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**THE UNIVERSITY OF GLASGOW**  
**FACULTY OF LAW, BUSINESS & SOCIAL SCIENCES**  
**SCHOOL OF BUSINESS AND MANAGEMENT**

**The Role of Resources in the Internationalisation of High Technology SMEs in  
Portugal**

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DOCTOR OF PHILOSOPHY

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## **Abstract**

This study identifies and examines the role of resources in the internationalisation of high technology SMEs in Portugal.

More specifically, drawing on the Resource-Based View of the Firm (RBV) the study suggests a set of mainly knowledge-based resources, specific to high technology SMEs, at firm and individual levels, explaining why in the same industry, some firms consistently outperform others in international markets.

A conceptual framework drawing on the RBV and on Transaction Costs Economics (TCE) was developed and operationalised.

Empirical research proceeded in two phases. Phase one involved a total of 12 exploratory interviews, respectively with 8 chief executives of high technology SMEs and with 4 experts and academics in the area of enquiry. The role of these exploratory interviews was to qualitatively identify and examine valuable resources to high technology SMEs emphasised or not in the extant literature and that have been included in phase two, which was concerned with a mail survey where 106 firms filled and returned the questionnaire.

The data collected provided the basis upon by using multivariate statistical techniques three sets of hypotheses, were developed, tested and discussed that are (i) *to examine the impact that resources have on firm international performance; (ii) to examine the influence that resources have on the entry mode in the main foreign market: independent vs. contractual arrangement; (iii) to examine the relationship between the use of a contractual arrangement in the main foreign market entry mode and performance in that same market, while considering resources as moderator influences in that relationship.*

The study main findings suggest the great importance for the high technology SME superior international performance of the human capital of the entrepreneur/chief executive as well as the need of building a stronger technology-base through a greater emphasis on R&D activities, by hiring high skilled personnel and the capitalising on continuous innovations based on technologies that are new to the market. In addition, another consistent finding of the study is that high technology SMEs with stronger international orientation currently achieve higher levels of performance.

Finally, at policy level, the findings of this study suggest the need to establish assistance programmes to develop the human resource-base, at all levels, of the high technology SME as well as to augment its technology-base, which are more delineated and detailed in the thesis along with the limitations and suggestions for further research.

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## **Dedication**

To my wife Vera and

*In memorium* to our beloved daughter Janete

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Embarking upon a doctoral research is not either an easy or a soft prospect. In spite of the “ups” and “downs” throughout this “process” my task has been made easier since I had the unfailing collaboration of different persons and organisations who have made this work possible even though, at times, from my own where more the “downs” than the “ups” during the “process”.

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## List of Abbreviations

Ad-hoc	For the particular purpose
CEO	Chief Executive Officer
CT	Communication Technology
ed.	edited/editor/s
e.g.	exempli gratia (for example)
etc.	et cetera (and so on)
excl.	excluding/exclusive
EU	European Union
FDI	Foreign Direct Investment
HQ	Head Quarters
HW	Hardware
IB	International Business
ICT	Information and Communication Technology
i.e.	id est (that is to say)
Incl.	including/inclusive
IO	Industrial Organisation Economics
IP	Intellectual Property
IT	Information Technology
MNE	Multinational Enterprise
NTBF	New Technology-Based Firm
OECD	Organisation for Economic Co-Operation and Development
p.a.	per annum
PCA	Principal Components Analysis
Per se	itself
PLC	Product Life Cycle
RBV	Resource-Based View
sic	written in this way intentionally
SME	Small to Medium Sized Enterprise
STBF	Small Technology-Based Firm
SW	software
TCE	Transaction Costs Economics
UIM	Uppsala Internationalisation Model
UNCTAD	United Nations Conference on Trade Development
Vis-à-vis	In relation to
vs.	versus

## **Chapter 1: Introduction**

### **1.1 Background to the Research**

Currently, the importance of SMEs and more specifically of high technology SMEs continues to increase in developed economies contributing to the wealth of those economies by creating technological innovations, skillful employment and raising living standards (ENSR, 2002; OECD, 2005). More recently the role of SMEs to the economy is even more important taking into consideration the slowdown in the world economy, and the effects on the business climate created by the events of 11<sup>th</sup> September 2001(OECD, 2005; 2002). Thus, high technology SMEs have a very important role in creating opportunities for new and very skilled employment making an important contribution to economic growth and development (Coviello and McAuley, 1999).

Nonetheless, high technology SMEs have shortages of different types of resources necessary to develop and implement their business strategies. These shortages may include financial, marketing, technological and managerial resources, skilled personnel, etc. (Buckley, 1989; OECD, 2002). Overcoming those shortages has become critical for their long term survival and profitability. In addition, due to the globalisation context where they operate they need to internationalise very often at early stages after their foundation. In this context, over the last fifteen years or so high technology SMEs have become increasingly active in international markets (Bonaccorsi, 1992; Oviatt and McDougall, 1994, 1999). Their internationalisation has been recognised as driven by the increasing globalisation and deregulation of the world economy and attributed to the decline in trading barriers imposed by different governments, on a worldwide basis, in parallel with advances in telecommunications, informatics and lower transportation costs. Such changes have opened the doors to international market opportunity of high technology SMEs (Bernardino and Jones, 2003).

However, high technology SMEs compete in markets characterised by short and shortening life cycles, in which technologies become fast obsolete. They face high technological risks and operate in industries subject to dramatic structural changes

(Coviello and Munro, 1995). Domestic technology markets may be too small to accommodate the technology-based niche strategies typically pursued by small firms, and consequently small high-tech firms need to be active abroad, practically from the outset (Coviello and Munro, 1995; Lindqvist, 1997). In fact, in spite of the importance of high technology sectors, which create new knowledge, innovations and technological advances, they are characterised by being very heterogeneous since high technology firms differ in their endowments of resources as well as on the risks involved in their innovative activities.

A few studies, emerging within the field of international entrepreneurship have focused on the firm's resource base as being of particular importance in relation to internationalisation (McDougall, Shane and Oviatt, 1994; Steensma, Marino, Weaver and Dickson, 2000; Vatne, 1995). This focus has emerged within a gap in the traditional literature on internationalisation which did not adequately address the effects of the small firm internal resource base, particularly in technology intensive sectors, on its international performance (Coviello and McAuley, 1999; McDougall and Oviatt, 1996). Moreover, the internationalisation literature has traditionally tended to examine small firms as a homogeneous sector within resource shortages, which have been seen as having the aggregate effect of acting as barriers, or inhibitors to geographical diversification (Buckley, 1989; Miesenbock, 1988).

This study tries to fill this gap since there is little attempt to empirically identify and examine the resources of high technology SMEs and the use of independent vs. contractual arrangement with a partner in the foreign market entry mode, which has an impact on their international performance.

Indeed, within the general body of literature on small firms, there is a number of studies that indicate that in order to overcome the above mentioned shortages, small firms may develop cooperative linkages, such as those contractual arrangements, with partners in order to pursue their growth strategies, regardless they are domestic or international (Jones, 1998, 1999). Establishing linkages with other firms may allow small high technology firms to gain access to resources that otherwise would require considerable

time and money and that currently they could not afford (Lu and Beamish, 2001; McDougall, Shane and Oviatt, 1994; Oviatt and McDougall, 1994; Zacharakis, 1997).

In this context, this thesis focuses on the internal resource-base of the high technology SME, and opportunity to access externally held resources through contractual cooperation with other firms in relation to the entry mode utilised in the main foreign market and their ultimate impact on international performance. More specifically, the main aim of this study is *to examine the relationship between the firm's internal resources and the use of contractual arrangements, in the main foreign market, distinguishing contractual versus independent modes and international performance. The central proposition of this study is that high technology SMEs have different types and endowments of resources and these differences will last long, influencing the foreign entry mode choice and ultimately the international performance.*

## **1.2 Value of Research and Expected Contribution**

The findings of this thesis are of value for practitioners, policy makers and the academic community.

For managers of high technology SMEs the purpose of this study is to make recommendations to firms on identifying, developing and deploying their resources that may influence their firms' competitiveness and consequently their international performance.

For policy makers the value of this study stems for a better identification and understanding of the key resources to the internationalisation of high technology SMEs. This will allow government entities to formulate and implement programs, which will leverage areas of high technology SMEs, which require further development.

Last but not the least, the value for the academic community mainly lies on an increased knowledge about the impacts of the high technology SME internal resource-base, on its international performance (Coviello and McAuley, 1999; McDougall and Oviatt, 1996). This research area has only so far merited a scant attention from the traditional literature on internationalisation. On the other hand, studies in the field of international

entrepreneurship in spite of emerging in recent years are still very patchy (McDougall, Shane and Oviatt, 1994; Steensma et al, 2000).

### 1.3 Research Aims

As stressed in section 1.2 the ultimately aim of this research is to identify and examine key resources, of high technology SME's, at firm and entrepreneur/ manager levels and the use of independent vs. contractual arrangements in the foreign market entry mode, explaining why, in the same industry, some firms achieve superior performance in international markets. In addressing this topic the following Research Aims are developed:

#### Research Aim 1

To identify and examine resources, at the firm level, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets.

#### Research Aim 2

To identify and examine resources, at the individual level, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets.

#### Research Aim 3

To identify and examine resources, both at the firm and individual levels, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets.

#### Research Aim 4

To identify and examine the impact that the resources identified in Research Aims 1 to 3 have on the international performance, measured by the international intensity of the high technology SME.

#### Research Aim 5

To examine the influence that resources of high technology SMEs, identified on Research Aims 1 to 3, have on the type of entry mode in the main foreign market (independent vs.contractual).

#### **Research Aim 6**

To examine the relationship between the use of a contractual entry mode and performance, in the main foreign market, while considering the resources identified in Research Aims 1 to 3, as moderator influences in that relationship.

Findings of the literature review will be synthesised in chapters 2, 3 and 4 in order to develop a conceptual framework (chapter 5) to provide a basis upon which these aims will be further examined and analysed.

### **1.4 Key Definitions**

The development of each definition will be provided in subsequent chapters (chapters 2, 3 and 4) of this study. However, at this stage the study presents the following working definitions of several key terms employed throughout this thesis:

#### **SME- Small to Medium Sized Enterprise**

In line with the EU definition, see chapter 2, section 2.2.1, and for the purpose of this thesis a small to medium sized enterprise exhibits the following characteristics:

- Organisational size: It has up to 250 employees.
- Independent status: No more than 25% of the capital or voting rights held by one or more enterprises which are not themselves SMEs (independence criteria used in the E.U.).

As regards to age this study adopts, similarly to other studies of high technology firms (Jones, 1998; Brock, 2000), an upper limit of 30 years since it is reasonable to expect that in a mature firm with 30 years it is still traceable its evolution over the years.

Nonetheless, the focus of the study is on firms which can be situated in a continuum ranging from a young NTBF with one year of age to a mature market led SME with up to 30 years of age.

## **High Technology SME**

For the purpose of this thesis and in addition to the characteristics of the small-medium sized enterprise presented above the high technology SME is characterised by developing, mainly through R&D activities, and selling marketable products/services with a high degree of technology content. The degree of R&D activities within a firm is called R&D intensity. R&D intensity in this study is measured by “*innovation input factors*” that are the R&D expenditures as a percentage of sales and by the human capital input that is the number or percentage of scientists, engineers and qualified personnel in R&D of a firm (ENSR, 2002).

In addition, firms belonging to some specific industry sectors characterised by being R&D intensive are considered altogether as high technology.

In this context, this study’s approach is based on R&D intensity and therefore are considered high technology those firms belonging to certain industry sectors (ENSR, 2002).

## **New Technology-Based Firm (NTBF)**

For the purpose of this thesis, see section 2.2.4, and in addition to the characteristics of the high technology SME presented above a NTBF is characterised by the following:

- Develops, produces and sells products, which are based on a high rate of complex and changing technologies and/or new technologies.
- Firms which, can be identified as “new technology” or even “emerging technology” in high technology sectors, in general or in specific industries such as “information and communication technologies” (ICT), electronics, laser technologies, biotechnologies, scientific instruments, etc.
- They are often established in particular geographical locations such as around universities, innovation centres and science parks.

## **Resources**

For the purpose of this thesis resources represent, basically, firm's tangible (e.g. financial) and intangible assets (e.g. marketing, technological, and organisational and individual) that firms use to develop and implement their strategies.

## **Internationalisation**

This thesis adopts Beamish's (1990) definition, who characterises internationalisation as a "*process by which firms increase their awareness of the influence of international activities on their future and establish and conduct transactions with firms from other countries*". In addition, internationalisation could also be seen as a process by which firms adapt their involvement and commitment to foreign markets by adjusting their international exchange transaction modalities and consequently their organizational-structure and resource-base (Andersen, 1997).

## **Foreign Market Entry Mode**

For the purpose of this study a foreign market entry mode is defined, see chapter 4 section 4.5.5, as *a governance arrangement, which allows a firm to implement its business strategy in a foreign market, independently via subsidiaries (e.g. sales or wholly owned) and direct sales to end customers or by means of contractual arrangements with partners through distributors or other contractual modes (e.g. licensing, contract R&D, contractual joint ventures)*.

In this context, this study broadly distinguishes two categorizations of entry modes: they are independent modes vs. contractual arrangements. The former acknowledges that ideally the high technology SME has all the required resources and capabilities to conduct business independently of any partner/distributor and will conduct sales direct to an end customer, generally a business organisation, in the target market or will set up a subsidiary, instead (Burgel and Murray, 2000). By contrast, the latter acknowledges that high technology SMEs establish contractual arrangements with prospective partners irrespective of the type of the foreign market entry mode used to conduct business



overseas. These contractual arrangements settle the relationships, although imperfectly, between the firm and prospective partners and could be crudely called *contractual cooperation*. In this context, this approach could be applied to a variety of contractual entry modes, ranging from exports through distributors, contractual joint ventures and other contractual modes. Thus, throughout this study the terms *contractual arrangements*, *contractual modes* and *contractual cooperation* will be, interchangeably, used.

In these circumstances, both the high technology SME and the prospective partner need to recognise the contractual arrangement not just as a base to settle disputes but also to move cooperation forward in the target market, while sharing revenues, costs and risks.

### **International Performance**

This study includes both objective and subjective measures of international performance. For objective measures international intensity, is chosen since the literature acknowledges as the most widely used measure of firm's scope of international activities (Aaby and Slater, 1989; Preece et al, 1998; Rodriguez and Rodriguez, 2005). On the other hand, as subjective measures it is proposed degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market.

### **1.5 Overview and Structure of the Thesis**

In addressing the Research Aims presented in section 1.3 this thesis will be structured as follows: Chapter 1 outlines an introduction to the topic of this thesis and presents Research Aims. Moreover, chapter 1 also emphasises the perceived value and contribution of this study in relation to practitioners and the academic community.

Chapters 2, 3 and 4 will review three key areas of academic literature in an attempt to develop a conceptual framework (chapter 5) pertinent to the topic of this study. In chapter 2 this thesis will identify and characterise the population of high technology

SMEs, which are the focus of the empirical investigation in this study. In addition, it makes an attempt to understand and evaluate the specifics of high technology SMEs by defining key characteristics, which need to be considered during the empirical part of this study. Furthermore, it assesses the problems and challenges facing high technology SMEs with emphasis put on their internal characteristics as well as on the market environment where they operate. Finally, chapter 2 will identify and characterises key strengths and weaknesses of high technology SMEs that will be assessed and discussed in Chapter 3, which correspond in fact to critical resources that might be source of competitive advantage and consequently can be important determinants of firm's international performance.

Chapter 3 will present the descriptive and prescriptive perspectives of the RBV, while discussing if the RBV is already a theory in strategic management. In addition, this chapter will describe and review different classifications of resources, proposed by different authors throughout the literature, using the Resource-Based View (RBV). Furthermore, chapter 3 will review and analyse the "broad" RBV relative to industrial organisation economics (Porter, 1980), neoclassical microeconomics (Ricardo, 1817) and evolutionary economics (Nelson and Winter, 1982). This study is positioned within the "broader" RBV (Barney, 2001), which encompasses some commonalities as well as some differences relative to those three perspectives. Thus, the main philosophical principles that underpin the foundations of this study will be presented. Finally, chapter 3 identifies and isolates key resources of high technology SMEs, at firm and individual levels, which may be source of competitive advantage and consequently may be important determinants of firm's international performance.

Chapter 4 starts by presenting a definition of the term internationalisation and how this concept has evolved over the years in order to get a richer understanding and broader scope of analysis relative to firm's international activities. In addition, by applying the RBV; mainly in an international context, it acknowledges the importance of those resources, proposed in the previous chapter (chapter 3) that may give the high technology SME superior performance relative to its competitors in foreign markets.

Moreover, chapter 4 proposes the use, in combination, of TCE and the RBV to predict and analyse entry mode choice for high technology SMEs.

Finally, chapter 4 will review behaviouristic models of internationalisation relative to knowledge acquired over firm's international activities with the subsequent reduction of market uncertainty; this leads to firm's higher commitment to foreign markets and higher international intensity.

Chapter 5 will attempt to integrate the research areas reviewed in previous chapters in order to develop a conceptual framework, which addresses the topic of this study. Conclusions drawn from the review of the literature will be used to address the Research Aims, presented in section 1.3, and stating specific set of hypotheses, for each research aim.

Chapter 6 will give both a quick overview of different sets of methodologies and instruments available to the researcher allowing a justification to the chosen methodology. In addition this chapter will present the main findings of the exploratory research phase and their specific interview guides. These findings will influence later stages of the research design, its instruments (the mail survey) and respective implementation.

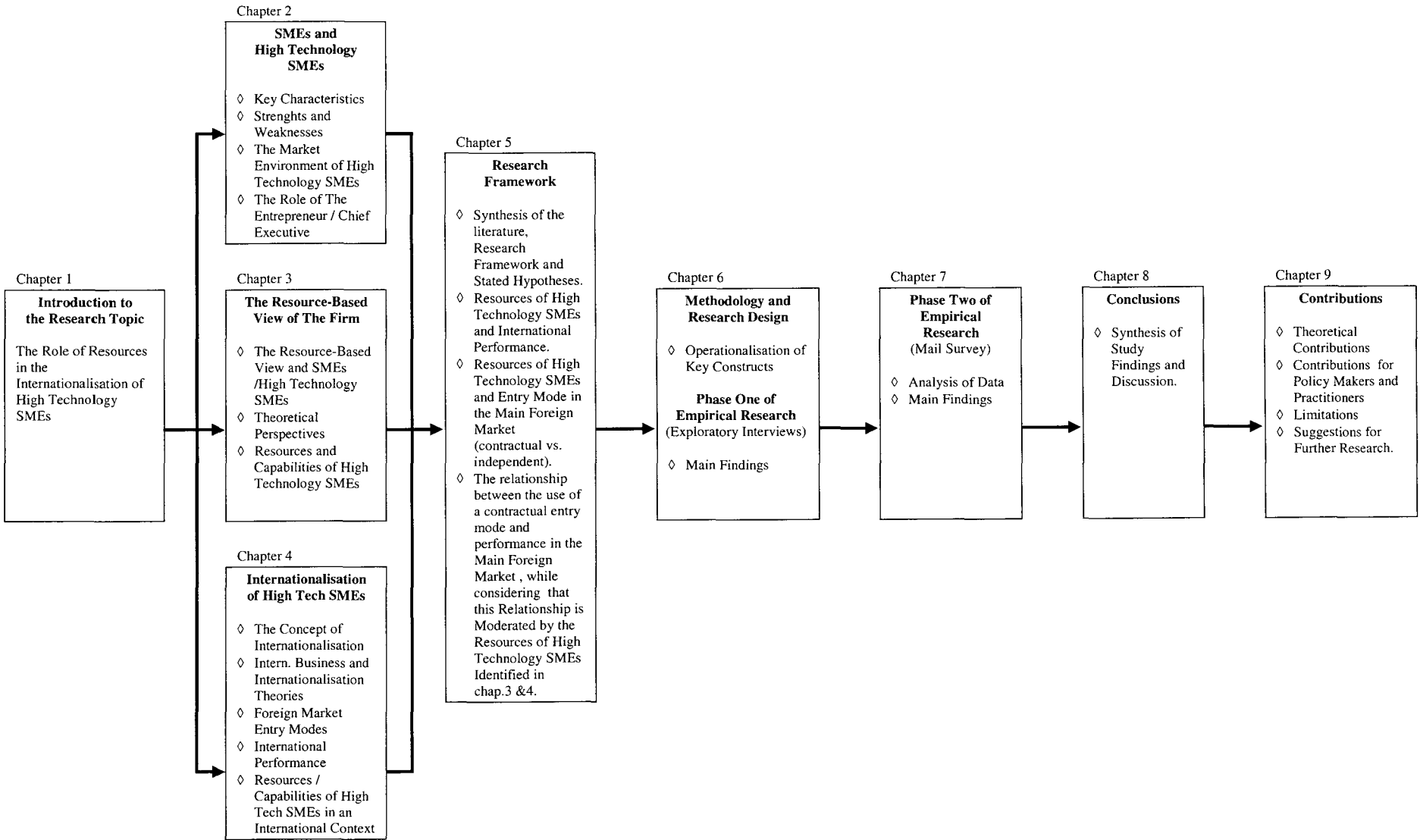
Chapter 7 will report the main findings of the mail survey, which address the Research Aims, of this study and the stated specific set of hypotheses, for each research aim.

Chapter 8 will synthesise and discuss the study main findings in relation to the Research Aims.

Finally, chapter 9 will address implications and contributions for academics, practitioners and public policy. A presentation of the study's limitations and suggestions for further research will close the chapter.

Figure 1.1 (overleaf) presents a diagrammatic summary of the structure of this thesis and outlines key issues at each stage of the research.

Figure 1.1 : Chapter Plan of Thesis



## **Chapter 2: SMEs and High Technology SMEs**

### **2.1 Introduction**

Over the years the contribution of SMEs to global economic growth and development has been widely recognised (OECD, 2005; 2002; ENSR, 2002). More recently SMEs are to a great extent considered as key pillars for economic dynamism, flexibility and innovation in developed countries as well as in emerging and developing economies (OECD, 2005). This movement upwards in terms of overall innovation, by SMEs, has benefited from their increasing presence in international markets. In fact, SMEs have adopted, in recent years, a posture for cross-border partnerships and collaboration with other organisations (OECD, 2005). In this context, the increasing internationalisation and continued innovation represent key factors for supporting SME competitiveness. More specifically, among SMEs, high technology firms exhibit their resources to make technological breakthroughs, or even to renew technologies or either to put large firms under pressure (OECD, 2005). Currently, SMEs are investing a growing share of their turnover in R&D even though still lagging behind large firms (OECD, 2005).

Overall, SMEs represent nowadays between 96-99% of the total number of enterprises in most OECD countries. In this population at least 95% of the enterprises can be considered small that is they have less than 50 employees. Furthermore, SMEs account for the majority of new business creation during the nineties. For example, at that time, in the United States, SMEs generated 90% of new businesses (OECD, 2002). It is also recognised the important contribution of SMEs to the overall employment both in manufacturing and services sectors. Moreover, SMEs can be considered a very important source of new job creation (OECD, 2005).

In sum, SMEs can be considered important sources of innovation (OECD, 2005; 2002) and more specifically of high technology SMEs, which are characterised by being particularly active in the development and implementation of technological innovations through the delivery of new products, services, systems and production processes that

create value (Linder et al, 2003). Thus, they have an important contribution to economic growth, skilled employment and increasing living standards.

Overall, high technology SMEs are highly innovative, creating and delivering products/services with high technological content and/or using state of the art production technologies.

Nonetheless, only a small minority of high technology SMEs operate in industry sectors characterised by new and emerging technologies (Shearman and Burrell, 1988). By contrast, the large majority of high technology SMEs in spite of the high technological knowledge embodied in their products and services tend to be incremental innovators by putting R&D efforts in areas related with commercialisation of technologies where knowledge currently exists. In addition, due to their light organisational structures high technology SMEs have the required flexibility to deal with technological changes, while fulfilling customer needs. On the other hand, they have shortages of different types of resources necessary to develop and implement their business strategies. These shortages may include financial resources, skilled personnel, marketing, technological and managerial resources, etc. (Buckley, 1989; OECD, 2002). To overcome these shortages high technology SMEs currently establish external linkages with other organisations.

Overall, high technology SMEs have a very important role in creating opportunities for new and very skilled employment making an important contribution to economic growth and development (Coviello and McAuley, 1999). In this context, the massive interest on the investigation of the population of high technology SMEs has emerged without surprise, over the years.

For example, important research areas include the role of high technology SMEs on the technological change and innovation for the whole economy (Bollinger et al, 1983; Yli-Renko and Autio, 1988; Cooper, 2000; Tether, 2000) their complementary role to large firms (Abernathy and Utterback, 1978; Rothwell, 1984), the technology transfer between small and large firms (Williamson, 1975) and the technology transfer between firms across national borders (Davidson and McFetridge, 1985).

Despite the great interest on high technology SMEs the literature assessing their internationalisation has received only a patchy interest (Burgel and Murray, 2000). In fact, the few studies identified in the literature focusing on the early years and early internationalisation of new technology-based firms (Lindqvist, 1991; Fontes and Coombs, 1997; Brock, 2000) while neglecting the great majority of the population of high technology SMEs. In this context, understanding and assessing the internationalisation strategies of high technology SMEs require to identify and characterise their internal characteristics that are their strengths and weaknesses as well as the market environment where they operate.

The objective of this chapter is threefold.

The first objective is to define and to characterise the population of high technology SMEs by defining key characteristics, which need to be considered during the empirical part of this study.

The second objective is to assess the problems and challenges facing high technology SMEs with emphasis put on the market environment where they operate.

Finally, the third and foremost objective is to identify and evaluate key strengths and weaknesses, which often characterise high technology SMEs, and may represent resources that may give superior competitiveness to firms possessing such resources (Wernerfelt, 1984) and will be assessed and discussed in Chapter 3. In fact, those strengths and weaknesses may correspond, to critical resources, for the high technology SME, irrespective of being developed in domestic or foreign markets, and source of competitive advantage and ultimately may be important determinants of international performance (Dhanaraj and Beamish, 2003; Rodríguez and Rodríguez, 2005).

In order to address these objectives this chapter will be organised as follows:

Section 2.2 examines the first objective by defining the terms “SME-Small and Medium-Sized Enterprise” and “high technology SME” and examining key

characteristics of high technology SMEs, which need to be considered during the empirical part of this study. Section 2.4 characterises the market environment where high technology SMEs operate. Finally, section 2.3 examines the third and main objective by analysing strengths and weaknesses of high technology SMEs that may represent key resources (Wernerfelt, 1984), for the high technology SME, mainly in international markets.

The chapter concludes with Section 2.5 in which the main findings will be presented.

These findings will be later used in the literature synthesis, in chapter 5, in order to address the specific Research Aims of this study.

## **2.2 Definitions of Key Terms**

This section defines key terms, critical to the sequence of this study, as follows: “small and medium-sized enterprise” (SME) and high technology SME.

### **2.2.1 Definition of “Small and Medium-Sized Enterprise” (SME).**

Characterising in precise words what “small” or “medium-sized” enterprises are, it becomes clear that no single suitable definition exists. For example, over the years in the U.K. the most well known characterisation of the profile of a small firm was that made by the Bolton Committee (1971). This report defines a small firm as an independent business, that is, it is not part of a larger organisation; managed by its owners or part-owners on a personalised way, that is, small firms are generally flat organisations rather than having very formalised hierarchical organisational structures; having small market shares in the industry sectors where they compete. Thus, small firms cannot influence both market prices and quantities bought or sold in factor markets. In this context, the concept of either “small firm” or “medium-sized enterprise”



varies from industry to industry since the size of a company is very often compared to the size of its competitors within the industry (Bolton Committee, 1971; Storey, 1994). However, these qualitative characteristics, stated in the Bolton Committee Report, are still ambiguous and controversial. Indeed, small firms addressing specific market niches can have significant market shares. Moreover, the independence of the owner/manager is often not a reality since small firms and mainly in high technology sectors rely, to a great extent, on external funding such as venture capital and therefore reducing considerably the independence of the owner/manager. Furthermore, the very patchy information available on the ownership of small firms constitutes in itself a very important limitation to the creation of knowledge in this area of investigation.

In contrast to the above “economic definition” of small firm, the Bolton Committee (1971) also adopts a “statistical definition” by using, the input measure, number of employees and/or, the output measure, turnover/sales for defining firm size. Depending on the industry sector considered Table 2.1 shows, according to the Bolton Committee (1971), the cut-off point applicable to small firms in the U.K.

Table 2. 1: Bolton Committee Definition of Small Firm (1971)

Sector	Definition
Manufacturing	200 employees or less
Construction	25 employees or less
Retailing	Turnover of £ 50'000 or less
Motor Trades	Turnover of £ 100'000 or less
Wholesale trades	Turnover of £ 200'000 or less
Road Transport	Five vehicles or less
Catering	All excluding multiples and brewery-managed houses

In this context, a specific firm can be considered small in a sector where the market size is large, where there are many strong competitors and another firm with similar size, in another industry sector, may be considered medium or large if there are few competitors with smaller firms in it.

Furthermore, it is acknowledged that in some instances size is defined by number of employees while in other instances is defined by turnover. In fact, criteria based entirely on the number of employees emphasise differences between capital and labour intensive firms, while criteria based just on turnover highlights the evolution overtime on a firm's business activity as well as differences between firms within a specific industry sector. In this context, the 1981 Companies Act, also in the U.K., defines small firm and SME combining both criteria, that is, financial situation and number of employees. This Report classifies small firm as an organisation that in two consecutive business years, two of the following three conditions are met:

- Turnover of £ 1.4m or less.
- Balance sheet total did not exceed £0.7m.
- Average number of weekly employees: 50 or less.

On the other hand, for “medium-sized” enterprises conditions are the following:

- Turnover between 1.4 and £ 5.75 m.
- Balance sheet total between 0.7 and £ 2.8m.
- Average number of weekly employees: between 50 and 250.

Moreover, the 1981 Companies Act makes no distinction between firms in different industry sectors.

In sum, these criteria can be termed as quantitative and therefore tend to disregard the fact that SMEs are heterogeneous and consequently if they are more or less small or medium that varies across industries.

More recently the European Union (E.U.) based implicitly on work done before setting out a single definition of SME to be implemented from January 1988 onwards across all EU programs and proposals, which is presented in Table 2.2.

Table 2. 2: Definition of SME (Small and Medium-Sized Enterprise), according to E.U. criteria

Criteria	Micro-enterprise	Small	Medium
Number of employees	<10	<50	<250
Annual turnover or total balance sheet	---	< € 7 m < € 5 m	< € 40 m < € 27 m
Independence	---	No more than 25% of the capital or voting rights held by one or more enterprises which are not themselves SMEs	

In this context, the EU criteria incorporate mainly quantitative measures and it is currently widely utilised. In addition, it recognises the heterogeneity of the SME sectors while emphasising their importance for employment and economic development, at country level.

In sum, in order to characterise an SME it is advisable to use both qualitative and quantitative measures. Thus, the following definition of SME, in line with the E.U., is proposed and will be used throughout the empirical investigation in this study:

- Organisational size: It has less than 250 employees.
- Independent status: No more than 25% of the capital or voting rights held by one or more enterprises which are not themselves SMEs (independence criteria used in the E.U.).

