises where they do and determine what factors would influence an owner/entrepreneur to relocate. In addition, the objectives of the survey are to identify the regional factors that encourage the creation of high-tech enterprises, establish the reasons why existing high-tech companies set-up their enterprises where they are and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location. Furthermore, an objective for the current study was to place emphasis on the South-East region of Ireland. In order to facilitate these objectives

the survey contained questions relating to these topic areas. Therefore, the survey included questions relating to the businesses' general background, current location, financial assistance, alternative locations considered, original location decisions, research institution collaboration, relocation and attraction and prevention factors for enterprise set-up and the South-East region.

In addition, this researcher needed to investigate the types of questions most suitable for the current research. Remenyi et al (1998) stated that there are only two types of questions namely open-ended and closed-ended questions. However, the web survey used for this current study enabled this researcher to choose from twelve different question types from which a selection of question types were chosen. For example, some of the question types that were selected included multiple choice questions, one answer questions, matrices and so on.

#### **3.10.4 Limitations of the Web Survey Questionnaire Method**

It is well-known that all research methods incur limitations, and the web survey used for this research was no exception. Coverage error can be a huge inadequacy of web surveys. This is mainly due to the portion of the population who has internet access and essential skills and hardware necessary to complete the survey. However, this researcher didn't find this to be a major limitation for the current research. This limitation was overcome mainly due to the fact that the chosen sample was a professional high-tech database and all of these businesses had the necessary requirements and abilities to complete the survey. To ensure coverage error was not going to be an issue in the current study, this researcher also made brief telephone contact with each business ensuring their ability to complete the survey, before the questionnaire was issued.

Another limitation with web surveys is that responses can be restrained due to factors such as apprehensions regarding privacy, respondents not being familiar with computer technology and interest in the subject area (Underwood, Kim and Matier 2000).



Additionally, Zanutto (2001) as cited in Gunn (2002) discussed a number of issues concerning Web surveys:

1. Questionnaires don't look the same in different browsers and on different monitors. Therefore, respondents may see different views of the same question, and not get the same visual incentive.
2. Respondents may have different levels of computer expertise. This deficiency in computer proficiency can be a cause of error or non-response.
3. The researcher is faced with concerns about data security on the server.
4. The sample in a Web survey isn't really a random sample, and there is no method for choosing random samples from general e-mail addresses.
5. Since information can be collected about respondents without their knowledge or permission, respondents may be concerned with privacy of the data they are entering. The researcher can determine the time of day the survey was completed, how long the respondent took to complete each question, how long the respondent took to finish the entire survey, what browser was used, and the respondent's IP address. (p.5)

The main limitations incurred with the current research were those related to the respondents' views and issues. However, this researcher sought to overcome these limitations through privacy assurance and a thorough explanation to each respondent of what their responses were going to be used for. In addition, the participants were also offered a copy of the research results upon completion of the study. However, only 2% of the respondents requested a copy of the findings. Also, in order to increase the response rate of the web survey in this current research, follow-ups were conducted through both phone and email contact, giving the respondents a reminder to cooperate and complete the questionnaire survey.

Working to overcome some of these limitations proved to be advantageous to this researcher as the current research yielded a response rate of 64%. This is acceptable when compared to other studies. For example, Adam and Deans (2000) achieved 17% for their

study. On the other hand the results of this current research are contrary to arguments relating to the low response of web surveys. For example, Dommeyer and Moriarty (1999) suggested that online data collection methods do not produce high response levels.

### **3.10.5 Pilot Survey**

The term pilot study is used in two diverse ways in social science research. It can denote “trial runs” which are completed as a grounding for the main study and furthermore to the “pre-testing” of a particular research tool (Von Teijlingen and Hundley, 2001). According to Remenyi et al (1998), it is necessary for a pilot study to be carried out to determine if the proposed questionnaire is understandable and unambiguous to the intended recipients. As De Vaus (1993) stated “Do not take the risk, pilot test first” (p.54). This statement by De Vaus concurs with Emory and Cooper (1991) who stated that the purpose of piloting is to discover potential weaknesses in the overall design of the questionnaire. Furthermore, Bryman (2004) also agreed by stating that piloting seeks to ensure the survey questions work well and also that the tool as a whole functions well.

For the current research, a preliminary pilot survey was sent out to four high technology businesses. These pilot surveys were sent out through a website link in an electronic mail. Pre-testing the survey gave this researcher the opportunity to assess the effectiveness of the questions and the cover letter and the ability of respondents to comprehend what they were being asked. Three out of four businesses completed the pilot survey. After the return of both the survey and comments from the chosen businesses, this researcher decided to make a slight change to one of the survey questions by rephrasing it so that it could be more easily understood.

Kane (1984) stated that a pilot survey is useful for establishing what is critical to the research and what appears to be important but is actually not that important. This researcher agrees with this statement as the pilot survey that was issued offered some initial warning and support on a problem area, such as one question that wasn't totally

understood. The mistakes or errors which a pilot survey can identify were discussed by Andrews, Nonnecke and Preece (2003) and include:

- Bias in question/answer wording
- Inconsistent wording and spelling errors.
- Requesting inappropriate demographic data
- Overlapping question scales or selection options
- Inaccurate or missing instructions
- Technical vocabulary with no definitions
- Insufficient space for open-ended question answers
- Lack of motivational techniques to go to the survey

and/or complete it

(p.17)

### **3.11 Research Methods**

Figure 3.3 demonstrates this current study's research method. The research criteria were applied to the sample of 300 enterprises, of which 134 were selected for this research. These 134 enterprises were selected as they met all aspects of the research criteria. They all operated in the high-tech industry, were wholly-owned Irish enterprises based in Ireland, non-subsidiary and were founded between 2002 and 2005. Prior to issuing the survey, it was reviewed through a pilot survey sent to 4 businesses from which there were 3 replies. From the responses and suggestions about the pilot survey, some of the questions were reworded to provide greater clarity for the survey participants. The online survey was then sent to the 134 enterprises that met the criteria. The result was 86 replies yielding a response rate of 64%.

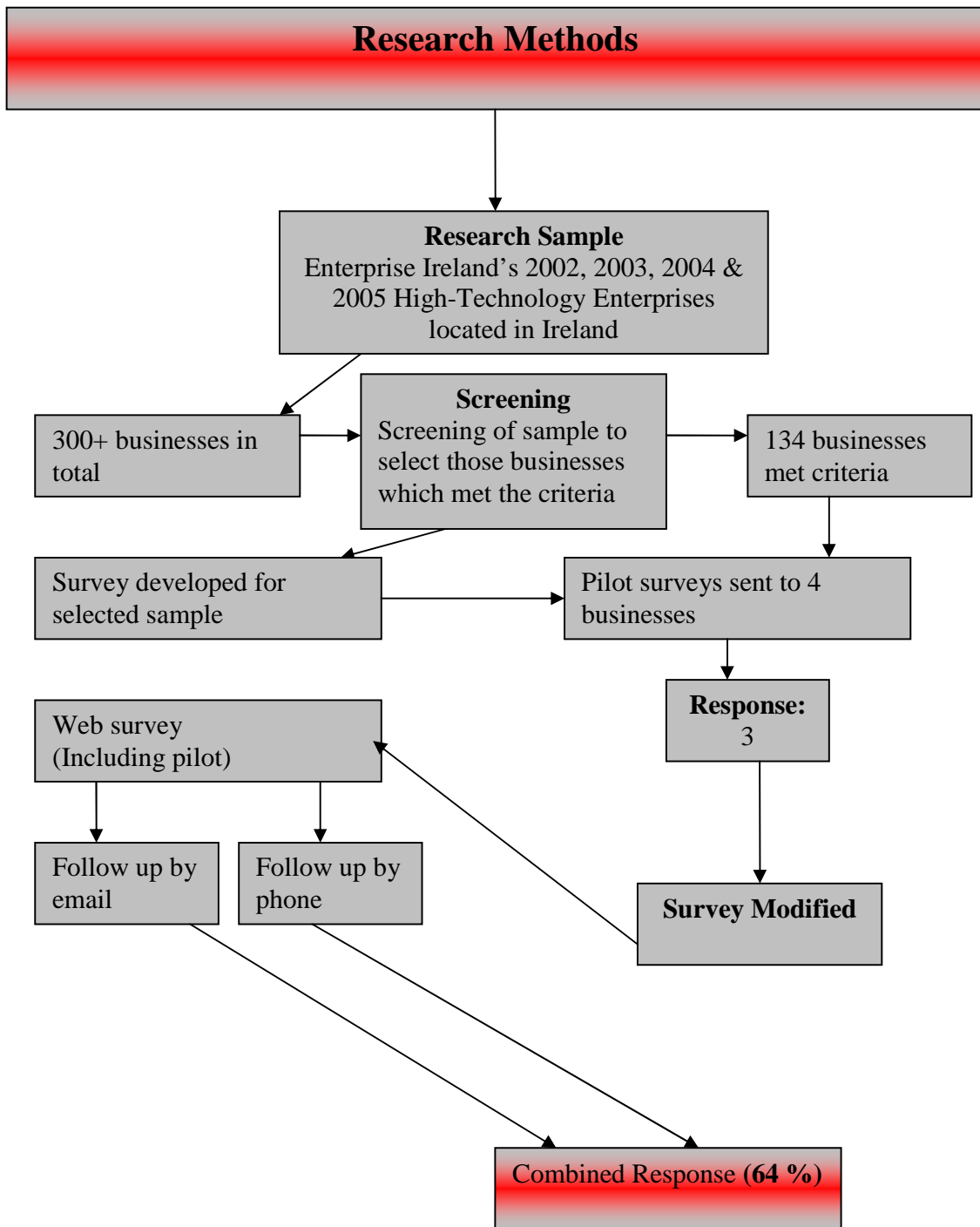


Figure 3.3

Research Methods

(Source: Current research)

### **3.12 Summary of Chapter**

In conclusion this chapter has presented the reader with an overview of the research methodology for this current study. The chapter began by discussing the research problem and stating the research question and objectives. Following these sections this researcher focused on the research design, philosophies and a discussion on the various differences between quantitative and qualitative research.

Prior to a discussion relating to data collection tools, the research criteria and sample selection were reviewed. Next, the selection of the research method and the choice of web surveys were examined. This chapter concluded by detailing the various survey methods available, the survey type selected for this current research, content of the survey, limitations of the chosen web survey method and finally the pilot surveys.

The next chapter analyses the findings from this current research.

# *Chapter 4*

## *Data Analysis*

## **Chapter Four**

### ***Data Analysis***

#### **4.1 Chapter Overview**

The purpose of this chapter is to present the current study's research findings. As stated in the Methodology Chapter, the research consisted of a web survey. Presented in this chapter are the findings from the questionnaire, to which there were 86 responses from a sample of 134 high-technology businesses, yielding a total response rate of 64%. All of the respondents were located throughout Ireland, which is the area of analysis for this current research.

The objective of the questionnaire was to identify the regional factors that influence the location choice of high-tech enterprises, establish the reasons why existing high-tech companies set up their enterprises where they are and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location. Literature states that factors such as universities, clustering, multinationals, science parks, spin-offs, and financial support facilitate the creation of high-tech firms in a particular area (Garnsey, 1998; Hall and Markusen, 1985; Tether and Storey, 1998; Stevansson, 1996; and Luger and Goldstein, 1991). Therefore, this survey was constructed with these factors in mind in order to test the extent to which Irish firms are influenced in the creation of the high-technology industry. To facilitate testing the extent to which Irish firms are influenced in the location choice, the factors examined in the survey included the businesses' general background, current location, financial assistance, alternative locations, original location decisions, research institution collaboration, relocation, attraction and prevention factors for enterprise set-up and the South East of Ireland.

For the purposes of analysis in this current research, a code was assigned to each respondent, for example R1=Respondent 1, R2=Respondent 2 and so on.

## 4.2 Survey Response Rate

As stated in Chapter 3, one of the criteria which the businesses needed to meet was that of being a wholly owned Irish company. Another criterion was that they could not be subsidiaries of other companies. From the 86 replies out of 134, 9 businesses were eliminated because 7 were not indigenous and 2 were subsidiaries. This left 77 useable responses. Table 4.1 depicts these results.

This current research yielded a total response rate of 64%. This is acceptable when compared to other studies. For example, Adam and McDonald (2002) had a response rate of 21% and Adam and Deans (2000) achieved 17% for their online surveys. However, the high response rate in the current research is contrary to Dommeyer and Moriarty's (1999) argument that online data collection methods do not produce high response levels.

In this current research, there were instances where respondents left answers blank but the remainder of the questionnaire was deemed suitable for coding. In these instances the missing data had been noted.

Original Questionnaire	(n=134)	
<b>Responses</b>	<b>Number of Businesses'</b>	<b>%</b>
Total Response	86	64%
Useable Responses	77	57%
Non Indigenous	7	5%
Subsidiary of MNE's	2	2%

Table 4.1 Breakdown of the Questionnaire/Survey (Source: Current research)



### 4.3 Industry sector of respondents

This current research is focused on understanding why high-technology businesses locate where they do. Some of the definitions examined to define high-technology enterprises were from The Organisation for Economic Cooperation and Development (OECD) (1986) and Fagerberg (2002). The Office of Technology Assessment (1982) described high-technology firms as those engaged in the design, development, and introduction of new products and/or innovative manufacturing processes through the systematic application of scientific and technical knowledge. This was the definition chosen as it was the most appropriate for the current research.

Figure 4.1 shows the industry sector breakdown of respondents. The largest proportions of respondents were from the software development sector (54%). This figure concurs with Ryan (1997) who stated that Ireland has become one of the key centres for world software production. However, literature also stated that Ireland is in a good position to participate in the biotechnological revolution (ICSTI, 1998) but this current research identified that only 8% of respondents were in the biotechnology sector.

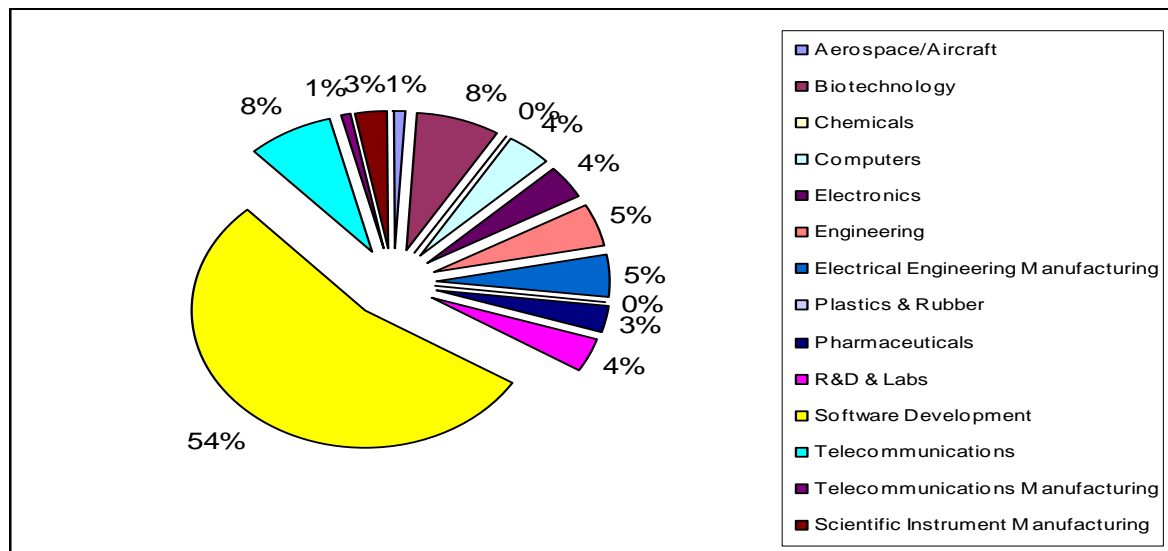


Figure 4.1 Industry Sectors of Respondents (Source: Current research)

#### 4.4 Respondents' Profiles

It can be seen from Figure 4.2 that the highest number of firms (16) were started in 2002. The next highest number of openings was in 2004 (15). These figures dropped dramatically in 2005 and 2006 with figures of 4 and 1 respectively. Prior to 2002, it can be seen that high-tech start-ups ranged from a mere 1 to 8 per year. R18 and R58 were the longest established businesses having started pre 1996. R77 was a relatively new business having started in 2006.