### 2.2.2 Definition of High Technology SMEs.

In today's modern societies the contribution to economic growth and development strongly depends on the generation of innovation and technological advances (ENSR, 2002). In this context, high technology SMEs are significantly involved in the development and implementation of technological innovations and therefore

contributing to the increasing well-being, employment and economic growth (OECD, 2005).

However, in the same way that is emphasised in relation to SMEs (see section 2.2.1) there is either no broadly accepted definition applicable to high technology SMEs both, in the academic literature, and in economic policy, in general (ENSR, 2002). For example, in the academic literature, once again, definitions vary by authors, nationalities, research focus and industries considered. In this context, over the years different names of high technology SMEs, used by different authors, have been proposed with often similar or related meanings such as, “new technology-based firms” (NTBFs), “high technology SMEs”, “knowledge-based firms”, “R&D intensive firms”, and so forth.

Efforts have been made in characterising, for the high technology innovating firm, the technological innovation involved in its products/processes. In this context, the technological product and process (TPP) innovating firm is “*one that has implemented technologically new or significantly technologically improved products and processes*” (OECD, 1997). In addition, this definition must be taken in a narrow perspective; that is the newness of the product/service and/or the process is applicable for the firm and not necessarily for the economy as a whole (ENSR, 2002). Indeed, what is considered today as high-tech may be considered low-tech tomorrow. Thus, high technology may be depicted in a temporal context.

In order to avoid these kinds of issues a second and different approach, very often used, is based on R&D intensity. R&D intensity is measured, in this study, and it will be presented in more detail in the following section, section 2.2.3, addressing “*research intensiveness*” aspects, by “*innovation input factors*” that are the R&D expenditures as a percentage of sales and by the human capital input that is the number or percentage of scientists, engineers and qualified personnel in R&D of a firm (ENSR, 2002).

In sum, high technology SMEs in this research are those R&D intensive, generally highly innovative and/or using complex production technologies (ENSR, 2002).

Overall, by comparing the two approaches, it can be concluded that the former has a much broader area of application since it includes firms implementing innovations even without conducting R&D or employing sophisticated technologies while the latter emphasises R&D aspects with the objective of creating new products and/or processes. In addition, firms belonging to some specific industry sectors characterised by being R&D intensive are considered altogether as high technology.

In this context, this study’s approach is based on R&D intensity and therefore those firms belonging to certain industry sectors are considered high technology.

The main advantage in applying this approach is that it allows a comparison of high technology sectors across different countries (Storey and Thether, 1998). In this context, within the E.U., eight industry sectors have been identified as high technology. These sectors represent 2 digit levels of NACE Rev.1 (Statistical Classification of Economic Activities in the European Community) and are identified in Table 2.3.

Table 2. 3: E.U. High Technology Statistical Classification of Economic Activities

NACE	DESCRIPTION
24	Manufacture of chemicals, chemical products and man-made fibres
29	Manufacture of machinery and equipment
30	Manufacture of office machinery and computers
31	Manufacture of electrical machinery
32	Manufacture of radio, television and communication equipment
33	Manufacture of medical, precision and optical instruments
72	Computer and related activities
73	Research and Development

Source: European Commission (2002) “High technology SMEs in Europe”, Observatory of European SMEs, No. 6

From Table 2.3 it can be concluded that “Computer and related activities” and “Research and Development” are service sectors, while the remaining six industry sectors are related to manufacturing activities.

Historically, high technology firms have been launched associated with the semiconductor industry and later to other sectors based on further developments of the semiconductor industry (Cooper and Bruno, 1977; Roberts and Wainer, 1968). Very often these sectors are termed as “information technology”. More recently, with the convergence of information technologies and telecommunications the industry is now known as the information and communication technology (ICT) sector. However, the identification of high and young technologies cannot be attributed solely to the electronics industry.

Indeed, although the importance of electronics to high technology sectors has been widely recognised, the emergence, for example, during the eighties, of biotechnology, laser technology, robotics and new materials was revolutionary in their own merits through the creation of new industry sectors (Shearman and Burrell, 1988). New technologies, due to their knowledge-base tend, over the years, to an increasing miniaturisation, which represents very attractive options for small firms. In fact, they may not require the huge investments in expensive equipments, as it was the case in the past in the production of electromechanical products.

The population of SMEs in high technology sectors can be considered very heterogeneous in terms of the way they currently function, the way they were founded, their organisational structures and the objectives and strategies that they pursue (Shearman and Burrell, 1988; Storey and Thether, 1998).

The literature generally acknowledges two different groups of firms: a first group includes the broader population of firms encapsulating the great majority of small and medium-sized enterprises operating in high technology industry sectors, while a second and much narrower group includes mainly new technology-based firms, which refers often to small firms, which conduct business activities in industry sectors, characterised by new and emerging technologies (Shearman and Burrell, 1988; Forrest, 1990; Goldman, 1982; Storey and Thether, 1998 ).

In this context, some authors (Rothwell and Zegvelld, 1982) using a broader perspective also consider as NTBFs, all young firms in high technology sectors irrespective if they

are or not developing new industries. In contrast, other authors (Shearman and Burrell, 1988) point out that high technology SMEs in comparison to NTBFs have more formal organisational structures even though both types of firms are characterised by being flat organisations with low hierarchical levels. In addition, both types of firms have a high degree of centralisation, often on the technical entrepreneur/CEO/ management team. Nonetheless, high technology SMEs may be more market oriented rather than technology led organisations, as NTBFs mainly are (Shearman and Burrell, 1988). In these circumstances, NTBFs refer only to firms focusing in the process of emerging industries (Shearman and Burrell, 1988). Thus, the number of firms, which comply with these criteria, is currently very small; all other firms may be considered as high technology SMEs (Shearman and Burrell, 1988).

In sum, this study addresses the overall population of high technology SMEs despite differences between NTBFs and other high technology firms. However, they often compete in the same market segments and may or may not have similar strategies.

This approach is seldom taken in other empirical studies, which are often characterised by using sample frames showing bias towards real NTBFs focusing on micro-enterprises (firms with less than ten employees) developing new and emerging technologies (Hoffman et al, 1998).

In the following subsections this study will present and discuss the main characteristics of high technology SMEs, while focusing on NTBFs, as a specific case within the wider population of high technology SMEs.

### **2.2.3 The Population of High Technology SMEs**

This section identifies the following main characteristics for the overall population of high technology SMEs: size, age and technological-base.

### Size

Throughout this chapter this study has already analysed issues related to firm size.

However, this research addresses a population of SMEs (firms with less than 250 employees) and therefore including from micro-enterprises (less than 10 employees), small firms (between 10 and 49 employees) and medium-sized enterprises (between 100 and 249 employees). In this context, it is reasonable to expect micro-enterprises to have very informal flat organisations with all the decision process centralised on the owner/ entrepreneur. By contrast in the medium-sized enterprises, mainly in high technology sectors, although they may remain entrepreneurial and relatively flat organisations with low hierarchical levels, there is a need for more formal organisational structures. This is an overtime established process, as a firm gets bigger. In this context, a challenge faced by entrepreneurs is how to establish a management structure, which complements their technical skills (Smith and Fleck, 1987).

Nonetheless, as the high technology SME size increases the owner/ entrepreneur acts in a way that the firm can retain the benefits of smallness remaining manageable and controllable as well being eligible to support programs currently set out by governments for SMEs (Smith and Fleck, 1987).

### Age

Currently, it is often assumed a close relationship between age and size of an organisation.

In fact, broadly speaking, large companies tend to be older than small ones. However, it cannot be inferred from this statement that small firms are always new organisations, since sometimes-mature companies may remain small, overtime. In this situation, to characterise a firm it seems necessary to take into consideration, in the analysis, both age and size since it is reasonable to expect that the importance of the entrepreneur tends to diminish as the firm evolves and grows. In this context, the study tries to accommodate the investigation both of young as well as mature high technology SMEs. However, in line with current research in high technology SMEs an upper age limit of 30 years will be applied. Nonetheless the evolution over the years of a 30 year old firm



is still traceable being this evolution led by the founder entrepreneur or a member of the founding team.

### Technological-Base

The technological-base is another key variable, which characterises a high technology SME. In fact, when doing a literature review a more or less explicit high technology emphasis can be identified. However, for the time being there is no single suitable definition of high-tech neither exists a definition how to operationalise it due to its multidimensional nature (Felsenstein and Bar-el, 1989). Nonetheless, Capon and Glazer, (1987) stress that technology can be defined by know how, that is all the information necessary to develop and deploy in the production of a product or a service. In this context, technology could be seen as the stock of relevant knowledge existent within the organisation, which allows new techniques to be used. Under these circumstances, knowledge can be identified at three levels within the organisation:

- Product/service technology that is the set of technological knowledge embodied in the product/service.
- Process technology that is the set of technological knowledge involved in the manufacture of the product/service or more broadly all the steps associated in process of product/service creation.
- Management technology as the set of management procedures throughout firm's value chain activities up to the sales and services of the product as well as the running and administration of the overall business (e.g. the management information system and the management control system).

*In this situation, a high technology firm is an organisation, which highlights the creation, development and/or production and selling of a product/service or process technology through the deployment of technological knowledge obtained by using of research and development (R&D) activities.*

In addition, in high technology sectors firms need to be innovative if they want to survive and to prosper, in the present and in the future. Often the issue of innovation

involves both generation of technological knowledge and the transfer of technology. While the former relates to R&D activities performed inside or outside the organisation the latter refers to the transfer of technology from outside sources.

### Research Intensiveness

Some organisational variables such as size, age and independence are easy to define and assess. By contrast, R&D intensiveness also termed in the literature as high technology or innovativeness is currently presented in a different way.

A distinction can be made between input, throughput and output innovation factors, at firm level (ENSR, 2002).

Innovation input factors include R&D expenditures as percentage of turnover and R&D personnel in terms of the percentage of scientists, engineers and other R&D personnel working in R&D functions to total number of employees. These indicators are very often used since they are easy to measure, while taking into account the actual working time of R&D personnel. However, they have the disadvantage of being less precise since they do not very often incorporate outsourcing R&D, which may be important for SMEs (ENSR, 2002).

Another approach is the *innovation throughput indicator* defined by the number or percentage of patent innovations. However, this factor has been widely criticised throughout the literature, mainly due to the fact that not all innovations are patentable as well as due to differences in the propensity to patent innovations across industries, products and process innovations, by firms, in different countries (OECD, 2005). Moreover, SMEs are currently less likely to use patent innovations or other forms of IP protection rather than larger and more established firms are (OECD, 2005). Thus, high technology SMEs do not often rely on these indicators to protect their core skills and resources and therefore they are only seldom used.

Last but not the least, innovation output factors are defined as share of turnover attributable to innovation, revenues by selling patents, licences, know-how and self-reported statements on innovation (ENSR, 2002). However, these indicators are also only seldom used since they are difficult to answer by respondents in surveys and

interviews, while presenting potential operationalisation problems. Nonetheless, as mentioned in the previous section, section 2.2.2, this study adopts innovation input factors to assess the research intensiveness of the high technology SME that are R&D expenditures as percentage of sales and R&D personnel that is the percentage of employees working in the R&D to the total work force.

#### **2.2.4 New Technology-Based Firms (NTBFs)**

Currently, NTBFs refer to a great variety of firms in high technology sectors that have in common being, small, new and innovative with a technological base at their core.

The term NTBF was first introduced by the consultancy firm Arthur D. Little (1977) in their pioneer study on new technology-based firms in the U.K and in West Germany. This study defines a NTBF as an independent owned business with a maximum of 25 years of age since its foundation, launched to exploit an invention or technical innovation and consequently assuming considerable technological risks. In this context, Bollinger et al (1983) and more recently Autio and Yli-Renko's (1998) study go even further by highlighting that NTBFs currently pursue the exploitation of a technically innovative idea while they can also be characterised by their proactive behaviour, that is, by being the first in the introduction of specific innovations in the industries where they are currently operating.

In sum, this definition of NTBF encompasses the ideas of young age, the importance of the individual/team of entrepreneurs, of his/her/their independent status while emphasising the ideas and/or the applications that the firm perform and develops to the successful market launching of their products/services rather than focusing on the source and nature of the technology used.

In sharp contrast to large firms whose innovation advantages are often scale – intensive, small firms, in line with the RBV, are characterised by strengths, which cannot be easily replicated by larger firms such as internal flexibility, strong technical specialised

expertise, entrepreneurial orientation and quick response to changing environment conditions (Autio and Yli-Renko, 1998).

Other authors (Shearman and Burrell, 1988; Rizzoni, 1991) emphasise the role of NTBFs as firms participating in the introduction of new and emerging technologies and often on the creation of new industries.

Taking the historical roots on the landmark study of A. D. Little (1977), already mentioned above, over the last thirty years or so systematic empirical research on NTBFs has been conducted, especially in the United States and Europe. These studies encompass a great variety of firms and research backgrounds since the concept of what is a NTBF is still subject to different definitions and interpretations. In fact, no standard of a NTBF has been adopted in the literature. Thus, different designations by different authors have been set out, such as:

- “New technology-based firms” (Bollinger et al, 1983)
- “New, technology-based firms” (Autio, 1997; Autio and Yli-Renko, 1998)
- “High technology small firms” (Oakey, 1991, 2003)
- “Small high technology firms” (Lang, 1996)
- “Early stage technology-based firms” (Preece et al, 1998)
- “Small technology-based firms” (Forrest, 1990)
- “Young technology-based firms” (Yli-Renko et al, 2001)

For example in the first two designations that are “New technology-based firms” and “New, technology-based firms” it is very ambiguous to assess to what these two designations exactly refer. Indeed, while the former may relate both to a young firm as well as to the “newness”/”innovativeness” of the technology of the firm the latter refers mainly to a young firm.

Currently, these designations focus on different organisational variables such as age (“New, technology-based firms”) size (“Small high technology firms”) and the “quality” and “intensity” of their technological-base (“Small technology-based firms, “New technology-based firms”).

In fact, in terms of “quality” and “intensity” of the technological-base one stream of research depicts NTBFs as firms at the boundaries of new technologies playing a critical role in the exploitation of new technologies and the creation of new industries (Rizzoni, 1991). Indeed, they are considered as drivers of new technological paradigms at the cutting edge of technology and being the first around the process of diffusion of new technologies and leading to a creation of new markets and new industries. In contrast, another stream of research encapsulates NTBFs as innovative firms operating in fast growing industry sectors where technology is not often stabilised yet. Thus, they can further take advantage on the evolution of technologies and the characteristics of market demand. In this context, NTBFs may adapt the characteristics of the product/service to the differentiated needs of different market niches. In addition, they may also specialise in the commercialisation of new technologies (Senker, 1985) and in doing so their strategies may be much closer to those pursued by the remaining population of high technology SMEs rather than on NTBFs implicit strategies.

In sum, this stream of research may be less enthusiastic but more pragmatic as it sees NTBFs as firms created in order to exploit a new idea or a new technological application that may lead or not to an emerging industry.

Overall, research on NTBFs conducted over the last three decades suggests that definitions and conclusions vary by author, research background and by the time frame of the study. Nevertheless, through the analysis of the sample frame utilised in different studies and by the main characteristics that they exhibit, it is possible to have a better understanding of what a NTBF is about.

A NTBF is characterised by being technology intensive where the “intensity”/“quality” of the technology can be analysed by the characteristics of its products. High technology products are considered those, which incorporate a high amount of scientific and technological inputs and/or based on a high rate of complex and changing technologies and/or new technologies.

Secondly, NTBFs are characterised by the high level of the technological skills of both the founder(s) and the group of qualified scientists and engineers. In addition, NTBFs

put R&D activities at the core of their activities. R&D includes not only in-house R&D but also contract R&D and co-operative R&D established with other firms.

Thirdly, NTBFs refer also to firms created by an entrepreneur or group of entrepreneurs emphasising aspects of independence and entrepreneurship in the way they are running the business. In addition, the profile of the entrepreneur or group of entrepreneurs is characterised often by being scientists or engineers coming from universities or large technological firms. Thus, NTBFs are often based on spin-offs from universities or medium and large technological firms.

Fourthly, they refer to firms which, can be identified as “high technology” or “new technology” or even “emerging technology” in high technology sectors, in general or in specific industries such as “information and communication technologies” (ICT), electronics, laser technologies, biotechnologies, scientific instruments, etc.

Fifthly, they are firms often-established in particular geographical locations such as around universities, innovation centres and science parks while constituting authentic geographical clusters and established with the support of incubators.

Finally, they are often funded by the use of venture capital since they are seen as high risk organisations.

### **2.2.5 Overall Characteristics of high technology SMEs**

In spite of the heterogeneity of the high technology SME sector the literature acknowledges that innovative activities of high technology SMEs tend to present similar characteristics across different industry sectors (Hoffman et al, 1998). For example, they tend to be more active in product innovation than in process innovation even though high technology SMEs mainly generate incremental innovations (Hoffman et al, 1998). In fact, for the great majority of high technology SMEs the focus is not to develop new and emerging technologies per se as it is sometimes the case of NTBFs (see previous

section 2.2.4); the focus is rather on the application of new technologies developed elsewhere or to complement and adapt internally core technologies developed by large firms. In this context, firms that may have limited in-house technological resources can nevertheless survive if they are able to build, develop and maintain a network with other firms in order to put and implement technologies externally obtained. Thus, it seems important that high technology SMEs have the ability to find select and transfer technologies from the outside (Hoffman et al, 1998).

Often high technology SMEs do not have production internally in order to avoid the investment on expensive facilities and equipments as well as because those investment expenditures are not critical for their business.

Under these circumstances, high technology SMEs are characterised by being research intensive, definition that is in line with some authors (Storey and Tether, 1998), that takes into consideration, implicitly, technology development, while avoiding the controversial discussion of what constitutes or not high technology.

In sum, the high technology SME in this study is characterised by:

- Organisational size: It has up to 250 employees, according to the E.U. definition.
- Independent status: No more than 25% of the capital or voting rights held by one or more enterprises which are not themselves SMEs (independence criteria used in the E.U.).
- Organisational age: It has up to 30 years of age. The focus of the study is on firms which can be situated in a continuum ranging from a young NTBF with one year of age to a mature market led SME with up to 30 years of age. Empirical evidence suggests that often NTBFs and high technology SMEs compete in the same market segments targeting the same customer groups.
- R&D intensity: Currently conducts R&D activities and can be more or less research intensive.
- Foundation and management style: created by an entrepreneur or group of entrepreneurs emphasising aspects of independence and entrepreneurship in the way they are running the business.

- **Product/service technology:** Creates, develops and sells marketable products/services with a high degree of technology content.

In this context, pure service firms (e.g. training and consultants), pure retailers and distributors of high tech products/services and non-profit organisations are out of the scope of this study (Hoffman et al, 1998).

## **2.3 Potential Strengths and Weaknesses of High Technology SMEs**

This section identifies and examines strengths and weaknesses, which currently characterise high technology SMEs, which may represent key resources to give a firm superior competitiveness to act in domestic or foreign markets (Barney, 1991; Wernerfelt, 1984).

### **2.3.1 Weaknesses of High Technology SMEs**

#### **2.3.1.1 Financial Shortages**

Shortages of financial resources are considered an inhibiting factor to the growth and development of SMEs. Thus, it may restrict SMEs to exploit market opportunities (ENSR, 2002).

The access to finance is even more difficult in the case of SMEs operating in high technology sectors, since innovation projects that they develop are characterised by being high risk that is associated with uncertainty of the expected returns. Uncertainty in technology development has a consequence, for high technology firms: the time period between product/service developments until its launch in the market is often quite long.

Secondly, investors often have problems in assessing the “quality” of the investment, since high technology sectors may be too complex for outsiders. Thus, the perceived risk of such investments may be considered high or sometimes too high.



Thirdly, high technology SMEs are also characterised by the importance given to intangible assets in comparison to tangible assets. Intangible assets include ideas, technical skills and expertise, which are more difficult to understand and value for investors in comparison with firms, which base their activity on physical assets. Thus, firms which own tangible assets such as land, buildings and equipments, which can be offered as a security, are likely to find it easier to raise funds rather than firms in high technology sectors whose assets are often mainly intangible.

Nonetheless, in high technology sectors it seems important to take into consideration differences in terms of investments required, such is the case of the software sector compared to the biotechnology sector. While the former only requires a well-equipped PC infrastructure associated with a skilled labour force to develop high performing products/services the latter requires the need to invest in very expensive analytical equipments associated with a very skilled team of scientists and engineers. Thus, biotechnology firms need to have a strong finance resource-base once they have costly and long-term R&D projects. By contrast, the investment needed at start-up for certain types of knowledge-base firms may be relatively small (Laranja, 1995).

Fourthly, sometimes the returns on the projects conducted by high technology SMEs may not be protected against copy and imitation due to the opportunistic behaviour of other firms. Therefore, protection is limited and consequently they may need to share the earnings of a project with other firms while reducing their own profitability.

In sum, empirical evidence shows that access to finance is more difficult for firms, which are small operating in high technology sectors and with strategies based on intangible assets. In fact, once fixed assets of high technology SMEs are not significant they are seen as risky and consequently they must pay a premium for cash or other credit lines obtained from banks, suppliers or other firms.

In a macro-environment characterised by a slowdown or even recession of the world economy, the downturn of the technology sectors associated with an unfavourable business climate (e.g. events of 11<sup>th</sup> September 2001) is assessed by investors, for

example, as concerns high technology SMEs as risky and consequently they refrain to lend cash or credit lines to firms, which they foresee as too risky.

Westhead et al (1995) study suggests that shortages of financial resources represent a constraint to the growth and development of technology-based firms. Thus, the study concludes that the more complex and/or risky the project is the more difficult to fund it is. In addition, the access to new markets is considered to be especially high-risk and consequently very often investors are reluctant to provide funding for those activities.

The importance of finance to high technology SMEs may also differ with the business life cycle. In fact, for innovative firms, start-up and commercialisation phases might be the most difficult stages of the life cycle to fund their activities (ENSR, 2002).

Last but not the least empirical evidence shows that banks are the main source of finance to different types and sizes of small firms (Jarvis, 2000). In addition, small firms are considered more risky than their large counterparts. Therefore, this tend to lead to short-term rather than long-term lending by banks, which represent an additional obstacle to small firms operating in high technology industries. Moreover, generally banks do not have the qualified staff to assess, in a rigorous way, innovative investment projects and their associated risks. In this context, due to specific issues addressing the needs in financing high technology SMEs, venture capital and “business angels” may be more appropriate forms in financing their activities (ENSR, 2002).

Venture capital is “*finance provided to unlisted companies by specialist financial institutions*” (Jarvis, 2000 p: 347). Venture capitalists tend to be involved in high-risk investments in different forms such as support to entrepreneurs, financing start-ups, developing businesses in different phases of the life cycle. On the other hand, “business angels” are considered source of informal finance from wealthy individuals with high business and entrepreneurial experience who invest their own funds in start-ups, early stage or expanding firms. In comparison to venture capitalists they have a high degree of involvement in entrepreneurial matters and how to manage the business.

However, it is not advisable to put too high expectations in venture capital and “business angels” in financing high technology SMEs. In fact, empirical evidence

shows that venture capital, mainly in Europe, is only available to a limited number of firms. In addition, the amount of capital needed by small high technology firms in certain knowledge-based industries and especially in the start-up phase might be too small to deserve the interest of a venture capital firm (ENSR, 2002).

As far as business angels are concerned empirical evidence shows that their contribution to the finance of small firms is much greater than venture capital. Nonetheless, a survey, in the U.K., of the ESRC (1996) discloses that business angels provided only 4% of funds for the sample of firms included in the study. Thus, the overall contribution of business angels to the finance of SMEs could be considered small.

### **2.3.1.2 Marketing Liabilities**

The critical role of marketing to firm's innovation and overall success is well documented in the literature (Roberts, 1991; Laranja, 1995; Dutta et al, 1999). However, small high technology firms lack the necessary marketing skills, at least in the early stages of the new venture (Roberts, 1991; Laranja, 1995).

Entrepreneurs, in general, have predominantly a technical profile emphasising the technological aspects of the business while neglecting marketing aspects. For example the SAPPHO studies, conducted in the UK, during the seventies concluded that successful high technology innovators have a better understanding of customer needs emphasising extensive marketing efforts (Rothwell, 1972, Rothwell et al, 1974).

However, often high technology firms, at least in their early stages, are technology led organisations while lacking the necessary resources to address customer needs in specific market niches (Roberts, 1991).

Although high technology sectors are highly heterogeneous they are generally characterised by market uncertainty, technology uncertainty and competitive volatility (Allen, 2003). Market uncertainty refers to the difficulty in addressing customer needs, by using a specific technology application. This situation is even exacerbated in the case of new technologies that customers are not aware of unless they get the adequate

knowledge. In addition, customers' posture may be sceptical until they are assured that the particular new technology will be a standard within the industry.

On the other hand, technology uncertainty refers to whether the new technology, delivered by the high technology firm, meets or not customers' expectations. Although customers, generally business organisations, are expecting the new technology to make their business more productive, the real situation is often the opposite since they need to give training to employees and settling problems that may arise in the adoption of the new technology. In addition, customers might be also concerned with the short life cycle of technologies and simultaneously without knowing how soon the technology recently developed will be considered obsolete and replaced by a newer technology in a context of dramatic technological changes. This fact gives serious concerns to the return that will be achieved on the investments conducted by high technology firms.

In sum, market needs are often latent and ill defined and customers' behaviour is volatile and unpredictable. Therefore, it is often quite difficult, for high technology firms, to build a strong customer base. In a similar vein, competition is very harsh and volatile and competitors, for a new technology, may be new comers to the industry. These new competitors may develop innovations not based on current competitors' approaches; instead new competitors may create value by making the technology more desirable to customers (Allen, 2003). In this context, the challenge for entrepreneurs, in high technology sectors, is to find unique market niches that take into consideration market, technology and competitive uncertainties to the survival and growth of the high technology firm (Allen, 2003).

Currently, the aim of high technology firms is to create, develop and deliver new products/services and systems. In order to succeed they should address at least apparent or latent customer needs. One of the main tasks of marketing, within the high technology firm, is to predict and evaluate the wishes and the needs of its current, potential and future customers. In this context, high technology firms must possess the necessary marketing skills, which allow them into understanding current and future customers needs and embodying these concepts and ideas into firm's products/services and systems.

## **2.3.2 Potential Strengths of High Technology SMEs**

### **2.3.2.1 Marketing Resources Development through Flexible Specialisation and Targeting Specific Market Niches**

Currently, the identification and selection of specific market segments is particularly critical to the success of high technology SMEs. They can achieve competitive advantage in targeting specific market niches even in industries dominated by large MNEs (Smith and Fleck, 1987; Dodgson, 1991; Dodgson and Rothwell, 1991; Robertson, 1991).

High technology firms may be highly specialised either in the scope of the activity and in the stage in the production cycle. Thus, they may conduct business in niche markets, supplying differentiated products/services in relation to their direct competitors.

Empirical investigation conducted by Monck et al (1988) gives evidence that although small high technology firms operate in very competitive markets many of the firms surveyed in the study consider that they were not competing in very crowded markets. This may reflect that small high technology firms have identified a specific market niche and oriented their offer to supply the needs of that niche. In this context, small high technology firms can be very successful if they are able to exploit the “right” market segments often characterised by their limited size, complexity and specificity. In addition, this type of market segments may not be the focus of interest of large volume-based firms.

In sum, high technology SMEs , when endowed with strong marketing resources often achieve competitive advantage by being more flexible in addressing specific customer needs of their target segments and by offering very differentiated and reliable products and services.

Roberts (1991) study goes even further by suggesting that as high technology SMEs expand and grow, most begin to address different market segments characterised by different needs. This represents a challenge for high technology SMEs since they are

more used to adjust to technical change rather than market change. In this situation, some of its observed competitive advantage may change from technological innovation towards customer-orientation or more precisely customer-service (Warren and Hutchison, 2000). These authors suggest customer-service to be critically important on the successful acceptance of a firm's new product on the market.

Indeed, nowadays customers have a wide range of available products to choose and therefore becoming more interested in issues such as service.

In short, high technology SMEs market and sell their products to other firms (Smith and Fleck, 1987). Their business models call for operating in market niches where there is no strong competition, supported by a specific technology and characterised by highly specialised and differentiated products.

#### **2.3.2.2 The Management Philosophy of High Technology SMEs: Leveraging Technological and Marketing Resources**

Research on small high technology firms suggests that over the years as the business grows its organisational structure needs also to grow and adapt, taken into consideration firm and environmental changes (Berry, 1996; Shanklin and Ryans, 1984). Often few years after foundation high technology firms need to evolve from technology led to market oriented organisations. Thus, strengthening intra-organisational links between R&D efforts and marketing and sales activities seems critical to the small high technology firm success. In this context, high technology firms must shift the focus from inward orientation, emphasising inventiveness alone, to outward orientation addressing customer needs in specific target segments (Roberts, 1991). In this situation, a change of management practices seems necessary while emphasising a marketing orientation approach if the firm wants to survive and to prosper, in short and medium term (Berry, 1996; Maidique and Hayes, 1984).

For example, Frauenfelder and Meier's (1998) study, quoted in ENSR (2002) about an analysis of young Swiss technology-based firms, classified firms within a sample in

different clusters ranging from “*customer-oriented niche providers*” till “*pure technology specialists*”. The study gives evidence that the first group operating in relatively stable markets addressing customer needs in their target segments was considered the most successful group. In contrast, “*pure technology specialists*” characterised by careless market segmentation, lack of customer focus and weak marketing resources was considered the least successful group even though they had a very strong technology focus.

In terms of management practices one typology used to classify high technology firms is the one proposed by Shanklin and Ryans (1984). They identify high technology firms as either “*market-driven*” or “*innovation-driven*” organisations.

In market-driven high technology firms R&D mission is to create innovations, which achieve specific market objectives through the use of traditional marketing research tools. By contrast, in innovation-driven high technology firms do not take, at least initially, customer needs into consideration in their R&D programs. Only when the R&D program is finished or almost finished “*innovation-driven*” organisations think on the best ways to commercialise their innovations. In addition, they do not rely on marketing research studies and techniques to sell their products/ services on the market.

A high technology SME cannot rely on exploiting alone its technological expertise if they want to achieve success, in medium and long-term (Berry, 1996). On the contrary, as the company evolves and eventually grows while addressing the needs of its niche markets in a context of increasing levels of competition. In this situation, the high technology SME may be better off adopting a market-oriented philosophy incorporating technical and marketing elements in the long-term strategy, explicitly or implicitly, formulated for the firm (Roberts, 1991).

However, in real life there is no black or white situation for firms, which are either “*market-driven*” or “*innovation-driven*”. In fact, a third group of high technology firms can be considered, which act as market led organisations, while emphasising their technological expertise in terms of gaining competitive advantage.

Berry's (1996) study points out that successful high technology small firms overtime evolve and grow from an initial starting point, based on a distinctive internal technological-base underpinning the business, at least in early stages, towards outward market-driven organisations as technologies become mature, associated with an increasing need to find new markets and in order to get the returns from R&D investments. Therefore, technology push strategies might be more adequate when technologies are new to the market (Perrino and Tipping, 1989). By contrast, when technologies become mature, associated with an increasing competition within the industry marketing-pull strategies may be more suitable if the firm wants to succeed. In addition, the identification of marketing opportunities to guide the overall R&D efforts may be also critical.

In sum, in early stages high technology small firms concentrate on innovativeness and technological competences focusing on R&D activities. Thus, technological aspects drive the overall business. Over time as firm evolves and eventually grows and current technologies become mature there may be a shift on R&D focus from radical and new technologies towards incremental innovations eventually to adapt and update firm's current product line (Berry, 1996).

### **2.3.2.3 The Entrepreneurial Orientation of High Technology Firms**

As defined earlier, in section 2.3.2, a high technology firm is mainly characterised by the creation and development of a product/service or a technological process through the deployment of technological knowledge obtained by using research and development (R&D) activities. Thus, innovation is critical, for high technology firms, in launching new products/services or technological processes in new or existent markets. In fact, Schumpeter (1934, 1942) was the first to emphasise the creation of wealth in societies when current markets were disrupted by the introduction of new products, services or technological processes, which have impact on economic growth, development and well-being. In addition, Schumpeter (1942) considered the role of innovation as part of the entrepreneurial process in a context of an economic system of



“*creative destruction*”, evolving overtime. These entrepreneurial processes are the basis of the firm strategy-making decisions (Lumpkin and Dess, 1996) and might reflect, firm’s organisational patterns, methods and management styles in acting entrepreneurially (Stevenson and Jarrillo’s, 1990). These attitudes and behaviour are also termed as firm’s entrepreneurial orientation (Lumpkin and Dess, 1996). In this context, an entrepreneurial firm is one that “*engages in product market innovation, undertakes somewhat risky ventures, and is the first to come up with proactive innovations, beating competitors to the punch*” (Miller, 1983: 771). Consequently, Miller’s (1983) study considered *innovativeness, risk-taking* and *proactiveness* as dimensions characterising and testing the concept of entrepreneurship. More recently other researchers have adopted Miller’s (1983) original conceptualisation (e.g. Covin and Slevin, 1989, Naman and Slevin, 1993).

For example, Covin and Slevin’s (1989) study, investigated performance issues of entrepreneurial firms in hostile and benign environments. In their study “*entrepreneurial strategic posture*”, a similar concept of entrepreneurial orientation, was measured using a scale, which ranked firms as entrepreneurial if they were *innovative, risk-taking* and *proactive*.

In sum, firms characterised by entrepreneurial orientation are innovative that is they emphasise product-market or technological innovation. In addition, they pursue high-risk projects with chances of very high returns where bold wide-ranging acts are common practice. Furthermore, entrepreneurial firms often try to go ahead of competitors in product novelty or speed of innovation. In order to reflect this strategic posture they stress technological leadership and research and development activities (Khandwalla, 1977). These are typically the attitudes and behaviour of high technology firms. Thus, high technology firms are characterised by being entrepreneurial organisations.

Although, entrepreneurship so far, in this study, is presented at firm level, traditional entrepreneurship models and theories currently focus on the characteristics and profile of the entrepreneur.

Currently, entrepreneur’s skills can be measured by firm’s performance even though firm’s performance is dependent on organisational and individual attitudes and

behaviour (Kuznetsov, McDonald and Kuznetsova, 2000). In fact, individual behaviour, by the entrepreneur, might affect organisation actions. Thus, the organisation may be considered an extension of the entrepreneur.

Finally, entrepreneurial firms are those in which the entrepreneur/ chief executive has a management style characterised by being innovative, proactive with a high propensity for assuming high-risks in the way he/she manages the business. In addition, this entrepreneurial orientation posture may be particularly appropriate for small firms acting in very dynamic and unpredictable market environments as it's the case of high technological firms (Covin and Slevin, 1989). Moreover, it is reasonable to expect, successful firms in hostile market environments to orient their competitive efforts to obtain or maintain competitive advantage (Covin and Slevin, 1989).

#### **2.3.2.4 The Technical Entrepreneur**

The entrepreneur can be considered an extension of the firm and simultaneously it's most valuable resource (Bruderl and Preisendorfer, 2000; Bruderl et al, 1992; Cooper and Bruno, 1977). The role of the entrepreneur is key in the case of small firms since he/she is simultaneously in charge of creating and developing the vision, mission, business strategy and leadership for the firm.

Entrepreneurs can have different backgrounds such as scientific, technical, academic or industrial. Nonetheless, the technical entrepreneur has very often a background in science and engineering disciplines (Knight, 1986). Furthermore, management disciplines are very often areas of weakness for technical entrepreneurs. Therefore, technical entrepreneurs tend to overemphasise the technological component of their business while neglecting other key strategic areas (Segal, Quince and Partners, 1985).

Overall the entrepreneur must have a sense of achievement and leadership, high skills and resources and possess a network of personal contacts (Kuznetsov, McDonald and Kuznetsova, 2000). These networks of contacts may represent the firm's initial

customer base (Smith and Fleck, 1987). Indeed, for example in high technology sectors, where it is critical to develop and market new technologies, the entrepreneur should have a high level of technical expertise in order to take full advantage of the potential of the technology that the firm deploys in the manufacture of its products/ services (Oahey, 1995, 2003). In this context, the competitiveness of high technology firms is often based on the technical knowledge and expertise of the entrepreneur.

Despite the key importance of the technical entrepreneur with his/her creativity, innovative ideas and technological expertise, mainly after inception of the new venture, these technical skills alone, will not be enough to develop the business, in the medium and long-term. Thus, a diversified senior management team with complementary skills and resources will be a success factor to move a firm forward from a technology-based start up to a market led high technology SME (Cooper, 1973; Smith and Fleck, 1987).

Another key characteristic of the technical entrepreneur is a high level of education (Hofmann et al, 1998, Storey and Thether, 1998; Cooper, 2000). In addition, after finishing studies very often most entrepreneurs start working for other organisations before establishing their own business.

Empirical studies suggest that as much as just over 80% of founders set up their own business in similar market segments and/or deploying similar technologies (Cooper and Bruno, 1977; Roberts, 1991; Cooper, 1998). In spite of the risk associated with the business venture, the knowledge and experience of the industry sector by the entrepreneur coupled with his/her skills and expertise may allow the reduction of uncertainty of the high technology firm.

The literature generally acknowledges that the skills and expertise of the entrepreneur are the result of a process obtained over time through personal experience before and after inception of the new venture. Indeed, founders have a propensity to start ventures in technologies, markets and geographical areas in which they have experiential knowledge (Vesper, 1980). Thus, experience is viewed as a stock and therefore the focus is on identifying all the components of the individual experience that may influence venture performance (Reuber and Fischer, 1999). This influence can be

obtained through the development of experiential expertise. Founders experience can be analysed by the duration or by the diversity of the experience. While the former relates, for example, to work and industry experiences, the latter emphasises aspects such as experience of the entrepreneur/ CEO/members of the management team in different functional areas, industries or organisations (MNEs, large firms, SMEs, small businesses).

Reuber and Fischer's (1997) study suggests that small firms with a more international experienced management team achieve a higher and earlier degree of internationalisation compared to those firms, which have a less experienced one. Similarly, Schoonhoven et al (1990) conclude that previous experience in a start up as well as in a same industry enhance entrepreneur skills and expertise, which in turn will have a positive effect on performance. These conclusions were also reported in other studies (Cooper and Bruno, 1977; Jones- Evans, 1996).

## **2.4 The Market Environment of High Technology SMEs**

### **2.4.1 Introduction**

Some authors argue that internal factors are more important determinants of innovation than external factors (Hoffman et al, 1998). However, many high technology SMEs establish a great variety of external linkages with other organisations for different purposes. These organisations can be other firms, universities, banks, venture capitalists, and research institutions and may represent important sources to high technology SMEs to get access to finance, technology, and new markets meaning to overcome some liabilities, highlighted in the previous section (section 2.3).

In fact, an innovation however often based on the creation of knowledge, within the high technology SME, receives the contribution of a multitude of actors outside the firm. Thus, firm's innovation success depends, to a great extent, on its access and acquisition to different types of knowledge held by external organisations. Nonetheless, the management of those external linkages is not straightforward and is obtained at a

cost requiring considerable technical and management efforts and resources of the high technology SME (Hoffman et al, 1998).

#### **2.4.2 The Importance of External Linkages**

External linkages allow high technology SMEs to get access to knowledge and complementary resources possessed by other organisations in the same or related industries. The increasing complexity of technological products and systems and the huge amounts of investments required in innovation projects calls for cooperation between firms. This, allows companies to reduce investments while sharing risks. In addition, SMEs are characterised by several behavioural advantages, in comparison to large firms, throughout the innovation process.

SMEs are flexible organisations with open management style, enjoying good intra-firm communication and responding quickly and efficiently to changes on the market (Rothwell and Dodgson, 1991). On the other hand, SMEs are not very keen on assuming substantial risks in relation to a portfolio of new products as well as in funding long-term R&D projects (Rothwell and Dodgson, 1991). Furthermore, often SMEs have difficulties in establishing the adequate external linkages with different sources of scientific knowledge and technological expertise. This network of contacts could be seen as very important, for high technology SMEs, in terms of technological knowledge accumulation since in-house technological resources are complemented with external know-how. Moreover, Rothwell and Dodgson (1991) make the distinction between “significant” innovators and “incremental” innovators concluding that empirical data suggest that those firms creating significant innovations present more external linkages than incremental innovators.

In sum, cooperation with other organisations allows innovative SMEs to complement their in-house R&D efforts (Rothwell and Dodgson, 1991).

In this context, high technology SMEs may establish specific networks for different purposes. In fact, in a PriceWaterhouse Coopers (2001) study of 351 high technology

SMEs, 75% of the respondents answered that they had established different kinds of alliances with partners in order to spread R&D costs, increasing their internal capability-base and entering in new markets.

Broadly speaking, empirical evidence suggests that customers and suppliers are the most common partners of high technology SMEs (ENSR, 2002). However, different kinds of collaboration may happen in different markets and in different value chain activities (Jones, 1999).

### **2.4.3 External Linkages with Large Firms**

A special focus of attention can be given to large and small firms once both can make substantial contributions to industrial technological innovation, at country level.

These contributions vary from sector to sector and can change over the life cycle of technologies and industries. In this context, Smith and Fleck (1987) emphasise the importance of linkages between small high technology firms and large enterprises irrespective of them being customers, suppliers, distributors or even potential competitors.

In a similar vein, Olleros and MacDonald (1988) argue that alliances between small and large firms allow large firms to exploit new technologies in new industries while minimising internal organisation diversification and financial exposure. Similarly, Hlavacek, Dorey and Biondo (1977) argue that there is often a feasible strategy in the case of a new product joint development and its commercialisation where the high technology SME provides the technical expertise while the large company makes available its marketing and sales resources. This is often the case in the biotech industry where the small firm is responsible for the overall process of research and development using its technical expertise while the pharmaceutical company with its strong market and financial resource-base will be responsible for further marketing and sales activities.

In sum, a challenge to high technology SMEs is on how they can access and integrate knowledge provided by other organisations allowing them to overcome resources deficiencies. This type of practices will enable high technology SMEs to reduce problems associated with high costs and risks. Furthermore, activities previously owned by a single firm such as R&D and production are currently shared between different firms specialising in different value chain activities. In this context, the high technology SME is ready to sacrifice autonomy in the process of creation and diffusion of technology with other organisations, because sharing control with them may be the best option in order to retain the possible control of its overall business (Dodgson, 1991).

Nonetheless, as Garnsey and Wilkinson (1994) pointed out, small firms should avoid to be locked into complex and exclusive joint ventures with other firms such as manufacturers or even customers. This may be cause of diseconomies of scope in the development of new technologies, because they may be too narrowing focused on the needs of a particular firm or customer, while neglecting the overall market.

Broadly speaking, linkages with large firms may be essential for small firms in order to provide the access to different types of resources and knowledge but, on the other hand, may create dependencies, which could jeopardise their long-term prospects.

There are two opposite views on how to position small high technology firms in relation to their environment (Autio, 1997). The traditional approach analyses high technology firms in a framework of broadly stable and well-defined markets and industries. Thus, small high technology firms are positioned to serve these markets in cooperation and/or competition with other firms depending on the circumstances. The pattern of cooperation vs. competition is dictated by the explicit or implicit strategy of the high technology firm.

On the other hand, the alternative approach, applicable mainly to the population of NTBFs, put in first place their technological-base. In fact, the main purpose of technology-based firms is to take advantage of their technological-base and consequently this perspective is internal oriented, to the fulfilment of their objectives. Furthermore, the market is not seen as a market as such, rather as a set of potential

customers and partners from a broad range of industries (Autio, 1997). In this context, technology-based firms develop their activities through close relationships with their customer-base through customer specialisation in order to avoid competition from different types of firms. In addition, contrary to current perceptions NTBFs may not be growth oriented, but the market-niches where they are active are so small that economies of scale and scope are often not applicable.

#### **2.4.4 The Role of Universities and Research Institutions**

Universities and Research Institutions represent an enormous source of knowledge for high technology SMEs. However, empirical studies suggest that external linkages between high technology, mainly small firms, and universities are quite limited.

For example, only 10% of innovative firms within the E.U. had cooperative agreements with universities and public research institutions in 1996 (ENSR, 2002). Therefore, small high technology firms are not conscious about the potential benefits that universities can bring to them. In addition, universities/research institutes and firms have different organisational cultures and objectives. In fact while the former emphasise research oriented towards academic aims the latter stresses practical research associated with business profitability.

Finally, in so that high technology SMEs become attractive partners to universities they should have some resources such as scientific personnel, availability of funds and technical equipments, especially in some industry sectors (e.g. biotechnology).

However, often small firms lack these types of resources making cooperation with universities/ research institutes even more difficult.

Overall, empirical evidence shows that for an effective and efficient cooperation with universities two prerequisites are important; they are physical proximity and personal relationships. In fact, physical proximity means that firms located in science parks are better able to take advantage of universities and research institutions. In addition,



personal relationships are also key to the development and implementation of common projects.

#### **2.4.5 The Incubator and the Pre-State of High Technology SMEs**

High technology SMEs tend to exploit technology and/or markets similar to the firm where the entrepreneur worked before founding his/her own business. Currently, this organisation is referred as the incubator. In addition, it is widely recognised as an important factor in the formation and nature of the small high technology firm (Cooper, 1973; Dodgson and Rothwell, 1990). Moreover, the incubator can be a firm, a non-profit research laboratory or an academic institution. In this context, it is not surprising that often entrepreneurs while launching new ventures target similar market segments using the same technologies as the incubator organisation.

The influence of the incubator may go far beyond the initial phase and the nature of the new, technology-based organisation and may have a significant influence in its evolution, in short and medium term (Fontes and Coombs, 1995).

Often high technology SMEs not only exploit technologies or markets similar to those where the incubator conducts business activities but also the new venture may also be active on the transfer of technology from the incubator.

#### **2.5 Summary**

Chapter 2 has reviewed the literature in relation to the main characteristics of high technology SMEs. In this context, it has examined the three objectives presented in the introduction of this chapter through the definition, identification and isolation of key characteristics of high technology SMEs, which are critical for the empirical part of this study. Furthermore, this chapter has identified some of their key strengths and weaknesses. This will be further developed in Chapter 3 in order to isolate those potential strengths and liabilities, which may give the high technology SME competitive

advantage *vis-à-vis* their competitors and therefore it, can be an important determinant of the firm's international performance.

This chapter has considered the population of high technology SMEs as including two main groups of firms. One group includes new technology-based firms, a group, which refers mainly to small firms, which conduct business activities in industry sectors, characterised by new and emerging technologies. On the other hand, the other group includes a much wider population of firms encapsulating all the remaining small and medium-sized enterprises operating in high technology industry sectors.

Although no accepted definition in the academic or economic areas of what constitutes a high technology SME exists, key organisational characteristics are: size, age, and technological-base and R&D intensiveness.

Potential weaknesses of high technology SMEs may include shortages of financial, marketing and management resources.

On the other hand, potential strengths can be considered the external linkages with other organisations (e.g. customers, business partners) and their flexible specialisation and market niche orientation. In fact, the identification and selection of specific market segments is particularly critical to the success of high technology SMEs. They can achieve competitive advantage *vis-à-vis* their competitors in targeting specific market niches even in industries dominated by large MNEs. Thus, they may conduct business in niche markets, supplying differentiated products/services in relation to their direct competitors.

The management philosophy of high technology SMEs is also important to emphasise the leveraging of technological and marketing resources as well as firm's entrepreneurial orientation. The former stresses that the high technology SME might be better off adopting a market-oriented philosophy incorporating technical and marketing elements in the long-term strategy, explicitly or implicitly, formulated for the firm (Roberts, 1991) while the latter characterises entrepreneurial firms by being innovative, that is, they emphasise product-market or technological innovation. In addition, they

pursue high-risk projects with chances of very high returns where bold wide-ranging acts are common practice. Furthermore, entrepreneurial firms often try to go ahead of competitors in product novelty or speed of innovation (Miller, 1983).

Nonetheless, the key element in the management philosophy of a high technology SME is the technical entrepreneur/ management team with its background and expertise. In fact, the accumulated human capital of the entrepreneur with his/her high level of education, working and industry experiences associated with the capabilities (e.g. finance, marketing and technological-base) developed overtime by the high technology SME may emerge as potential key characteristics and determinants of future firm performance.

Some authors argue the importance of internal factors for innovation. However, many high technology SMEs establish a great variety of external linkages with other organisations for different purposes. These organisations can be other firms, universities, banks, venture capitalists, and research institutions and may represent important sources to high technology SMEs to get access to finance, technology, and new markets.

The following chapter by applying the Resource-Based View of the Firm (RBV) examines some of those strengths and weaknesses, put forward in section 2.3, of this chapter, which may be understood as key resources of high technology SMEs explaining why, in the same industry, some firms consistently outperform others.

## **Chapter 3: Resources and Capabilities of High Technology SMEs**

### **3.1 Introduction**

Chapter 2 has reviewed the literature on SMEs and high technology SMEs. Chapter 2 has also described main characteristics of high technology SMEs by identifying current strengths and weaknesses. This approach has prepared the ground to the current chapter where by applying the Resource-Based View of the Firm (RBV) it examines some of those strengths and weaknesses, which may be identified as key resources of high technology SMEs explaining why, in the same industry, some firms consistently outperform others.

Resources represent, basically, firm's attributes both tangible (e.g. financial) and intangible (e.g. marketing, technological, and organisational and individual) that firms use to develop and implement their strategies. In fact, those attributes of a firm that enable it to effectively and efficiently deploy resources and transform them into products and services which fulfil the needs of end customers are currently called capabilities (Amit and Schoemaker, 1993; Grant, 1991).

Nevertheless, since this study is based on perceptions, opinions and attitudes of CEOs of high technology SMEs (see chapters 6 and 7) regarding mainly to intangible assets that firms use to develop and implement their strategies, therefore throughout this research the term *resources* will be used instead of capabilities.

After these quick remarks this chapter is organised as follows: Section 3.2 emphasises the importance in recent years of the RBV by different streams of research in economics, industrial organisation, and organisation science as well as in some areas of management. In addition, section 3.2 also presents both the descriptive and prescriptive values of the RBV while discussing if the RBV is already a theory of the firm in strategic management.

Section 3.3 describes different classifications of resources and their main characteristics according to the different perspectives provided by different authors. Furthermore, section 3.3 adopts Miller and Shamsie (1996) categorisation of resources to emphasise

the role of both property and knowledge-based resources, which may be relevant to the high technology SME performance, as presented later in section 3.6.

Section 3.4 positions the “broad” (Barney, 2001) or “modern” (Rugman and Verbeke, 2002) RBV in relation to Industrial Economics, Neoclassical Theory and Evolutionary Economics.

In fact, the literature on strategic management acknowledges some commonalities as well as some differences between the “broad” RBV and those three streams of research.

In this context, section 3.5 examines those three streams of research and presents the main theoretical principles of the RBV which underpin this study.

Section 3.6 can be considered the main part of this chapter since based on Miller and Shamsie (1996) characterisation of property and knowledge-based resources it proposes a set of resources, both at firm and individual levels, which may give the high technology SME superior international performance. All these constructs will be operationalised in the Methodology chapter (chapter 6).

Finally, the chapter concludes with section 3.7 where summary and main conclusions will be presented.

In sum, the objectives of this chapter are threefold:

The first objective is to present the descriptive and prescriptive perspectives of the RBV as well as to describe and review different classifications of resources proposed by different authors throughout the literature, using the RBV. After conducting those tasks this study adopts Miller and Shamsie (1996) typology of resources in order to identify and distinguish property and knowledge-based resources specific to high technology SMEs. In addition, in each category, two different types of resources are proposed being discrete and systemic resources.

The second objective is to review and analyse the “broad” RBV relative to industrial organisation economics (Porter, 1980), neoclassical microeconomics (Ricardo, 1817) and evolutionary economics (Nelson and Winter, 1982). This study is positioned within the “broader” RBV (Barney, 2001), which encompasses some commonalities as well as

some differences relative to those three perspectives. Thus, the main philosophical principles that underpin the foundations of this study will be presented.

The third and foremost objective using Miller and Shamsie (1996) typology this chapter identifies and isolates key resources of high technology SMEs, at firm and individual levels, that may be source of competitive advantage and consequently may be important determinants of firm's international performance.

### **3.2 The Resource-Based View of the Firm**

Emerged in the mid eighties the Resource-Based View (RBV), largely due to the seminal articles of Wernerfelt (1984) and Rumelt (1984), has been receiving since the nineties a growing attention not only from strategic management but also from other strands of research in economics, industrial organisation, organisation science as well as in some specific areas of management such as finance, marketing and international business (Peng, 2001; Rugman and Verbeke, 2002).

Currently, the approach of the RBV is to analyse the firm itself, its competition and its objectives from the perspective of its resource endowments, deployments, while developing and building, over time, new ones (Amit and Schoemaker, 1993; Barney, 1991; Conner, 1991). In fact, since the RBV emphasis is on firm-level factors of company performance it represents a fundamental advantage in relation to industry-level determinants typically used, for example, in industrial organisation economics, which often are vague and ill defined (Barney, 2001; Makhija, 2003). In this context, the RBV is simple and easy to understand and conclusions are very straightforward (Peng, 2001). In addition, as it is the case of this study, once it brings together different streams of research it may be particular suitable to use together with other theoretical often complementary perspectives in the same studies (Peng and York, 2001).

Nevertheless, the RBV has been criticised due to difficulties to conduct empirical work (Godfrey and Hill, 1995), while lacking operationalisation (Miller and Shamsie, 1996) maturity and being tautological (Priem and Butler, 2001a). Moreover, the precise definitions of some key concepts such as resources, capabilities and dynamic capabilities, competences and core competences have not reached a consensus among researchers or still remain far from clear (Rugman and Verbeke, 2002).

In fact, while some authors emphasise its paradigm status (Conner, 1991; Foss, 1997; Mahoney and Pandian, 1992; Sharma and Erramili, 2004) other authors argue about its lack of contribution both to theory building in strategic management and explanatory power (Porter, 1991; Priem and Butler, 2001a). For the former stream of research contributions, over the years, lay on the characteristics of firm's resources that can contribute to its sustainable competitive advantage that is firm's ability to maintain sustainable above normal returns (i.e. rents) relative to competitors (Dierikx and Cool, 1989; Peteraf, 1993).

In this context, it seems completely wrong to link Edith Penrose (1959) seminal work with the theoretical developments, over the years, of the resource-based perspective; since she never suggests the use of resources as a tool to obtain rents (Rugman and Verbeke, 2002). On the contrary, Penrose main contributions lay on the following: firstly that the firm may be able to be seen as a set of fungible resources and, secondly, suggesting an optimal pattern for firm's expansion by using, in a balanced way and in a particular sequence internal and external resources, and thirdly, pointing out to the limits to firm's growth due to managerial constraints, and the importance of behavioural and learning elements in the firm's growth processes (Rugman and Verbeke, 2002).

By contrast, for the latter stream of research, the RBV does not represent a new theory of the firm since critical aspects are not addressed such as why the firm exists instead of alternative systems for organising economic activities as well as what determines the scope of the firm (Coase, 1937; Seth and Thomas, 1994).

In addition, some authors also argue that it is the market environment, through the analysis of opportunities and threats that determines the value of a specific resource for

a firm obtaining competitive advantage over its competitors (Priem and Butler, 2001a). In this context, as the market environment changes, some previous valuable resources may erode and become obsolete. Therefore, critics of the RBV argue that the resource value is assessed from a source exogenous to the RBV (Priem and Butler, 2001a). However, this line of reasoning seems not to hold since the firm may adjust its resource/capability-base ahead of the changes of the market environment in order to maintain sustainable competitive advantage (Bernardino and Jones, 2003).

Last but not the least, although object of some criticisms (Priem and Butler, 2001a) this study agrees on the operational validity of the RBV that is “*the ability of the practitioner to implement the action implications of a theory by manipulating its causal or independent variables*” (Thomas and Tymon, 1982: p 348). In fact, this is what this study is mainly about and that will be developed in this chapter and throughout this thesis; to propose a bundle of resources, specific to high technology SMEs, which can contribute to increase their performance in foreign markets.

In this context, it is expected that the RBV have both descriptive and predictive value not only for practitioners but also for academics and public policy. In fact, from a descriptive perspective the RBV considers a firm as a bundle of linked and idiosyncratic resources, which generate over time specific new resource combinations, while reinforcing the heterogeneity among firms (Barney, 1991). Therefore, each firm is unique and its uniqueness is based on the resources it possesses, the way they are deployed and combined to build up new resources and capabilities. Moreover, firm’s uniqueness is long lasting since resources are imperfectly mobile and tradable, that is, they cannot be bought or sold in factor markets (Barney, 1991).

On the other hand, from a prescriptive approach the RBV emphasises firm’s generation and investment in resources, to the extent that they are firm-specific, that is imperfectly mobile, valuable to customers, imperfectly substitutable and difficult to imitate (Barney, 1991). Under these circumstances, a set of superior resources is not equally available to all firms. Therefore firms, possessing higher endowments of those specific resources in relation to their competitors would expect to achieve above normal returns. This is, indeed, one of the main aims of the RBV.



In sum, since firms within an industry can be characterised by their differences in terms of resources; this would lead to differences in terms of performance, which can be sustained overtime (Mahoney and Pandian, 1992).

In short, firm's unique resources represent the "isolating mechanisms", which may give the specific firm sustained competitive advantage in relation to their competitors (Rumelt, 1984). In addition these "isolating mechanisms" can be considered similar to entry barriers at industry level and mobility barriers at the industry group level (Mahoney and Pandian, 1992).

In more practical terms the RBV can be used to analyse the relative strengths and weaknesses of firms and thereby being complementary to industrial organisation (Porter, 1980), in which the focus is on the external analysis that are on opportunities and threats with little or no reference on the specific firm's resources to deal, in a suitable way, with the challenges of the market environment (Wernerfelt, 1984; Barney, 1995).

After presenting in the following section (section 3.3) some broad categorisation of resources, this study will contrast, in section 3.4, the RBV with the following theoretical frameworks: industrial organisation economics (Porter, 1980), neoclassical microeconomics (Ricardo, 1817) and evolutionary economics (Nelson and Winter, 1982).

### **3.3 The Resource-Based View: Nature and Categorisation of Resources**

Developed as already pointed out from Strategic Management, the RBV was originally conceptualised in the mid eighties by Wernerfelt (1984) and Rumelt (1984).

Unlike Industrial Organisation Economics (Porter, 1980) the RBV shifts the focus from the environment in which firms compete, to the resources and capabilities that they have developed over time, in that environment conditions. In this situation, firms possess a

bundle of specific resources that have a great influence on their objectives and strategies (Amit and Shoemaker, 1993; Barney, 1991). In addition, these resources may be source of firm's competitive advantage and creation of economic rents. Economic rents are considered the above normal returns that firms get from the implementation of their strategies (Barney, 1991). On the other hand, competitive advantage refers to a firm, which pursues a strategy not implemented by any other of its current and potential competitors (Barney, 1991). Furthermore, the competitive advantage is considered sustained when competitors are unable to replicate firm's current strategy. For firms within an industry these resources may be heterogeneously distributed and those differences may be lasting for long periods of time (Barney, 1991).

In short, the RBV posits that a firm, within an industry, possess different strategic resources which may have a strong influence in its competitiveness and consequently in its performance.

Firm resources, in general, include all tangible and intangible assets, organizational processes, firm attributes, knowledge, etc controlled by the firm which enable the firm to create develop and implement its strategy and improve its efficiency (Daft, 1983) or in a broader sense "*anything that might be thought of as a strength or weakness of a given firm*" and so could be defined as those "*tangible and intangible assets, which are tied semi permanently to the firm*" (Wernerfelt, 1984: 172). Therefore, firms have been described as a bundle of heterogeneous resources (Barney, 1991; Grant, 1991). Indeed the literature in economics attempts to present different resource categorisation typologies. For example, Barney (1991) suggests that resources could be classified in physical, human and capital categories. Grant (1991) added to these categories financial, technological, and organisational resources. However, these categorisations do not have a direct relationship with Barney's (1991) criteria to define resources, which have the potential for giving the firm competitive advantage. In fact, according to this author those kind of resources should be characterised by the following features: 1) Valuable, that is they must exploit market opportunities or render market threats ineffective; 2) Scarce, among current and potential competitors; 3) Non substitutable for other resources, and 4) Imperfectly imitable, that is, competitors do not possess them neither

can they obtain these resources, (Barney, 1991; Dierickx and Cool, 1989; Peteraf, 1993).

However, all these broad categorisations of resources are not very useful in identifying those resources, which are valuable, scarce, imperfectly tradable non substitutable and non imitable (Miller and Shamsie, 1996). In fact, only seldom are resources defined in operational terms in order to measure their impact on performance (Miller and Shamsie, 1996). These authors suggest that inimitability may have a strong impact on performance. In this context, following Miller and Shamsie (1996) this study distinguishes property and knowledge-based resources. The former refers to those resources, which are protected by property rights such as physical assets, contracts or patents while the latter are only protected by knowledge-based barriers that competitors do not know, at least early enough, how to imitate firm's skills, processes and capabilities. In addition, Miller and Shamsie (1996) investigation also considers for both property and knowledge-based resources, as having two different types of resources, in each category, that are discrete and systemic resources. Discrete resources refer to those resources, which have value independent of their organisational contexts. On the other hand, systemic resources are only valuable as part of a network or system (Miller and Shamsie, 1996).

In sum, property-based resources are related to the ownership and control of a specific and well-defined asset (Barney, 1991). The firm may or may not get above normal returns for its deployment until the market erodes the value of the asset. Furthermore, it is understood that the specific asset is not available to competitors at least in the same favourable terms (Miller and Shamsie, 1996).

By contrast, knowledge-based resources are protected from imitation not by property rights rather by knowledge barriers. They include specific skills and resources, which sometimes are difficult to recognise. Knowledge-based resources make it possible for organisations to succeed not by the ownership or control of unique market physical assets rather by giving firms the skills and capabilities to adapt their products and services to the needs of specific market niches, even in very unpredictable and uncertain environments. Since those resources sometimes are embodied in tacit knowledge, that

is, knowledge ill codified often competitors do not have reasonable explanations for the success of certain firms. In addition, although knowledge barriers do not guarantee the firm strong protection against the threats posed by competitors; imitating firm's skills takes time. Meanwhile, a firm may have the possibility to develop its skills further, maintaining different options in their use (Lado and Wilson, 1994).

For property-based resources their value may cease when the environment changes in such a way not predicted when the asset was acquired, created or developed.

Nonetheless, a notorious exception to this principle is financial resources, since they can be used to create, acquire or develop other types of assets.

By contrast, *knowledge-based resources* are more suitable to identify and respond to changes in customer needs and new market trends. Furthermore, they can accommodate changes in the market environment and deal with a greater number of contingent situations (Lado and Wilson, 1994). Moreover, in dynamic environments firm's knowledge may evolve so quickly that will be hard to imitate by competitors (Miller and Shamsie, 1996).