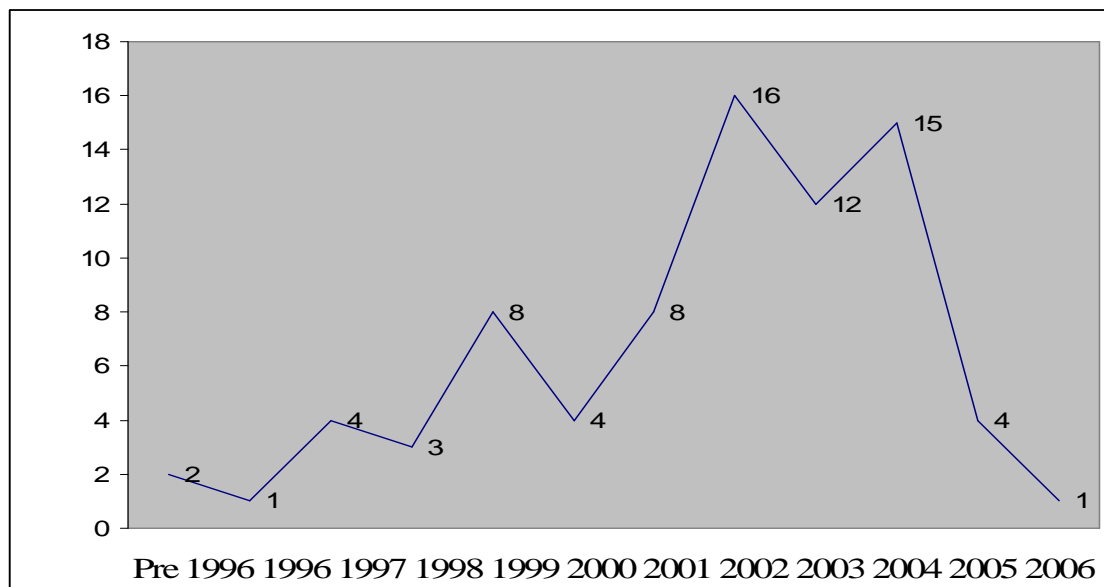


Figure 4.2 Year Founded (Source: Current research)

The findings in this study show a large amount of the businesses are located in County Dublin (47%). This coincides with a study by Crone (2002), who found that the dominant area for high-tech firms in Ireland is Dublin. He continued by stating that Dublin accounts for 83% of all software employment and 76% of all software companies in Ireland. The next highest numbers of companies (24%), in this current research, were situated in County Cork. This finding is in line with the American University (2003), which stated that the Cork area is the secondary centre of software activity in Ireland. County Waterford was third with a figure of 8%. Figure 4.3 illustrates these figures.

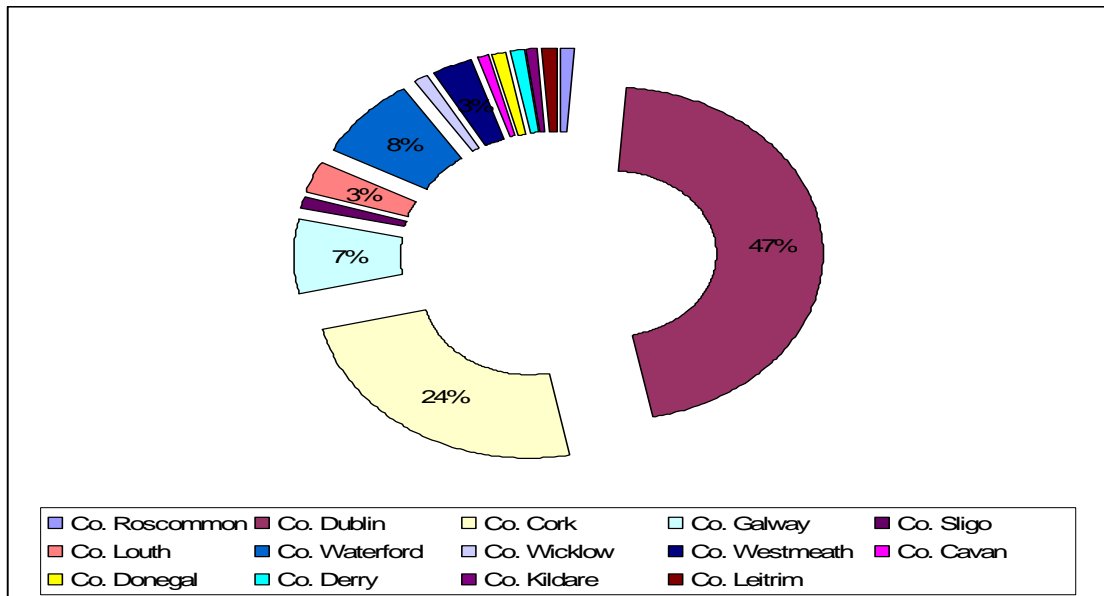


Figure 4.3 Location business started up in (Source: Current research)

The numbers of people employed in the businesses are shown in Figure 4.4. Forty-four percent of the businesses employed between 1 and 10 people, 37% employed 11-25 with 13% providing work for 26-50 people. Only 1% employed 51-100 with 5% having 101-500 employees. No business employed over 500 people.

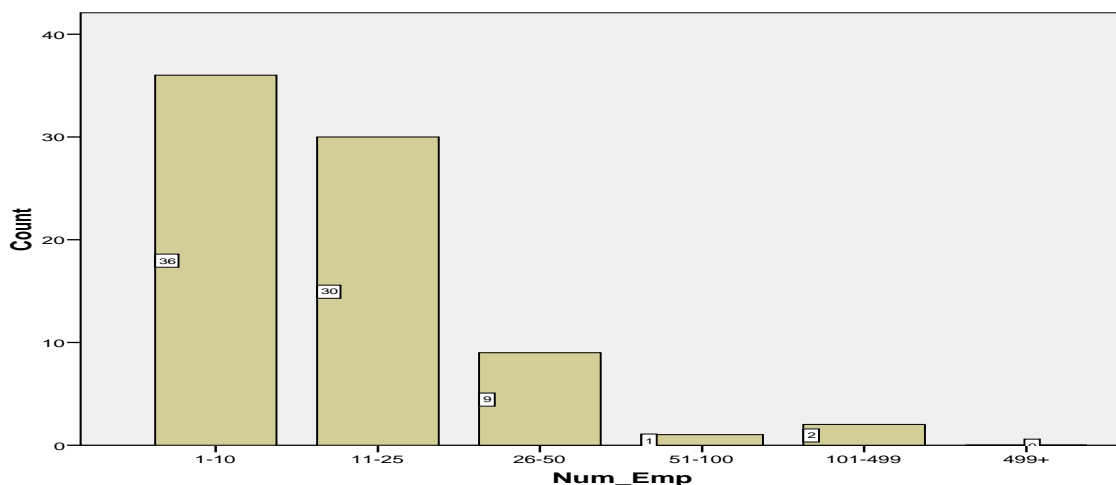


Figure 4.4 Numbers of Employees (Source: Current research)

Finally, as a general overview of the surveyed businesses, the respondents were asked if they operated all their business functions from one or more locations. The answers received showed that 41% of the businesses operated separate functions from more than one location with 59% operating the business from one central location. This research found that of the 41% who managed separate functions from more than one location over half of the respondents had their sales departments in other locations.

#### 4.5 Support Agencies

The survey respondents were asked if they received any inputs or supports from various enterprise support agencies. These agencies included Enterprise Ireland, IDA Ireland, and the County Enterprise Board. Figure 4.5 shows the largest amount of support was received from Enterprise Ireland (68%). Seventeen percent got support from other sources such as the Western Development Commission. The remaining 15% of the businesses received support from other schemes such as the Business Expansion Scheme (BES) (R6), Trinity College (R12) and the Genesis Enterprise programme (R15). The final 15% of respondents received advice either from the Irish Business and Employers Confederation (IBEC), a Business Innovation Centre (BIC) or a County Enterprise Board. Seven percent of the respondents stated that they received no support from any state agency.

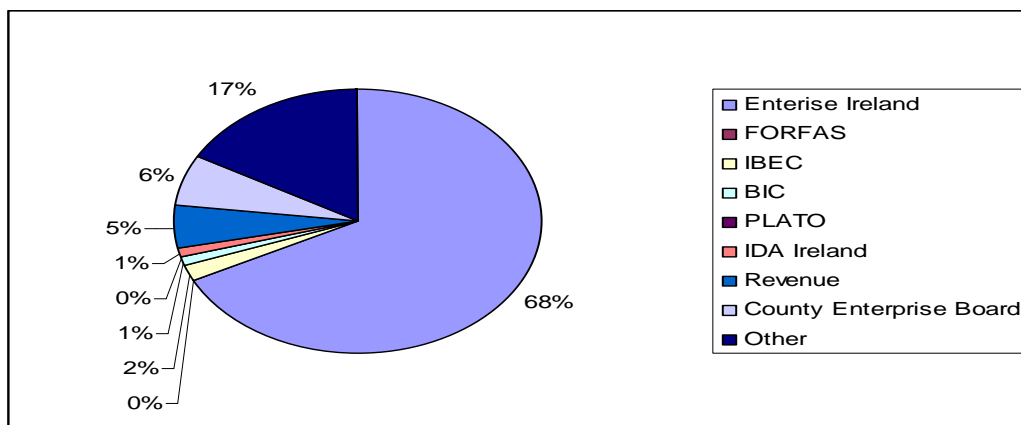


Figure 4.5 Enterprise Support Agency assistance during start up

(Source: Current research)

#### **4.6 Financing the business**

Stiglitz and Weiss (1981) argued that innovative firms face difficulties in securing required finance. According to Cordes, Hertzfeld and Vonortas (1999), there is widespread belief that these difficulties are increased for high tech firms. They continued to say, this is because these firms place significance on “growth opportunities and scientific and technological knowledge, thus having little collateral value to offer in exchange for external funding” (p.29). In fact, Fitzgerald and Breathnach (1994) suggested that a lack of finance is one of the major problems faced by the Irish high-tech sector. Therefore, one of the aims of this current research was to establish to what degree government/financial assistance influenced location choice, how important the availability of finance was at start-up and what source of finance was used by the respondents.

Bhide (1999) found that in the development of a high-tech start-up enterprise, external sources of finance are a significant factor for the firms’ location decision. However, the findings of this current research show that 79% of the respondents stated that neither government nor financial assistance had an influence on the location choice of the business. Furthermore, it is interesting to note that 48% found the availability of finance from external sources to be unimportant (Figure 4.6). In fact, R40 commented that the availability of finance was “not very important at all”. On the other hand, 29% of the respondents stated that finance availability was somewhat important, and 21% found it very important.

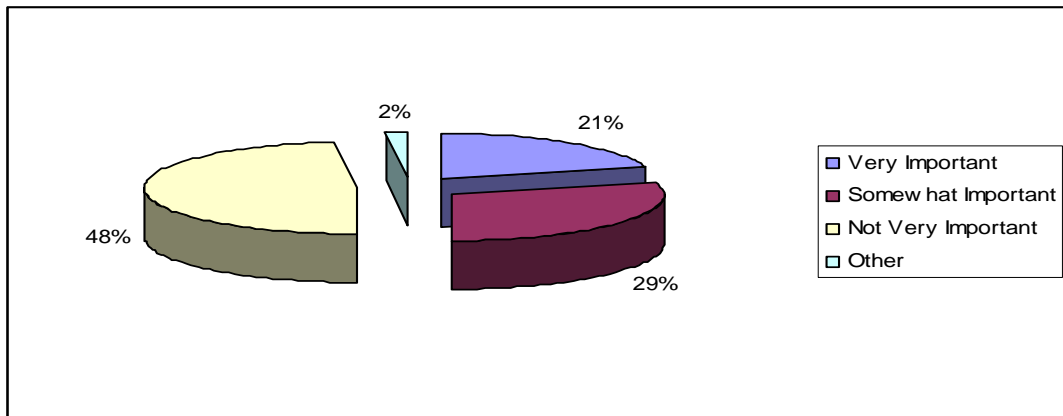


Figure 4.6 Importance of the availability of Finance (Source: Current research)

The findings also showed that that the largest amount of respondents (32%) used their own personal finances to set up the business. This concurs with studies conducted by Oakey et al. (1985 and 1986), who also found a high percentage of businesses relied on personal finance as a main source of investment to start their enterprises. By comparison, venture capital played a more modest role (14%). This figure is quite low and seems contrary to De Vol (1999) and Hsu and Kenney (2005) who suggested that the allocation of venture capital establishes the degree of localisation of high-technology industries in a region.

Development Agency grants were used by 11% of founders as a source of finance. The remainder of the respondents used Banks, BES, Partners, Business Angels and government as a source of finance for initial start up. These results are illustrated in Figure 4.7.

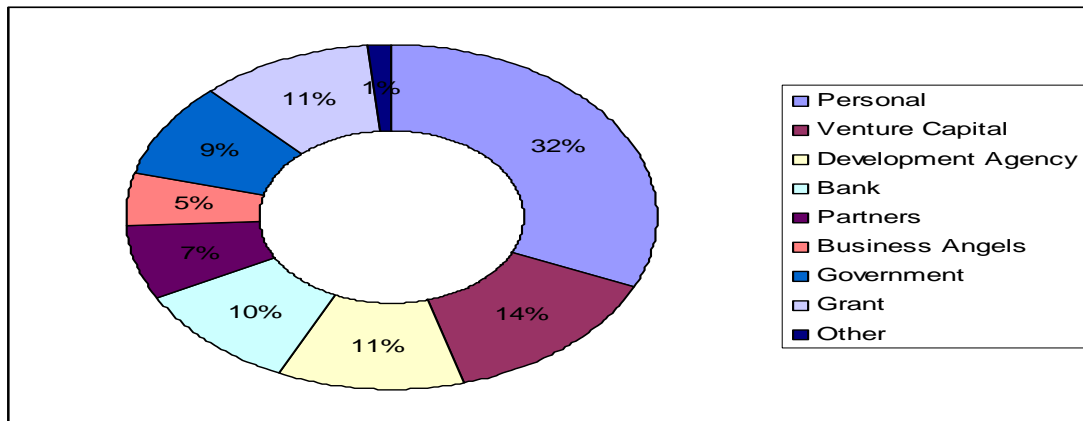


Figure 4.7 Source of Finance (Source: Current research)

#### 4.7 Spin Offs

The literature review identified that spin offs create advantages to the regions in which they are developed if the region provides them the ability to do so. It also identified that spin offs are an essential foundation of new firm creation in the high-tech sector (Markusen, Hall and Glasmeir, 1986; Oakey, Rothwell and Cooper 1988 and 1990). This current research differs from this literature as only 9% of the responding businesses were spin-offs. The findings also show that from the businesses who responded that were spin offs 66% were located in County Dublin while the remaining businesses, were located in County Cork (34%). All of the respondents gave many varied replies, regarding whether or not they still had a relationship with the original business. These included “the original business is now a partner/sister company of our current business” (R49 and R59). R13 was a spin out from a University and stated that the business “remains working closely with the University for research and development”. R58 resulted from a management buy out of a division of a company but now both are running autonomously. Garnsey (1998) stated that a relationship with the original business improves performance and there is an ability also to receive information on how to run a business. However, it is interesting to note that the findings in this study show that 55% of the respondents had no current relationship with the original business.

#### 4.8 Collaboration for Research Purposes

The European Union Commission White Paper (1993) stated that the main issue with countries such as Ireland is the capability to join forces for research and development. However, the evidence from the current research is contrary to this suggestion with 50% of the respondents collaborating with a research institution. Figure 4.8 shows that of the half who do collaborate with institutions, 60% of the respondents collaborated with a University, 28% with an Institute of Technology and 9% with private research and development organisations. R1, R13 and R21 answered that they used all three sources of research and development.

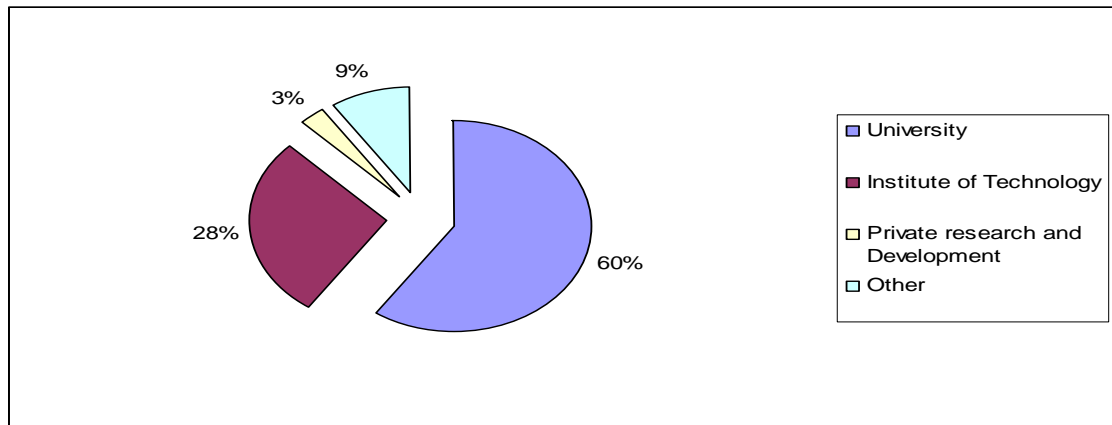


Figure 4.8 Type of Research Organisation used for research collaboration

(Source: Current research)

#### 4.9 Start Up Influences

Frenkel (2001) stated that high tech entrepreneurs tend to establish their businesses close to where they live for reasons of convenience and that these considerations usually characterise indigenous firms. This current research supports this statement as 32% of the respondents founded their business in the county where they lived. Setting up the business, where the entrepreneur was born in the county, was cited by 23% of the



respondents with the same result found for those who worked in the county (23%). Figure 4.9 illustrates the results.