In short, knowledge-based resources are particularly helpful in rapid changing environments. As already presented in chapter 2, this is actually the situation facing high technology SMEs. In addition, the aims of this study, stated in chapter 1, are on the internationalisation of high technology SMEs that is about market diversification. In this context, firms face different market environments. Therefore, *knowledge-based resources*, both *discrete* and *systemic* may be particular important.

According to (Miller and Shamsie, 1996: 523) the former refers to those "*resources that stand alone and value more or less independent to their organisational contexts*". They may represent firm specific technological and marketing resources, which may remain valuable in uncertain environments. Thus, they are subject to uncertain imitability since those firms's marketing and technological resources may remain viable even in changing market conditions (Miller and Shamsie, 1996). Moreover, they are very suitable for firms to adapt their product portfolio with the changes in the market environment (Wernerfelt and Karnani, 1987). For example in high technology sectors,

where competition is very hard and life-cycles are short, those resources may be very valuable to create and develop superior products ahead of competition.

On the other hand, *systemic knowledge-base resources* are related to firm's organisational processes in order to integrate and coordinate skills from different areas of the organisation (Miller and Shamsie, 1996). This is the case of high technology SMEs since they should be entrepreneurial if they want to survive and grow. In this context, those integrative and coordinative skills are called entrepreneurial orientation (Lee et al, 2001; Miller, 1983; Lumpkin and Dess, 1996).

Finally, financial resources, which are property-based resources, may also be very important in development over time of the small firm resource-base.

Property and knowledge-based resources are not independent since the former can be used to develop the latter, or the other way round. For example, for small high technology firms, capital can be used to hire more skillful personnel, who overtime can develop firm's resources (Schoonoven et al, 1990).

In sum all the resources, property and knowledge-based, are deployed with the intent of their transformation into final products and services through managerial processes.

Retrospectively, the focus of this study, at firm level, is both on property-and knowledge-based resources. In section 3.6 the study examines key resources identified and proposed in this section in more detail.

Last but not the least, the RBV is still not an unified theory of the firm rather it is still part of a developing perspective in strategy research (Amit and Schoemaker, 1993; Das and Teng, 2000; Miller and Shamsie, 1996). Thus, next section (section 3.4) positions the "broad" RBV relative to industrial organisation economics (Porter, 1980), neoclassical microeconomics (Ricardo, 1817) and evolutionary economics (Nelson and Winter, 1982). That section highlights commonalities and specificities of those three perspectives relative to the broad resource-based view framework (Barney, 2001) in

order to identify and emphasise key theoretical aspects, which will help to position this study.

### **3.4 Positioning the RBV Relative to Different Theoretical Frameworks**

#### **3.4.1 The RBV and Industrial Organization Economics**

Unlike the RBV, which focus on the analysis of different types of resources possessed by the firm, industrial organisation economics (IO) shifts the focus to the analysis of the competitive environment. In this context, traditional strategy research suggests the complementarity between IO and the RBV, since firms need to find a strategic fit between their internal characteristics (strengths and weaknesses), emphasised by the RBV, and their market environment (opportunities and threats) highlighted by IO.

IO tries to describe and identify opportunities from the market environment that may conduct to high levels of firm performance. Thus, the main focus of IO is on the impact of environment conditions on firm's competitiveness. For IO, competitive advantage is mainly due to industry structure, rivalry between competitors as well as entry and exit barriers on the competitive position of firms (Porter, 1980).

In this context, IO acknowledges that firms within an industry sector present relatively similar profiles and consequently they control or own the same type of assets and pursue roughly the same strategies (Porter, 1981; Sherer, 1980). In addition, these models also acknowledge that if a specific firm acquires different resources and capabilities in comparison with other firms, within the industry, this situation will not last for long periods of time since resources that firms deploy to implement their strategies, are highly mobile, that is, they can be bought or sold in factor markets (Barney, 1986; Hirshleifer, 1980). For IO firm's source of competitive advantage and performance are linked with firm competitive/market situation (Porter, 1980).

This perspective is in sharp contrast with the RBV, which focus inwards on firm's resources and capabilities to explain firm performance. In other words, the resources

that a firm possesses would determine what it accomplishes. Nonetheless, the RBV also suggests that “*a firm’s competitive position is defined by a bundle of unique resources and relationships*” (Rumelt, 1984:557) and therefore, having a balanced perspective in comparison with market environment models.

Finally, the RBV argues about the heterogeneity and immobility of resources as sources of competitive advantage (Rumelt, 1984; Wernerfelt, 1984). Thus, firms within an industry are heterogeneous in terms of endowments of resources that they own and control. Moreover, these resources are not mobile across firms and consequently heterogeneity may last for long periods of time.

Under these circumstances there is little consensus among researchers on the relative role of these two influences, that are, the industry environment, acknowledged by IO, and resources, acknowledged by the RBV, on firm’s performance. Despite above normal returns can be attributed to both external and internal conditions faced by the firm, it will be nevertheless quite difficult to assess the relative importance of these two perspectives in explaining firm performance (McGahan and Porter, 1997). Nevertheless the role of resources may be less understood since resources, which can be source of competitive advantage are quite often intangible in relation to firm’s current competitive position (Makhija, 2003). In addition, firm’s resources and capabilities become even more important when changes in the market environment become quite dramatic, as it is the case of high technology industries (Grant, 1991). Indeed in fast moving market environments, firm’s market position becomes less important than in predicted and stable environments. Thus, it is reasonable to expect that firm’s resources and capabilities may explain its future performance better (Makhija, 2003).

According to this line of argument, for industry sectors, which undergo fast and dramatic changes such as high technology industry sectors, it may be more appropriate to predict and explain firm’s future performance by using the RBV rather than IO economics.

### 3.4.2 The RBV and Neoclassical Microeconomics

Neoclassical microeconomics focuses “*on how market forces determine the quantity, quality and price of goods and services sold in a market*” (Barney, 2001: 644). This theory also posits that the long-term survival for a firm is based on the logic of economic efficiency (Friedman, 1953). Thus, firms are assumed to be rational with the main objective of deploying scarce resources in order to maximise profitability. These profits would be partly reinvested in order to expand production capacity making more products and services available in the market, which will operate with increasing efficiency.

However, neoclassical theory does not explain firm strategic behaviour on key issues such as transaction costs, constraints on factor mobility or technological uncertainty (Rumelt, 1984). Nevertheless, neoclassical microeconomics and the RBV share some assumptions such as firm managers are characterised by being utility maximisers and by bounded rationality. Bounded rationality refers to the fact that when managers take decisions they do not have access to all critical information neither do they all have full comprehension of the information made available to them. In addition, information possessed by managers varies on an individual basis in markets that also vary in terms of competitiveness.

Nonetheless there is at least one significant difference between the RBV and neoclassical theory. The former acknowledges that some firm resources are not elastic in supply, neither in short or in medium term, while the latter argues that most resources (called factors of production) are elastic in supply (Barney, 2001). This fact has an important implication in neoclassical theory since if a demand for a specific resource increase, the price for obtaining this resource also increases and consequently the amount paid on the market also increases (Barney, 2001).

In contrast, the RBV acknowledges that some firm resources and capabilities are path dependent that is they can only be developed over long periods of time. In addition these resources and capabilities are very often knowledge-based and consequently it is difficult to understand how they were developed in short and medium term (e.g. causal



ambiguity). Moreover, they are also social complex, that is, they cannot be bought or sold in factor markets.

In sum, some resources and capabilities, often intangible assets, may be inelastic in supply (Barney, 1991, 2001; Dierickx and Cool, 1989). This situation gives firms that have resources and capabilities inelastic in supply the possibility to obtain competitive advantage and consequently to generate economic rents that are returns above the industry average (Barney, 2001; Priem and Butler, 2001a).

In a more rigorous way, when analysing factors of production that are inelastic in supply neoclassical theory suggests only few factors of production having the characteristics to make them fixed in supply (Ricardo, 1817; Peteraf, 1993).

In the same vein of the RBV this study argues that there are many more resources, which are inelastic in supply. Furthermore, these resources may be specific to high technology SMEs facing unpredictable and uncertain environments (Miller and Shamsie, 1996; Priem and Butler, 2001a).

In short, the RBV could be seen as an extension of neoclassical theory while considering many other factors of production that may or might be source of firm's competitive advantage (Barney, 1991, 2001; Peteraf, 1993). These factors are imperfectly competitive and therefore firms need to develop over time resources and capabilities in order to generate economic rents (Barney, 1986).

Firm's resources and capabilities are not valuable per se rather it is the specific market conditions where firms operate which value them. For firms to obtain competitive advantage and generating economic rents they must develop and acquire all the resources and capabilities in order to create and implement their strategies in imperfectly competitive strategic factor markets (Barney, 1991).

### **3.4.3 The RBV and Evolutionary Economics**

The most important contribution in the field of evolutionary economics is Nelson and Winter (1982) seminal paper. In their framework these authors consider that firms vary in terms of routines that they have developed over time in conducting business activities. Thus, some of these routines are more efficient and effective than others and consequently the less effective and efficient routines need to be abandoned or changed so that firms can survive not only in short term but also in medium and long terms. In contrast the most effective and efficient routines may allow firms creating competitive advantage. In this context the concept of routines is quite similar to firms' resources and capabilities (Barney, 2001). As Grant (1991) pointed out, if capabilities are the ability for firms to deploy resources in order to obtain competitive advantage, thus routines and capabilities are practically identical.

Build on Nelson and Winter (1982) seminal paper more recently, Teece, Pisano and Shuen (1997) have developed the dynamic capabilities framework, which aims to understand how firms achieve and maintain competitive advantage in market environments characterised by rapid and sometimes dramatic technological changes. Competitive advantage is based on firm's strategic capabilities, which encompasses: firstly, its managerial and organisational processes, that are its routines. There is a strong variation among firms on how they coordinate those routines and capabilities. Moreover, empirical evidence suggests that those differences will have both a strong impact on firm's performance and will last for long periods of time.

Secondly, competitive advantage is also influenced by firm's specific asset position, at a certain moment in time. Firm's asset position refers to those knowledge-based imperfectly mobile non tradable assets, which a firm deploys in order to implement its business strategy. Those assets are mainly technological, reputational and relational (Teece, Pisano and Shuen, 1997). A notorious exception, posited by the authors, are financial assets, which might be important since they have, even for large companies, on the short term, strategic implications. Thus, they may or may not allow the pursuit of certain business strategies. By contrast, production equipment once it is available in

imperfect factor markets is not considered as providing competitive advantage. Nevertheless, the above asset classification of Teece, Pisano and Shuen (1997), with the exception of financial assets, seems difficult to measure and lacks operationalisation (Miller and Shamsie, 1996).

Thirdly, competitive advantage is also influenced by the evolution paths that are both the paths that the firm has adopted (path dependency) as well as the attractiveness of market alternatives, which lie ahead (Teece, Pisano and Shuen 1997). Thus, changes in the environment will determine that past routines will be either abandoned or changed in order to ensure firm survival, in medium and long term.

Similarly as the broad RBV emphasises dynamic capabilities must be valuable, scarce, unique, non substitutable and non imitable (Teece, Pisano and Shuen, 1997). They are intangible, built over long periods of time and they can not be bought or sold in imperfect factor markets. Thus, these sets of resources/capabilities are not available to all firms and therefore may be considered as a precondition for achieving economic rents. In addition, this heterogeneity among firms can be induced or reinforced especially in terms of new resources combinations and configurations through a process of competition on innovation, path dependencies, first mover advantages and the use of complementary or co-specialised resources (Rugman and Verbeke, 2002; Teece, Pisano and Shuen, 1997). Moreover, they allow the firm to develop new products/services and processes, and respond to rapid changes in the market environment. In rapidly changing environments firms need to possess the ability to create new capabilities (new routines) and reconfigure their asset structure to accommodate changes on market conditions in order to achieve competitive advantage (Amit and Schoemaker, 1993; Teece, Pisano and Shuen 1997).

### **3.5 Comments and Criticisms on different perspectives of the RBV.**

#### **Positioning this Thesis**

As posited in section 3.4 the RBV, in the field of strategic management research, is a very influential theoretical framework explaining how competitive advantage within

firms is achieved and maintained over time (Barney, 1991; Nelson and Winter, 1982; Rumelt, 1984; Teece, Pisano and Shuen, 1997; Wernerfelt, 1984). As this approach focuses on the internal part of firms, it is considered complementary to industrial organisation economics, which highlights industry structure and strategic positioning within that structure as the key determinants of competitive advantage (Henderson and Cockburn, 1994; Porter, 1979, 1980).

As already indicated in section 3.3 the RBV can be analysed using different perspectives (Barney, 2001). These perspectives are summarised in Table 3.1.

Table 3. 1: Comparison between the different perspectives to analyse the RBV

	<b>Broad Resource-Based View (RBV)</b>	<b>Industrial Organisation (IO)</b>	<b>Neoclassical Microeconomics</b>	<b>Dynamic Resources Perspective</b>
Assumptions	<ul style="list-style-type: none"> <li>• Firm heterogeneity</li> <li>• Resources immobility</li> </ul>	<ul style="list-style-type: none"> <li>• Firm homogeneity</li> <li>• Resources mobility</li> </ul>	<ul style="list-style-type: none"> <li>• Elasticity in supply of factors of production</li> </ul>	<ul style="list-style-type: none"> <li>• Asset accumulation, replicability and inimitability</li> </ul>
Focus	<ul style="list-style-type: none"> <li>• Internally on firm's resources</li> </ul>	<ul style="list-style-type: none"> <li>• Externally on the industry in product-markets</li> </ul>	<ul style="list-style-type: none"> <li>• Economic efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Internally on firm's dynamic resources</li> </ul>
Unit of analysis	<ul style="list-style-type: none"> <li>• Firm</li> </ul>	<ul style="list-style-type: none"> <li>• Industry</li> </ul>	<ul style="list-style-type: none"> <li>• Firm</li> </ul>	<ul style="list-style-type: none"> <li>• Firm</li> </ul>
Analysis	<ul style="list-style-type: none"> <li>• Disequilibrium</li> </ul>	<ul style="list-style-type: none"> <li>• Disequilibrium</li> </ul>	<ul style="list-style-type: none"> <li>• Equilibrium</li> </ul>	<ul style="list-style-type: none"> <li>• Disequilibrium</li> </ul>
Source of rents	<ul style="list-style-type: none"> <li>• Valuable, scarce, imperfect mobile and non imitable resources.</li> <li>• Resource superiority vis-à-vis competitors</li> </ul>	<ul style="list-style-type: none"> <li>• Industry entry barriers</li> </ul>	<ul style="list-style-type: none"> <li>• Factors of production</li> </ul>	<ul style="list-style-type: none"> <li>• Asset accumulation, replicability and inimitability</li> </ul>
Nature of rents	<ul style="list-style-type: none"> <li>• Ricardian</li> </ul>	<ul style="list-style-type: none"> <li>• Chamberlinean</li> </ul>	<ul style="list-style-type: none"> <li>• Ricardian</li> </ul>	<ul style="list-style-type: none"> <li>• Ricardian</li> </ul>
Role of Industrial structure	<ul style="list-style-type: none"> <li>• Endogenous</li> </ul>	<ul style="list-style-type: none"> <li>• Exogenous</li> </ul>	<ul style="list-style-type: none"> <li>• Endogenous</li> </ul>	<ul style="list-style-type: none"> <li>• Endogenous</li> </ul>
Environment	<ul style="list-style-type: none"> <li>• Unpredictable/uncertain</li> </ul>	<ul style="list-style-type: none"> <li>• Variable</li> </ul>	<ul style="list-style-type: none"> <li>• Stable</li> </ul>	<ul style="list-style-type: none"> <li>• Unpredictable/uncertain</li> </ul>
Short term capacity for strategic reorientation	<ul style="list-style-type: none"> <li>• Low (path dependency)</li> </ul>	<ul style="list-style-type: none"> <li>• High (no path dependency)</li> </ul>	<ul style="list-style-type: none"> <li>• Low (path dependency)</li> </ul>	<ul style="list-style-type: none"> <li>• Low (path dependency)</li> </ul>
Managers' behaviour	<ul style="list-style-type: none"> <li>• Rational</li> </ul>	<ul style="list-style-type: none"> <li>• Rational</li> </ul>	<ul style="list-style-type: none"> <li>• Rational</li> </ul>	<ul style="list-style-type: none"> <li>• Rational</li> </ul>

Source: Adapted and expanded from Teece, Pisano and Shuen (1997)

In this context, one stream of research of the RBV argues about its positioning in relation to industrial organisation economics, focusing on the impact of industry

environment characteristics and firm attributes on firm performance (Barney, 1991; Conner, 1991; Peteraf, 1993).

The stream of research, which positions the RBV relative to neoclassical theory, tries to identify, describe and measure those resources and capabilities, which are inelastic in supply, and characterised by path dependency, causal ambiguity and social complexity as their main characteristics. Moreover, firms which possess resource superiority vis-à-vis their competitors consistently perform better (Barney, 1986; Diericx and Cool, 1989; Peteraf, 1993).

Another stream of research posits the RBV in relation to evolutionary economics. The main focus of this stream of research is on how resources and capabilities also called dynamic capabilities change over time, and what will be the implications for firm competitiveness (Eisenhardt and Martin, 2000; Teece, Pisano and Shuen, 1997). In this perspective firms that have higher ability to develop new resources in parallel with the changes in the market environment may achieve higher performance in a form of economic rents.

In sum, the RBV can be applied using different perspectives depending on the type of the study. In this context, the RBV can be analysed in terms of 1) firm vs. industry effects; 2) identification of firm's resources and capabilities that can be source of competitive advantage and 3) the development of firm's dynamic capabilities, that is, how firm's capabilities evolve over time.

With the exception of industrial organisation economics all the above approaches share the principle that resources and capabilities are heterogeneously distributed across firms and these differences will remain for long periods of time. This fact explains why some firms outperform others.

However, over the years the RBV has been object of strong criticism (Priem and Butler, 2001b; Williamson, 1999). For example, this thesis, in section 3.3, presents some broad definitions and categorisations of resources almost suggesting that anything associated with the firm can be defined as a resource (Wernerfelt, 1984). Those broad

categorisations of resources, may not take into account, for a specific industry sector, the identification of the valuable resources that should be considered and secondly the characteristics of the environment where firm's resources will be deployed (Priem and Butler, 2001a).

In fact, the literature acknowledges too many generalisations about the merits of certain resources per se, while not addressing the context within which of these resources may be of value for the firm (Miller and Shamsie, 1996). Thus, the RBV lacks establishing the boundaries where specific resources are particularly important.

For example, Miller and Shamsie, (1996) study argues about the benefits of better specifying the organisational resources, which have the potential to generate, above normal returns. In addition, the distinctive advantages of those organisational resources should be put forward making possible to enhance precision to the research. These distinctions may be very important avoiding vague characterisations about some firm's resources just because it has performed well, without establishing a rigorous cause/effect relationship (Black and Boal, 1994; Miller and Shamsie, 1996). Secondly, the RBV needs also to present the market environment prospectively in which different types of resources would be most valuable. In the same vein, as contingency theory, which suggests to relate firm's structures and strategies to the contexts in which they are most appropriate so it may be useful too that the RBV addresses the contexts within which of different types of resources will have the highest value, in other words the best influence on performance (Miller and Shamsie, 1996). The value of resources can be enhanced or vanished due to technological changes, changes on competitors' behaviour as well as on customers' needs (Porter, 1991). In addition, the RBV still lacks empirical testing may be due to difficulties in defining, measuring and operationalising resources (Miller and Shamsie, 1996; Priem and Butler, 2001). For example a resource, which may be difficult to measure and operationalise is tacit knowledge, since it is not well known and ill codified and therefore not suitable to suggest to practitioners as source of competitive advantage.

Moreover, some authors put the predictive value of the RBV in doubt (Priem and Butler, 2001a).

In sum, the RBV has been called conceptually vague and tautological; not explaining the mechanisms by which resources contribute to competitive advantage (Mosakowsky and McKelvey, 1997; Priem and Butler, 2001b; Williamson, 1999), while lacking operationalisation and empirical testing (Miller and Shamsie, 1996; Priem and Butler, 2001a; Williamson, 1999).

However, this thesis tries to address, some of the above issues, by distinguishing property and knowledge-based resources, specific to high technology SMEs. The identification of those resources is based on the literature relative to high technology firms (see chapter 2) and on the results of the exploratory interviews (see chapter 6, sections 6.4.2 and 6.4.3). Furthermore, the study considers that high technology SMEs actually operate in very dynamic fast changing market environments even though in an international context, market environments may vary. In addition, this study argues that firms which develop their strategies based on intangible assets specific to high technology SMEs that are scarce, valuable, and costly to imitate (*“the isolating mechanisms”*) and have resource superiority vis-à-vis their competitors, outperform firms, which base their competitiveness on tangible resources and/or possess a lower endowment of intangible resources.

Finally, a cross sectional empirical study is conducted (see chapter 7) to put it manageable in a time frame of a PhD and in order to test the impact of the identified valuable specific high technology SMEs resources on international performance.

Next section, based on the findings presented on chapter 2, about strengths and weaknesses of high technology SMEs, identifies describes and analyses key resources specific to high technology SMEs.

### **3.6 Internal Resource-Base of SMEs**

One of the challenges faced by researchers applying the RBV is to identify and separate out the resources, explaining how competitive advantage within firms is achieved and

maintained over time (Barney, 1991; Teece, Pisano and Shuen, 1997). This task is particularly problematic since management information systems tend to show only a partial and fragmented base of firm's resources. Formal accounting systems are clearly inadequate in this matter because balance sheets in particular do not take into account the great majority of intangible assets (a notorious exception are software packages) and human resources. Indeed this situation is mainly due to the difficulty to evaluate intangible assets. The heterogeneity and imperfect transferability of the great majority of intangible assets make the use of valuation systems such as market prices, stock market values etc. difficult if not impossible. In this context, a possible approach to appraise intangible assets would be to do the calculation of the difference between the stock market value and the replacement value of its tangible assets (Cockburn and Griliches, 1988).

Nevertheless this type of reasoning is not applicable to the type of firms, which are object of this study that are high technology SMEs since most of them are not quoted in the stock market. More important for researchers in this area of enquiry is the challenge to develop measures of value in relation to intangible resources. To overcome this situation the study follows Miller and Shamsie (1996) (see section 3.3) approach by considering both property and knowledge-based resources specific to high technology SMEs operating in very dynamic, unpredictable and uncertain environments.

The literature on high technology firms combined with the exploratory interviews (see chapter 6, sections 6.4.2 and 6.4.3) with entrepreneurs/chief executives of high technology SMEs experts and academics suggest the critical importance, at firm level, of the following resources as potential sources of competitive advantage and it is also suggested that these are likely to potentially influence a firm's international performance:

- Discrete knowledge-based resources: marketing and technological resources.
- Systemic knowledge-based resources: entrepreneurial orientation.
- Discrete proprietary-based resources: financial resources



Moreover, as examined in chapter 2, in small high technology firms the entrepreneur plays, at individual level, a critical role in firm's long term success. Thus, resources of the entrepreneur/ senior management team, at individual level, will be examined separately.

All these resources, at firm and individual levels will be presented and discussed in the next sections.

### **3.6.1 Discrete Firm Knowledge-Based Resources**

#### **3.6.1.1 Marketing Resources**

Marketing resources reflect how the firm targets customers both in domestic and/or foreign markets and positions/differentiates in relation to its competitors. At the operating level marketing resources consist of firms' effective performance on product, price, distribution, promotion and market research activities. In other words marketing resources refer to firm's ability to build a strong awareness and reputation for its products and services. Firms with greater reputation can successfully exploit market niches, charging premium prices and increasing profitability. Thus, a firm to be successful should be market oriented, staying close to its customers and ahead of its competitors (Day, 1994).

Market orientation refers to firm's superior skills and capabilities in understanding and satisfying customers needs (Day, 1994). In this context, firms should possess high standards and reputation for their products and services, brand awareness and image as well as strong partner channels that provide value to customers. Firm's long term survival and growth depends, to a great extent, on how well it delivers value to its customers that may give the firm competitive advantage over its competitors (Anderson, 1983; Lado et al, 1992).

However, as already pointed out in chapter 2 (section 2.3.1.2), often small high technology firms, at least in their early stages, are technology led organisations while

lacking the necessary marketing resources and capabilities to address customer needs in specific market niches (Roberts, 1991).

Overall firm superior performance is achieved through the development of marketing capabilities and the implementation of a superior marketing strategy (Day, 1994). Marketing strategy includes decisions about market segmentation, targeting and positioning/differentiation, which determine the marketing programme, that is, decisions about product, price, distribution and promotion (Kotler, 1994; Landon and Lendrevie, 1996).

Once again, in high technology sectors, as also indicated in chapter 2 (section 2.3.1.2), market needs are often latent and ill defined and customers' behaviour are volatile and unpredictable. Therefore, it is often quite difficult for high technology firms to build a strong customer base and competition is very hard. In addition, this competition may be constituted, to a certain extent, by newcomers to the industry. These new competitors may develop innovations not based on current competitors' approaches; rather new competitors may create value by making the technology more desirable to customers (Allen, 2003).

In this context, market research analysis is fundamental to the development of the marketing strategy of the high technology firm since it is the foundation to market segmentation and targeting decisions. Segmenting and targeting show firm's commitment to satisfy the needs of particular customer groups through the investment in specific resources and distinct capabilities (Kotler, 1994; Landon and Lendrevie, 1996). These resources may enable the firm to create a differentiated offer to the target market supported by decisions about product/ service innovations, price, distribution and promotion. For example, in high technology sectors, important issues relative to firm's products are their innovativeness that is the assessment if, in recent years, the firm has launched new product lines and if changes in that product lines have been quite dramatic or only of minor nature (Covin and Slevin, 1989).

In terms of price, high technology SMEs address the needs of specific market niches not covered by a large number of competitors. In this situation, if high technology SMEs have superior marketing and technological resources, they may be able to charge

customers premium prices since they generally do not pursue market share objectives (Dutta, Narasimhan and Rajiv, 1999).

Relative to distribution, high technology SMEs generally adopt a selective distribution strategy by carefully addressing needs of target customers, which may require high levels of pre and/or post sales service relative to turnover.

The two major tools of the communication strategy of high technology SMEs are promotion and sales force activities. The former includes expenditures by the firm in advertising over the media or the Internet, promotional activities, direct marketing, public relations, participation in workshops, exhibitions, symposiums and conferences while the latter refers to firm's interaction with its customers. Since high technology products/services are often expensive, complex and high risk, sales force activities may be necessary to close sales, providing customer satisfaction and retention.

Overall, marketing resources leverage firm competitiveness by anticipating customers' needs ahead of competition and creating long lasting relationships with customers, suppliers, distribution channels and other potential partners (Day, 1994). Thus, high technology firms should be market oriented organisations focusing on collecting, analysing and using market information in a more systematic and rigorous way before current and potential competitors do it. This market information may include the following behavioural components: firstly, customer orientation that is firm's understanding of customers' needs and expectations in the target market; secondly, competitor orientation that is firm's understanding of long-term distinctive capabilities of current and potential competitors in the target market and finally the long lasting cooperative relationships both within the organisation and with other external partners, such as distributors and suppliers (Narver and Slatter, 1990).

In sum, the business philosophy in market oriented organisations in achieving superior business performance is accomplished by possessing superior skills in understanding and satisfying customer needs. This will be attained by delivering, in an ongoing basis, innovative and high quality products and services. Thus, firms should recognise emerging market needs in assessing quickly customers' response, while developing and implementing sounding marketing strategies. In this context, the entrepreneur/senior

management team of high technology SMEs should have a strong commitment in putting customers as top priority (Day, 1994).

### **3.6.1.2 Technological Resources**

Technological resources may represent sources of sustainable competitive advantage since they are currently valuable and difficult to imitate by competitors (Dhanaraj and Beamish, 2003; Rodríguez and Rodríguez, 2005). Technological resources include technological knowledge generated by R&D activities, product and process innovations and other technology-specific intellectual capital, patents protected by law and intellectual property rights. In addition, if these skills are tacit and complex, as it is very often the case about technological resources, they are very hard to imitate knowing that they remain embedded in firm's organisational routines (Barney, 1991; Kogut and Zander, 1995; Winter, 1987). Furthermore, they have a high degree of specificity that is they are idiosyncratic, making them more valuable to the firm than for other organisations. Thus, they are imperfectly mobile and complex in the sense that is difficult to identify the sources that generate this type of capabilities (Kogut and Zander, 1993). In this context, each firm is heterogeneous in terms of its endowment of technological resources, which are imperfectly imitable, tradeable, and imperfectly substitutable (Rodríguez and Rodríguez, 2005).

Nonetheless, not all technological resources are protected by patent law; some are protected only by knowledge barriers. Indeed, although knowledge barriers seem to be a weak protection against the potential opportunistic action held by competitors, it is important to bear in mind that very often competitors are not able to imitate firm's skills, processes and capabilities (Miller and Shamsie, 1996). Nevertheless, competitors may develop their skills to achieve the foreseen talent and knowledge of the incumbent firm. However, this is a process which currently takes time while the incumbent develops its skills, further maintaining the gap to its current and potential competitors. Technological resources may represent to the firm the possibility to give momentum to innovation which represents market value to the firm over a certain period of time.

In sum, technological resources depend to a great extent on the technological knowledge and know-how developed within the firm through R&D activities, innovations on products and processes in order to deliver on the market state of the art products, systems and services.

Overall technological resources may be considered scarce, valuable, non tradeable and imperfectly imitable. Thus, they can give firms possessing superior technological resources competitive advantage vis-à-vis their competitors, mainly in foreign markets (Rodríguez and Rodríguez, 2005). In fact, competitive advantage may be achieved either through cost reductions via the development of new and more efficient production processes or through differentiation by means of product innovations, which address the needs of firm's target customers, or even by developing products with a higher quality content. Indeed, a high quality product characterised by differentiation in relation to its competitors may be a key element in terms of firm's international success (Cavusgil, Zou and Naidu, 1993; Styles and Ambler, 1994).

In sum, technological resources while providing the firm with greater international competitiveness gives it incentives to expand into foreign markets in order to earn higher returns from its investment, since the appropriability regime is improved when extending the market of a product (Teece, 1986). In fact, the domestic market is often too small to allow a firm to recover from its R&D investments and international activities become a necessity for survival and long term growth.

### **3.6.2 Systemic Firm Knowledge-Based Resources**

#### **3.6.2.1 Entrepreneurial Orientation**

The concept of entrepreneurship has been lengthened from individual—the entrepreneur—to firm level and is called entrepreneurial orientation (Covin and Slevin, 1991; Lumpkin and Dess, 1996). For Timmons (1994: 7) “*entrepreneurship is the process of creating or seizing an opportunity, by the entrepreneur, and pursuing it regardless of the resources currently controlled*”.

As suggested by Miller (1983) and further developed in other studies (Lee et al, 2001; Lumpkin and Dess, 1996; Covin and Slevin, 1989) EO is characterised by three dimensions: they are *innovativeness*, *risk-taking propensity* and *proactiveness*. *Innovativeness* refers to a firm's propensity to engage in the generation and development of new ideas, in the introduction of new products/ services and/or technological processes. More particularly, innovation is very important for high technology small firms since otherwise they would rely on traditional ways of doing business and consequently they would have less chance to be successful on the market (Lumpkin and Dess, 1996; Covin and Slevin, 1989). Indeed, without innovations high technology SMEs would deliver in the market traditional products and services through traditional distribution channels. Under these circumstances high technology SMEs would stay at a disadvantage situation in relation to established competitors since high technology SMEs could be characterised by shortages of resources, limited awareness and brand reputation coupled with less competitive cost structures. In sum, the introduction of new products, processes and marketing innovations is very important for high technology SMEs in order to differentiate them from competitors (Lee et al, 2001; Lumpkin and Dess, 1996). Bruderl and Preisendorf (2000) in a recent empirical study of a sample of German start-up's found innovation as the most important predictor of firm growth.

Another dimension of EO is *risk-taking behaviour*, which is characterised by the large commitment of resources to high-risk uncertain business in order to achieve high returns by identifying opportunities in the market. Examples of high risk actions are, for instance to borrow heavily, investing in new technologies or launching new products in new markets (Lee et al, 2001; Lumpkin and Dess, 1996). In this context, internationalisation may be considered part of the risk-taking behaviour of the entrepreneur since it represents to the firm new and innovative activities, which have the goal of value creation across national boundaries (McDougall and Oviatt, 1997). Finally, another dimension of E.O. is *proactiveness*. *Proactiveness* refers to the seeking of market opportunities which may or may not be related with firm's current activities. Examples of these opportunities include the introduction of new products, systems and services ahead of the competition as well as through the streamlining of operations/

processes which are in mature or declining life cycles. Proactive firms may be considered pioneers in their domain of activities by their first mover actions, influencing market trends, creating new market segments or replacing existing firms by the introduction of new products and services.

In sum, the concept of entrepreneurial orientation puts the focus on the firm, which goes beyond the analysis solely on the entrepreneur. Nevertheless, an entrepreneur (see chapter 2, section 2.3.2.4) is someone often regarded as an innovative and creative person who runs a firm, which emphasises innovation. Moreover, the entrepreneur searches for new opportunities ahead of competition and therefore reflecting firm's proactiveness. In addition, often he/she is willing to go ahead with high risk projects with chances of high returns associated with great aggressiveness in pursuing market opportunities (Kuznetsov, McDonald and Kuznetsova, 2000). In this situation, the entrepreneur decisions and actions can be measured in terms of firm performance. Thus, firm's performance is a function of firm as well as individual level behaviour (Covin and Slevin, 1991). For example, in small firms the entrepreneur's/chief executive entrepreneurial orientation/strategic orientation is likely to be the same as the strategic orientation of the firm (Kuznetsov, McDonald and Kuznetsova, 2000).

In short, entrepreneurial orientation attempts to capture organisational/management processes in order to integrate and reconfigure firm's resources as well as on the methods and styles developed and implemented by the entrepreneur/chief executive within the organisation (Brown, 1996; Merz et al, 1994). They can be considered as providing competitive advantage, since they are embedded in firm's organisational routines; they are intangible and dispersed across teams and individuals although they rely, to a great extent, on the entrepreneur/chief executive and are not available on the market (Lee et al, 2001; Lumpkin and Dess, 1996).

Nonetheless, previous studies agree on conceptualisation created by Miller (1983) as well as on the measurement, with slight modifications, of entrepreneurial orientation as a composite of innovation, risk-taking and proactiveness.

### **3.6.3 Firm Proprietary-Based Resources**

#### **3.6.3.1 Financial Resources**

Financial resources represent resources used as a medium of exchange for other productive resources (Chatterjee, 1990). They offer the most flexibility to managers in its deployment. Financial resources generated through the business activity could be distributed in the form of dividends or other payments to shareholders/venture capitalists or could be redeployed in further business activities, instead. These business activities may include R&D for the development of new products and processes, new manufacturing plants or the expansion to new geographical areas (Elango, 2000). In fact high technology SMEs may invest a high proportion of their available financial capital in product and market development (Lee et al, 2001). Nevertheless, they very often lack the financial resources necessary to develop other critical activities such as technology development, marketing research and marketing communications because they do not have the borrowing capacity or the cash usually available to larger or longer established firms (Lee et al, 2001).

Indeed, since their fixed assets are not very significant, the firms are seen as risky and consequently they must pay a premium for cash or other credit lines obtained from banks, suppliers or other firms. In this situation compared with bigger and more established firms, high technology SMEs are charged with higher interest rates by financial institutions and they must pay higher prices with unfavourable credit conditions from suppliers and other firms. By contrast, firms with greater amounts of financial capital create a situation of more resource independence for the firm (Dollinger, 1995). Furthermore, in order to overcome liabilities of newness, new high technology ventures with sufficient financial capital can afford to hire very skillful personnel in key areas critical to firm's future development. Empirical evidence lends support to the observation, that other conditions being equal, "under financed" firms perform worse than firms with "adequate" financial resources (Schoonhoven et al, 1990; Roberts and Hauptman, 1987). In this context, a firm is considered "under financed" when it does not have the financial capital required to successfully develop the business according to market opportunities (Teece, Pisano and Shuen, 1997).



Finally, according to the RBV, financial resources do not provide sustained competitive advantage since they are not rare, non imitable, or non tradeable. Nonetheless, it is reasonable to expect that those firms which invest more financial resources in their business will accumulate larger stock of strategic assets, tangible and intangible, compared with other firms lacking financial resources to the development of their business (Dierickx and Cool, 1989).

### **3.6.4 Individual Knowledge-Based Resources**

#### **3.6.4.1 Entrepreneur/Chief Executive Human Capital**

One major focus of this study is on the role of the entrepreneur/chief executive. Indeed he/she can be considered the most valuable resource within the firm (Bruderl and Preisendorfer, 2000; Bruderl et al, 1992). The role of the entrepreneur/chief executive is even more critical in the case of small firms since he/she is simultaneously in charge of creating and developing the vision, strategy, leadership for the firm, but also often performing some functional and administrative tasks to venture success. At personal level he/she must have a sense of achievement with high motivation, high skills and capabilities and possessing a network of personal contacts based on his/her own previous experience (Kuznetsov, McDonald and Kuznetsova, 2000). Very often this network of contacts represent firm's initial customer base (Smith and Fleck, 1987).

This study applies human capital theory to investigate the attributes of the entrepreneur/chief executive education, career, history and previous experience on business performance. In this context, Becker (1975) makes the distinction between general and specific human capital. The former refers to years of schooling and years of working experience, while the latter is related to entrepreneur's industry specific experience and specific human capital. Industry specific experience is an important predictor of specific human capital because it enhances knowledge about attractive niches in order to develop business activity. Entrepreneur's industry specific experience refers to entrepreneur's experience in the industry. On the other hand,

entrepreneur/chief executive specific human capital refers to the following dimensions: 1) Self-employment experience of the entrepreneur; 2) Leadership experience in managing and directing employees; and 3) Parental self-employment.

In addition, entrepreneur-specific human capital may represent to the entrepreneur the best preparation, in terms of knowledge acquired, for future's entrepreneurial venture.

In sum, human capital for the entrepreneurial firm growth and development may be critical since several empirical studies give evidence of a positive correlation between human capital of the entrepreneur/chief executive and profitability (Bates, 1985; Bruderl, et al, 1992). In this context, even before the set-up of the firm, people with higher human capital are able to detect profitable market niches not yet covered by other competitors (Bates, 1985). Currently, people with higher human capital may have the knowledge on how to start and run a business successfully through the assessment of all relevant information and consequently all opportunities and threats.

### **3.7 Summary and Conclusions**

Throughout this chapter this study has identified and examined key resources of high technology SMEs, by applying the resource-based view of the firm (RBV). Moreover, this study is positioned within the broad RBV, which receives some insights and complementarities, but also some differences relative to industrial organisation economics (Porter, 1980), neoclassical microeconomics (Ricardo, 1817) and evolutionary economics (Nelson and Winter, 1982).

In this context, this chapter has emphasised the normative and prescriptive values of the RBV while acknowledging its importance, in recent years, in some research areas of management such as finance, human resources and international business.

This thesis adopts the classification of resources proposed by Miller and Shamsie (1996) study distinguishing two categories that are property and knowledge-based resources. Property-based resources are related to the ownership and control of a specific and well-defined asset. By contrast, knowledge-based resources are protected from imitation not

by property rights rather by knowledge barriers. They include firm's specific skills and capabilities to develop their products and services to the needs of specific target markets in very unpredictable and uncertain environments.

Miller and Shamsie (1996) study also considers, for both property and knowledge-based resources, as having two different types of resources, in each category, that are discrete and systemic resources. Discrete resources refer to those resources, which have value independent of their organisational contexts. On the other hand, systemic resources are only valuable as part of a network or system. In this context, by applying Miller and Shamsie, (1996) framework, the literature on high technology firms combined with the preliminary interviews with entrepreneurs/chief executives of high technology SMEs experts and academics suggest the critical importance, at firm level, of the following resources applicable to high technology SMEs:

- Discrete knowledge-based resources: marketing and technological resources.
- Systemic knowledge-based resources: entrepreneurial orientation.
- Discrete proprietary-based resources: financial resources

Moreover, as examined in chapter 2, section 2.3.2.4, for small high technology firms the entrepreneur plays, at individual level, a critical role in firm's long term success. Thus, human capital of the entrepreneur/chief executive, (discrete knowledge-based resources) has also been proposed.

With the exception of financial resources all the other resources are valuable, scarce, imperfectly tradable and non imitable.

This chapter argues that marketing resources are particularly important since they leverage firm competitiveness by anticipating customers' needs ahead of competition and creating long lasting relationships with customers, suppliers, distribution channels and other potential partners.

Secondly, technological resources are also particularly important for high technology SMEs. In fact, they include the technological knowledge generated by R&D activities which constitutes firm's know how, that is, all the information necessary to develop and

deploy in the production of a product or a service. In addition, technological resources could also be seen as the stock of relevant knowledge existent within the organisation, which allows new techniques to be used.

Thirdly, other important dimension in the capability-base of high technology SMEs is entrepreneurial orientation (EO). EO attempts to capture organisational/ management processes based on the methods and styles developed and implemented by the entrepreneur/chief executive within the organisation (Brown, 1996; Merz et al, 1994) in order to develop, integrate and reconfigure firm's resources.

Currently, EO is a multidimensional concept including three dimensions that are *innovativeness, risk-taking propensity and proactiveness*. *Innovativeness* refers to a firm's propensity to engage in the generation and development of new ideas, to the introduction of new products/ services and/or technological processes. On the other hand, *risk-taking behaviour* is considered the large commitment of resources to high-risk uncertain business in order to achieve high returns, by identifying opportunities in the market. Finally, *proactiveness* refers to the seeking of market opportunities which may or may not be related with firm's current activities.

Fourthly, financial resources are also particularly critical, for high technology SMEs, since very often they lack the capital necessary to develop key activities such as technology development and marketing research. In fact, they do not have the borrowing capacity or the cash usually available to larger or longer established firms. Their fixed assets are not very significant and those firms are seen as risky and consequently they must pay a premium for cash or other credit lines obtained from banks, suppliers or other firms.

According to the RBV, financial resources do not provide sustained competitive advantage, since although they are valuable and scarce for high technology SMEs, they are imitable and tradable. Nonetheless, it is reasonable to expect that those firms which invest more financial resources in their business will accumulate larger stock of strategic assets, tangible and intangible, compared with other firms lacking financial

resources to the development of their business (Dierickx and Cool, 1989; Teece, Pisano and Shuen, 1997).

Finally, the entrepreneur/chief executive could be considered the most valuable resource within the firm (Bruderl and Preisendorfer, 2000; Bruderl et al, 1992). Its role is even more critical in the case of small firms since he/she is simultaneously in charge of creating and developing the vision, strategy, leadership for the firm as well as on the management, integration and reconfiguration over time of different types of resources within the organisation.

## **Chapter 4: The Internationalisation of SMEs and High Technology SMEs**

### **4.1 Introduction**

The previous chapters have reviewed the literature relating to the characteristics of SMEs and high technology SMEs (Chapter 2) and resources and capabilities of high technology SMEs (chapter 3).

In fact, chapter 2 has mainly identified high technology SMEs current strengths and weaknesses. That chapter has prepared the ground to chapter 3, which drawing on the literature of the Resource-Based View of the Firm (RBV), mainly in a domestic context, has examined some of those strengths and weaknesses, which may be understood as representing key resources (Werenerfelt, 1984) of high technology SMEs explaining why some firms consistently outperform others. Furthermore, based on Miller and Shamsie (1996) characterisation of property and knowledge-based a set of resources, both at firm and individual levels, have been proposed, which may give the high technology SME superior performance vis-à-vis its competitors. They include marketing and technological resources (discrete knowledge-based resources), entrepreneurial orientation (systemic knowledge-based resources) and financial resources (discrete proprietary-based resources). Moreover, as examined in chapter 2, section 2.3.2.4, in small high technology firms the entrepreneur plays a critical role to firm's long term success. Thus, the human capital of the entrepreneur/chief executive, (discrete knowledge-based resources) has also been proposed.

The first main part of this chapter reviews, international trade theory (section 4.5.1), international business (section 4.5.2) and internationalisation (section 4.5.3) models and frameworks as well as the resource-based view (RBV) and internationalisation (section 4.5.4), which are also key for this study. In addition, section 4.5.4 will also review the RBV literature, in an international context, relative to the resources, suggested on chapter 3, which may explain why some high technology SMEs achieve superior international performance.

The second main part of this chapter, section 4.5.5, reviews international business and internationalisation theories and the resource-based view in relation to entry mode choice; since one main part of the research framework is the relationship between resources of the high technology SME and the service mode in the main foreign market. Moreover, the following section, section 4.5.6 proposes the use, in combination, of transaction costs economics (TCE) and the RBV to predict and analyse entry mode choice of high technology SMEs.

As far as models of internationalisation are concerned they were developed during the seventies and eighties and do not capture market globalisation and economic integration. In this context, section 4.3 presents main trends towards the increasing globalisation of the world economy and section 4.4 examines the role of SMEs in the global economy.

Overall, as noted by Coviello and McAuley (1999), the complexity of the field of internationalisation, mainly in the areas of small and entrepreneurial firms, in high technology sectors, merits complementary interpretation from multiple theoretical perspectives. As indicated in chapter 6 of this thesis, concepts that depict issues taken from behaviouristic models of internationalisation, resource-based view and transaction cost approaches, have been employed in the development of the main arguments and constructs of the framework, and will be equally used in the interpretation and analysis results of future empirical stages of the research. In fact, in the same vein, as Young, et al (2000) this study argues that those models/ frameworks can be understood as complementary rather than stressing the merits of each one taken *per se*.

Finally, section 4.5.7 will propose both objective and subjective measures to assess international performance. Throughout this section different objective measures of international performance, generally acknowledged in the export and internationalisation literatures, will be put forward.

Last but not the least, once the sample in this study is based both on mature high technology SMEs and on small and young technology firms, section 4.5.8 describes and

analyses the rise of international “start ups”, firms that are international practically from the outset.

Overall, internationalisation of both mature high technology SMEs and “start ups” becomes an imperative rather than an option due to the increasing globalisation of high technology industry sectors.

In sum, the goals of this chapter are sixfold:

- Firstly, to present a definition of the term internationalisation and how this concept has evolved over the years in order to get a richer understanding and broader scope of analysis relative to firm’s international activities.
- Secondly, by applying the RBV, mainly in an international context, this study will assess the importance of the resources, proposed in chapter 3, which may give the high technology SME superior performance vis-à-vis their competitors in foreign markets.
- Thirdly, to review international business and internationalisation theories, and the RBV in relation to the entry mode, in the main foreign market.
- Fourthly, this study proposes the use, in combination, of transaction costs economics (TCE) and the RBV to predict and analyse entry mode choice for high technology SMEs.
- Fifthly, to review behaviouristic models of internationalisation relative to knowledge acquired over firm’s international activities with the subsequent reduction of market uncertainty; this leads to firm’s higher commitment to foreign markets.
- Sixthly, to propose both objective and subjective measures to assess firm’s international performance.

#### **4.2 The concept of Internationalisation**

Internationalisation is a very important component of the business strategy of most business firms (Melin, 1992). There are, however, some specific aspects that distinguish internationalisation from other strategy processes. Firstly, internationalisation focuses



on the transfer of products, services or other resources across national boundaries and in so doing a firm has to select the countries, which the transactions will be done with. Secondly, the type of international exchange transaction, in other words, the choice of foreign market entry mode that will be selected (Andersen, 1997). Despite the importance of these two components –country selection and foreign market entry mode– in the concept of internationalisation the perception among researchers is that concept goes far beyond those two issues. In fact, there is no general agreement of internationalisation researchers about a definition of internationalisation. For example Turnbull (1987) considers internationalisation as the outward movement in firms cross border activities. This definition has a clearly narrow scope compared with Welch and Luostarinen (1988) definition which takes into consideration both sides of the process that are the inward/outward cross-border activities in firm's increasing involvement in international operations.

Currently, there are different views about internationalisation. Some of them emphasise process aspects over time while others concentrate more in decisions taken in a certain moment in time. In this context, one view considers internationalisation as a pattern of investments of a multinational enterprise (MNE) in foreign markets explained by rational economic decisions based on the analysis of ownership, location and internalisation advantages (Dunning, 1977, 1980, 1988). Another view addresses internationalisation as a process of increasing international involvement by a firm as a result of knowledge and commitment to foreign markets (Johanson and Vahlne, 1977). This latter view takes internationalisation as a natural and sequential process of increasing international involvement in association with changes in terms of international organisational forms (Bilkey and Tesar, 1977; Cavusgil, 1980).

A third view, however process-based, as the latter, takes also into consideration the inward/outward movements of internationalisation, which go beyond market selection and foreign market entry-mode and in doing so capturing the whole process.

Indeed, this view of internationalisation also emphasises firm's product offering, overall organisational capacity, personnel skills and organisational structure supporting internationalisation (Welch and Luostarinen, 1988). Moreover, Welch and Luostarinen,

(1993) demonstrate that internationalisation has to be analysed in a more holistic way that is potentially influencing different functional areas of an organisation and not just marketing and sales activities in a foreign market.

Finally, another view of internationalisation is that proposed by Beamish (1990: 77), which define internationalisation as “*the process by which firms increase their awareness of the influence of international activities on their future and establish and conduct transactions with firms from other countries*”. This concept of internationalisation perhaps has the advantage of being more operative since it integrates the other three perspectives in a single holistic definition of internationalisation (Coviello and McAuley, 1999). In fact, Beamish’s definition acknowledges the following aspects: firstly, that internationalisation is process-based evolving overtime even though he does not emphasise incremental involvement/commitment as a critical component of internationalisation. Secondly, that internationalisation is a learning process for the organisation that impacts on international economic decisions. Thirdly, that internationalisation is an important element of the strategy of the firm towards its growth and development. Finally, that this definition captures all the transactions established and conducted with firms from other countries, that is, not only the international outward links but also the inward cross-border links.

In fact, the traditional general acceptance of internationalisation as a one-way process of increasing involvement and commitment in foreign markets has been widely criticised (Turnbull, 1987; Calof and Beamish, 1995).

For example, Calof and Beamish, (1995) suggest that throughout the internationalisation process, firms not always show a pattern of increasing involvement and commitment, but periods of de-investments, that is, periods of temporary decrease in international business activities may happen. Therefore, according to these two authors, internationalisation could be seen as “*the process of adapting firm’s operations (strategy, structure, resources, etc.) to international environments*”. This view is also shared by Andersen (1997) who sees internationalisation as “*the process of adapting exchange transaction modalities to international markets*”. In this context, Andersen

(1997) gives particular attention to the type of products and assets that will be transferred across national boundaries as well as on the markets (countries) where these transactions will be carried out.

In sum, one can conclude that various definitions of the term “*internationalisation*” have been proposed in the literature. Nonetheless, there are some vectors which may characterise internationalisation as a:

- Developmental dynamic process by which firms develop their awareness of the direct and indirect influence of international transactions on their future.
- As part of firms’ strategy they adapt their involvement and commitment to foreign markets by adjusting their international exchange transaction modalities and consequently their organizational-structure and resource-base.

Finally, internationalisation can be seen as a feasible strategy to firm growth and development.

#### **4.3 Characteristics of the World Environment: Market Globalisation and Economic Integration**

Globalisation represents the increasing interdependence between national economies involving different actors such as consumers, suppliers, producers, investors and governments in different countries (Knight and Cavusgil, 2000).

In this process those actors behave in such a way as if the world economy consisted of both “*a single market and a production area with regional and national sub-sectors rather than a set of national economies linked by trade and investment flows*” (UNCTAD, 1996).

In this context, globalisation is associated with the declining in trading and investment barriers imposed by national governments, the de-localization to low cost production locations by large MNEs, the ability of domestic firms to source raw materials, components and parts internationally from cost-effective suppliers and by the fact that

national markets are becoming much more open to international competition (Dunning, 1993).

Over the years globalisation has been a gradual process facilitated by the end of the cold war (Luostarinen, 1994) and the consequently increase in economic and political liberalism (Luostarinen, 1994; UNCTAD, 1996), the creation of free trade areas (e.g. EFTA, NAFTA, ASEAN) and market economies (Luostarinen, 1994). The philosophy behind economic liberalisation is that free trade gives economic benefits to all participating nations. In other words, if nations are engaged in playing their role globally they are better off than staying isolated no matter what their specialisation patterns might be.

This political and economic push towards globalisation is, to a great extent, facilitated by advances in communications and telecommunications, informatics and information technology, logistics and transportations (Luostarinen, 1994; Knight and Cavusgil, 1996; UNCTAD, 1996). These factors led to a more observable day to day situation such as the shrinking differences between national markets and life styles (Levit, 1983) as well as by the development of global mass markets and international niche markets. Nonetheless, globalisation is not a soft and smooth process since it increases market turbulence, increasing competition especially by MNEs, loss of protected markets due to trade liberalization and growing volatility in financial markets (Knight, 2000). In fact, the integration and scale activity of international financial markets is seen as a powerful driver towards market globalisation and economic integration.

At microenvironment/firm level further developments also suggest an increasing trend towards globalisation such as the increasing R&D costs for firms (Granstrand, 1998) in parallel with the decreasing product-life cycles. Under these circumstances competing globally, or at least internationally, become for firms more a necessity than a mere option. This situation is even more dramatic for firms, which compete, in technology intensive sectors.

In sum, technology factors have in recent years strong effects at macroeconomic level, mainly in terms of the nature and amount of worldwide production and trade.

#### **4.4 Globalisation and SMEs**

Research on the effects of market globalisation on SMEs is still patchy despite it has been increasing in recent years (Knight, 2000).

However, over the last decade or so Small and Medium Sized Enterprises (SMEs) are becoming increasingly active in international markets (Bonaccorsi, 1992; Oviatt and McDougall, 1994, 1999). The internationalisation of SMEs is recognised as driven by the increasing globalisation of the world economy. This increasing globalisation, as already suggested in section 4.3, is mainly due to the decline in trading barriers imposed by different governments, on a worldwide basis, in parallel with advances in telecommunications, informatics and lower transportation costs. Such changes have opened the doors of international market opportunity to small and medium sized firms. Furthermore, the importance of SMEs is widely recognized to a country's development and well-being (Reynolds, 1997).

Nonetheless, the literature considers the limited role of SMEs in cross border activities due to their shortages in human, financial and managerial resources (Buckley, 1989). However, some studies and reports suggest about the growing importance of SMEs in international business activities (OECD, 1997; ENSR, 1997). In addition, the great majority of these studies emphasise export related activities rather than other patterns on conducting business overseas. In this situation, it is not surprising the appearance of a new stream of research focusing internationalisation in a more holistic way clearly beyond mere exporting activities (Jones, 1998; Coviello and McAully, 1999). Nevertheless, the role of FDI is still very limited even though this type of entry mode is growing within the population of SMEs. In fact, according to a relatively recent OECD report (1997) only 10% of the SME population was accounted for in FDI activities. Moreover, this 10% represents the larger SMEs that are those firms that have between 250 and 500 employees. Thus, this categorisation does not fall in this thesis definition,

which classifies an SME, in line with the E.U. criteria, as a firm with less than 250 employees.

FDI and other foreign market entry modes such as licensing, franchising, management contracts and so forth represent for only roughly 10-15% of international business activities currently developed by SMEs (OECD, 1997).

More specifically, SMEs in high technology sectors have an important role in creating opportunities for new and very skilled employment making an important contribution to economic growth and development (Coviello and McAuley, 1999). However, these SMEs compete in markets characterised by shorter and shorter life cycles, in which technologies fast become obsolete. They face high technological risks and operate in industries subject to dramatic structural changes (Coviello and Munro, 1992). Moreover, domestic markets currently tend to be too small to accommodate the technology-based niche strategies typically pursued by small firms, and consequently small high technology firms need to be active abroad, practically from the outset (Coviello and Munro, 1992; Lindqvist, 1997).

In sum, there is a trade-off between some factors which favour international activities of SMEs such as the growing market liberalisation and the declining in trading barriers associated with advances in telecommunications, information technology and reduction on transportation costs make things easier for SMEs to get access to foreign markets. On the other hand, factors which hinder international activities of SMEs are the increasing competition, both domestic and international, which makes things harder for the SME survival and growth. Moreover, the increasing consolidation in most business industries represents even more difficulties for SMEs to find their accessible and profitable market niches.

#### **4.5 Internationalisation Theories: Country vs. Firm Level**

According to the level of analysis one can make the distinction between international trade theory and international business theories/ internationalisation theories.

The former is related to country-level of analysis mainly explaining why countries trade in general as well as on their patterns of specialisation, while the latter focuses at firm level analysing how and why MNEs (international business theories) and SMEs (internationalisation theories) are active in foreign markets.

#### **4.5.1 International Trade Theory**

The reasons why countries engage in trade are twofold. First since there are differences between countries they try to find arrangements that are beneficial to the parties involved. Second, countries try to specialise in a limited range of products and in so doing they can achieve economies of scale in production (Krugman, 2000, McDonald et al, 2002).

Empirical evidence shows that characteristics in international trade reflect the interaction between different patterns of economic specialisation, in different countries, associated with the achievement of economies of scale, which enhance productivity and efficiency in those countries.

Classical theory (Adam Smith, 1760) suggests that absolute advantage is achieved by one country when it produces a specific good using lower labour costs. In this context, trade is established because it is beneficial not only to the country, which produces the good but also to other countries, which can obtain that good at a lower price.

In the nineteenth century neo-classical theory (Ricardo, 1819) posits that even if a country does not get absolute advantage, international trade would be beneficial to that country if it possesses comparative advantage. In fact, the Ricardian model/comparative advantage model suggests that if even one country in particular is able to produce all its goods cheaper than another country, trade can still be beneficial for both countries based on comparative rather than absolute cost advantages. Therefore, countries should only produce those goods where they get comparative advantage in

comparison to other countries. They can trade those goods for other products where they have higher labour productivity that is where they not hold comparative advantage.

A country owns comparative advantage in the production of a specific good if the opportunity costs in producing that good, in terms of other products, is lower in that country in comparison with other countries (Krugman, 2000; McDonald et al, 2002).

In addition, according to neo-classical theory (Ricardian model) international trade takes place due to differences in productivity of labour more than any other factors of production. In this context, there are some similarities between neoclassical theory and the RBV. The former refers to only two factors of production (labour and land) while the latter is extended to more factors of production (Barney, 2001). In addition, the RBV calls to economic rents: Ricardian rents.

Although the Ricardian model makes good predictions in terms of why trade may happen and in the respective impact at country level it also gives rise to some misleading conclusions. In fact, it foresees a high degree of country specialisation that does not exist in real world. Secondly, it sees no significant role in differences of resources among countries as a cause of international trade once, for neo-classical theory, trade is only explained by differences in labour productivity. On the contrary, the unequal distribution of resource endowment among countries appropriately explains the occurrence of international trade and international production. Thirdly, it does not account for the role of economies of scale possessed by certain producers in certain countries and consequently it does not explain why international trade occurs among nations with similar specialisation patterns (Krugman, 2000; McDonald et al, 2002).

Later in the twenty century Heckscher (1950) and Ohlin (1933) developed a theory suggesting that international trade is to a great extent, driven by differences in factor endowments in different countries. In fact, this theory argues that the proportions of factor endowments of resources, available in distinct countries, are dissimilar and the proportions in which they are used are also distinct in the production of different goods.

Some naïve assumptions of the models, presented above, such as perfect competition, the absence of economies of scale have been revised (e.g. Krugman, 2000). Indeed, for



this author, the emergence of market imperfections in trading between countries arises due to imperfect competition as a result of the manifestation of economies of scale. Overall all these theories state a static market-equilibrium.

#### **4.5.2 International Business Theories**

Much of early research on internationalisation has been focused on the activities of Multinational Enterprises (MNEs) and their processes of expansion in foreign countries (Buckley and Casson, 1976; Rugman, 1982) emphasising aspects of Foreign Direct Investment (FDI), which emerged from different theoretical backgrounds.

For example, the market imperfection approach (Hymer, 1976) posits that some firm-specific advantages such as superior product technology, management skills and so forth of a MNE could offset costs and information advantages detained by national companies in their home markets. In fact, while the latter have an intimate knowledge of the market conditions in their domestic countries the former can only obtain that knowledge at a cost. The competitive advantage of MNEs is explained by imperfections in markets for goods or factors of production. These imperfections are the consequence of certain firms acquiring competitive advantage through product differentiation, technological and marketing advantages and the access to financial resources.

The market imperfections approach was further developed and refined to become the core of the internalisation theory (Buckley and Casson, 1976). These authors argue that MNEs in a situation of product development or intermediate-product market imperfections that deal with aspects such as knowledge and technology, which represent firm's resources, are difficult to organise and costly to use. Thus, the market for components or intermediate products will rely on the internalisation of these markets through FDI. In this context, the MNE is motivated to create internal markets where transactions can take place at a lower cost rather than by using external markets (McDonald et al, 2002).

In fact, the meaning of internalisation is that the MNE will establish a specific business transaction through its internal hierarchical organisational structure rather than relying

on external factor markets (Coase, 1937; Williamson, 1976). The emphasis of internalisation is on the motivations of the MNE to extend international operations by its own.

Currently, further theories in international business (Rugman, 1980) are based on, directly or indirectly, market imperfections and the need to internalise imperfect factor-markets. In this context, theories of market imperfections and internalisation conducted to the use of transaction costs analysis in explaining why and how internationalisation occurs.

In sum, firms internationalise in order to reduce costs by internalising the transfer of goods and services across national boundaries, choosing for each stage of production the lowest cost location and optimal organisation structure in so that transaction costs are minimised (McDonald et al, 2002).

In addition, it also considers that a MNE develops some specific monopolistic advantage in the home market and can keep this advantage in foreign markets at little additional costs (Caves, 1982). However, if this specific advantage cannot be kept throughout the process of internationalisation against any opportunistic behaviour of other firms, market imperfections or other situations, it is likely that firms prefer to internalise these activities within their hierarchical organisational structures. Indeed, by internalising activities firms are more able to keep control of valuable and unique resources that may possess. In other words, for firm's expansion these unique resources and capabilities are better protected and deployed by the use of sales/wholly owned subsidiaries rather than relying on the use of external markets.