Additional reasons for start up influences included, “the current locality is a well connected business location” (R42), “the area being a medical device hub plays an important role in our business” (R48), “the proximity to the existing company is important to our business” (R58) and R69 stated “the region is good for infrastructure, staff, productivity and quality of life”. R69 also stated that he wanted to leave out personal circumstance and choice to concentrate on what was best for the business “the emphasis needs to be placed on the business when starting up in a particular location. This is what makes the business a success. Personal factors need to come second if you want a business to be successful”.

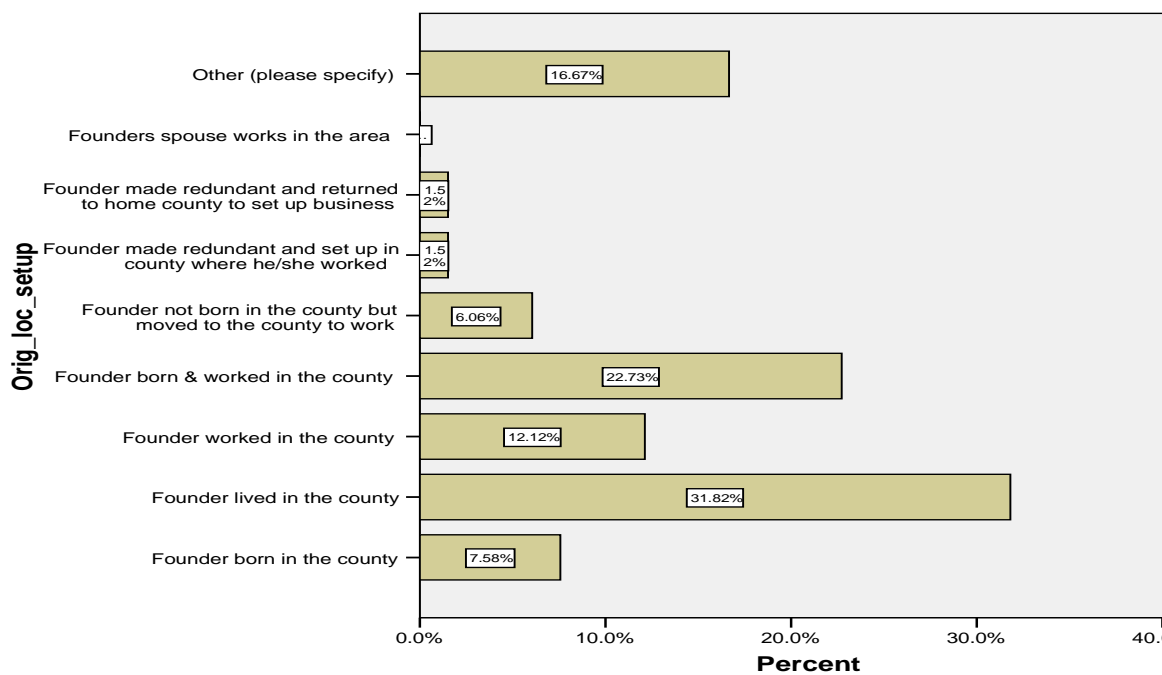


Figure 4.9 Founder’s Personal Reasons for Setting Up the Business in its Original Location (Source: Current research)

#### 4.10 Alternative Locations

The majority of respondents (78%) replied that they did not consider an alternative location at initial start up while the remaining 22% stated that they had. Figure 4.10 shows that of those who had considered an alternative location, Dublin was the main location considered (40%). Other counties considered as alternative locations included Limerick (13%), Cork (7%) and Wicklow (13%). The remaining respondents considered Wexford (R78), Westmeath (R63) and Galway (R32 and R69).

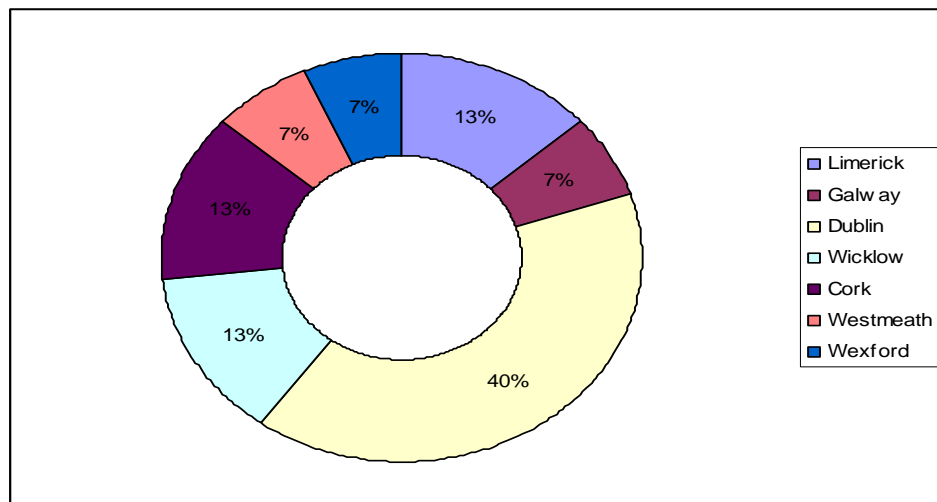


Figure 4.10 Alternative Location Considered (Source: Current research)

The survey sought to discover what factors deterred the respondents from selecting the alternative location they had considered at start-up. Literature has discussed the importance of a nearby educational facility as a deciding factor for the location of high-tech firms (Malecki, 1979; Oakey, 1984; and Bushwell, 1983). However, interestingly, only 3% of the respondents considered large distances to educational facilities to be a deterrent when looking at regions in which to locate the business. Long commuting times were also cited by respondents as a deterring factor (15%). This is contrary to researchers such as Downey (2000) and Howard (2000) who both discussed the willingness of employees to commute to their place of work. The current research findings also show that of those respondents who had considered alternative locations,

high operating costs (13%) were also considered a dissuading factor. Figure 4.11 illustrates the reasons why alternative locations were not selected by the respondents.

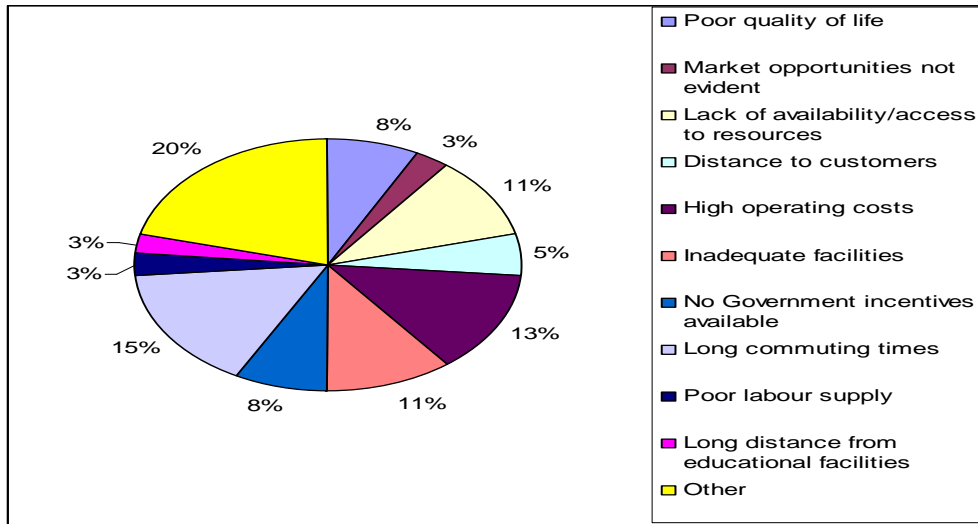


Figure 4.11 Reasons for not selecting the alternative location that was considered  
(Source: Current research)

#### 4.11 Most Significant Factors Involved in the Location of the Business

There were many varied factors mentioned by the respondents regarding the most significant factors involved when deciding whether or not to locate a business in a particular region. These responses have been categorised into the five most reoccurring answers. Figure 4.12 shows that the highest percentage of respondents found Space/facilities the most significant factor involved in the business' location (34%). The next highest was the availability of skilled labour in the region (26%). This finding is in line with researchers such as Oakey and Cooper (1989) and Hall and Markusen (1985) who signified the importance of skilled labour as a location factor. By comparison, low costs associated with the location of the business such as parking were mentioned by 15% of respondents while 13% referred to public transport. These findings correspond with FORFAS (1998) who discussed the implications of the costs imposed on industry such as

increased overheads arising from the provision of car parking space for workers in the absence of an adequate public transport system. The existing communications infrastructure was also cited by 12% of the respondents as being an important factor when deciding where or where not to locate. For example, R11 commented that “the abysmal state of broadband in rural Ireland is disgraceful”.

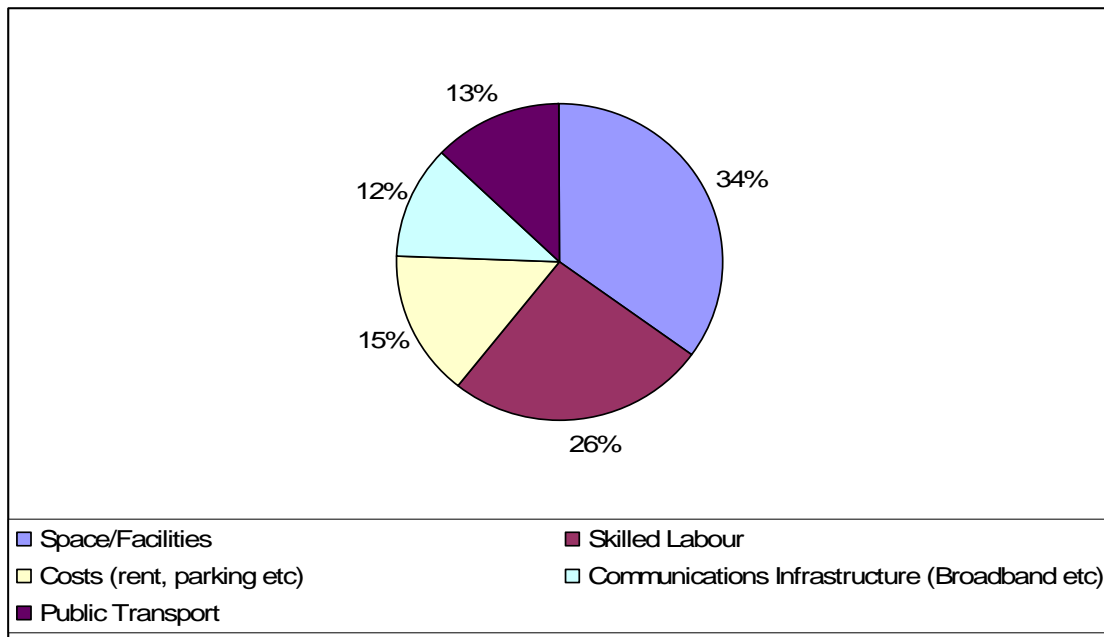


Figure 4.12 Factors considered important surrounding choosing the business' location  
(Source: Current research)

#### 4.12 Relocation

Overall, 74% of the respondents have not relocated since the business's initial start up while the remaining 26% have. Figure 4.13 shows that 52% of the businesses that relocated had done so to County Dublin and 24% to Cork County. The remaining 24% of respondents relocated to counties Sligo, Donegal and Waterford.

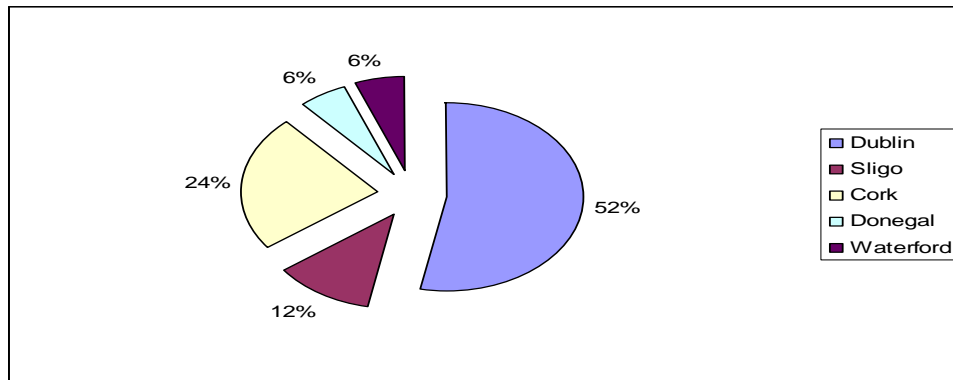


Figure 4.13 County the business has relocated to (Source: Current research)

The respondents that relocated were asked to state the importance they would allocate to various location factors that influenced the businesses' decision to relocate. They were offered a list of 20 location factors which were ranked on a 1-4 scale representing their importance at the time of relocation choice: (1) Very Important; (2) Important; (3) Somewhat important and (4) Not important.

The most important factor in terms of relocation, related to the expansion of facilities. In fact, 18% of respondents classified this factor as being 'Very Important'. The second most important factor is the modernisation of facilities, classed 'Very Important' by 10% of respondents. It is important to note that the respondents considered the modernisation and expansion of facilities as two separate issues for the purposes of this study. The third most important factor is the availability of highly skilled labour in the region (8%). This result is not surprising as the availability of qualified labour is discussed frequently throughout literature as an essential determinant of relocation decisions (Felsenstein, 1996; Frenkel, 2001).

Literature considers proximity to educational facilities as an important factor by high-tech businesses when deciding where to locate (Hall and Markusen, 1985; Segal, Wince and Wicksteed, 1985 and Garnsey, 1998). However, the current research findings are contrary to this literature as none of the respondents found this an important factor. Furthermore, 41% of those respondents that relocated described it as being unimportant in relocation decisions.

This current research found that only 17% of respondents who did relocate were influenced by financial assistance in the choice to relocate, while the remaining 83% were not influenced by this factor. Of those who had received support from a development or government agency while relocating the businesses the support was equally received from Enterprise Ireland (40%) and IDA Ireland (40%) (Figure 4.14).

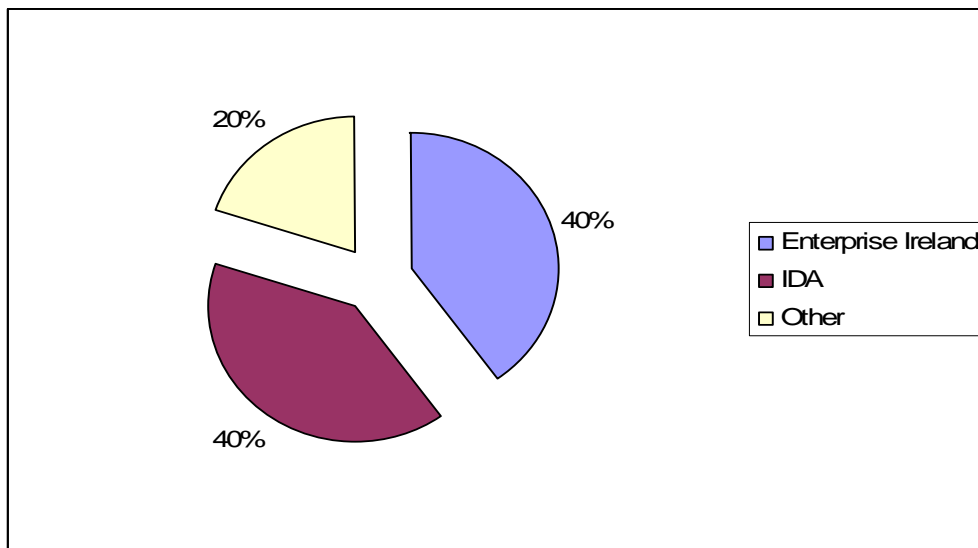


Figure 4.14 Agency support for relocation (Source: Current research)

#### 4.13 Attracting High-Tech Firms to Regions

The results from the current study show that skilled labour was rated by 17% of respondents as being 'very important' as a factor for influencing location choice. This finding corresponds to studies by researchers who discussed the importance of skilled labour for the high-tech industry, particularly for the development of technical innovations (Malecki, 1979a, 1979b; Bushwell, 1983; Anderson and Johansson, 1984; and Johansson and Nijkamp, 1987). Furthermore, Frenkel (2001) suggested that skilled labour is attracted to regions with a high quality of life with good educational opportunities, which he believed are more prevalent in city areas. Therefore, it is interesting to note here that most of the respondents in this current research were located

in city areas. The next highest factors rated 'very important' were communications infrastructure and government hard support (grants), 15% and 13% respectively. This finding also concurs with Frenkel (2001) who considered that having a first-rate telecommunication infrastructure contributes to the attractiveness of locating in a particular region for the high-tech industry. Some of the other factors that would attract high-tech firms into the region include financial assistance which was cited by 13% of respondents being 'important' (Figure 4.16). Social networking (15%) and government soft support such as mentoring (11%) were considered somewhat important (Figure 4.17).