Another economic approach to internationalisation is Dunning's Eclectic Paradigm (Dunning, 1980, 1988) which in contrast with transaction cost economics (TCE) suggests that the minimisation of transaction costs is not the only factor influencing internationalisation. Indeed, in his framework Dunning suggests that the combination of ownership (O), location (L) and internalisation (I) are the main factors explaining internationalisation decisions. Ownership advantages represent firm unique assets and resources that allow the firm to obtain competitive advantage. Examples of Ownership

advantages could lay on the access to unique resources (static ownership advantages) and/or the capacity to organise mobilize and deploy resources in a more efficient way (dynamic ownership advantages). Location advantages intend to represent the attractiveness of a certain market in terms of market size, potential growth and potential risk. In addition, more recently Dunning (1993) added other measures of location advantages such as availability of lower labour costs, country infrastructures and similarities in terms of culture and habits. Finally, internalisation advantages refer to the savings in transaction costs achieved (Williamson, 1981) of choosing an internalised hierarchical mode of operation rather than an external mode.

Overall, Dunning's framework is mainly concerned with international production/operating choices of MNEs as well as on the intra firm trade for intermediate products. In this context, the focus of Dunning's Eclectic Paradigm, is on decisions taken in certain moment in time, by a MNE, in a later stage of the internationalisation process rather than understanding the process as a whole. As Johanson and Vahlne (1990) study states international business theory is more concerned with the outcome of internationalisation and not how the process occurs and evolves over time.

In short, the key issues of Internalisation Theory and Dunning's Eclectic Paradigm are on why and in what forms MNEs exist and the types of foreign market expansion they currently use rather than trying to explain the evolution process in becoming MNEs.

Last but not the least, international business theories assume that decision-makers within MNEs take rational decisions based on perfect knowledge about situations they face. Thus, these theories do not include behavioural-related variables. This fact, to some extent, may be less important in the case of MNEs compared to the situation of less experienced SMEs.

In conclusion, the main advantage of international business theories lie in explaining firm's decisions or choices taken in a certain moment in time. Consequently, its analysis of internationalisation is mainly static and therefore does not capture process and system dynamics, overtime. In addition, the main focus of most economic models is on MNEs instead of SMEs.

The next subsection will present a more in-depth analysis of TCE. The importance given to TCE is due to the fact that an important component of the research framework, in this study, is the type of entry mode used by the high technology SME, in the main foreign market that is: independent or rather contractually. In fact, the extant literature acknowledges that in TCE studies, the dependent variable is typically the entry mode (Peng, 2001). This is specially the case for discriminating dichotomous modes used in this research (Sharma and Erramili, 2004). In addition, this approach may be appropriate once another one of the main aims of this study is, by using the RBV, to link entry modes with foreign market performance (Peng, 2001).

#### **4.5.2.1 Transaction Cost Economics (TCE)**

Transaction costs economics (TCE) has been since the early eighties a very influential framework explaining internationalisation decisions and predicting entry mode choice, mainly by MNEs, in manufacturing and service industries (Erramili and Rao, 1993).

Current studies, influenced by TCE, treat each specific foreign market service mode as a *transaction* and the key decision, for a MNE, is whether to internalise business activities via, for example FDI or relying through arm's length of external markets (Williamson, 1975, 1985). In this context, the choice of the appropriate institutional arrangement is a function of *transaction* efficiency, which in turn is dependent upon the method that is most cost effective to establish that transaction. This assessment is done based on the following assumptions: firstly, people are opportunistic, that is, they mainly pursue their own personal goals (Seth and Thomas, 1994; Williamson, 1988). Secondly, people are bounded rational, that is, they do not have access to all critical information to make decisions neither do they have full comprehension of the information made available to them (Seth and Thomas, 1994) and thirdly when asset specificity influences the transaction; for example when idiosyncratic assets are closely attached to a specific strategy; firms should rely on their own hierarchical structures rather than on external markets (Rumelt et al, 1991).

Currently, TCE suggests that firms with higher endowment of internal resources try to protect their know-how against any opportunistic behaviour of potential partners (Williamson, 1988). In addition, any form of cooperation, even through a contractual entry mode is done very carefully, on an *ad-hoc* basis.

Potential benefits of cooperation are mainly related with the exchange of knowledge-based resources, between partners (Lawless and Price, 1992). However, as TCE also suggests the transfer of knowledge to outside partners face important limitations such as bounded rationality and opportunism (Seth and Thomas, 1994; Williamson, 1988).

In these circumstances TCE points out to the transaction costs on inefficiencies on the transfer of knowledge to external partners while minimising the effects of bounded rationality and opportunism. Moreover, some forms of knowledge are more difficult to transfer than others due to the indicated effects of bounded rationality and opportunism and consequently involving higher transaction costs when transferred to outside partners. For example, tacit knowledge, knowledge that is ill codified, embedded in organisational routines, is very hard to transfer across firm boundaries (Anderson and Gatignon, 1986; Buckley and Casson, 1996).

On the other hand, as far as opportunism is concerned anecdotal evidence suggests that it increases the risks related with the transfer of knowledge to external partners. In other words, it increases the dissemination of risk (Agarwall and Ramaswamy, 1992). Dissemination of risk refers to the risk that some of firm's resources, which might be source of competitive advantage, may be object of appropriation by the partners whom the firm cooperates with. This is a very important issue since, as suggested in chapter 3, (see sections 3.6.1 and 3.6.2) often knowledge-based resources constitute the basis for competitive advantage, for high technology SMEs.

Nonetheless, TCE also acknowledges benefits of cooperation based, for example, on a contractually entry mode. This is the case when a MNE establishes a partnership with a local firm to enter a foreign market. In this situation, the local partner may provide relevant knowledge about the host market such as market potential, market segments, competition and market trends. On the other hand, the MNE provides, to some extent, knowledge about its products, systems, services and business practices in order to

extend and exploit its competitive advantages without significant additional costs in the foreign country (Dunning, 1993; Makino and Delios, 1996). In these circumstances the MNE may reduce the investment and the risk in doing business in an unknown environment and simultaneously leveraging its competitive advantage allowing its geographical expansion much faster and to more locations.

At this point it is important to stress the importance of using TCE to better understand the foreign market entry mode not only of MNEs but also for small entrepreneurial firms (Zacharakis, 1997).

In sum, decisions of cooperation, through a contractual arrangement with a partner, vs., internalisation incorporate both advantages and disadvantages. In fact, according to TCE both involve substantial transaction costs. The latter may include costs related with hiring additional personnel; overheads; added costs on plant and equipment; and opportunity costs with the ownership of specific assets to internal transactions (Shrader, 2001) while the former includes the costs associated to all bureaucracy in establishing contracts with other firms, training, technology and management assistance and potential conflict due to different and opposed goals of the alliance partners (Buckley and Casson, 1996; Lyles and Salk, 1996). Furthermore, the conflicting situation between partners may arise due to the possible incompetence of the partner located in the host market (Buckley and Casson, 1996). Nonetheless, according to TCE, the most important costs of establishing contracts with other firms, as already mentioned above, are associated with bounded rationality and opportunism.

In sum, there are significant tradeoffs between internalisation and contractual cooperation. Therefore the decision of contractual cooperation vs. internalisation in the foreign market entry mode is dependent upon the circumstances. A decision should be conferred to the one which economise on transaction costs. In this context, economising, in economic terms, means optimising tradeoffs between costs and benefits in firm's decisions in the host market. In more practical terms the organisational structure of the firm in the host country must take into consideration the opportunities in

the target market, which have influence on firm performance in terms of both goal achievement and costs incurred (Williamson and Ouchi, 1981).

#### **4.5.3 Internationalisation Theories**

In sharp contrast to international business theories internationalisation theories address the process of the internationalisation of mainly SMEs. Some authors termed internationalisation theories as a field of international entrepreneurship (McDougall and Oviatt, 2000).

For entrepreneurship researchers activities of SMEs, in their respective domestic markets, have been over the years a primary focus of attention. Furthermore, entrepreneurship researchers also consider diversification of activities to new geographical areas as an act of entrepreneurship (Lumpkin and Dess, 1996). In this context, two streams of research in internationalisation theories/international entrepreneurship have been identified (McDougall and Oviatt, 2000; Antoncic and Hisrich, 2000). For the first stream of research the focus is on established SMEs. In fact, this stream of research tends to focus on multiple aspects of SMEs exports analysing the antecedents, strategy processes and behaviours and their relationships with export performance (Miesenbock, 1988; Aaby and Schlater, 1989). In addition, more recently this stream of research extended investigation beyond activities of mere exporting to include a broader perspective of internationalisation in terms of processes, behaviours and patterns (Coviello and McAuley, 1999; Bell, Crick and Young, 2004).

By contrast, for the second stream of research the focus of analysis is on born-global/international new ventures; firms that are international practically from the outset analysing the antecedents and outcomes of their internationalisation (Autio, Sapienza and Almeida, 2000).

Despite the well developed literature in both streams of research surprisingly much less is known about the identification and characterisation of resources, specific to high

technology SMEs, conducting business activities in very dynamic fast changing domestic and international environments, and measuring their impact on international performance.

In order to continuously, consistently and systematically identify knowledge and proprietary-base resources, which may be important to the high technology SME international performance the following sections review different models/frameworks of internationalisation created and developed over international operations.

#### **4.5.3.1 The Establishment Chain/ Stages Model**

Stage models of internationalisation have their origins on theory of firm growth (Penrose, 1959; Aharoni, 1966), behaviour and learning theories (Cyert and March, 1963), which describe internationalisation as a gradual development process of firm expansion over a certain period of time, very often several years (Melin, 1992). In addition, according to this perspective, internationalisation evolves through stages (the establishment chain) from less to more complex foreign market service modes. Currently, firm's international activities quite often starts with indirect importing or exporting and subsequently evolving to direct exporting and/or importing (inward/outward cross-border activities) and further developing to more complex foreign market service modes (e.g. licensing, joint ventures, subsidiaries). In this context, stage theory suggests that internationalisation occurs incrementally. Throughout this process a firm will get increased export experience and consequently could have increasing involvement in international operations, regardless of its size.

From past reviews the following models were identified as the most widely cited, applied, criticised and rewied models:

1. The Uppsala Internationalisation Model (Johanson and Vahlne, 1977, 1990).
2. The Export Developmental Models or Innovation-Related Models (Andersen, 1993; Leonidou and Katsikeas, 1996).
3. Pre-Export Models: Wiedersheim-Paul et al (1978) and Olsen and Wiedersheim-Paul (1978).



Nonetheless, all these internationalisation models focus on the outward cross-border links of internationalisation.

For a quick snapshot on main types and activities of outward cross-border links see Figure 4.1.

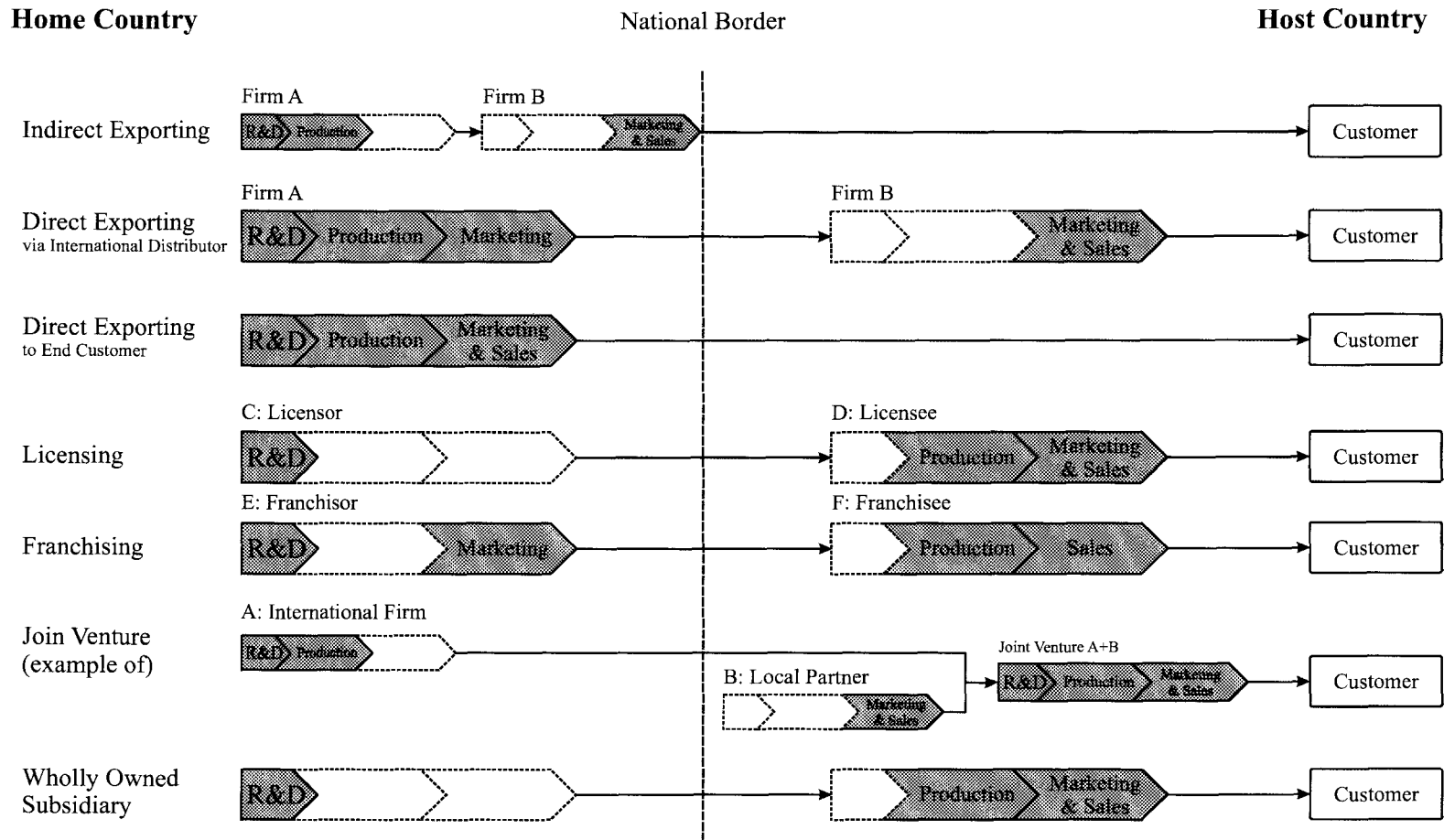


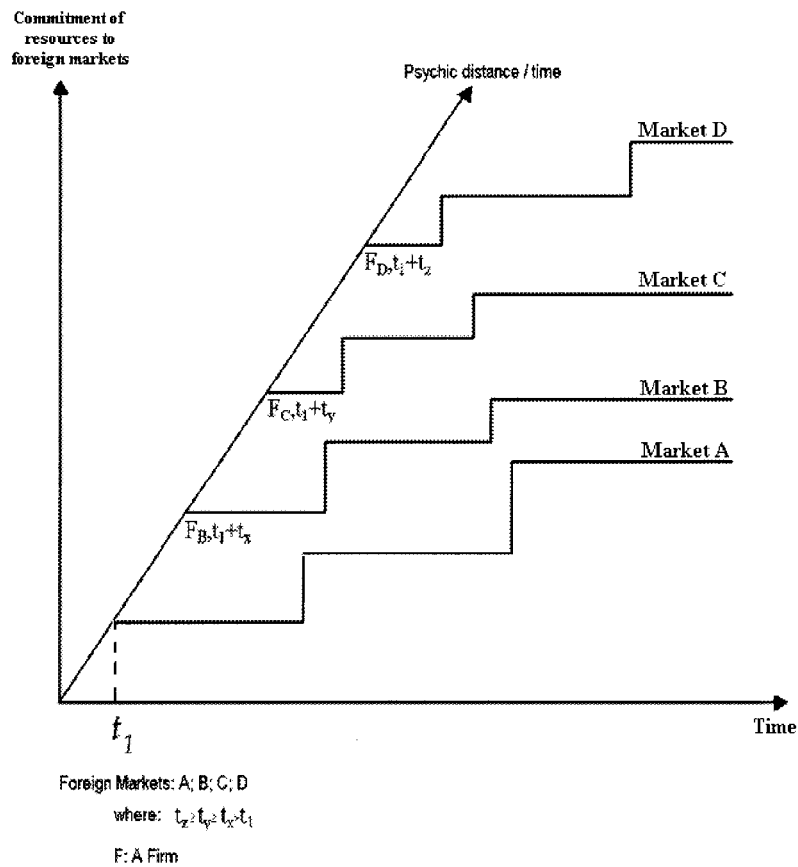
Figure 4. 1: Main Outward Cross-Border Activities

#### **4.5.3.1.1 The Uppsala Internationalisation Model**

Currently, stage models are also known as the Uppsala model of internationalisation. This model is based on the research initiated by Johanson and Wiedersheim-Paul (1975) and further modelled and refined by Johanson and Vahlne (1977). Later the model was revised and extended by the same authors (Johanson and Vahlne, 1990). However not explicitly mentioned, the Uppsala model is based on the theory of the growth of the firm (Andersen and Kheam, 1996).

Currently, the model posits that firms first only have business activities in their home markets and then gradually, over time, they develop activities overseas (Johanson and Wiedersheim-Paul 1975) “*as a consequence of a process of incremental adjustments to changing conditions of the firm and its environment*” (Johanson and Vahlne 1977). The Uppsala model suggests that internationalisation occurs incrementally, through a sequence of stages (steps), from no regular exports, to exports via independent distributors or agents and finally to sales and production subsidiaries (Johanson and Wiedersheim-Paul, 1975). The authors termed this sequence of stages as the “establishment chain” (see Figure 4.2).

Figure 4. 2: The Establishment chain of a firm (F) in a process of expansion to foreign markets with increasing Psychic Distance and Commitment of Resources



Source: The Author

In addition, these pre-deterministic stages represent increasing levels of commitment of resources and consequently an increasing control of firm's foreign market operations (Johanson and Wiedersheim-Paul, 1975). This sequence of stages was confirmed by empirical evidence from a case study on the internationalisation of four Swedish multinational companies (Johanson and Wiedersheim-Paul, 1975).

In these circumstances it is clearly assumed that firms want to keep their overall risk exposure at minimum levels. In fact, before starting the internationalisation process, firms are characterised by lack of knowledge about foreign markets due to lack of information and consequently facing a situation of market uncertainty if they decide to venture abroad (Johanson and Vahlne, 1977, 1990). However, throughout the

internationalisation process, firms will accumulate experiential knowledge, that is, knowledge that can only be learned through personal experience about foreign markets and consequently reducing uncertainty and the perceived risks on foreign operations (Johanson and Vahlne, 1977). This behavioural perspective of a firm, as a learning organisation, having limited knowledge and bounded-rationality that is not possessing all the relevant information in the decision-making process stands in remarkable contrast to the rational decision-making assumptions that characterised international business theories, discussed earlier in this chapter (see section 4.5.2). In addition, stages refer to the overtime evolution of a firm's internationalisation in a single country. This host country, at least in the early phases of internationalisation, should be characterised by a short psychic distance to firm's home country. In other words, firms currently "*start exporting to neighbouring countries or countries that are comparatively well known and similar to their home countries*" (Johanson and Wiedersheim-Paul 1975).

In their study Johanson and Wiedersheim-Paul (1975) define psychic distance as the factors that may prevent or disturbing the flow of information between the host and the home country. They include factors such as differences in language, culture, education, political systems and level of economic development. However, psychic distance is not always correlated with geographic distance that is the case of Portugal and Brazil or the Former Portuguese Colonies. In addition, Johanson and Wiedersheim-Paul (1975) depict psychic distance as dynamic, that is, it can change over time.

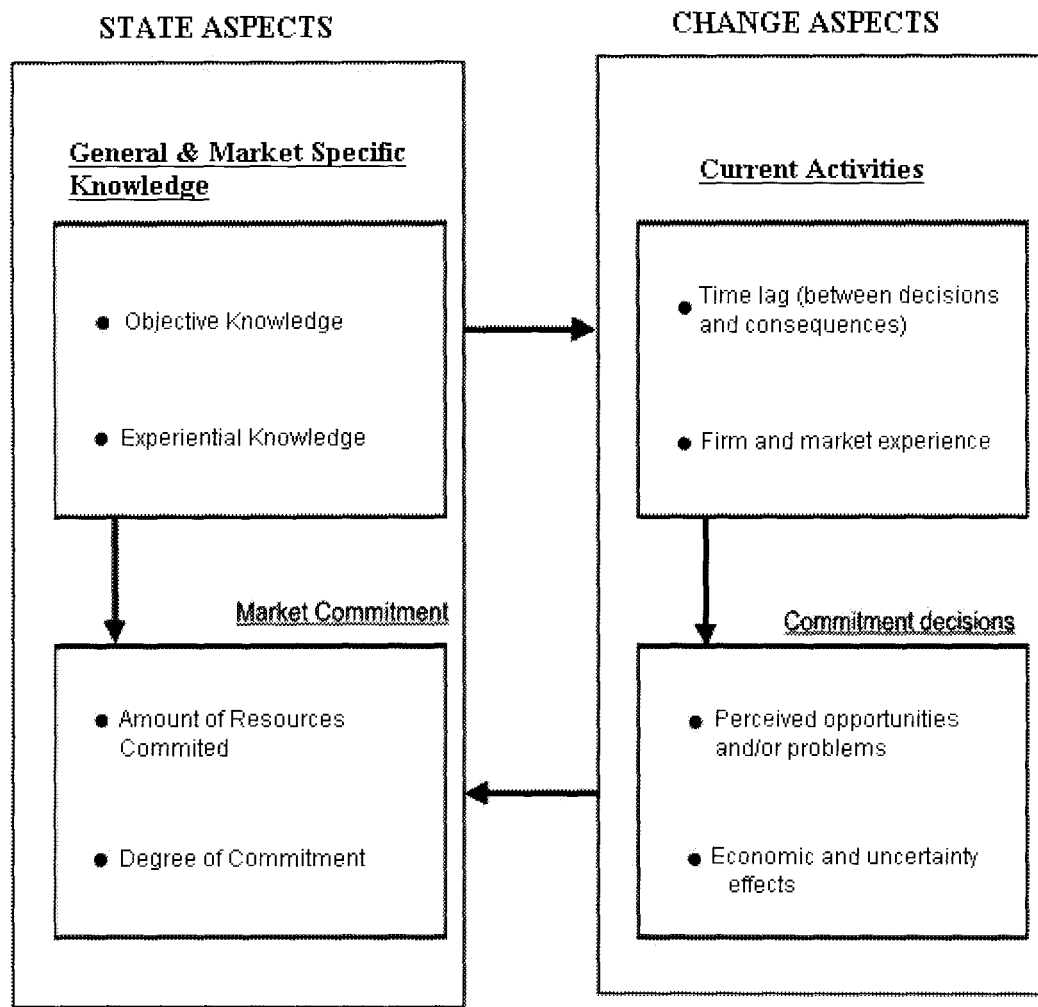
The driving force of the Uppsala model is that throughout this sequence of stages firms gradually increase their international involvement in a process characterised by the development of market knowledge and increasing commitment to foreign markets. Currently, it is assumed, in the model that increased market knowledge will lead to increasing market commitment and vice versa.

Under these circumstances the model encompasses the fact that firms overtime are able to enter gradually new international markets with greater psychic distance (see Fig. 4.2). In addition, firms are able to deploy the knowledge acquired through experience in a

certain market in other similar foreign markets and consequently skipping some of current stages in the internationalisation process.

The basic mechanism in Johanson and Vahlne (1977) model explaining the establishment chain in the internationalisation process is presented in a dynamic model that distinguishes state and change aspects (see Figure 4.3).

Figure 4. 3: The Basic Mechanism of Internationalisation (State and Change Aspects)



Source: Adapted from Johanson and Vahlne (1977)

The former refers to current market knowledge and commitment of the firm to foreign markets while the latter represents the factors affecting and potentially changing the

current state of business activities of the firm. Both state and change aspects interact between each other as indicated by the arrows in Figure 4.3.

More specifically, state aspects refer to both general and market specific knowledge and market commitment by the firm to foreign markets. The latter includes the amount of resources committed and the degree of commitment, while the former involves firm's objective and experiential knowledge about foreign markets, at general and market-specific levels.

On the other hand, change aspects of the model include firm's current activities and decisions to commit resources to foreign markets. More specifically, current activities of the firm are characterised by a time lag between decisions taken, their implementation and correspondent outcome to the organisation. In addition, the model suggests that the higher this time lag is the higher the commitment of the firm to foreign operations is. Moreover, the model also posits that current activities performed, by the firm, in foreign markets, can be considered the primary source of experience. The second component of the change aspects in the model is the commitment decisions of resources to foreign operations. These decisions are influenced by firm's diagnosis of problems and opportunities as well as by economic and uncertainty effects. The former is associated, basically, with an increase in the scale of business activities in the market while the latter is related to market uncertainty. Market uncertainty refers to the lack of ability by managers to foresee present and future market-influencing factors. Nonetheless, uncertainty could be reduced "*through interaction and integration with the market environment*" (Johanson and Vahlne, 1977: 29).

In sum, decisions on current activities, by the firm, in foreign markets, are formed and dependent upon firm's international experience.

Market-specific knowledge can be acquired overtime through experience in that market that can in turn be transferred to other foreign markets (knowledge of international business activities). On the other hand, the amount of resources deployed can be defined by the amount of financial, physical and human resources required to the entry-mode in the foreign market while the degree of commitment refers to the difficulty of finding an alternative use for the resources deployed.

The linkage between state and change aspects in Johanson and Vahlne (1977) model gives it a dynamic content. Indeed the main assumption got from the model is that market knowledge and market commitment (state aspects) affect decisions on commitment as well as on how current activities are performed (change aspects) that in turn influence the next sequence of events, that is market knowledge and commitment. In this situation, there is an ongoing process of events followed by decisions and the other way round.

In line with Penrose (1959), Johanson and Vahlne (1977) make the distinction between objective and experiential knowledge. The former can be taught while the latter can only be acquired through experience. Indeed experiential knowledge obtained through experience in a certain foreign market is simultaneously path dependent and unique to the firm (Nelson and Winter, 1982).

Overall, some empirical studies give support to the evolutionary path, predicted by the model, while other empirical studies do not support that view. Nonetheless, *the concepts of market knowledge/experiential knowledge and market commitment remain critical on the assessment of firm's international orientation.*

In terms of internationalisation experiential knowledge is also critical for early detection and assessment of market opportunities while reducing market uncertainty.

Currently, the Uppsala internationalisation model assumes that international activities will be critical in creating and developing firm's knowledge-base resources. Thus, market commitment in a specific foreign market will be made gradually overtime.

In sum, firm's increasing knowledge about foreign markets will impact on its experience and commitment to international markets enhancing the scope of firm's international activities. Therefore, the pace of firm's international growth depends, to a great extent, on its accumulation of foreign organising knowledge-base (Eriksson et al, 1997; Johanson and Vahlne, 1977, 1990).

In short, based on the Uppsala internationalisation model this study also argues that the increase of experiential knowledge of international activities would reduce foreign



market uncertainty, which will lead to greater commitment to foreign markets and a higher international intensity (Johanson and Vahlne, 1977, 1990). Thus, *firm's knowledge, experience and commitment to foreign markets are also important predictors of firm's international performance and scope of international activities that is its international intensity.*

#### **4.5.3.1.2 Export Developmental Models**

The background of export developmental or innovation models is basically the same as the Uppsala internationalisation model. In addition, the backbone of those models is also firm's lack of knowledge and uncertainty about foreign markets (Andersen, 1993). Furthermore, all these models posit an incremental involvement and commitment to foreign activities, based on learning and experience with the main attention given to the different stages in export activities and consequently neglecting other forms of business activities that nevertheless the Uppsala internationalisation model incorporates.

In addition, export developmental models of internationalisation can be considered overtime as a learning process associated with the adoption of an innovation by the firm.

Currently, these models are based on Rogers (1962) conception of the adoption process. Most of the innovation related models were developed in the late seventies and in the eighties. Examples of these models include Bilkey and Tesar (1977), Cavusgil, (1980, 1982), Czinkota (1982), Reid (1981). The main differences between these models are in the number of stages that they propose and in the description for each stage (Andersen, 1993).

Although the trigger mechanism, for a firm, to start exports is different from model to model, differences between models are minimal about the nature and the process of internationalisation (Andersen, 1993). Nevertheless, these models differ in terms of number of stages, stages classification criteria and on the trigger mechanism to start exports.

For example Bilkey and Tesar (1977) model, based on a push mechanism, is characterised by an increasing export level to psychologically more distant countries. Indeed Bilkey and Tesar (1977) empirical study gives evidence that firms increase their level of exports moving from one stage to the next through a learning process, developed overtime. Thus, firms at early export stages focus on psychologically close markets. In contrast, firms at later export stages could expand their business activities to more distant or different markets.

Although export developmental models do not have a significant contribution to theory of the internationalisation of the firm, they emphasise the importance of the trigger mechanism (internal or external) on export initiation. Often this trigger is not an internal agent rather an external force, such as an unsolicited order.

Currently, all the models evolve stage by stage and as a firm enters each new stage, more resources and capabilities are required. Furthermore, the process of firm's internationalisation is seen overtime as of increasing commitment to international operations.

Conversely, Welch and Luostarinen (1988) study points out the fact that empirical evidence shows that any stage of "*de-internationalisation*" through disinvestments may be due to firm or market reasons that may occur.

More recently, Luostarinen and Helman (1993) defined an integrated model of internationalisation based on an empirical study of a sample of small Finnish firms. The approach is to analyse both inward and outward movements of internationalisation. Moreover, Luostarinen and Helman (1993) model includes four stages and different possible paths in the internationalisation process. In the first stage the model suggests firms with only domestic activities. The second stage is characterised by the inward movement where cross-border activities are limited to technology transfer and/or imports of raw materials and/or components. The third stage that reflects outward movements of internationalisation may include activities such as exporting, sales and production subsidiaries, subcontracting, licensing or any co-operation activity oriented to the domestic market. Finally, the fourth and last stage, understood as the co-operation

stage, posits that the firm may have different forms of co-operation in one or several value-chain activities that are R&D, Purchasing, Production or Distribution Agreements.

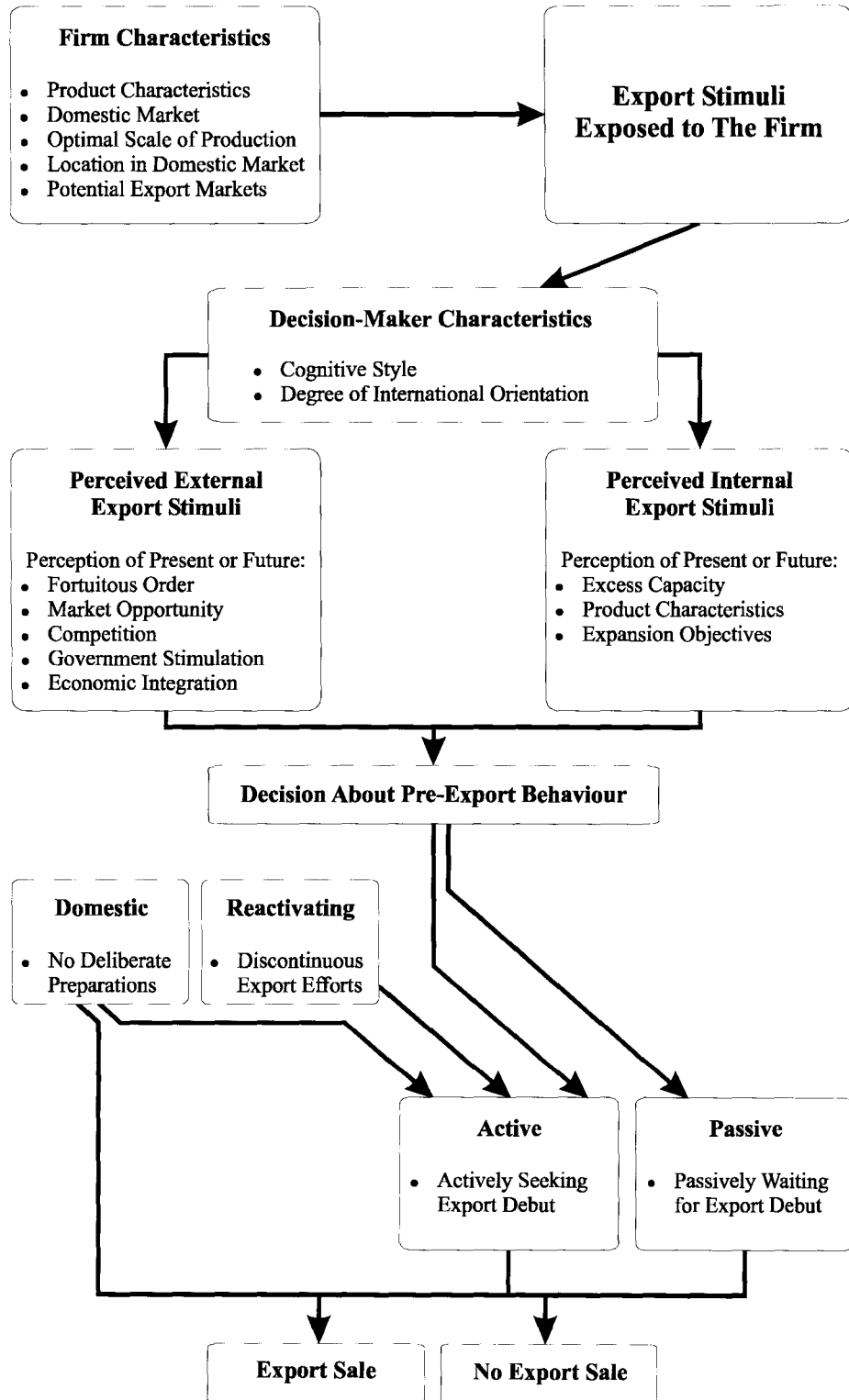
Both the Uppsala and the innovation related models are behavioural and based on the incremental pattern of firm internationalisation. This pattern of gradual internationalisation overtime is due to firm's lack of international market knowledge and uncertainty about the decision whether to internationalise. Nonetheless, all the innovation-learning models explain the process of incremental internationalisation based on Johanson and Vahlne's (1977) early contribution.

#### **4.5.3.1.3 Pre-Export Models**

Wiedersheim-Paul et al (1978) and Olson and Wiedersheim-Paul (1978) models in a preliminary analysis basically extend the establishment chain/stage models backwards to include a pre-export stage.

Like the Uppsala model and export developmental models pre-export models assume that firms from inception have only business activities in the home country. In addition, pre-export models also assume the importance of the founder/entrepreneur as the single decision-maker in the firm. Therefore, a firm from the outset is seen as a flat organization, rather small and characterised by a high degree of centralisation in the decision-making process. In fact, the founder/entrepreneur, according to the model, will face internal and external evoking factors that will influence his/her decisions about initiating exports. Moreover, these models integrate push and pull factors towards exports. This is a strong contrast to the export developmental models whose focus is either on push or pulls factors (see Figure 4.4).

Figure 4. 4: Pre-Export Models of Internationalisation



Source: Adapted from Olson and Wiedersheim-Paul (1978)

In sum, the founder/entrepreneur with his/her actual perception of the firm and the market environment, matched with his/her living, working and industry experiences is seen as key determinant if the founder/entrepreneur is willing to take the necessary steps to prepare the firm for export initiation in a relative short term.

Pre-export models posit, in the same way as the Uppsala model, that lack of knowledge and uncertainty about foreign markets are seen as the current situation of a firm in a pre-export stage.

Depending on the cognitive style and the degree of international orientation of the founder/entrepreneur the perceptions and vision that he/she has about the firm and the environment, in short and medium term, will dictate the decision or not to initiate exports. If the decision-maker decides to start exports, his/her pre-export behaviour will be characterised by an increasing information gathering and careful analysis about foreign markets coupled with the establishment of some preliminary international contacts.

In short, pre-export models stress the critical role of the key decision-maker (generally the founder/entrepreneur) rather than the firm as a whole.

Indeed, these models highlighting the internationalisation process on an individual level while characterising the “pre-state” stage of the firm before starting exports give to pre-export models a singular scope of analysis. In fact, this perspective is not explicitly considered in other behavioural models.

Currently, *the overall living, working and industry experiences of the founder/entrepreneur were shown to be highly influential in terms of international outlook* and perceptions regarding foreign markets uncertainty, which have a strong impact on how small firms are managed.

Several empirical studies give evidence on the importance of the concept of international experience at individual level (Bloodgood et al, 1996; Reuber and Fischer, 1997; Zou and Stan, 1998). In addition, some empirical studies focusing on the foreign market expansion of MNEs emphasise the fact, in line with the RBV, that top managers may be one of the most valuable, unique and hard to imitate resources. In fact, as the

MNE expands to foreign markets; the more likely its top managers will have significant international experience (Peng, 2001; Roth, 1995). In this context, international experience may represent tacit knowledge difficult to access and develop by top managers, which do not possess such kind of experience (Peng, 2001).

In sum, in similar vein, as posited about international market knowledge/ experience and commitment, this study also considers *the international experience, at individual level, generally of the entrepreneur/chief executive and/or the other members of the founders/senior management team as an important predictor of firm's scope of international activities that is its international intensity.*

#### **4.5.3.2 The Network Approach to Internationalisation or the Update of the Uppsala Internationalisation Model**

Johanson and Vahlne (1990) study updates their original process/behavioural model of internationalisation. Theoretically they extended the model by incorporating findings from industrial marketing area mainly focusing in non-hierarchical systems, where firms are integrated in international networks of business relationships (Johanson and Mattson, 1988, 1992). These business relationships may include suppliers, customers, competitors or even social relationships such as family, friends or other social contacts.

According to this stream of research, the focus of the firm is to strengthen and monitor its position within its international network of business relationships. In fact, the development of business relationships in foreign countries can be established through extension, penetration and integration (Johanson and Mattson, 1988). Extension refers to the investment in networks that are new to the firm. By contrast, it is considered penetration the increased development and resource allocation in existing firms' networks. Finally, integration is achieved through coordination among different national networks. In this context, internationalisation occurs not because a specific firm within a network decides to go international rather as consequence of a decision taken by the network as a whole.

Johanson and Mattson, (1988) consider internationalisation as a cumulative process where relationships are continually established, developed, maintained and broken to the achievement of firms' short-term financial goals and medium and long-term strategic objectives such as firm's extension, penetration and integration in business networks.

The model emphasises the development of market knowledge and access to valuable resources through integration in business networks. Moreover, firm's position in the network can be considered at micro (firm to firm) or macro (firm to network) levels.

At micro level the relationships to other firms can be of complementarily or rather competitively or both throughout the process of internationalisation. This means that firms are interdependent to other firms through co-operation or by competition.

At macro level it can be said that individual firms hold positions in networks as a result of developing activities that represent at once important opportunities and constraints to present and future activities. Although the individual firm makes investments in resources committed to create, build or acquire assets for firm growth and development, the network perspective emphasises that the firm, integrated in a network of business relationships, is also dependent on resources controlled by other firms that are also part of the network. Thus, a firm could get access to external resources according to its network position (Johanson and Mattson, 1988).

In this situation, firms may internationalise their activities because they want to develop and deploy resources in such away that their long-term economic and financial objectives will be achieved.

In sum, firm's success in its expansion to new foreign markets is more dependent on its network of relationships within the markets, both domestic and international, where it currently develops business activities rather than on the market characteristics of the selected host countries (Johanson and Mattson, 1988). This perspective represents a shift from one key concept of the Uppsala internationalisation model (the psychic distance concept), to a new approach emphasizing the fact that many firms enter new foreign markets almost blindly, not dictated by strategic decisions or even as a result of

market research activities rather by social exchange processes, interactions and networks (Johanson and Vahlne, 1992).

Overall, the network approach goes beyond the original perspective presented by the Uppsala model of incremental internationalisation by suggesting that “*firm’s strategy emerges as a pattern of behaviour, influenced by a variety of network relationships*” (Coviello and Munro, 1997). In addition, these two authors give evidence, in a sample of New Zealand Software SMEs, which while supporting the network perspective acknowledge the existence of internationalisation stages, however in a more condensed and accelerated form.

Several other empirical studies also give evidence about the important influence of networks on a firm’s internationalisation process (Johanson and Vahlne, 1992; Coviello and Munro, 1995, 1997; Chetty and Blakenburg Holm, 2000).

For example, Coviello and Munro (1995, 1997) found that successful New Zealand Software Firms are actively involved in international networks outsourcing some R&D activities to network partners.

Bell (1995) reported on the influence of customers/clients and suppliers relationships on the internationalisation of Irish, Finish and Norwegian Software companies.

Chetty and Blakenburg Holm (2000), in a longitudinal case study, developed in New Zealand, reported about the importance of networks for firms to get access to new opportunities, knowledge, learning experiences or the pool of resources made available to them by their networks of relationships.

#### **4.5.4. The Resource-Based View and Internationalisation**

Developed from strategic management research the resource-based view (RBV) of the firm has become in recent years a very influential framework (Peng, 2001).

Indeed for strategic management researchers are key the identification and understanding of factors that can be source of sustained competitive advantage (Rumelt, 1984; Barney, 1991). In this context, the RBV argues that firms can obtain sustained competitive advantage by developing their strategies based on leveraging internal



strengths according to windows of opportunity, both national and international (Barney, 1991). In fact, the RBV suggests that firms in their product-market strategies should deploy effectively and efficiently their resources in order to achieve sustainable competitive advantage, which lead to obtain above normal returns associated with long-term profit maximisation (Conner, 1991). In fact, achieving ricardian rents is often a primary motive for firm's expansion in foreign markets. For example, firms in high technology sectors, characterised by their differentiated product portfolio or proprietary technology, will foresee to exploit their specific competitive advantages in foreign markets in order to obtain above normal returns (Contractor, 1984).

Nonetheless, as already pointed out in chapter 3, (see sections 3.6.1 and 3.6.2), high technology SMEs may compete basically in terms of knowledge-based resources, which may give them the skills and capabilities to develop competitive products/services to target attractive market niches, irrespective of being domestic or international (Young et al, 2000). Moreover, high technology firms develop their products targeting global markets where product life cycles are expected to be short. This fact represents a strong stimulus to high technology SMEs to accelerate even further firm's internationalisation.

The RBV suggests that firms should create and develop their valuable, rare, imperfectly imitable resources and utilising them in the domestic and/or foreign markets (Young et al, 2000; McDougall et al, 1994).

Currently, international diversification allows firms to target the most attractive markets for their resource deployment. Thus, firm's international strategies will depend on its internal resource-base (Young et al, 2000). Therefore, internationalisation can be seen as very situation specific due to resource heterogeneity across firms (Jones, 2001).

The RBV also posits that firm's internationalisation evolve not necessarily through a pre-deterministic postulated sequence of stages rather according to the capability-base of the firm. In addition, it determines important issues for a firm such as earliness and speed of internationalisation and foreign market entry mode as well. In fact, recent research adopting a RBV perspective has criticised stage models (see section 4.5.3.1) of

internationalisation by arguing that small and young firms, mainly in technology intensive sectors, may have the necessary resources and capabilities, mainly knowledge-based, in order to venture abroad practically from the outset (Knight, 2000; McDougall et al, 1994).

The contribution of the RBV has also been meaningful in identifying the resources required for a firm in order to overcome its potential liabilities of foreignness in international markets (Peng, 2001). In this context, this study has identified, in chapter 3, section 3.6, those resources, which may be critical to high technology SMEs, and summarised in Table 4.1:

Table 4. 1 Key Resources of the High Technology SME

	<b>Firm Level</b>	<b>Individual Level</b>	<b>Firm/ Individual Level</b>
<b>KNOWLEDGE-BASED</b>			
Marketing Resources	√		
Technological Resources	√		
Human Capital of the entrepreneur		√	
Entrepreneurial Orientation			√
<b>PROPRIETARY-BASED</b>			
Financial Resources	√		

Currently, all of these proprietary and knowledge-base resources, may be key, to develop and deploy both in domestic and foreign markets (Young et al, 2000) and can exist in any of the functional areas of the high technology SME (Sharma and Erramilli, 2004).

Broadly speaking, industrial organisation argues that firm's international strategies are influenced by both firm and market factors. However, due to the inability of external factors to explain why some firms outperform others within the same industry it is reasonable to expect that firm's resources may play a key role on its international

strategies. Thus, differences among firms, on their international involvement, are often dependent upon their resource-base (Roquebert, Philips and Westfall, 1996).

Nonetheless, the RBV suggests the development of new resources through the establishment of international social contacts (Wernerfelt, 1984). This is the case of small firms that very often only cover part of the value chain activities and consequently their strategy is dependent both on their internal resources but also upon their business contacts with other firms. Firms that are limited by their resource-endowment consequently need to establish business contacts with other firms having complementary resources (Lee et al, 2001, Borch and Arthur, 1995). These external contacts may play a very important role not only to the procurement of those complementary resources/assets but also in the exploitation of market opportunities, irrespective of being national or international.

Cooperation with other firms seems to be critical in the search for market opportunities, to the testing of new ideas, or getting access to external resources (Lee et al, 2001).

In sum, small firms establish linkages with other firms in which partners make available and obtain resources through long lasting relationships. In addition, these relationships evolve explicitly exchange of resources in two ways (Lee et al, 2001; Jones, 1999). Furthermore, in some cases international business activities may be an important factor in the development of firm's resources and capabilities and consequently in the increasing firm's competitiveness even in its domestic market (Young et al, 2000).

Overall, the RBV suggests that internationalisation evolves in a much less deterministic way than what it was proposed by economic and behaviourist models of internationalisation. In addition, these models of internationalisation, summarised, respectively in sections 4.5.2 and 4.5.3, of this chapter, sometimes do not appropriately explain the rapid internationalisation of high technology small firms. For example, McDougall et al (1994), building on the RBV, explain the international scope of international new ventures, firms with international activities practically from inception, by the individual resources of their entrepreneurs, such as their networks of social and business contacts that they have developed from previous activities. These facilitate their awareness in combining resources made available from different foreign markets.

Nonetheless, empirical evidence suggests that often small firms face huge constraints in their operations. These constraints may include lack of management skills and shortages of human and financial resources (Young et al, 2000).

A key element in firm's internationalisation is the transfer of resources to enter foreign markets. In this context, the RBV is a very influential framework since it focus on firm's ability to develop, acquire and maintain resources in order to achieve superior performance vis-à-vis its competitors. In this situation, internationalisation may become a source of firm's resources irrespective of being developed either inside or outside the firm (Young et al, 2000). In respect to the former shortages of internal resources do not represent an inhibitor to firm's internationalisation since small firms can build or leveraging resources through the establishment of international partnerships in order to access partner's technological or marketing/sales expertise, production facilities while sharing risks (Young et al, 2000). These resources built and developed by the small firm over the internationalisation process leverage current resources, while generating new competences, which may explain a variety of entry modes in different markets.

The entry mode chosen by the small firm, in a specific foreign market, will be the one that leverages firm's competitive position in that same market (Young et al, 2000). In this context, this study focuses on the type of entry mode, in the main foreign market, distinguishing modes in which the firm operates with a partner, that is, contractually vs. modes whereby the firm acts totally independently. The former includes international sales *through distributors and other contractual modes (e.g. licensing, contract R&D, joint ventures)* since they involve participation from partners, while the latter refers to direct sales to end customers or sales/ wholly owned subsidiaries since they do not involve operation with other partners (Shrader, 2001; Root, 1994).

Other resources not critical in leveraging current resources can quickly erode and become obsolete within a system of continuous resources development. In this context, taken internationalisation as a process, early stages may reflect available resources while later stages will be influenced by the strengthen of current resources and simultaneously by creating and developing new ones, both from domestic and

international activities in the same or in different value chain activities (Young et al, 2000; Bell, Crick and Young, 2004). Indeed as firms possess different endowments of resources and capabilities they utilise different alternative paths throughout the process of internationalisation in order to the achievement of growth and profitability (Young et al, 2000). Thus, firms are inherently heterogeneous in terms of resources and capabilities and therefore the foreign market entry mode may reflect firm's endowment of resources and capabilities, which have been adjusted over time in accordance with the evolution of their own internationalisation process.

Table 4.2 provides a comparative assessment, between the RBV, TCE, Market Imperfection/ Internalisation Theory, and Internationalisation Theories, in terms of the conceptualisation of the firm, main objectives, firm's behaviour, competitive environment and main theoretical contributions:

**Table 4. 2: Comparative assessment between the RBV, TCE, Market Imperfection and Internationalisation Theories**

	Market Imperfection/ Internalisation Theory	Internationalisation Theories	Transaction Costs Economics (TCE)	Resource-Based View (RBV)
<b>Firm</b>	• A bundle of heterogeneous skills and resources	• A set of skills and resources	• A bundle of heterogeneous skills and resources	• A heterogeneous bundle of scarce, valuable and imperfectly imitable resources and capabilities
Unit of analysis	• Firm	• Firm	• The Transaction	• Firm
<b>Main Objective</b>	• Long-term profit maximisation	• Short-term profit satisficing	• Long-term profit maximisation	• Long-term profit maximisation
Firm's behaviour is based upon	• Internalisation in foreign markets through FDI	• Managerial decisions in a context of market uncertainty	• Transaction costs minimisation	• The deployment of scarce, valuable and imperfectly imitable resources and capabilities
<b>Assumptions</b>	• MNE monopolistic advantage	• Gradual increase of market knowledge, experience and commitment.	• Bounded rationality • Opportunism • Asset specificity	• Firm heterogeneity • Resources immobility
Competitive advantage	• Resources superiority • Product differentiation	• International experience	• Overall costs minimisation. • MNE superior resources	• Resources superiority • New combinations of resources
<b>Environment</b>	• Stable	• Variable	• Unpredictable/uncertain	• Unpredictable/uncertain
Theoretical contributions	• Coase (1937) • Hymer (1976) • Buckley and Casson (1976)	• Penrose (1959) • Cyert and March (1963) • Johanson and Vahlne (1977)	• Anderson and Gatignon (1986)	• Wernerfelt (1984) • Rumelt (1984)

Source: Adapted and expanded from Sharma and Erramilli (2004)

#### 4.5.5 Market Selection and Foreign Market Entry Mode of High Technology SMEs

As already pointed out in section 4.2, internationalisation is, to some extent, about the transfer of products/services across national boundaries. In this context, the firm has to select both the markets/countries where these transactions will be established and the most suitable way to enter those markets. Furthermore, both decisions are intimately connected (Andersen, 1997).

Market selection, at least in early stages for SMEs, may be related to a stimulus from a change agent, internal or external to the firm, such as an unsolicited order, Government Agency or Industry Association which brings the window of foreign market opportunities to firm's attention. These situations represent an externally decision in which a firm simply responds to a foreign market opportunity. In other cases, as emphasised in the Uppsala model (Johanson and Vahlne, 1977), market selection often, in a context of uncertainty and lack of knowledge about foreign markets, is characterised by the choice of markets/countries, which represent lower psychic and/or geographical distances. This approach makes sense in a way that often SMEs run short of financial, human and managerial resources. However, in recent years SMEs tend to internationalise much faster than they used to do in the past "pulled out" by their customers and by their international business networks (see section 4.5.3.2).

Different approaches to foreign market selection emphasise the rationality and logic of decisions, taken by entrepreneurs/CEOs of SMEs, which may be based on intuition and pragmatism due to their contacts with customers and partners and not as a result of market research or careful planning, established in advance.

In a similar vein, entry mode choice has received, over the years, an in depth focus of attention by international business researchers (Sharma and Erramilli, 2004).

Traditionally, foreign market entry modes are seen as methods employed by firms to gain access to international markets (Young et al, 1989; Root, 1994).

The literature broadly classifies foreign market entry modes in exports, contractual and investment modes. Export entry modes include indirect and direct exports either through distributors or sales subsidiaries. Similarly, contractual entry modes refer to a variety of contractual arrangements such as licensing, contract R&D, contract manufacturing, franchising, service contracts, turnkey contracts, contractual joint ventures, etc. Finally, investment modes include wholly owned subsidiaries and equity joint ventures (Young et al, 1989; Root, 1994).

With export modes products are manufactured in the home country or in a third country and then sold in the host country. Thus, the emphasis of exports is just on sales of

products in the target market. By contrast, contractual modes involve not simply the transfer of products across national boundaries, but also the transfer of intangible assets, skills and know-how to national companies in their home markets. Lastly, FDI entry modes can be conducted with full ownership and control over foreign operations through wholly owned subsidiaries or either by sharing ownership and control with partners by using equity joint ventures.

Overall, this classification of modes has tended to emerge from analysis and comparison between individual entry modes types, mainly from research on multinational manufacturing firms (Jones, 2001).

Currently, each entry mode determines, to some extent, the degree of control that the firm has over foreign business activities (Anderson and Gatignon, 1986; Root, 1994), the level of risk and resource commitment to the foreign market (Hill, Hwang and Kim, 1990), level of fixed and variable costs and return on investment (Buckley and Casson, 1985) and level of organisational commitment and market involvement (Johanson and Vahlne, 1977; Welch and Luostarinen, 1988; Erramilli and Rao, 1990; Burgel and Murray, 2000). In addition, the traditional view of foreign market entry mode indicates that initial entry mode choices may be changed with considerable investment of time and money (Hill et al, 1990; Root, 1994). Therefore, the selection of the appropriate entry mode is a strategic and potentially long-term decision for the internationalising firm (Agarwall and Ramaswami, 1992).

Over the years different definitions of entry mode were put forward. Nonetheless, international business researchers tend to consider the foreign market entry mode as an arrangement allowing the entry of a firm's products/services into a foreign country associated with the transfer of finance, human, technological or other resources (Root, 1994) in order to organise firm's business activities in that target country (Hill, Hwang and Kim, 1990). In this context, some researchers emphasise aspects such as control defining an entry mode as a governance structure giving a firm the purpose to exercise control over its international activities (Anderson and Gatignon, 1986; Gatignon and Anderson, 1988). In fact, a firm has a set of foreign market entry modes available on a



continuum from high (e.g. wholly owned subsidiaries) to low control (e.g. indirect exports).

In sum, the foreign market entry mode encapsulates two key strategic decisions that are the location of different value chain activities (e.g. R&D, production, marketing and sales), within or outside the foreign market and their ownership (full, partial or no ownership).

In a slightly different perspective with the traditional entry mode literature presented above, but consistent with some studies recently set out (Burgel and Murray, 2000, Shrader, 2001; Sharma and Erramilli, 2004) about foreign market entry modes choices, mainly for high technology ventures, this study defines an entry mode as *a governance arrangement, which allows a firm to implement its business strategy in a foreign market, independently via subsidiaries (e.g. sales or wholly owned) and direct sales to end customers or by means of contractual arrangements with partners through distributors or other contractual modes (e.g. licensing, contract R&D, contractual joint ventures)*.

In this context, exports, conducted either by means of distributors or sales subsidiaries, are concerned not just with sales of products in foreign markets, but also with the need in identifying and providing pre- and after-sales support services such as installation, maintenance, updates and upgrades, due to high technological content of the products and services sold, by the high technology firm, in the foreign market (Burgel and Murray, 2000). In this context, ideally if the firm has all the required resources and capabilities to conduct business independently of any partner/distributor it will set up a sales subsidiary (Burgel and Murray, 2000). However, often small high technology firms are resource constrained and therefore need to establish cooperative relationships with distributors in order to get access to assets and capabilities that they do not own (Burgel and Murray, 2000). These cooperative relationships, in downstream value chain activities, with a distributor are key elements in contracts, which settle the relationships, however imperfectly, between the firm and the distributor and could be crudely called *contractual cooperation*. Similarly, this approach could be applied to a variety of contractual entry modes, already presented in this section, as well as to contractual joint ventures.

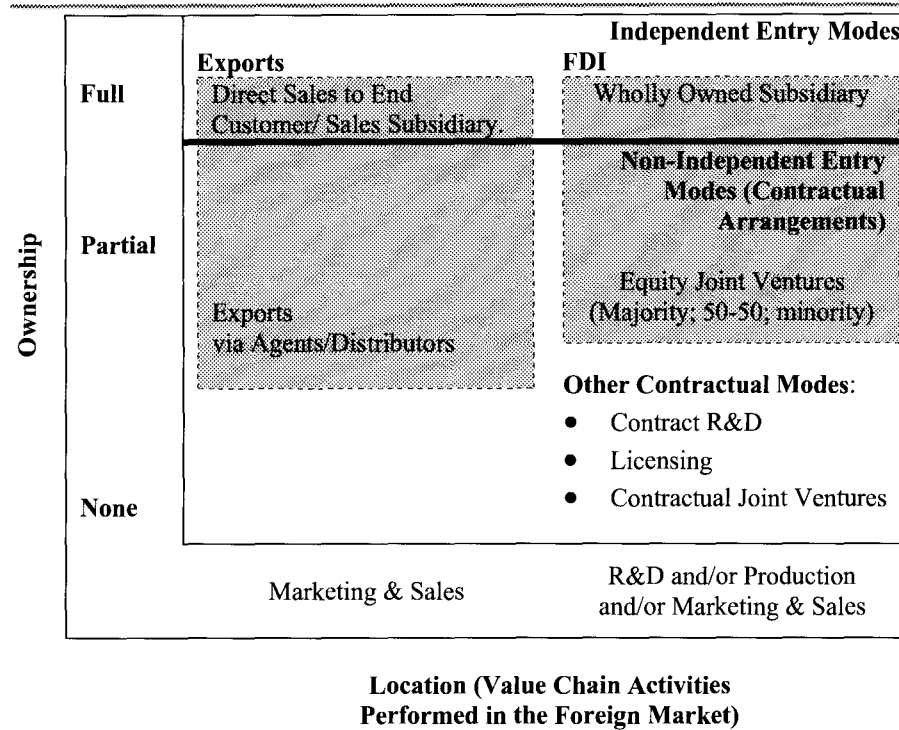
Last but not the least, small high technology firms only seldom engage in limited overseas investments. In this situation, they usually set up either marketing and sales subsidiaries or rather establish alliances with prospective partners in a form of contract R&D or contractual joint ventures (Bell, 1995; Burgel and Murray, 2000). Once again, these alliances are based on cooperation detailed in those contractual arrangements/contractual modes. Therefore throughout this study the terms *contractual arrangements*, *contractual modes* and *contractual cooperation*, will be, interchangeably, used.

In these circumstances, both the high technology and the prospective partner/distributor need to recognise the contractual arrangement as a base to move cooperation forward in the target market, while sharing revenues, costs and risks.

Overall, high technology SMEs, are dependent upon their resource endowments and may conduct business in the *foreign market entry mode*, either *independently via subsidiaries or direct sales to end customers or by means of contractual arrangements with partners through agents/distributors or other contractual modes*. In other words, high technology SMEs may have the choice when going international to establish some form of contractual cooperation or rather to select a sole venture.

Figure 4.5 presents various types of foreign market entry modes, incorporating both the perspective of the traditional literature on entry mode choice and the perspective followed in this study, which is consistent with recent studies in this research area (Burgel and Murray, 2000, Shrader, 2001; Sharma and Erramilli, 2004), along with ownership and location dimensions.

Figure 4. 5: Classification of Foreign Market Entry Modes by Location and Ownership Characteristics



Source: Adapted and expanded from Sharma and Erramilli (2004)

Overall, international business theories, internationalisation theories and more recently the RBV, already succinctly analysed, in this chapter, respectively, in sections 4.5.2, 4.5.3 and 4.5.4 try to predict and explain firm's foreign market entry mode. While the first two theories take a market-based view of the firm, that is, an outside-in view of the firm the RBV describes and explains firm's decisions from a perspective of the endowment and deployment of its resources; therefore it encompasses an opposite perspective, that is, an inside-out view of the firm (Sharma and Erramilli, 2004). In this context, the RBV tries to explain firm entry mode choice from its resource perspective.

In short, since the RBV and the market-based views depict the firm from two opposite sides it is expected that these two perspectives enhance explanations and the predictive power of a variety of foreign market entry modes from exports, contractual and hierarchical modes. In this context, in the following subsections this study addresses international business theories, internationalisation theories and the RBV in relation to entry mode choice.

#### **4.5.5.1 International Business Theories and Entry Mode Choice.**

As already pointed out in section 4.5.2 early theories in international business emerged from FDI investments of US firms after World War II. In fact, the market imperfection theory (Hymer, 1976) states that the entry mode choice is a function of market imperfection created by a MNE for its current monopolistic advantage that are its superior technology, management skills, etc. in relation to national companies in their home markets. Imperfect markets are created by limiting the number of current and potential competitors, by mergers and acquisitions, while establishing high entry barriers through strong investment in expensive and unique production equipments or product differentiation. In this context, the market imperfection theory partially explains the ownership dimension distinguishing FDI and licensing entry modes while neglecting joint ventures or exports.

In sum, a key concept in the market imperfection theory is the “exploitation of a firm’s monopolistic advantage for foreign market entry”, which has become a cornerstone of entry mode explanation (Sharma and Erramilli, 2004). Later the market imperfection approach evolved to the internalisation theory (Buckley and Casson, 1976), which basically tries to explain the growth of US MNEs after World War II by internalising international markets for components or intermediate products, which are related with aspects such as knowledge and technology that are difficult to organise and costly to use. Thus, those markets for components or intermediate products will rely on the internalisation within the hierarchical structure of the MNE through FDI, where transactions can take place at a lower cost rather than by using external markets. Thus, the model suggests that a choice for a specific foreign market service mode is the one, which minimises costs relative to other alternative entry modes.

As also stressed, in this chapter, also in section 4.5.2, another economic approach to internationalisation is Dunning’s Eclectic Paradigm (Dunning, 1980, 1988), built upon ownership advantage (O), location advantage (L) and internalisation advantage (I), the original version of Dunning’s Eclectic Paradigm (1980) explained three types of entry modes: exports, licensing and FDI. More recently (Dunning, 1995), emphasises that the

underlining principles for entry modes choices up to the late seventies were guided for the internalisation within the hierarchical structure of the MNE rather than relying on the market. Thus, the original version of Dunning's Eclectic theory (1980) did not explain cooperative entry modes and especially joint ventures, which have become quite important since the early nineties, onwards. Nonetheless, Dunning (1995) presents a modified framework in which the "O" includes the skills/resources of the partners, the "L" takes into consideration the spatial integration between locations and the "I" is broadening including contractual arrangements. In this context, Dunning's modified framework, in addition to the original study, also analyses contractual entry modes giving satisfactory explanation of ownership and location dimensions (Sharma and Erramilli, 2004).

Already in subsection 4.5.2.1 this study highlighted the importance of the transaction cost economics (TCE) for predicting entry mode choice, both for manufacturing and service firms (Erramilli and Rao, 1993; Sharma and Erramilli, 2004). TCE emerges from Anderson and Gatignon's (1986) study application to foreign market entry mode choice of US firms. The authors classify entry modes along a continuum from high control (e.g. wholly owned subsidiaries) to low control (e.g. licensing). In a similar vein, Anderson and Coughlan (1987) classified export modes ranging from high control (e.g. sales subsidiaries) to low control (e.g. exports through international agents/distributors).