Thirteen percent of respondents cited Multinational Enterprise (MNE) presence to be 'unimportant'. Also, it is noteworthy to consider that only 2% of respondents cited this factor to be 'very important' and only 3% classified MNE presence to be 'important'. This current research, therefore, is contrary to Stevenson (1996), who stated that multinationals play a major role in the setting up of high-technology firms when choosing their business' location. Figure 4.18 illustrates that the effects of government policy in a region was cited by 12% to be 'unimportant'. This finding differs from Hall (1991), who stated that government policies can be crucial at certain stages in the development of high-tech firms. Luger and Goldstein (1991) believed that science parks can encourage economic growth and development. However, it is interesting to note that from the current research, the existence of a nearby science park was considered 'unimportant' by 12% of respondents.

Figures 4.15, 4.16, 4.17, and 4.18 illustrates the results.

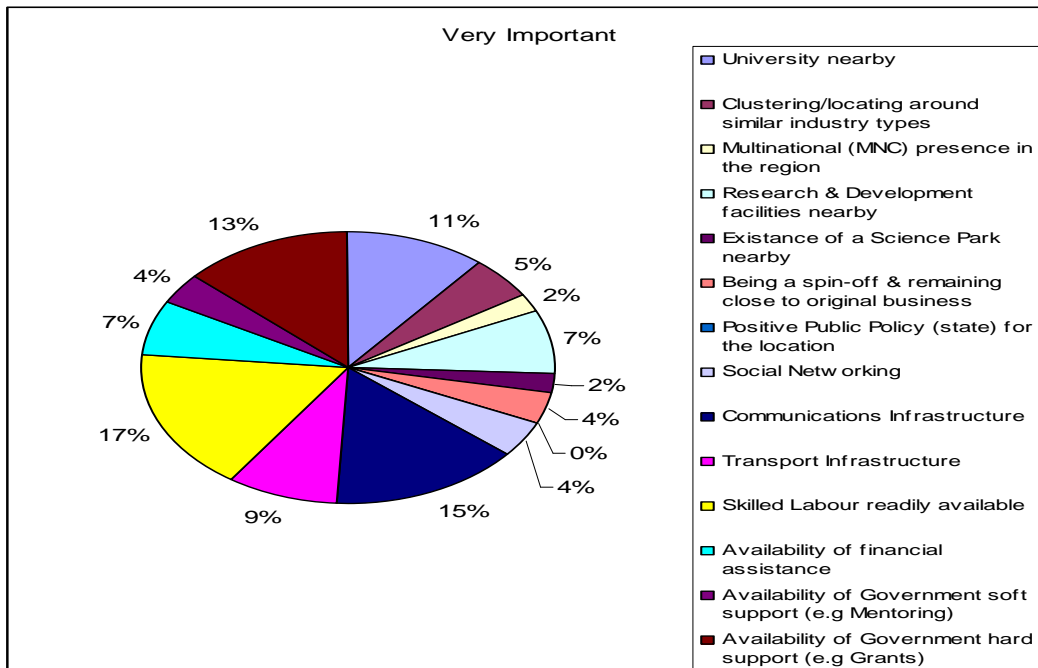


Figure 4.15 Factors considered 'Very important' for Attracting firms to a region  
(Source: Current research)

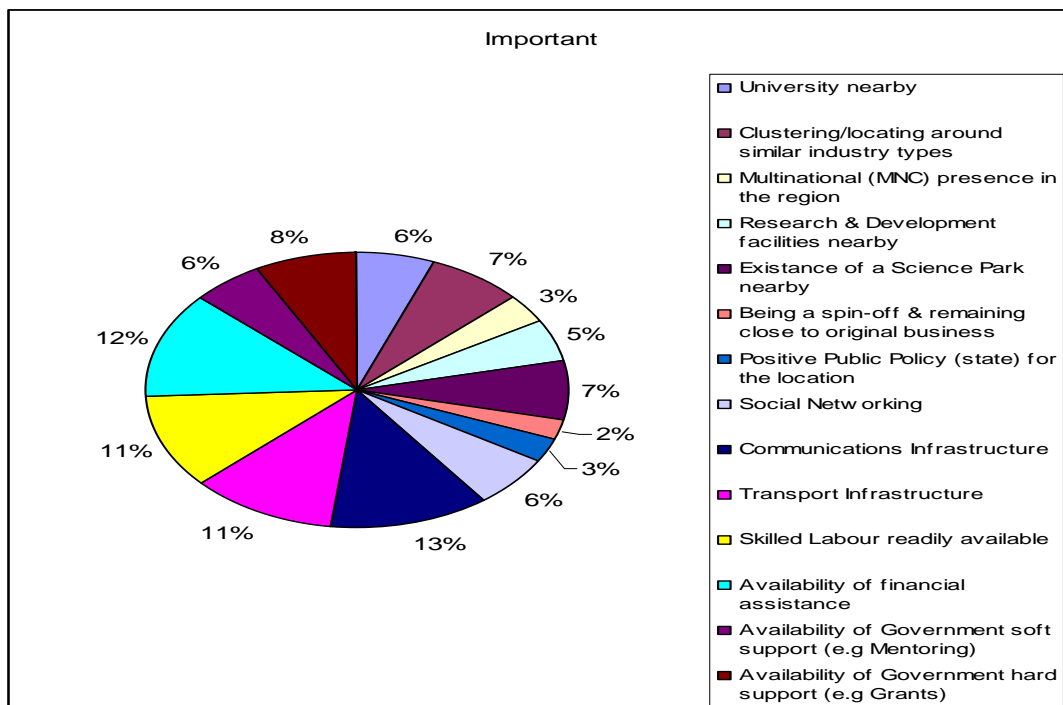


Figure 4.16 Factors considered 'Important' for attracting firms to a region  
(Source: Current research)



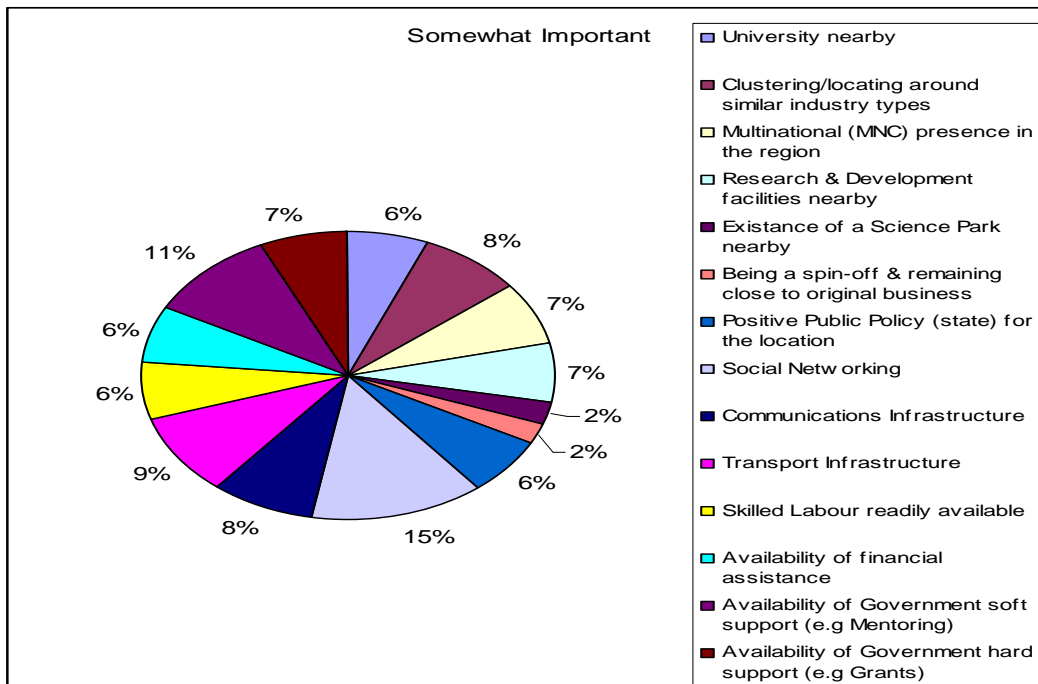


Figure 4.17 Factors considered 'Somewhat Important' for attracting firms to a region  
(Source: Current research)

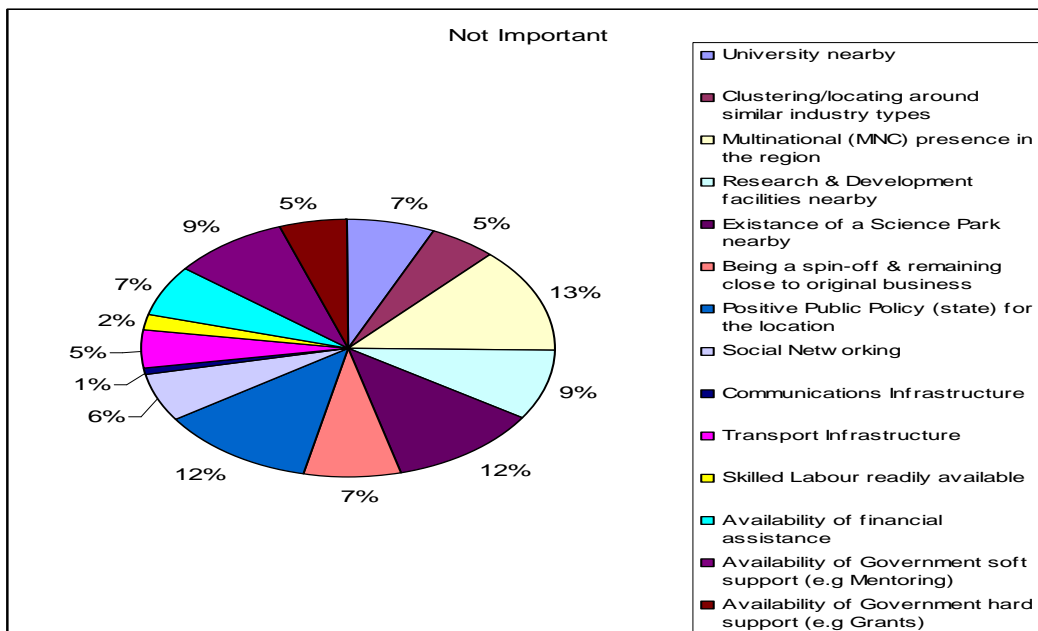


Figure 4.18 Factors considered 'Not important' for attracting firms to a region  
(Source: Current research)

#### **4.14 Unique Locational Factors**

From the 77 useable responses, 35% stated that the current location they are situated in had no 'unique factors'. For example, R13 stated "there are no unique factors in the current location and if our staff were willing to move, then we could and we would". The remaining 65% gave varied answers as to what they believed to be unique factors of their current location. Figure 4.19 illustrates the ten most frequent answers proffered by the respondents regarding the unique factors of their current location.

The highest percentage of respondents (11%) stated that both having a research institute nearby and the costs involved in conducting business at the current location were unique factors. Proximity to customers (8%) and a skilled workforce (8%) were also considered to be unique factors at the respondents' current location. R61 stated "the concentration of certain types of customer is unique to our location and we believe that there is only this degree of a concentration of customers in Dublin and Cork that are relevant to our business". R57 commented on the business' specific labour requirements in the location: "the current location of our business is unique in the sense that there is a high concentration of developers (Java & C++) which is vital to our software development". This statement emphasises the need of a skilled labour force in the high-technology industry.

Founders living nearby (6%) was also cited by the respondents as a factor that they considered distinctive in their current location. This draws a parallel with Frenkel (2001) who suggested that people establish their business near to where they live. He continued by saying that this usually characterises small newly formed businesses. The findings in the current research show that the public transport infrastructure was also considered as unique in the sense of efficiency in some locations. For example, R30 and R73 commented on the advantages of the unique transport infrastructure at the business' current location with R30 stating:

“an efficient and adequate public transport system is the main factor the business considers unique at the current location. We are based in D’olier St. in Dublin; this location is in the heart of Dublin city and is easily accessible by public transport. With the current state of Dublin traffic, especially in the City Centre, it’s essential that our staff can use public transport to travel to work.”

Research by Glass and Curry (2005) suggested that clusters for high-tech firms are a very much used concept at the moment. However, the current research found that only one respondent (R79) found clustering to be a unique factor in its business’ location. There are, on the other hand arguments that discuss the reasoning behind the lack of clustering in Ireland. For example, Stoerring and Christensen (2004) stated that periphery regions such as Ireland don’t have a large amount of firms that may operate as a pull factor for an increase of agglomeration economies/cluster emergence.

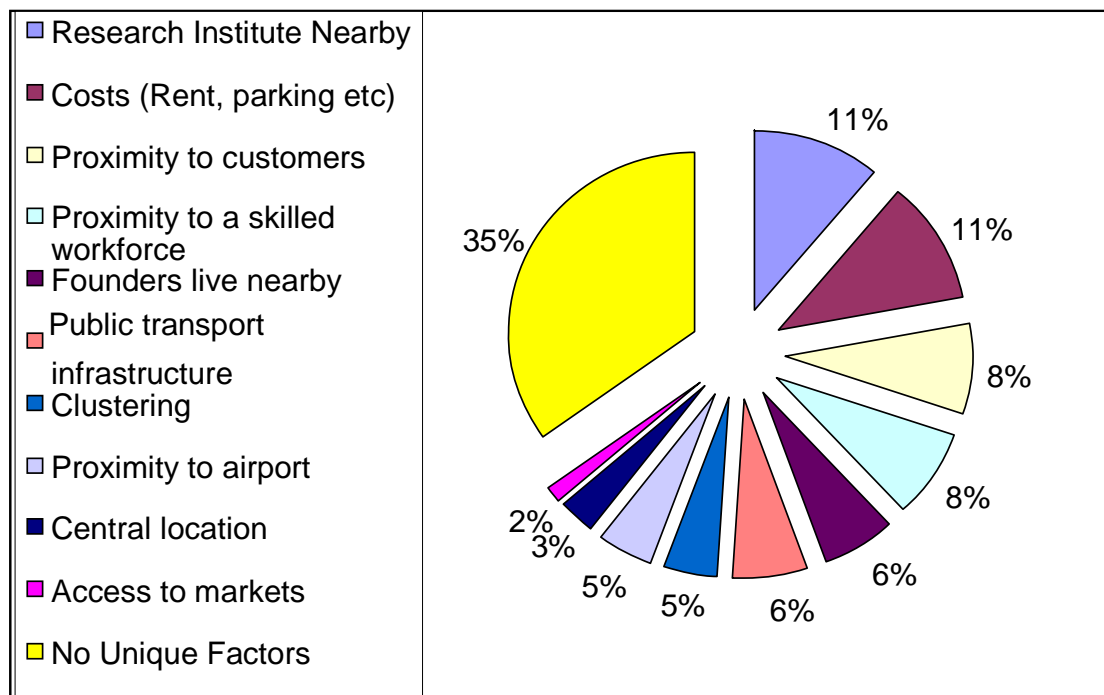


Figure 4.19 ‘Unique’ factors in the business’ current location  
(Source: Current research)

#### **4.15 Helpful factors aiding businesses at their current locations**

De Vol (1999) addressed the fact that skilled labour is critical to the high-tech industry. The evidence from the current research supports this observation as skilled labour was considered to be the most 'helpful' factor at the current location (26%). However, this finding is contrary to research by van der Panne and Dolfsma (2002) who suggested that the labour market is irrelevant in explaining high-tech industry location.

The next highest response was the business being in a central prestigious location (18%). Prestige location is discussed by Gripiaios (1989) as an important locational factor decision. An interesting comment which concurs with Gripiaios' research made by one respondent relating to the central and prestigious location of the business was:

“the status of the business' address, secretarial support and access to good high calibre meeting rooms are the most helpful assets to the business. We can look like we are bigger and more established when we are actually small and have little capital” (R39)

Hall and Markusen (1985) suggested that research institutes are an excellent factor for helping high-technology firms at their location. However, an interesting finding from this current study was that only 8% of the respondents found that having a research institute nearby was helpful to the business at their current location. Other factors highlighted as aiding the business in their current location were public transport (11%), financial support (5%) and the communications infrastructure (5%). Then again, it is interesting to note that in the current study, 16% of the respondents believed that their current location had no helpful factors. Figure 4.20 illustrates these findings.

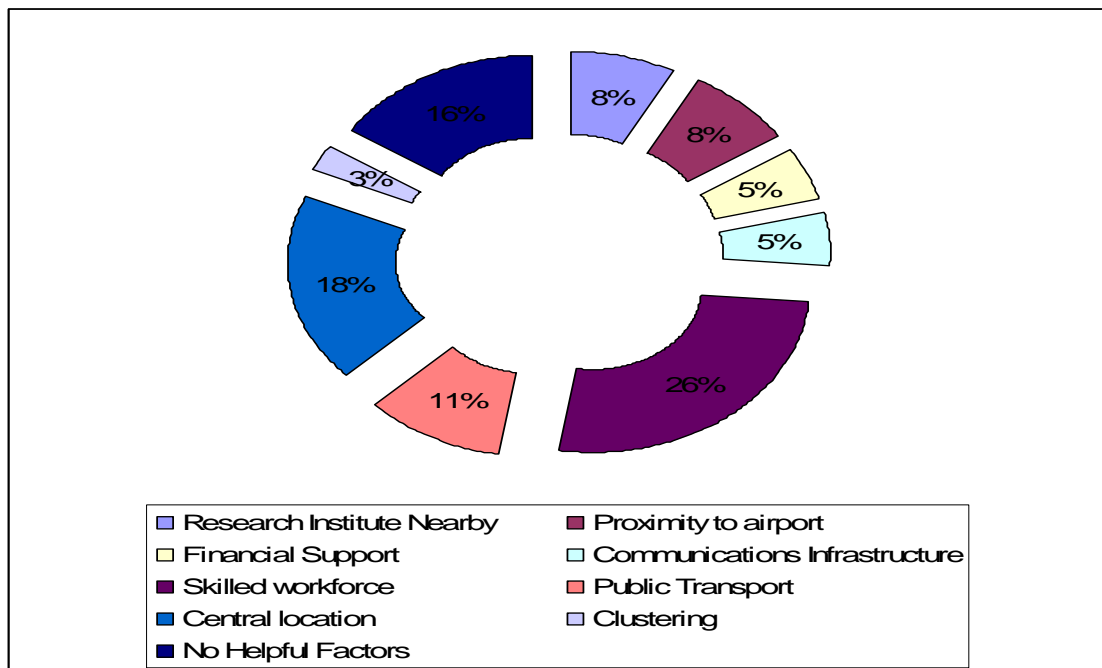


Figure 4.20 ‘Most helpful’ factors aiding the business at the current location  
(Source: Current research)

#### 4.16 The factors needed to attract more high-tech firms into a region

The survey asked respondents to give their opinion as to what they perceived was needed to attract more high-technology firms into a region. Their replies have been condensed into the five most frequent responses.

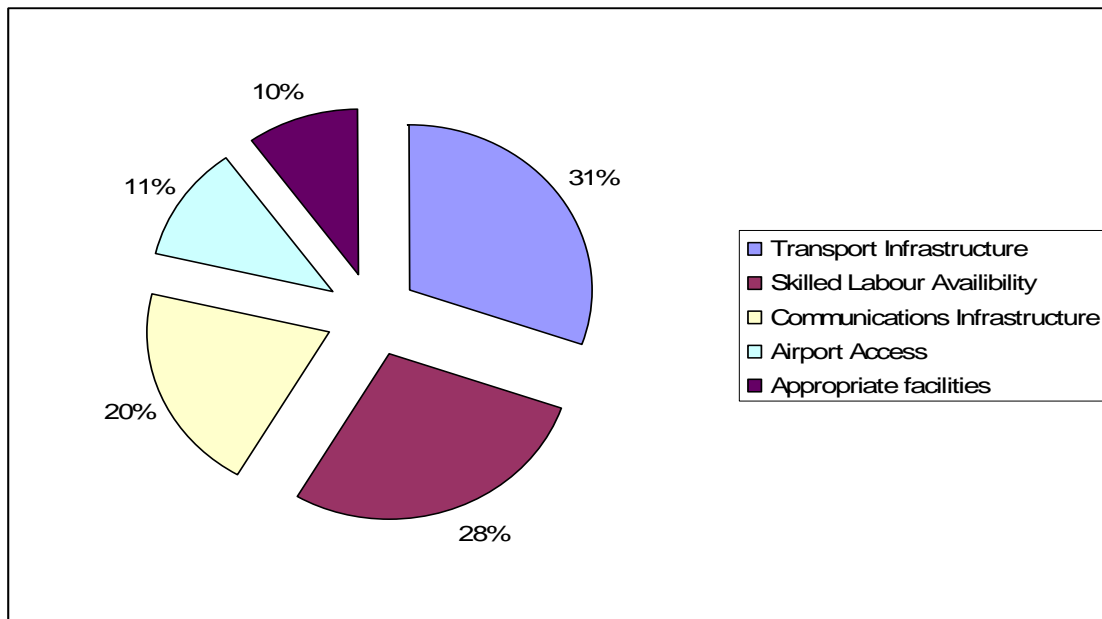


Figure 4.21 Five most frequent factors needed to attract firms to a region  
(Source: Current research)

Figure 4.21 illustrates that 31% of the respondents perceive an efficient and excellent transport infrastructure as a major factor to entice high-tech firms into a region. This finding is contrary to Lawless and Gore (1999) who argued that transport, chiefly public transport, is of minimum significance in explaining business location decisions. Another factor is the availability of a well educated skilled labour force (28%). This finding is in line with literature which stated that the availability of a nearby labour force in a locality is listed as one of the most essential determinants in attracting high-tech firms (Oakey, 1981; Premus, 1982). The third most important factor identified that attracts high-tech firms to a region (20%) was a fast communications infrastructure.

Kasarda (2000) stated that new international airports that were created in recent times or under development are producing substantial high-tech development around them. He continued to suggest that these will be the basis of new active regions. However, in this current research only 11% of the respondents highlighted access to an airport as an important attracting factor.

#### 4.17 Hindering factors

Seventeen percent of the respondents felt that their current location was in no way hindered by any particular factors. For example, one respondent stated “there are no factors in the business’ current location that I can think of which hinder the business” (R58). From the remaining 83% who felt their location had unhelpful factors, the biggest concern respondents had was the bad road infrastructure/traffic congestion (44%). Many comments were made in this regard including R11 stating “the traffic gridlock in Dublin creates huge inconvenience to the business”. Figure 4.22 depicts these results.

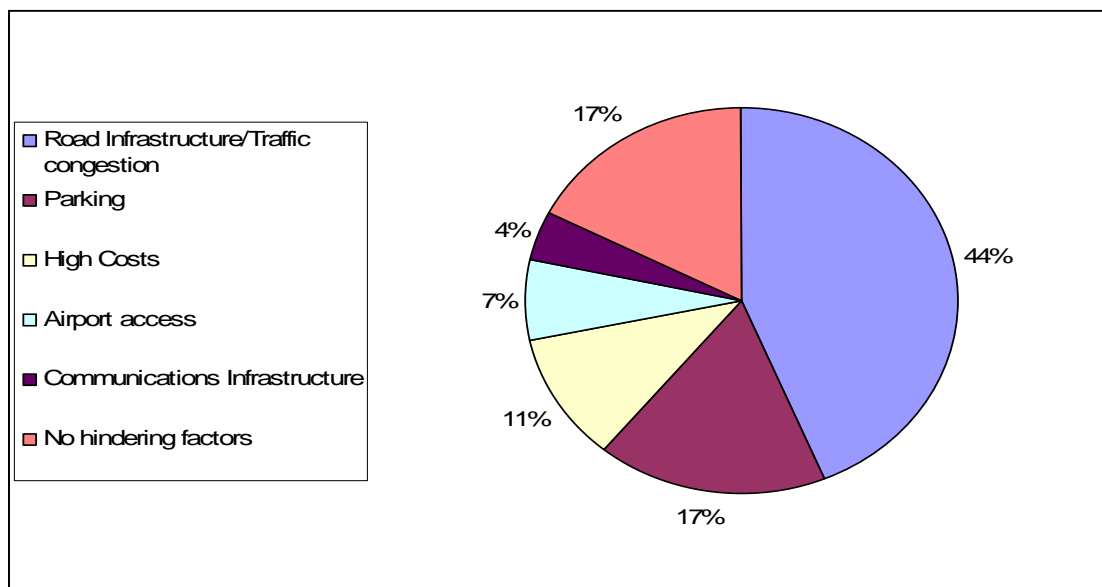


Figure 4.22 Hindering factors at current location of business

(Source: Current research)

Specifically, references were made to time spent getting to customers and vice versa (R15) and travelling to meetings (R50). Parking was noted by 17% of respondents as being inadequate in the business’ current location. For example, R21 noted that “it is very difficult for employees and visitors to park in the city centre and this provides for a large drawback for us. It is the biggest hindering factor the business has to deal with as it causes a large inconvenience to a lot of people”.

The issues highlighted in the current research are in line with those discussed by FORFAS (1998) who stated:

“the high levels of economic and industrial growth in Ireland in recent years have placed unexpected pressure on all aspects of the infrastructure particularly on the transportation system including road, rail, ports and airports”.

Figure 4.23 illustrates the main factors that respondent’s felt would discourage them from setting up business in a region.

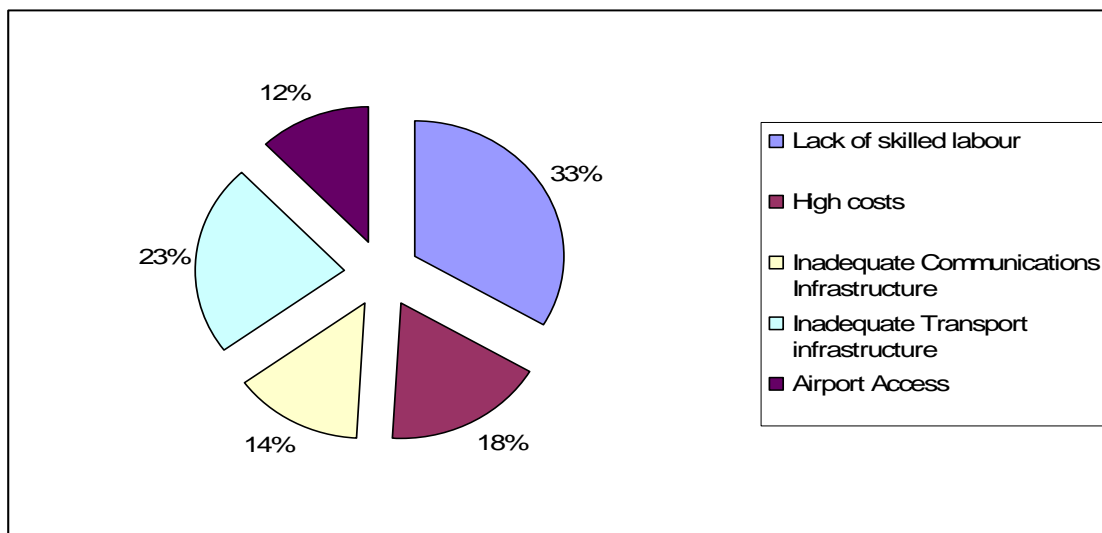


Figure 4.23 Factors that discourage high-tech firms setting up business in a region  
(Source: Current research)

Literature has repeatedly discussed the availability of qualified labour as being an important factor for high-tech businesses in their location decision (Browning, 1980; Oakey, 1981; Premus, 1982; Malecki, 1985 and 1986; Rees and Stafford, 1986; Galbraith and De Noble, 1988). This current research concurs with these researchers as the findings show that the lack of skilled labour had the highest response (33%) for the respondents not locating their businesses in a given region. An inadequate transport infrastructure is also a major deterrent for respondents (23%). High costs were found to be a deterring factor by 18% of respondents with R5 commenting “the cost in terms of money and time



associated with setting-up and running the business are a major issue". Other comments referred to costs in many areas for example, "cost of premises" (R40), "expansion costs" (R45) and the "cost of renting / purchasing premises -set up costs" (R50)

The findings also show that respondents selected no or limited airport access as a location deterrent (12%). This concurs with Weisbrod, Reed and Neuwirth (1993) who suggested that businesses find airports attractive nearby the business location. They continued by saying that they do not directly depend on the airport for their function, but the significance of location near an airport is for its prestige, air services and the convenience of location for visiting customers and also for employees travelling by air.

Frenkel (2001) stated that telecommunication infrastructure is one of the most important factors behind the development of innovation in the high-technology industry. He continued by saying that it allows firms easy access to information and contributes to the overall efficiency of the business. The results of the current research are in line with this statement as 14% of the respondents stated that an inadequate communications infrastructure is a location deterrent (14%). For example, R17 stated "a poor communications system is a nightmare for any business, particularly in the high-tech industry. The business needs easy access to broadband and Wi-Fi". Therefore, the findings suggest that without an adequate communications infrastructure high-technology industry is not willing to locate in a region as it impedes on the everyday running of their business.

#### **4.18 Locating the business in the South East Region of Ireland**

The questions in the final section of the survey were aimed at summarising how respondents felt about the South-East region as a location choice. The research found that 77% of respondents would not locate in the South-East region of Ireland.

#### 4.18.1 Attractive/Unattractive factors of the South-East region

The findings concerning the four main reasons why the businesses would or would not locate in the South-East region are illustrated in Figure 4.24.

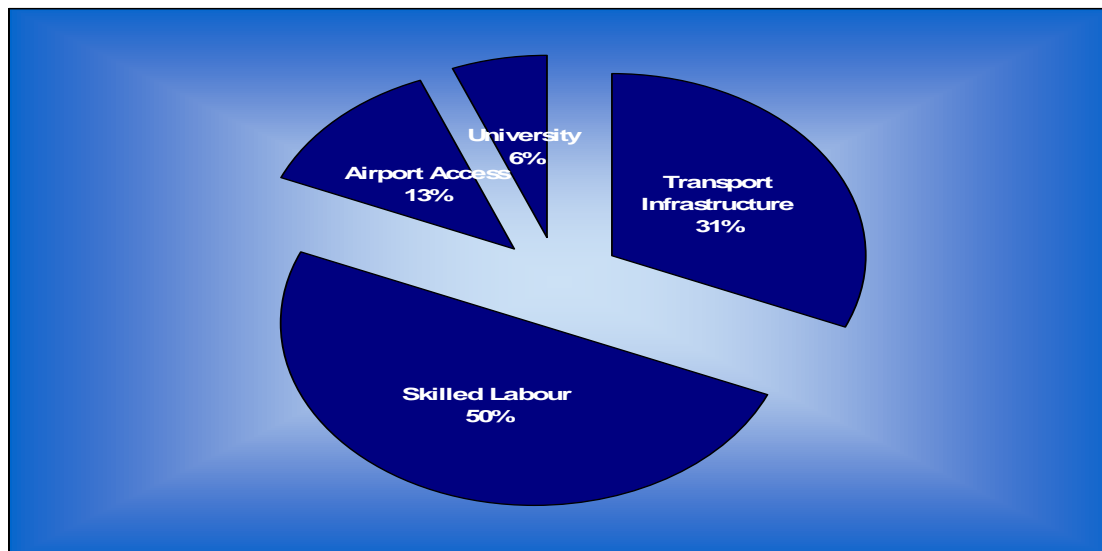


Figure 4.24 Reasons not to locate in the South-East (Source: Current research)

O'Malley and O'Gorman (2001) discussed the importance of the availability and quality of the skilled labour force in Ireland. This current research concurs with this and shows that the lack of availability of skilled labour is the main reason the respondents would not locate in the South-East region (50%). R17 stated that the South-East has “no pool of skills particular to our industry which is the main reason that the business would not choose to locate in the region” while R75 said the region contains a “lack of relevant employees suitable to the high-technology industry”.

The findings of the current research also show the importance of an adequate physical infrastructure to the respondents. The survey found that 31% of the respondents felt that the road infrastructure in the region was inadequate. For example, R11 commented “if the transport infrastructure in the South-East region was better we would not have located in Dublin”. This is in line with Wince-Smith (2003) who commented that “a strong

physical infrastructure is a baseline requirement for a prosperous regional economy....roads, highways, airports, railroads, support the efficient movement of people, goods and services” (p.5).

Other comments made regarding the transport infrastructure in the South-East included “the South-East should focus on good infrastructure in order to improve the attractiveness of the region for high-technology businesses” (R71). Another interesting assertion was made by R30 who remarked on the importance of the transport infrastructure to the business by stating:

“it is vital that the business be easily accessible by public transport, train or bus. With the current state of traffic in Ireland it is essential that our staff can use public transport to travel to work. As a business we consider the South-East region to be lacking in a satisfactory transport infrastructure”.

Furthermore, R58 when discussing the transport infrastructure in the South-East region stated:

“being environmentally conscious the business is of the opinion that public transport probably needs to be improved to facilitate access in general. The business thinks all the other prerequisites have a natural fall out if this is in place”.

The Aviation White Paper (2003) discussed that certain sectors of the economy that are likely to be drivers of future growth, such as the high tech industry, profoundly rely on air services. This is echoed by 13% of the respondents who stated that the lack of airport access was a deterrent for locating in the South-East region. However, it is interesting to note that those businesses who commented on the airport situation in the South-East chiefly had international customers. R35 mentioned “no international airport” as a reason why he would not relocate to the South-East region while R11 stated “the limited number of flights out of Waterford particularly to international destinations is a huge disadvantage to the region”. Nonetheless, there are however, arguments as to the extent

of the connection between airports and the high-technology industry. For example, OMIS (2006) suggested that there is a modest relationship between air connectivity and location attractiveness to businesses.

The current research findings show that the lack of a University in the region would prevent 6% of the respondents from locating in the South-East. This current research does not fully agree with Premus (1982) and Maleki and Bradbury (1992) who proposed that the university effect on the high-tech industry is not uniformly crucial everywhere. However, this current research is in contrast to further international literature which discusses the direct associations the high-technology industry has with universities (Saxenian, 1985; Smilor et. al., 1988; Roberts, 1991; Massey et. al., 1992).

Regarding a university in the region, R30 remarked:

“the South East needs a University, Waterford Institute of Technology does a great job but it's still not a university. Simply look at what the University of Limerick (UL) has done for Limerick”.

On the other hand, an interesting comment was made by R41 regarding a university in the region. He stated that:

“proximity to 3rd level institutions in the South-East is largely irrelevant. As a general rule, Irish 3rd level institutions are bad at partnering with private companies and bad at spinning off start-ups, mostly because they want to retain too much of the IPR for which they have financed the creation”.

Of the 23% of respondents who said they would relocate in the South-East region, the three most significant reasons are illustrated in Figure 4.25.

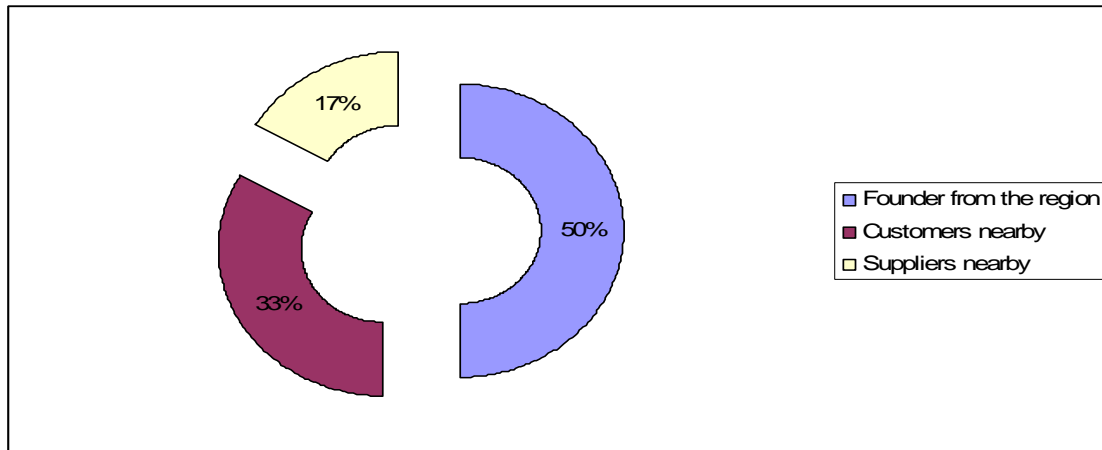


Figure 4.25 Reasons why businesses would locate to the South-East region  
(Source: Current research)

Frenkel (2001) stated that high-tech entrepreneurs tend to establish their businesses close to where they live for reasons of convenience and these reasons usually characterise indigenous firms. The findings from this current research agree with Frenkel; as the founder being from the region was the most significant reason for the respondents to locate in the region (50%). R51 remarked:

“it's essentially a living choice. If it's possible to live and work in a place (i.e. you want to live there and you can get to your clients without a huge amount of travel) then it will work”.

R61 merely stated “concentration of customers” as being one of the reasons why the business would choose to locate in the South-East. Overall, customers being located nearby were considered as a reason to locate in the region by 33% of respondents. This corresponds to researchers such as Oakey and Cooper (1989) and Hall and Markusen (1985) who regarded customer proximity as an important location decision factor.

A study by Bathelt and Hecht (1990) found suppliers being in close proximity to be an important factor directing locational decisions. The findings of the current research are in line with this statement as 17% stated this factor to be a reason for potentially relocating

to the South-East region. Therefore, this current study's findings suggest that if suppliers are based nearby in a particular region, it can influence the location of a high-tech business.

It is noteworthy that the findings show that nearly half of the respondents ranked the South-East as 'Good' in relation to proximity to the businesses' supplier base, though none of the respondents found it to be 'Excellent'.

#### **4.18.2 How businesses rated the South-East region**

Respondents were requested to rate the importance they would allocate to various location factors relating to the South-East region. They were presented with a list of 17 location factors which were to be categorised as Excellent, Very Good, Good, Bad and Very Bad by respondents. The results are shown in Figures 4.26, 4.27, 4.28, 4.29 and 4.30.

Figure 4.26 illustrates the factors which respondents rated as 'excellent' in the region. The findings show that the attractiveness of the region had the largest response (23%). This concurs with Gripaio (1989) whose research showed that this factor was ranked highest in desirable location factors. R2 stated that the "pleasant working environment on the coast is appealing to employees". However, R2 also stated the South-East needs to provide "better promotion on the quality of life in the region". The cost of housing was also thought to be an excellent pull factor of the South-East (13%). For example, R9 considered the "availability of housing at reasonable prices in the region" to be excellent.

Herzog and Schlottman (1991) found that high-technology workers were less likely to relocate regardless of lesser house prices. However, the findings from the current study do not wholly agree with this statement. The results show that 13% found the region rates as very good with the cost of housing (13%), and the purchase cost of premises and the rental cost of premises had equal figures of 10% (Figure 4.27). On the other hand,

findings show that 14% of respondents rate the South-East as ‘bad’ for both the quality of third level educational facilities and the ability to attract key personnel. (Figure 4.28). Nineteen percent of respondents rated the region as ‘very bad’ for proximity to customers. The shortage of skilled labour was rated by 11% of respondents as ‘very bad’ in the south-east (Figure 4.29).

Some of the respondents’ comments regarding the South-East region include:

“the South East needs to market its uniqueness. The region also needs to strongly promote the area as being a great place to be an indigenous entrepreneur” (R39)

“the region needs to promote some success stories of indigenous Irish software companies that are running a successful international business from the south east. Display that by moving to the South East your company can continue to grow while your staff gain all the benefits of living in the South East” (R30)

“more PR and getting people to seriously think about running their own businesses in the South-East region are required” (R67)

“as a business it is not know what resources are available in the region. This leads to the thought that the region needs to promote the available resources it has that are beneficial to the high-tech industry” (R63)

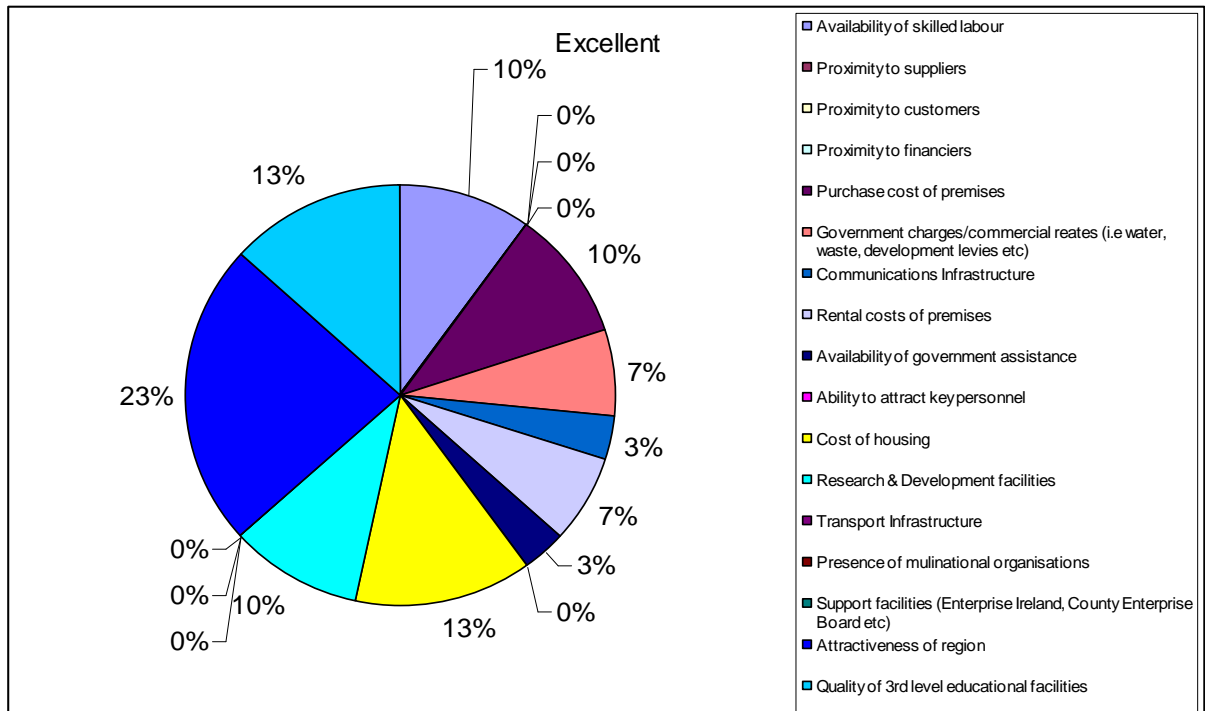


Figure 4.26 Factors considered 'Excellent' in the South-East  
(Source: Current research)

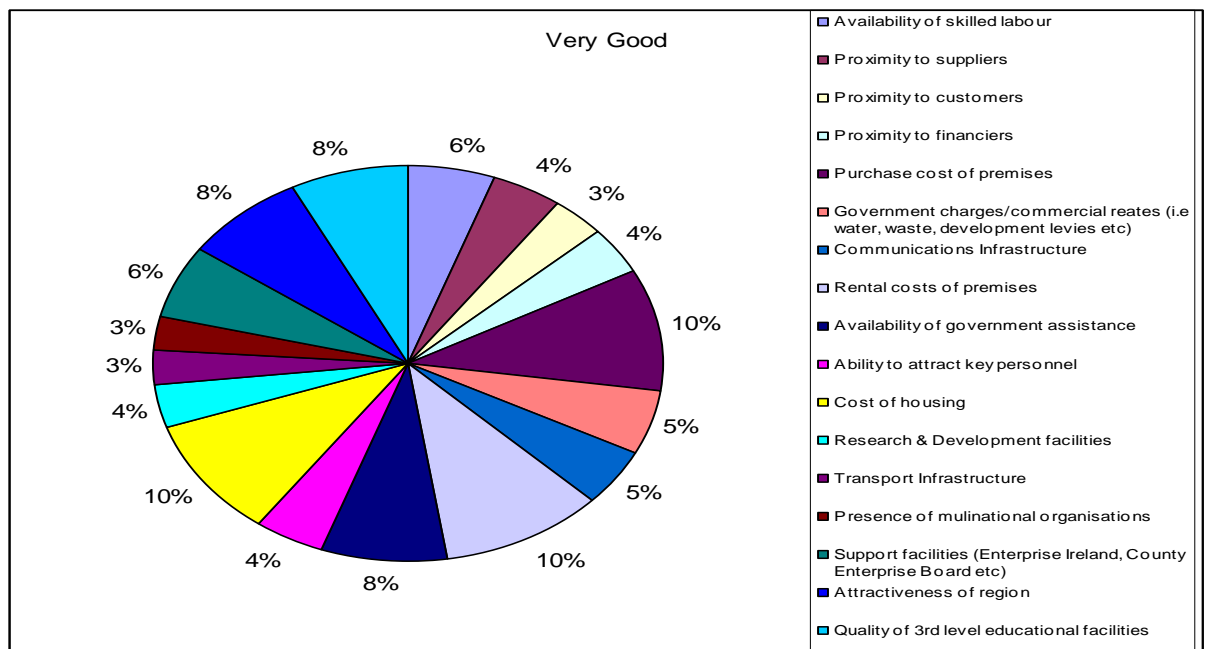


Figure 4.27 Factors considered 'Very Good' in the South-East  
(Source: Current research)



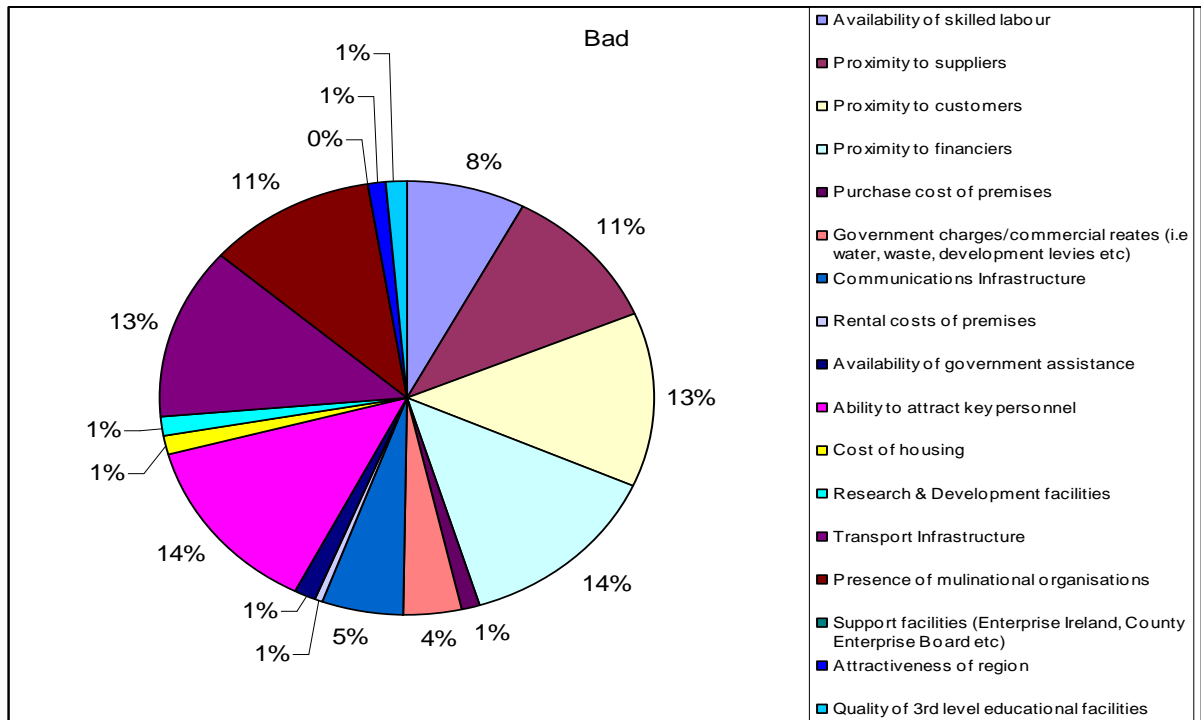


Figure 4.28 Factors considered 'Bad' in the South-East

(Source: Current research)

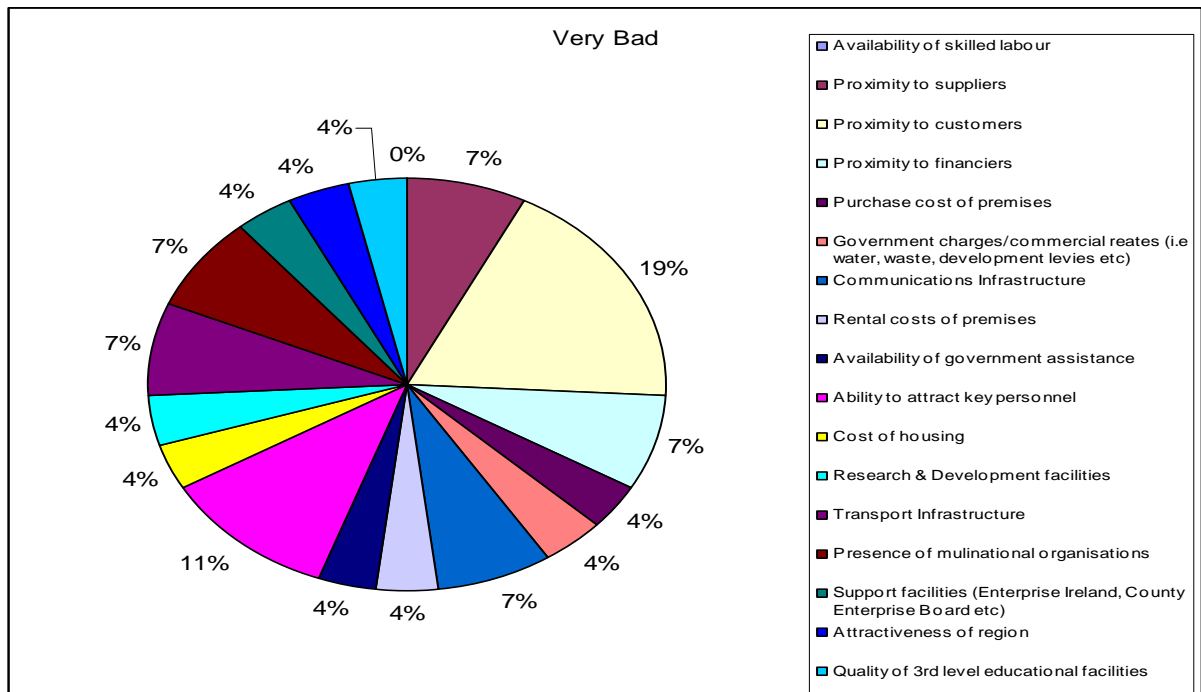


Figure 4.29 Factors considered 'Very Bad' in the South-East

(Source: Current research)

## 5.2 Chapter Summary

The purpose of this research was to establish why high-technology businesses locate in particular regions. In essence, the research sought to discover the factors that encourage firms to start up where they do, determine factors that would influence businesses to move location and ascertain what factors encourage a high-technology business to remain in the original start up location.

The findings show there are a number of factors that attract a high-technology business into a location of their choice, to remain in their chosen location and also to influence their choice to relocate. These factors include availability of skilled labour, airport access, transport infrastructure, proximity to home, communications infrastructure and low costs associated with running the business.

Regarding factors that would attract high-tech businesses to a region, multinational presence was considered to be the most unimportant factor by respondents (13%). Public policy and the existence of a nearby science park were also found to be not high on the respondents' priority list when choosing a location for the businesses. On the other hand, the availability of skilled labour and an efficient communications infrastructure were considered important factors in attracting businesses to particular regions. In relation to clustering only one respondent (R35) found it to be a key consideration to the business' current location. On the other hand, public transport was found to be the most helpful factor for the businesses current location (17%). Relocating the business had been undertaken primarily due to the need to expand facilities (18%). The second most important reason for relocating was to modernise facilities (10%).

In relation to factors that would deter a business from setting up in a particular location, the lack of skilled labour was mentioned by 33% of the respondents. The next highest result was an inadequate infrastructure (23%). Other factors discussed were high costs (18%); an inadequate communications infrastructure (14%) and lack of airport access (12%).

It was found that there were differences in the number of businesses that found financial assistance, government or otherwise to be influential in the choice of location and those who found it not to be influential. For example, 48% stated that the availability of finance was not very important while 21% rated this factor to be 'very important'. This research also found that a limited number of respondents were in fact spin-offs from existing businesses or educational institutes (9%). Additionally, it was found that those who were spin-offs were primarily located in only two regions, i.e. Dublin and Cork.

Another interesting finding from this current research is the respondents' opinions on research institutes, in particular Universities. Although half of the respondents collaborated with research institutions, there was only 6% who felt that the South-East region not having a University was a deterrent from locating in the region. In addition, 41% of respondents felt that proximity to educational facilities was unimportant as a reason for relocation.

Overall, based on this current research there are a number of factors which encourage the creation of high-tech firms in a region and that would influence an entrepreneur/owner manager to move from their original set-up location. The following chapter discusses this study's research findings in association with the literature reviewed in chapter two.

# *Chapter 5*

## *Discussion*

## **Chapter Five**

### ***Discussion***

#### **5.1 Chapter Overview**

The findings of this current research identified that there are a number of certain factors that attract a high-technology business setting up in a particular location. The findings also discovered factors that encourage high-technology businesses to remain in their chosen location. The factors that influence their choice to relocate were also revealed.

The discussion of these findings will be presented under three headings which reveal the major discussion points arising from the primary research. The first point of discussion is the group of findings which gave general information about where the respondents' businesses were located and why they had chosen to establish the company there. This provided the researcher with an overview of the respondents' businesses location decision making process.

The second point for discussion focuses on the study's research findings concerning the factors that encourage the creation of high-tech enterprises and the factors that prevent them from locating in a particular region. The influences on an entrepreneur/owner manager to move from their original set-up location and the factors that encourage an entrepreneur/owner manager to remain in the location of original start-up are also discussed.

The concluding part of the discussion relates to the South-East region of Ireland and high-technology businesses locating there. The discussion on the region concentrates on the respondents' opinions and perceptions of the region and the differences which appear between the reasons why the respondents stated that they would locate the business in the region and the reasons why they would not.

## **5.2 General structure of the Irish high-tech indigenous business sector**

The primary research made a number of general findings regarding the location of indigenous high-technology businesses in Ireland. Firstly, findings in relation to the industry sector, regional location, collaboration, spin-offs, support agencies and financing of the business will be discussed. These findings established that the largest sector in an Irish context was the software development industry. There was an evident gap between the numbers of firms in the software development sector compared to the other sectors. For example, fifty-four percent of businesses were in the software development sector with the next highest percentage of industries being telecommunications and biotechnology with eight percent. In order to encourage growth in high-tech sectors the findings suggest that perhaps an increasing emphasis should be placed on encouraging increased support to more high-tech start-ups. This is evident from the suggestions made by respondents that there was very little value placed on encouraging the start-up of the high-tech indigenous industry in Ireland. In the opinion of this researcher, this could be possibly achieved through greater collaboration among the firms and research institutions. This idea corresponds to DeLisi and Baram (1991) who stated that in order to improve growth in the biotechnology industry for example, it is important to develop the links between education, research and commercial development.

The most prominent regional location for businesses was the Dublin region (50%) with the next highest result in the current findings being the South-West region (25%). While the figures for both of these regions are suitably high with respect to concentration, the findings suggest that other Irish regions are falling short on high-technology industry. The Midlands, Mid-East and South-East are the lowest areas of high technology industry concentration, with figures of three and four percent respectively. The findings indicated that the respondents felt they didn't know what was available to them in certain regions and in the opinion of this researcher, these regions need to promote themselves as practical locations for indigenous high-technology industry. Thus, the findings indicate the importance of developing and promoting regions to attract high-technology industry, in order to provide a more even concentration of these businesses throughout Ireland.

This is in line with Donovan (1999) who stated that regions need to have a strong promotion ethic in order to attract high-tech industries. He continued to say that the high-tech industry in particular is attracted by highly skilled labour, quality of life and research bases.

Garavan, Cinneide and Fleming (1997) discussed the need for better collaboration among industry with research institutes. This current research ascertained that collaboration with research institutions was conducted by exactly fifty percent of respondents. Therefore, the results of the survey in the current study suggest that collaboration with research institutions is important to the industry and played a role in the location choice of many of the businesses in the indigenous high technology industry. This is reflected in the amount of businesses that collaborate with these institutions in some form or another. The findings also indicated that if access to well-established institutions in a region is first-rate then the attraction of industry would certainly follow. This is in agreement with Engel and Frier (2000), who stated that the probability of a high-tech start-up arises from proximity to a university whereby industry and institute relationships can take place effectively.

Researchers such as Markusen, Hall and Glasmeir (1986) and Oakey, Rothwell and Cooper (1988) suggested that spin-offs are critical to the high-technology industry as they create advantages to the regions in which they are developed if the region provides them with the ability to do so. They continued to say that spin offs are an essential foundation of new firm creation in the high-tech sector. However, the current research findings show that a small number of respondents exist as 'spin-off' businesses (9%). It is important to note that all of these spin-offs were located in two regions, namely the Dublin and South-West regions. Therefore, the findings suggest that other Irish regions are perhaps not providing the ability for spin-offs to locate and create regional advantage.

The findings from the current study also show that the majority of survey respondents financed the business through personal finances. This finding coincides with corresponding findings from this current research which show the majority of

respondents found the availability of finance from private sources to be not unimportant. However, this finding perhaps suggests that many aspiring indigenous entrepreneurs may never get the business off the ground due to a lack of personal finance. In the opinion of this researcher, there may be many people with great business ideas for high-technology, who simply cannot gather adequate personal finances to start up the business. On the other hand, the findings show that venture capital, grants and banks as a source of finance were selected by few respondents. This finding indicates the need for more influence in regions to create greater financial assistance for the industry. Moreover, literature has pointed out the importance of support and financing to the high-tech industry (STIAC, 1995 and De Vol, 1999). Nonetheless, 79% of the respondents in the current study considered government or financial assistance not to be influential in their location choice. In the opinion of this researcher, private sources of finance being unimportant is perhaps attributable to the fact that the majority of respondents had used personal finances therefore inclining them not to consider the availability of finances important. The survey results also show that Enterprise Ireland offered the majority of support to the respondents (68%). On the other hand, 7% of the respondents received no support from any enterprise support agency during the initial start up of the business.

### **5.3 Factors encouraging and hindering the location and relocation choices of high-tech firms**

The results from this current research revealed that the main reason for the respondents locating their business where they did was that the location was close to where they live. In fact, the majority of respondents (32%) located the business in the county where they lived. This finding concurs with literature which stated that businesses locate close to where they live for reasons of convenience and that this characterises indigenous industry in particular (Frenkel, 2001). Therefore, the findings indicate that ease of access to the workplace is a factor that relates strongly to the personal preferences of founders in the indigenous high-tech industry in Ireland.



This current research also found that the availability of skilled labour was considered very important by the respondents. In fact twenty-six percent of respondents stated that the availability of skilled labour is the most 'helpful' factor at the current location. This researcher is of the opinion that the importance of this factor is perhaps attributable to the technical and specialisation needs of the industry. Therefore, the findings concur with Pottier (1987) who suggested that if skilled labour is a central requirement for a business then it will have an essential effect on the business' choice of location. However, Oakey et al (1990) suggested that businesses that require skilled labour are able to operate in relatively remote locations. Nevertheless the findings from this current research do not agree entirely with this suggestion as respondents repeatedly discussed that cities, for example met most of the requirements of the business.

A strong communications infrastructure was considered important by the respondents. The findings concur with researchers such as Frenkel (2001) who found that having a first-rate telecommunication infrastructure contributes to the attractiveness of regions for the high-tech industry. The findings indicate that if the communications infrastructure in Ireland were to make major changes with regard to improvement and extending services for example, broadband access in Ireland, high-tech industry would be more flexible in the business location choice. In the opinion of this researcher, government intervention would perhaps grant the ability to provide an efficient telecommunications infrastructure in order to cultivate development of the high-technology industry in all Irish regions. It is worth pointing out however, that even though the liberalisation of the telecommunications industry in 1998 increased the number of providers and thus improved the country's poorly developed telecommunications industry. However, broadband access in rural areas has yet to be developed to its full extent.

An efficient and excellent transport infrastructure received a lot of comment in this study. Enterprise Ireland (2006) when discussing the how critical transport infrastructure was stated that this factor is a requirement for sustained economic and regional development and that the lack of an adequate transport infrastructure is hindering economic growth. It is the opinion of this researcher that this inadequate infrastructure plays a strong role in

deciding where high-tech entrepreneurs locate their businesses. This suggestion arises from the continually stressed need for transport infrastructure to be improved in Ireland by the respondents in this current research. The current research findings showed that 44% of respondents found the inadequate transport infrastructure the most unhelpful factor at the business' current location. This current study also indicated that it was the most important factor required to attract a business to a region according to 31% the respondents. The fact that indigenous high-tech industries find the Irish transport infrastructure to be so inadequate is disturbing. This issue was central throughout the survey responses. This current research suggests that if the transport infrastructure is improved in the regions, the distribution of high-tech industry throughout Ireland will improve. Furthermore, public transport is discussed as a reason to remain in the current location by the respondents. However, it is interesting to note that the findings show that of those who found public transport to be of quality in their current location, the business is located in central city areas. A high level of accessibility is a requirement for all businesses to function well. An efficient and effective transport infrastructure enables ease of access for customers and suppliers and vice versa. Frenkel (2001) argued that public transport also attracts key personnel. The findings concur with this statement as key personnel were mentioned numerous times to be a vital aspect to these high-technology businesses.

In a statement made by The Irish Minister for Transport, Mr. Martin Cullen (2005) stated that the ease of access to an adequate airport is in the top three factors of a businesses location decision and businesses are becoming increasingly reliant on air transportation and tend to locate nearby an airport. He further stated that in the high-tech industry sector, 50% more businesses demand air transportation compared to traditional industry and easy airport access has the potential to have significant benefits for the high-technology industry. This is in line with researchers such as Kasarda (2000) and Neuwirth, Reed and Weisbrod (1993), who suggested that high-technology industries do not rely on a nearby airport necessarily for their operation but more so for its services and accessibility to customers and suppliers. The findings of the current research show that airport access is important to the respondents. However, literature has also shown that the

most important factor governing whether a company needs to be near an airport appears to be the degree to which the company is involved in multinational trading or contacts (Smyth, 2003). In the current study, R11 suggested that if a region does not provide sufficient airport services then it reduces the region's capability to attract and preserve high-technology businesses. In this regard, this researcher suggests that the services available in the smaller airports in Ireland such as Waterford should be re-examined and extended in order to assist in attracting high-tech industry to the region.

Throughout literature, the importance of the nearby presence of MNEs as a factor that attracts high-tech industry is well documented. For example, Stevansson (1996) referred to the interdependency between multinationals and the local economy and stated that multinationals have contributed to the development of the indigenous high-tech industry sector. However, the current research findings do not fully agree with Stevansson as MNE presence was considered unimportant by the respondents as a factor for attracting high-tech businesses in Ireland. The survey results show that proximity to MNEs rate highest as the factors deemed unimportant by the respondents for attracting firms into a region suggesting perhaps that dependency on MNEs is perhaps reducing in Ireland's high-technology industry.

Road infrastructure/traffic congestion received the highest rating as a hindering factor when deciding where to locate a business. This finding concurs with FORFAS (1998) who stated that economic growth in Ireland has put severe pressure on the transport infrastructure. The survey results from the current research indicate that if there is not some form of improvement of the transport infrastructure then the high-tech industry sector is restricted to choosing locations in Ireland that have a sufficient transport infrastructure. Moreover, 44% of the respondents found this factor to be the most inhibiting at the business' current location. This may be attributable to factors such as traffic congestion causing time delays for both customers and employees.

Hall and Markusen (1985) signified the importance of a supply of skilled labour in a region. This current study's findings concur with this statement and show that the lack of

skilled labour is a major deterrent for the location choice of the high-tech industry. The results of the survey show that 33% of the respondents stated that the lack of a skilled labour force in a region would hinder their choice to locate there.

Among the respondents surveyed for this study, a total of 26% had relocated their business. The finding indicates that the most important factor for relocation was to expand and modernise facilities. This suggests that the businesses that had relocated have done so possibly due to increasing success. Again, the shortage of the availability of skilled labour was discussed by the respondents as a reason for their choice to relocate. The findings of the current research suggest that the locations of the respondents businesses were not attracting key personnel and therefore the business decided to relocate. In essence, skilled labour is of great significance, in particular for the development of technical advancements (Hall and Markusen, 1985). The findings suggest that availability of skilled labour supply in a region will have an encouraging influence on a high-tech business' location decision. That is, the business will relocate to a region where labour supply is plentiful.

It is worth noting that some factors were ranked by the respondents as having less importance than is usually assigned to them in previous research. One of these is the proximity to academic and research institutions, generally considered a very important location factor by high-technology businesses. For example, there are many previous studies that highlighted that proximity to a University in the creation and development of high technology concentrations (Dorfman, 1983; Saxenian, 1985; Segal, Quince and Wicksteed, 1985; Scott, 1994 and Kelly, Weber, Friend, Atchison, DeGeorge, and Holstein, 1992). The findings from this current research disagree with the literature as proximity to educational facilities was considered to be unimportant with regard to the respondents relocating the business.

Braham and Temple (1995) found costs were not a key criterion in the location decision. However, the findings of this current study revealed that the low cost involved in running the business was considered important for the business to remain in its current location.

This current study also shows that these businesses are in the early stages of growth and this researcher suggests that it is at this stage of business development, that cost plays an important role in sustaining a business. Respondents' opinions that high costs in a region reduce their choice to locate there, suggest that regions need to drive and support incentives to enable the industry to develop at a low cost, particularly in the early stages of development. In the opinion of this researcher, more government and state body support is required both in a financial and a consulting role in order to reduce costs to enable a high-tech enterprise to start-up within their means.

A prestigious central location is discussed in literature as being an important factor for attracting and retaining high-tech industry (Frenkel, 2001). The findings show that respondents pointed out that their current location of the business is well-known as a prosperous business location and therefore enables the business to appear bigger than it actually is. The fact that the high-technology industry sector is competitive, the suggestion is that the more well established and central that a business is or seems to be the more successful it is likely to be (Gripaios, 1989). The results of the survey are in line with this statement and show that the respondent's current location plays an important role in aiding the business. The findings therefore indicate that high-tech industries favour an area that emits an impression of success.

#### **5.4 Locating high-tech enterprises in the South-East region**

The findings from this current research illustrated that 77% of the respondents stated that they would not locate in the South-East region. The unavailability of skilled labour was the main reason for respondents' unwillingness to locate in the region. In fact, half of the respondents selected this factor. However, the South-East has three third level Institutes of Technology, which have a total student enrolment in excess of 15,000 students per annum (American Chamber of Commerce Ireland, 2007). Each of these third level institutes has developed strong links with industry and they have important research

capabilities. This indicates that skilled labour availability does exist in the region and in the opinion of this researcher the region needs to promote this availability further.

At the time of this research, the South-East did not have a university, though the best efforts of Waterford Institute of Technology to secure this status are continuing. Researchers such as Hall and Markusen (1985) and Oakey and Cooper (1989) discussed the importance of having a University in the region to encourage the development of high-technology enterprises in a region. However, the survey indicated that only six percent of respondents found that the lack of a University in the South-East would prevent them from locating in the region. In fact, one of the respondents in particular felt that a university in the South-East is largely irrelevant to the high-tech industry.

The importance of the transport infrastructure is discussed by Wince-Smith (2003) who stated that “a strong physical infrastructure is a baseline requirement for a prosperous regional economy....roads, highways....support the efficient movement of people, goods and services” (p.5). The findings of the current study show that 21% of the respondents perceive the South-East region to be inadequate in regard to the transport infrastructure. This finding indicates that an improvement in the transport infrastructure in the South-East region is required. This point is stressed by one of the respondents who commented that a good physical infrastructure is a condition whereby, if efficient, all other important location factors fall into place. Therefore, the findings suggest that at present there is undeniably an issue surrounding the transport infrastructure in the region, journey time to Dublin for example, being discussed in particular by the respondents as a hindering factor of the region’s transport infrastructure. In the South-East, however, by 2010 the region will be easily accessible with substantially reduced journey times to and from other regions and the reduction of major bottlenecks when the N25-Waterford city bypass, the N9 Kilkenny and Carlow bypass will all be completed. This should ensure faster travel times to Dublin from the region which respondents indicated as a particular concern.

The respondents’ perceptions of the airport service of the region imply that there is an inadequate service and therefore is a hindering factor for choosing to locate in the region. The findings indicate that the issues revolve around the problem of access to an

international service and the distance to an airport which provide the necessary facilities. Researchers such as Kasarda (2000) argued that high-technology businesses develop around airports. It is interesting to note that in this current study the highest percentage of firms were located in regions with international airports, that is, Dublin and the South-West. It is from this distinctive finding that this researcher concurs with Kasarda (2000) and proposes that an international airport in the region would influence the location choice of the high-technology industry to locate in the South-East. This is not something which can be seen to occur in the near future, in the opinion of this researcher. However, on a positive note the regions airport in Waterford serves an ever-increasing level of commercial and business flights. It should also be noted that those respondents who emphasised the inadequate airport services in the region chiefly had international customers.

While 77% of the respondents stated they would not relocate to the South-East, 23% said they would. Of those who stated they would locate in the region 50% mentioned the founder was from the South East. This is consistent with Frenkel (2001) who stated that high-tech entrepreneurs tend to locate near to where they live. In the opinion of this researcher, the results of this current research are not surprising but the realism of a business locating in a region solely on the basis of being born there may not be completely realistic if all required pull factors to a region are not evident. However, that being said, it must also be considered that a noteworthy amount of the respondents represent the view that the founder being from the region was the main influence in locating the business in that region.

Hall and Markusen (1995) stated that customer proximity was a very important location decision factor. This current study identified that respondents would locate in the South-East as they had existing customers in the region (33%). Head et al (1995) suggested that a firm locating near local suppliers allows the business to purchase appropriate materials conveniently. In addition, Meredith (1992) stated that if a business is located nearby its suppliers there will be no need to carry surplus stock and capital will not be attached to storage costs and inventory. The survey results from this current study showed that

locating near suppliers was considered to be a pull factor to the region by seventeen percent of the respondents. This result suggests that being close to suppliers is important to the high-tech industry sector in Ireland. On the other hand, however, according to the survey very few businesses had suppliers in the South-East region.

The survey asked respondents to rate the South-East region based on a list of seventeen location factors. The findings indicated that the attractiveness of the region was highlighted as being excellent by 23% of the respondents. This concurs with Longhi (1999) who suggested climate for example, attracted businesses to locate in a particular region. The current research findings imply that the region is an attractive place to locate a business. However, many respondents did mention the fact that the region needs to emphasise its attractiveness. This indicates that the region needs to promote itself strongly as a perspective location for high-tech industry. The low cost of premises and housing is also shown in the findings to be a factor that would encourage businesses to locate in the region. Nevertheless, the findings also show that high-tech industries feel that the South-East region has its flaws. Proximity to customers and the ability to attract key personnel were discussed as factors that the businesses rated as bad or inadequate. In the opinion of this researcher, from the current study's findings it appears that the region is not promoting its highly skilled worker availabilities.

## **5.5 Chapter Summary**

The main point of discussion in this chapter was that there are many factors that influence the location choice of high-technology businesses. The findings indicate that the factors which attract firms to a location and assist in the creation of the high-tech industry echo those that hinder their creation. Skilled labour and the transport infrastructure are prime examples. They are listed as being important but also as factors that, if inadequate, will hinder the choice of a particular location. The current research also indicates that the impact of skilled labour; airport access; transport infrastructure; proximity to home; communications infrastructure and low costs are the prominent factors hindering the



location choice of indigenous high-technology enterprises. The findings show that an improvement is required in these factors for high-technology industry in Ireland to consider locating in rural areas such as the South-East region. Furthermore, the South-East region is shown to be a region which is not considered as a location choice by many respondents in the industry. This was primarily attributed to the lack of skilled employees, an international airport and a weak transport infrastructure.

The next chapter, which is the closing chapter of this thesis will draw conclusions from the overall discussion, presents the limitations of this current research and make recommendations for future research.

# *Chapter 6*

## *Conclusions, Recommendations & Limitations*

## **Chapter Six**

### ***Conclusion, Limitations and Recommendations***

#### **6.1 Chapter Overview**

From the beginning this current study's aim was to identify the regional factors that influence the location choice of high-tech enterprises, establish the reasons why existing high-tech companies set up their enterprises where they are and to determine what factors would influence an entrepreneur/owner manager to move from their original set-up location. The research question and objectives were answered through the completion of the literature review and the conducting of the primary research.

The purpose of this final chapter is to draw conclusions from this current research. Furthermore, the strengths and limitations associated with this current study are also examined. Finally recommendations for future research are made.

#### **6.2 Conclusions**

Chapter Five discussed a number of key findings from this current research which indicated that there are many factors which both positively and negatively affect the choice of location of high-technology indigenous enterprises in Ireland. Firstly, this current study found that the largest sector in Ireland is software development (54%) and that the majority of respondents are located in the Dublin region (47%). It was also discovered that aspects of the founder's background influenced the choice of location for the businesses. Furthermore, the current research findings showed that most founders set up in a location well-known to them and they had either set up where they lived in their youth (23%) or in a locality where they worked prior to starting their own business (23%). In relation to this finding, many founders had deep-seated attachments to family

and friends or owned a house in the vicinity (32%) and these acted as factors attracting the businesses to remain in their current location.

This current research also established that the availability of skilled labour, transport infrastructure, telecommunications infrastructure, airport access and the costs of running the business are the factors most important to the founders when deciding where to locate their businesses. Interestingly, the findings show that factors discussed in literature such as proximity to educational facilities were deemed to be insignificant by many respondents (41%). This is contrary to researchers such as Saxenian (1985), Scott (1988) and Holstein (1992) who highlighted the importance of educational institutions.

With regard to locating the businesses in the South-East region of Ireland, the majority of the respondents said they would not choose to locate in the region (77%). The main reason stated for this is the lack of available skilled labour (50%). The transport infrastructure in the region was considered inadequate, as was the lack of an international airport. Moreover, the respondents rated the region as 'bad' in relation to customer proximity. On the other hand, the majority of the respondents rated the South-East region as excellent as regards its attractiveness (23%).

### **6.3 Strengths and Limitations of this current research**

The most important strength of this research is the high response rate (64%). This is contrary to research by Fricker and Schonlau (2002) who suggested that response rates for online surveys are smaller than other media. A further strength of this current study is that all of the respondents were considered to be computer literate, suggesting a higher response rate was to be attained. This concurs with Zhang (2000) whose respondents consisted of researchers, who were also considered to be computer literate. The respondents of Zhang's study were given a choice of mail or online replies with 80% selecting the online method. However, in comparison, in a study conducted by Sedivi Gaul (2001) a survey was sent to librarians of whom only 5% responded online. On the

other hand, there are limitations attached to the current research. Firstly, there was the lack of an existing high-technology enterprise database. At the time of this research, there was no database existing in Ireland, separating industry sectors. Therefore, a compiled list of Enterprise Ireland's high-potential start-up (HPSU) enterprises from 2002 through to 2005 was used. This researcher went through the list for each year and selected businesses to develop a database appropriate for this current study. This is a limitation for this study as it was anticipated that all of the enterprises listed by Enterprise Ireland, would be consistent with the definition of high-tech selected for this research. However, the listings included many sectors which were not applicable to the chosen definition, for example, the food sector.

Furthermore, the research sample comprised only of businesses' from the Republic of Ireland that had a relationship with Enterprise Ireland. This is a limitation as this excludes many high-tech enterprises that exist in Ireland, who have had no support from Enterprise Ireland. Therefore, a more extensive study may have been conducted had businesses been selected from the high-technology industry as a whole rather than only businesses immediately associated with Enterprise Ireland.

In addition, this current research does not control for a number of factors including industry sector. The current study does not distinguish between these business sectors nor does it conduct a comparative analysis between the different industry sectors. The limitation is that the decision to aggregate the industries perhaps has the effect of hiding important sectoral differences, which may lead to the impression that all sectors are subject to the same opinions regarding business location decisions. Therefore, it is suggested that an examination of firms that operate in different sectors and regions would have been more comprehensive and would have provided for the emergence of stronger regional patterns. Moreover, this would also establish a deeper understanding of the way certain factors influence the location decisions of the high-technology industry in Ireland, particularly in the South-East region.

#### **6.4 Recommendations for Future Research**

The limitations of this study highlight a number of opportunities for future research. It is proposed that the limitations of this study be addressed in order to create a more accurate overall view of high-technology location decisions in Ireland. For example, a similar study could be conducted on a national level and such a study would allow for comparisons to be made between regions and sectors. This further research would be beneficial in determining the regional patterns of high-technology industries in Ireland.

Another proposal for future research is to conduct a similar study but with only a limited number of businesses, for example using a detailed case-study approach of a small number of firms. Thus, the researcher could gain a deeper insight into the subject area. A case study approach would acknowledge qualitative and quantitative information to be drawn together to facilitate a better understanding of the intricate steps that are gone through in the decision process involved in selecting an appropriate location for a high-tech business. A surveillance time of six months for example during the location decision process would perhaps be difficult to achieve but would yield some interesting information. The researcher could establish how the location is chosen by the business through the gathering and use of relevant data.

Another suggestion is to perform research, similar to the current research, on an international basis. Such research may identify regional and national specific factors that influence that creation, growth and development of high-tech enterprises.

Finally, another recommendation for future research would be an investigation into the growth patterns of high-technology industry in Ireland over the past ten years. This would identify any decline or increase in the industry throughout the years and provide an analysis as to what factors effected these changes.

This proposed research would have implications for regional development, regional studies, entrepreneurial regions, enterprise policy, and enterprise development. This

research would be of benefit to a variety of individuals and organisations including academics and entrepreneurs.

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# *Appendices*

## **Appendix 1**

Dear Sir/Madam

My name is Denise Hall. I am currently doing my Masters by research in the Centre for Entrepreneurship, Waterford Institute of Technology. The focus of the research is to understand the factors that encourage or hinder hi-tech enterprises to locate in a given region/location. The database being used for this research has been generated with the assistance of Enterprise Ireland. As your business is considered to be high-tech, I would be grateful if you would complete the survey for this research.

The survey will take approximately ten minutes to complete and can be accessed through the following link:

<http://www.surveymonkey.com/s.asp?u=255042895121>

I assure you that any information you provide will be treated in the strictest confidence, and will be aggregated so that individual firms will not be identifiable. All of the information provided will be used solely for my own personal research. A summary of these findings will be available to you on request.

Should you require any further information, regarding the survey or my overall project, please do not hesitate to contact me. I would also like to thank you in advance for participating in this very important research.

Kind Regards  
Denise Hall  
Centre for Entrepreneurship  
Waterford Institute of Technology  
dhall@wit.ie  
Tel: 051-302946

## **Appendix 2**

1. Name of business
  
2. Name of respondent
  
3. Role in organization
  
4. Industry sector of business
  - Aerospace/Aircraft
  - Biotechnology
  - Chemicals
  - Computers
  - Electronics
  - Engineering
  - Electrical Equipment Manufacturing
  - Pharmaceuticals
  - Plastics & Rubber
  - R&D and Labs
  - Software Development
  - Telecommunications
  - Telecommunications Manufacturing
  - Scientific Instrument Manufacturing
  - Other (please specify below)

5. Number of employees

- 10 or less
- 11-25
- 26-50
- 51-100
- 101-499
- 499 or more

6. Name of founder(s)

7. In what year was the company founded?

- Pre 1996
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006

8. Is the business a wholly owned indigenous business?

- Yes
- No



9. Is the business' HQ located in Ireland?

Yes

No

10. Location of current business when founded?

Town/City

County

11. Was government/financial assistance an influence in your choice of location?

Yes

No

12. Did you get any inputs or support from any of the following agencies during your decision to set up? (Tick as many as applicable)

Enterprise Ireland

FORFAS

IBEC

BIC

PLATO

IDA Ireland

Revenue

County Enterprise Board

Other (Please specify)

13. Is the business a subsidiary of another business?

Yes

No

14. If 'Yes' to question 13, please state name of parent company

15. Is there more than one location involved in the different functions of the business, i.e. production, management etc?

Yes

No

If yes, please specify where and what

16. In what other countries, if any is your company based?

17. Is the business a 'spin-off' from an existing company?

Yes

No

18. If 'Yes' to question 17, what is the current relationship with the original business?

19. Were any alternative locations considered at initial start up?

Yes

No

20. If 'Yes' to question 19, please indicate alternative location considered

Town/City

County

21. If yes to Q.19 please indicate reason(s) for not choosing alternative location

- Poor quality of life
- Market opportunities not evident
- Lack of availability/access to resources
- No evident similar industry types
- Distance to suppliers
- Distance to customers
- High operating costs
- Inadequate facilities
- No Government incentives available
- Inadequate Demographics (age of population in area)
- Long commuting times
- Local amenities inadequate
- Poor labour supply
- Long distance from educational facilities
- Other (please specify)

22. Which of the following apply to the business setting up in its original location?

- Founder born in the county
- Founder lived in the county
- Founder worked in the county
- Founder born & worked in the county
- Founder not born in the county but moved to the county to work
- Founder made redundant and set up in county where he/she worked
- Founder made redundant and returned to home county to set up business
- Founders spouse works in the area
- Other (please specify)

23. Please rate the level of importance of each of the following factors regarding the company and its initial location decision.

	Very Important	Important	Somewhat Important	Not Important	N/A
University nearby	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Clustering/locating around similar industry types	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multinational (MNC) presence in the region	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Research & Development facilities nearby	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Existence of a Science Park nearby	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Being a spin-off & remaining close to original business	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Positive Public Policy (state) for the location	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Social Networking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Communications Infrastructure	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Transport Infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Skilled Labour readily available	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Availability of financial assistance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Availability of Government soft support (e.g. Mentoring)	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Availability of Government hard support (e.g. Grants)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

24. Do you collaborate with research institutions in product & process development?

Yes

No

25. If 'Yes' to question 24, please choose type of research institution

University

Institute of Technology

Private research and development

Other (please specify)

26. Please describe factors unique to your current location that are not available elsewhere

27. What do you consider as the most 'helpful' & most 'unhelpful' factor aiding the business at the current location?

Most Helpful

Most Unhelpful

28. Has the business relocated since start-up?

Yes

No

29. If 'Yes' to question 28 where has the business relocated to?

City/Town

County

30. If 'Yes' to question 28, rate the level of importance of the business' reasons for relocation

	Very Important	Important	Somewhat Important	Not Important	N/A
Improve quality of life	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Market opportunity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Availability/access to resources	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Clustering/Locating around similar industry types	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Closer to suppliers	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Closer to customers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consolidate into fewer facilities	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Establish a presence in a new market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lower operating costs	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Modernise equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Modernise facilities	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Expansion of facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Government incentives	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Staff retention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Availability of key skills	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Demographics (age of population in area)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Commuting times	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Local amenities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Labour supply	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Proximity to educational facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31. If 'Yes' to question 28 was government/financial assistance an influence in your choice of relocation?

Yes

No



32. If 'Yes' to question 28 did the business receive support to relocate from any of the following agencies? (Tick as many as applicable)

- Enterprise Ireland
- FORFAS
- IBEC
- BIC
- PLATO
- IDA Ireland
- Revenue
- County Enterprise Board
- Other (please specify)

33. State the 3 most significant factors involved in the location/relocation of the business

- 1.
- 2.
- 3.

34. If you are not located in the South East of Ireland, (Carlow, Kilkenny, South Tipperary, Waterford, Wexford), would you ever consider locating there?

- Yes
- No

35. Please give reasoning to your answer in question 34

- If 'No' please state reason(s)
- If 'Yes' please state reason(s)

36. How do you think the South-East region rates with regard to the following, regardless of whether the business is located in the South-East region or not.

	Excellent	Very Good	Good	Bad	Very Bad
Availability of skilled labour	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Proximity to suppliers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Proximity to customers	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Proximity to financiers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Purchase cost of premises	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Government charges/commercial rates (i.e. water, waste, development levies etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communications Infrastructure	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Rental costs of premises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Availability of government assistance	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Ability to attract key personnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost of housing	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

Research & Development facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transport Infrastructure	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Presence of multinational organisations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support facilities (Enterprise Ireland, County Enterprise Board etc)	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Attractiveness of region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality of 3rd level educational facilities	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

37. What factor(s) would prevent you from setting up your business in a particular region?

38. In your opinion, what is needed to attract more high tech firms into a particular region?

39. Source(s) of finance used for your business when setting up?

- Personal
- Venture capital
- Development Agency
- Bank
- Partners
- Business Angels
- Government
- Grant
- Other (please specify)

40. How important was the availability of finance when deciding where to locate your business?

- Very Important
- Somewhat important
- Not very important
- Other (please specify)

41. Do you have any further comments/remarks you would like to make?