Overall, TCE is particularly suitable to explain dichotomous entry modes (e.g. full ownership vs. no ownership) and not between different degrees of ownership (Gatignon and Anderson, 1988; Erramilli and Rao, 1993). In fact, the purpose of this study is to discriminate between dichotomous entry modes that are independent entry modes characterised by full ownership, by the entrant, and contractual arrangements' entry modes characterised by only partial ownership. Thus, TCE seems, in articulation with the RBV, an appropriate theory to explain entry mode choices.

In sum, international business theories for entry mode choice emphasise the following aspects: firstly, that firms expand to foreign markets in order to exploit their "monopolistic specific advantage" also referred as ownership advantage; secondly, this

advantage must be sustainable (Hymer, 1976) and cost-effective transferable across countries. In fact, for firms not possessing any specific advantage the probability of success in the international arena is quite limited.

#### **4.5.5.2 Internationalisation Theories and Entry Mode Choice.**

As stated in section 4.5.3.1 internationalisation theories were first proposed by Johanson and Vahlne (1977) and Johanson and Weidersheim-Paul (1975) (the Uppsala Internationalisation model), which later evolved to the Network Approach of Internationalisation Johanson and Vahlne (1990; 1992). Internationalisation theories have their origins on the theory of the growth of the firm (Penrose, 1959; Aharoni, 1966), behaviour and learning theories (Cyert and March, 1963).

In addition, as pointed out in section 4.5.3.1, according to this perspective, internationalisation evolves through stages (the establishment chain) from less to more complex foreign market service modes. Currently, firm's international activities quite often starts with indirect exporting and subsequently evolving to direct exporting via international agents/distributors and further developing to sales and wholly owned subsidiaries. Thus, the model gives a dynamic view of entry mode choice, which is basically determined by managerial decisions in a context of market uncertainty.

Nonetheless, empirical studies, published since the mid eighties onwards, challenge the stage models of internationalisation by being too deterministic while emphasising that internationalisation does not necessarily occur through a sequence of stages (Turnbull, 1987; Bell, 1995).

Overall, internationalisation theory explains both ownership and location dimensions however not in a rigorous way. In fact, this theory fails to explain joint ventures and other contractual modes (Young et al, 2000).

In short, international business and internationalisation theories may be understood as complementary to explain entry mode choice rather than considering them as competing theories (Bell, Crick and Young, 2004; Young et al, 2000; Bell and Young, 1998).

In fact, all these theories of entry mode choice share the fact that they are grounded in the market-based view of the firm. Thus, entry mode choices are explained from the market side or the product side of the firm (Sharma and Erramilli, 2004). By contrast, the RBV explains entry mode choice from a perspective of firm's endowment and deployment of resources. Since resources and products are two sides of the same coin (Wernerfelt, 1984) it is reasonable to expect that the use of the RBV to entry mode choice may be suitable in improving the extant explanations of firm's entry mode choices (Sharma and Erramilli, 2004).

#### **4.5.5.3 The Resource-Based View and Entry Mode Choice.**

According to the RBV each firm is characterised by its distinctive resource profile, which induce or reinforce the heterogeneity among firms. Thus, firms' business strategies may depend upon their resource-base (Barney, 1991).

When a firm expands to a foreign market it is expected to rely on its current resources to compete in that market rather than developing new ones from scratch. Therefore, the foreign market entry mode may be analysed, to some extent, as a way to transfer resources from the parent company to the venture in the target market (Root, 1994). Moreover, the value of a resource stays on its contribution to firm's competitive advantage (Madhok, 1997). Thus, according to the RBV, the selected entry mode choice will allow the transfer of resources from the home market to the target market, while keeping firm's competitive advantage often obtained in the home country. Nonetheless, different entry modes may allow firms' to preserve the value of the transferred resources to the host country, while maintaining its competitive advantage in that same market.

A specific firm may perform in the target market one or several value chain activities in order to sustain its competitive advantage, making non-neglectable investments with the expectation of obtaining above normal returns. However, in cases where firms achieve competitive advantage basically in marketing activities often they may address the

needs of that market through exports and maintaining other value chain activities in the home country and/or in a third country and therefore minimising investment costs (Sharma and Erramilli, 2004).

In sum, the location of firm's business infrastructure is related to its overall posture to establish competitive advantage both in the domestic and in foreign markets. Moreover, in the case of high technology SMEs due to their poverty of resources, if key advantages are **difficult** to transfer to the host market it is expected that the firm will rely its business in that market through exports directly to an end customer, generally another business organisation, or via a sales subsidiary. Similarly, if key advantages are **costly** to transfer to the host market high technology SMEs may organise the business through exports via international distributors/agents (Sharma and Erramilli, 2004).

#### **4.5.6 The Use of the Resource-Based View (RBV) and Transaction Cost Economics (TCE) to Analyse Entry Mode Choice of High Technology SMEs**

Currently, the foreign market entry mode is a trade-off between costs and benefits (Erramili and Rao, 1993; Shrader, 2001). Different entry modes involve significant differences in terms of costs and benefits obtained by firms. Entry mode costs may include investment, operating and opportunity costs, etc. Different entry modes models tend to agree on the cost side. In addition, it's currently acknowledged that exports and contractual modes involve fewer costs compared with equity joint ventures and wholly owned subsidiaries.

By contrast, entry modes models and frameworks differ significantly in terms of the benefits provided by the modes even though both the foreseen costs and benefits are difficult to anticipate, *ex-ante*. For example, in TCE the foreseen benefit is the reduction of transaction costs while for the RBV is the effective transfer of resources to the target market with minimal erosion of their value, keeping the competitive advantage in that same market.



Broadly speaking, as already stressed using TCE, see section 4.5.5.1., a firm can transfer its resources to the target market via internal modes or via arm's length market modes. The choice between these two alternatives stays on the suitability to transfer **or not** its competitive advantage to the host market, for example, to a local partner. In the latter case the firm will rely on the transfer of resources through an internal mode that is through a sales or a wholly owned subsidiary. In addition, according to the RBV, some of firm's resources are characterised by being imperfectly imitable by partners (Madhok, 1997). In fact, resources with high degree of complexity, tacitness and causal ambiguity, such it is often the case of firms operating in high technology sectors, since those resources are idiosyncratic and embedded within organisational routines, are difficult to transfer to outside partners and consequently resulting in loss of competitive advantage. In a similar vein, TCE also argues that this kind of intangible resources, often knowledge-based, involve considerable transaction costs as well may be subject to the opportunistic behaviour of a potential partner in the host country and therefore, both the RBV and TCE, suggest that hierachical/company-owned modes are more effective to transfer imperfectly imitable resources (Sharma and Erramili, 2004; Shrader, 2001).

In short, the ownership decision is to some extent determined by the international firm's ability and strategic choice to transfer its key resources to a potential partner in the target market. In this context, if the firm is able to effectively and efficiently transfer its key resources to a partner in the target country without putting its core competitive advantage at risk due to a potential opportunistic behaviour of an outside partner, it is likely that the high technology SME would choose a cooperative entry mode; otherwise it would select a sole venture (Sharma and Erramili, 2004; Shrader, 2001).

Summarising, as the RBV suggests, firms are inherently heterogeneous in terms of resources and capabilities. In this context, foreign market entry mode may reflect firm's endowment of resources and capabilities, which have been adjusted over time in accordance with the evolution of their own internationalisation process. Therefore, high technology SMEs might have the choice to internationalise through independent vs. contractual entry modes. Thus, it is suggested that the use of a contractual arrangement

vs. internalisation in the foreign market entry mode is dependent upon the situation (Shrader, 2001). In fact for firms' both represent substantial transaction costs. Thus, the rationale for choosing a contractual mode is conferred when the tradeoffs between costs and benefits for a contractual mode are optimised in relation to an internalised choice. The reverse is also true.

In sum, high technology SMEs may miss important foreign market opportunities if they do not move quickly into foreign markets or if they lack the necessary resources to internationalise. There is also an additional risk if they neither intended to develop their resources internally nor they want to collaborate with other firms in the host country.

Empirical studies on the internationalisation of high technology SMEs give evidence that their competitive advantage is based on offering innovative and differentiated products and services (Coviello and Munro, 1995; Oviatt and McDougall, 1994, 1995). Moreover, these studies, in line with the RBV, suggest that high technology SMEs enter into foreign markets in order to recover from expenditures in R&D, which may be too significant to recoup in their home markets, while developing their capability-base often in very dynamic and unpredictable market environments (Bell, Crick and Young, 2004; Oviatt and McDougall, 1994, 1995). Furthermore, because these products have a short life cycle, continuous investment in R&D is required in order to maintain their competitive advantage. Although proprietary and knowledge-based resources, gained from R&D, can be transferred to partners against the payment of royalties or other fees it seems very unlikely to do this transfer because knowledge-based resources are idiosyncratic by nature, sometimes ill codified, complex and characterised by uncertainty. Very often this knowledge may be so complex that even firm's personnel do not comprehend it and consequently it cannot be communicated to an external partner (Buckley and Casson, 1996).

Thus, *there are significant difficulties to transfer to external partners organisational/entrepreneurial orientation and technological resources of high technology SMEs. By contrast, firms may be keen on transferring to local partners marketing-based advantages through brand reputation and product differentiation* (Shrader, 2001). These latter advantages generally require an in depth knowledge about

local market demand, customers preferences and tastes. It is the knowledge about the host market that local partners are well suited to provide.

Under these circumstances it is advisable that the firm cooperates, for example, contractually, with a local partner so that the new venture, in the foreign market, can obtain from the outset competitive advantage for example by establishing their products or services as industry standards ahead of competition (Jolly et al, 1992; Oviatt and McDougall, 1995).

Overall, high technology SMEs currently may not possess all the required resources to establish business activities overseas and consequently face the paradox of trying to protect their core competencies (e.g. technology knowledge, trade secrets, manufacturing skills) whilst and simultaneously trying to establish linkages with other firms to get access to external resources. Furthermore, the higher the endowment of firm resources is the more likely it will look for potential partners, mainly in downstream value chain activities, in order to expand abroad quicker and to more locations (Shrader, 2001). Thus, the more likely the firm will be seen as a suitable partner by other firms.

#### **4.5.7 International Performance of High Technology SMEs**

To date, although there is a prolific and well-developed literature on export performance, much less is known about the more general effect of internationalisation on SME international performance (Coviello and McAuley, 1999; McDougall and Oviatt, 1996). This is a very important issue since internationalisation is important to firm performance and long term profitability. Indeed, profitability and performance are two closely linked concepts since they represent the return that a firm gets from its international involvement. It may be presumed that firms, which internationalise their business, have certain performance targets in mind in relation to their international activities.

The extant literature, has for the most part, focused on internationalisation performance in relation to the scope and growth of sales overseas (Antoncic and Hisrich, 2000).

Accordingly, the great majority of studies present international intensity that is the percentage of firm overall sales accounted to international sales and international sales growth as the main criteria to measure international performance (Aaby and Slater, 1989).

However, some studies suggest other criteria to measure international performance such as international sales profitability in comparison with domestic sales profitability (Nakos et al, 1998), geographic scope of foreign sales (Reuber and Fischer, 1997), or return on sales (Shrader, 2001; Elango, 2000). These are objective financial measures of export performance. Nonetheless, it has been suggested that subjective measures of performance and profitability should be used in studies of SMEs (Spanos and Lioukas, 2001). Indeed, although managers' responses in survey research may be problematic due to the subjectivity of their perceptions, the alternative of collecting "objective" data has its own drawbacks.

Very often, financial data for SMEs is unavailable or unreliable due to differences in accounting procedures or managerial manipulation (Dess and Robinson, 1984). This managerial manipulation may be often related to the avoidance of firm or personal taxes from the owners. In addition, the heterogeneity of small firms and of their industries raises questions of equivalence in the use of performance measures. Thus, it may be necessary to introduce some kind of normalisation of the considered variable (e.g. performance) in relation to the industry average so that the comparison will be meaningful. In addition, it can be argued that industry boundaries are quite fuzzy and ill defined. Therefore, the validity of such comparison will be questionable.

In sum, although the subjectivity of perceptual measures has attracted some criticism, in practice they may provide more meaningful comparators than "objective" data and "absolute" measures (Spanos and Lioukas, 2001).

This study includes both objective and subjective measures of international performance. For objective measures international intensity is chosen since the literature acknowledges it as the most widely used measure of firm's scope of international

activities (Aaby and Slater, 1989; Rodriguez and Rodriguez, 2005). On the other hand, as subjective measures degree of satisfaction of the entrepreneur/chief executive with some financial targets, in the main foreign market, is proposed.

#### **4.5.8. International Start-Ups**

Recent empirical studies give evidence regarding the limitations of stages models. Indeed recent investigations have identified a growing number of firms that do not follow the traditional path of stages throughout the internationalisation process. Their aim is to be active in international markets practically from the outset. Such companies have been termed as “*infant multinationals*” (Lindqvist, 1991), “*born globals*” (Knight and Cavusgil, 1996; Madsen and Servais, 1997), “*high technology start-ups*” (Jolly et al, 1992), and “*international new ventures*” (Oviatt and McDougall, 1994).

For example, Oviatt and McDougall (1994) define an international new venture (INV) as a “*business organization that, from inception, seeks to derive significant competitive advantage from the use of resources and the sale of outputs in multiple countries*” (p.49). This represents a sharp contrast to traditional firms that develop business activities overtime from domestic to international through a gradual and increased commitment to foreign operations. In these circumstances INVs have an international posture practically from inception even though they may face shortages of different types of resources.

In several case studies McDougall et al (1994) report that none of the firms that they have investigated followed a pattern of incremental internationalisation through stages. Therefore, stage models may fail to provide comprehensive explanations why INVs operate from the outset on the international arena rather than only in their domestic markets.

Confirming these findings Bell (1995) in his study of small software companies reports that stage models do not identify, in a comprehensive manner, the factors, which have impact on the internationalisation process of those firms. In fact, according to the author, the internationalisation process was strongly influenced by client followership in

foreign markets, the targeting of very specific niche markets as well as by industry-specific aspects, rather than simply relying on exports to close geographic or cultural markets.

In addition, Bell's (1995) study also found little support for the fact that firms necessarily progress in a deterministic way from exports to other more resource-intensive foreign market entry-modes. For example, firms do not necessarily establish activities first in the home market, starting foreign sales only at later stages. Sometimes international sales start just after a short period as the entrepreneur/founding team, due to their prior experiences and networks of social and business contacts, searches for international customers, practically from the outset.

Currently, several studies report about an increasing number of firms that start exports within the first six years of their existence (Christensen and Jackobsen, 1996; Madsen and Servais, 1997). For example, Christensen and Jackobsen, (1996) study points out that internationalisation is very firm-specific depending on the strategic choices of the entrepreneur/founding team. This approach is, to some extent, very similar to the "pre-export" models, which suggest that differences on management practices between entrepreneurs lay on the type of contacts and knowledge acquired prior to the new business has been initiated.

In fact, examples of factors that can impact on firm's business activity are previous experiences lived by the entrepreneur before the foundation of the firm. They may include level of education, working and industry experiences, and knowledge about foreign markets, social contacts, international experience, etc.

In these circumstances it is not absolutely correct presenting "*born globals*"/"*international new ventures*" as "*instant internationals*" since previous background of a firm's founder or team of founders is critical to understand the management style of this type of firms.

More recently, Chetty and Holm (2000) argue about the importance of general and specific human capital of the entrepreneur/ founding team in understanding and explaining further developments throughout the internationalisation process.

However, taking a different perspective of analysis one can argue that the world economy has changed, quite dramatically, since stage models were presented in the mid seventies.

Overall, the “born global” phenomenon should be seen in a context of market globalisation and economic integration where the reference level for foreign market operations for a firm is much higher and the subsequent speed of internationalisation is much quicker when compared with the traditional firm of the seventies or even eighties that operated in a less open and integrated economy (Bell, Crick and Young, 2004; Preece et al, 1998).

This supports the view that the increasing commitment to foreign markets which led to higher degree of internationalisation is a concept that remains valid.

Nonetheless, the initial reference for firms becoming active in foreign operations is much higher than it has been in the past.

## **4.6 Summary**

This chapter has reviewed, in a broader scope, the concept of internationalisation, which has not for the time being reached a consensus among international business researchers.

Chapter 4 has also reviewed the literature on the RBV, in an international context, acknowledging the importance of the following resources, proposed in chapter 3, to the superior international performance of the high technology SME:

- Firm knowledge-based resources: marketing and technological resources and entrepreneurial orientation.
- Firm proprietary-based resources: financial resources.
- Individual knowledge-based resources: entrepreneur human capital.

In fact, all these resources may be critical to the superior performance of the high technology SME over their competitors, irrespective of being in domestic or foreign markets.

The chapter has also reviewed behaviourist models of internationalisation and in so doing two additional constructs have been proposed that are *firm's international orientation and entrepreneur/senior managers international experience*. The former, suggested by the Uppsala internationalisation model, refers to firm's increasing knowledge gained from international operations associated with the subsequent reduction of market uncertainty, which may lead to firm's higher commitment to foreign markets and therefore to firm's higher international intensity, while the latter suggested by human capital theory, but also to a certain extent, by pre-export development models as well as by Reuber and Fischer (1997) study emphasises the role of the entrepreneur/ other founders as the decision makers within the organisation. In fact, depending on his/her cognitive style, previous experience of living and/or working abroad associated with the perceptions and vision about the business, may be highly influential in terms of further development of international activities. Thus, they may be important predictors of firm's scope of international activities and therefore of its international intensity.

Broadly speaking, behaviouristic models of internationalisation and the RBV emphasise important aspects, in this study, such as the working and industry experiences of the entrepreneur associated with his/her experiential knowledge gained from international activities.

In fact, behaviouristic models of internationalisation although proposed in the seventies are still very influential, as the exploratory interviews phase in this study has revealed (see chapter 6, sections 6.4.2 and 6.4.3). Moreover, market knowledge and market commitment are still very important concepts if the high technology SME intends to pursue and develop international business activities. Thus, these concepts and constructs will also be integrated in the research framework.

This chapter has also reviewed TCE and the RBV to predict and explain firm's entry mode choices. While the former takes a market-based view of the firm that is an



outside-in view of the firm, the latter describes and explains firm's decisions from a perspective of the endowment and deployment of its resources; therefore it encompasses an opposite perspective that is an inside-out view of the firm (Sharma and Erramilli, 2004). In this context, since the RBV and TCE depict the firm from two opposite sides these two perspectives are expected to enhance explanations and the predictive power for the choice of the foreign market entry mode: independent or in a cooperative contractual arrangement.

Chapter 4 has suggested, in line with TCE and the RBV that the use of cooperation based on a contract established with a partner vs. internalisation in the foreign market entry mode is dependent upon the situation (Shrader, 2001). In fact for firms' both represent substantial transaction costs. Thus, the rationale for choosing a contractual entry mode is conferred when the tradeoffs between costs and benefits for a contractual mode are optimised in relation to an internalised choice. The reverse is also true.

More specifically the RBV suggests that high technology SMEs enter into foreign markets in order to recover from expenditures in R&D, which may be too significant to recoup in their home markets, while developing their capability-base often in very dynamic and turbulent foreign market environments (Oviatt and McDougall, 1994, 1995). In this context, although proprietary and knowledge-based resources, gained from R&D, can be transferred to partners against the payment of royalties or other fees it seems very unlikely to do this transfer because knowledge-based resources are idiosyncratic by nature, often ill codified and very complex. It cannot and should not be transferred to an external partner.

There are, for example, *significant difficulties to transfer to external partners' entrepreneurial orientation and technological resources of high technology SMEs. By contrast, firms may be attracted to transfer to local partners marketing-based advantages. Moreover, the higher the endowment of firm's marketing resources, the greater its international orientation and the higher the entrepreneur/chief executive international experience are the more likely it is for the firm to look for potential partners* in order to expand quicker abroad and to more locations (Shrader, 2001).

Finally, this chapter concludes proposing both objective and subjective measures of international performance. For objective measures international intensity is chosen since

the literature acknowledges it as the most widely used measure of firm's scope of international activities (Aaby and Slater, 1989; Preece et al, 1998; Rodriguez and Rodriguez, 2005). On the other hand, as a subjective measure this study assesses entrepreneur/ chief executive degree of satisfaction with performance, in the main foreign market. This measure may provide, for SMEs, more meaningful comparators of performance than "objective" data and "absolute" measures (Spanos and Lioukas, 2001).

In short, this chapter has highlighted issues related to the research topic taken from strategic management research (The Resource-Based View of the Firm), international business theories (Transaction Cost Economics) and behaviouristic models (Establishment Chain and the Network Approach) of internationalisation.

In chapter 5 these multiple, but complementary, theoretical perspectives will be presented and integrated in a single research framework.

## **Chapter 5: Literature Synthesis, Research Framework, Research Aims and Stated Hypotheses**

### **5.1 Introduction**

After reviewing the relevant literature to this thesis next section (section 5.2) presents a synthesis of each chapter main conclusions. This synthesis will be further used to develop the research framework (section 5.3) and overall research aims and stated hypotheses (section 5.4), presented in chapter 1. In addition, the research framework will form the backbone to the next chapter, the research methodology chapter, in which the selected research design will be discussed and the operationalisation of key constructs will be established.

### **5.2 Synthesis of the Literature**

Chapters 2 to 4 have reviewed the core literature, both theoretical and empirical, to this thesis. In this context, chapter 2 has examined the characteristics of SMEs and high technology SMEs and more specifically it has identified high technology SMEs current strengths and weaknesses. Chapter 3, drawing on the literature of the Resource-Based View of the Firm (RBV), mainly in a domestic context, has examined some of those strengths and weaknesses, which is implied as representing key resources (Wernerfelt, 1984), specific to high technology SMEs. Finally, chapter 4 has reviewed the literature on the RBV, in an international context, as well as international business and internationalisation models, which underpin key elements of this thesis, namely: transaction costs economics and behavioural models of internationalisation.

More specifically throughout the next sections the fundamentals of each chapter will be presented.

### 5.2.1 SMEs and High Technology SMEs

Chapter 2 has reviewed the literature in relation to the main characteristics of high technology SMEs. In fact, Chapter 2 has identified and characterised the population of high technology SMEs, and discussed key characteristics, which need to be considered during the empirical part of this study. In this context, chapter 2 has considered the population of high technology SMEs as formed by two main groups of firms. A first group includes the broader population of firms encapsulating the great majority of small and medium-sized enterprises operating in high technology industry sectors. On the other hand, a second and much narrower group includes mainly new technology-based firms, which refers often to small firms, which conduct business activities in industry sectors, characterised by new and emerging technologies.

Currently, although no accepted definition in the academic or economic areas of what constitutes a high technology SME exists, key organisational characteristics include: *size, age, R&D intensiveness and industry sector*.

In addition, it is particularly relevant for this study to assess the problems and challenges facing high technology SMEs with special emphasis put both on their internal characteristics and on the market environment, where they operate. In fact, the identification and understanding of the market environment where high technology SMEs operate seems particularly important in order for a further assessment of the resources, which may be particularly valuable within those contexts (Barney, 1991; Miller and Shamsie, 1996). In fact, chapter 2 has examined key strengths and weaknesses of high technology SMEs, particularly relevant in contexts of very dynamic and turbulent market environments, the type of environments where these firms currently conduct business activities. This was further developed in Chapter 3 in order to isolate those potential strengths or weaknesses, which may represent valuable resources (Wernerfelt, 1984) specific to high technology SMEs. In this context, chapter 2 has identified the following potential weaknesses of high technology SMEs: *financial shortages, marketing liabilities and lack of managerial resources*. On the other hand, chapter 2 has identified as potential strengths *its flexible specialisation while targeting of specific market niches*. In addition, their often *strong entrepreneurial orientation as*

*well as the key role of the entrepreneur/chief executive* as its most valuable resource were also put forward. Similarly, chapter 2 has also characterised the market environment where high technology SMEs operate, in order to examine if their current strengths and weaknesses are particular relevant under those environments.

Chapter 2 has also emphasised the management philosophy of high technology SMEs since over the years as the business may expand and grow, its organisational structure needs also to grow and adapt, according to firm and environmental changes. Often only few years after foundation the high technology small firm needs to evolve from a technology led to a market oriented organisation even though both aspects may remain over the years critical to its long term success. Furthermore, chapter 2 has also stressed that successful high technology firms require a close coupling between technological developments and market needs. Thus, firm's strategy should neither be wholly technology driven nor market driven; rather they should achieve a balance between the two. In this context, firms should focus in both developing and/or deploying superior technologies while addressing market requirements. Thus, high technology firms should focus on both inward emphasising innovativeness and outward orientation addressing customer needs in specific target segments.

Finally, a key element in the management philosophy of a high technology SME, as mentioned above, is the entrepreneur/ chief executive with his/her background and expertise. In fact the accumulated human capital of the entrepreneur with his or her high level of education, working and industry experiences associated with firm's functional resources (e.g. finance, marketing and R&D) developed overtime, may emerge as potential determinants of future firm performance.

### **5.2.2 Resources and Capabilities of High Technology SMEs**

Chapter 3 begins by emphasising the importance in recent years of the RBV for different streams of research such as in economics and in some areas of management (e.g. marketing, finance and international business). In addition, Chapter 3 also presents

both the descriptive and prescriptive perspectives of the RBV while discussing if the RBV is already a theory of the firm in strategic management.

Chapter 3, using the Resource-Based View of the Firm (RBV), has examined some strengths and weaknesses of high technology SMEs, put forward in chapter 2, which may be implied as their current resources. In addition, chapter 3 based on Miller and Shamsie (1996) typology of proprietary and knowledge-based resources, both at firm and individual levels, acknowledged those resources that may give the high technology SME performance superiority vis-à-vis its competitors. More specifically, this study gives a special emphasises to knowledge-based resources of the high technology SME, which may represent specific skills and resources to develop its products and services according to the needs of specific target markets in very unpredictable and uncertain environments that is the type of market environment that high technology SMEs are currently facing.

In this context, Miller and Shamsie's (1996) framework, combined with preliminary interviews with entrepreneurs/chief executives of high technology SMEs experts and academics (see chapter 6, section 6.3), suggest the critical importance, at firm level, of the following resources:

- Knowledge-based resources: *marketing and technological resources*.
- Proprietary-based resources: *financial resources*

Moreover, as examined in chapter 2, in small high technology firms the entrepreneur/chief executive plays a critical role in the firm's long term success. Thus, *the human capital of the entrepreneur/chief executive* has also been proposed.

Last but not the least, *entrepreneurial orientation*, a knowledge-based resource, considered both at firm and individual levels, has also been put forward since it attempts to capture organisational/management processes established, implemented and reconfigured over time by the entrepreneur/chief executive of the high technology SME.

With the exception of financial resources all the other considered functional resources are valuable, scarce, imperfectly tradable and non imitable. By contrast, financial resources however valuable and scarce are tradable and imitable.

Chapter 3 has argued that marketing resources are particularly important since they reflect how the high technology SME targets customers in domestic and/or foreign markets and positions/differentiates itself in relation to its competitors. In addition, marketing resources leverage firm competitiveness by anticipating customers' needs ahead of competition and creating long lasting relationships with customers, suppliers, distribution channels and other potential partners.

In sum, marketing resources will lead the high technology SME to develop its technological-base in order to create new products or improving existing ones in order to address customers' needs irrespective of being in domestic or foreign markets.

Secondly, technological resources are also particularly important for high technology SMEs since they include the technological knowledge generated by R&D activities, which generally incorporate new and innovative technologies in order to achieve firm objectives. This is done by the delivery, in specific foreign target markets, of innovative and highly differentiated products/services superior to those of competitors, while meeting or exceeding customers' expectations.

Innovation arisen within the developed technology by the high technology SME is a key element for obtaining competitive advantage in very dynamic and unpredictable market environments (Knight, 2000).

Technological resources may enable the high technology SME to increase its competitiveness to market new or adapted products/services faster than competitors according to the specific needs of the target markets.

Thirdly, another important dimension in the capability-base of high technology SMEs, is entrepreneurial orientation once it attempts to capture organisational/ management processes based on the methods and styles developed and implemented by the entrepreneur/chief executive within the organisation.

Fourthly, financial resources are also particularly critical for high technology SMEs because very often they lack the required capital to develop key activities, such as product development, market research and promotion activities. These latter

expenditures include those made in advertising over the media or the Internet, promotional activities, direct marketing, public relations, participation in workshops, exhibitions, symposiums, conferences, and other international meetings. These are key activities to venture's survival and long term growth and profitability.

Currently, the possession of an adequate amount of financial resources might be considered a prerequisite for the high technology SME to internationalise. As already stressed in chapter 3 financial resources can be exchanged by other types of resources offering the most flexibility for firms to redeploying them (Chatterjee, 1990). In addition, they are clearly the easiest type of resources to transfer to foreign markets (Elango, 2000).

Finally, the entrepreneur/chief executive may be considered the most valuable resource within the firm. His or her role is even more critical in the case of small firms since he or she is in charge of creating and developing the vision, strategy and leadership for the firm as well as of the management, integration and reconfiguration over time of different types of resources within the organisation.

### **5.2.3 Internationalisation of high technology SMEs**

Chapter 4 has reviewed the literature on the RBV, in an international context, acknowledging the importance of the resources, proposed in chapter 3, to the superior performance of the high technology SME.

In fact, those resources, specific to high technology SMEs, may underpin the organisational foundations of the firm, which will be almost impossible to separate out irrespective of being created and developed in domestic or foreign markets (Young et al, 2000).

Chapter 4 has also reviewed behaviouristic models of internationalisation and in doing so two additional constructs have been proposed: *firm's international orientation and entrepreneur/senior managers' international experience*. The former, suggested by the Uppsala internationalisation model, refers to firm's increasing knowledge gained from



international operations associated with the subsequent reduction of market uncertainty, which may lead to firm's higher commitment to foreign markets and therefore to firm's higher international intensity. By contrast, the latter suggested by human capital theory, and to a certain extent, by pre-export development models emphasises the role of the entrepreneur/ other founders as the decision makers within the organisation. In fact, depending on his/her cognitive style, previous experience of living and/or working abroad associated with his or her perceptions and vision about the business, may be highly influential in terms of firm's further internationalisation. Thus, it is reasonable to expect that these constructs may be important predictors of firm's scope of international activities and therefore of firm's international intensity.

Broadly speaking, behaviouristic models of internationalisation and the RBV emphasise important aspects in this thesis such as the working and industry experiences of the entrepreneur associated with his/her experiential knowledge gained from international activities.

In fact, behaviouristic models of internationalisation however proposed in the seventies, are still very influential, as the exploratory interviews phase in this study have revealed (see chapter 6, sections 6.4.2 and 6.4.3). Moreover, market knowledge and market commitment are still very important concepts if the high technology SME intends to pursue and develop international business activities. Thus, these concepts and constructs will also be integrated in the research framework.

The chapter has also reviewed transaction costs economics (TCE) in the context of foreign market entry mode distinguishing between *independent* vs. *contractual entry modes*. TCE suggests that hierarchical modes are not always appropriate; depending on the contingencies contractual entry modes may be suitable to enter international markets. In fact, the rationale for choosing a contractual foreign market entry mode is conferred when the costs of internalisation are higher relative to the costs of establishing, running and enforcing a contract, although sometimes all these costs are not easy to anticipate *ex-ante*. In these circumstances, contractual modes such as international sales through agents and distributors, quite common among high technology SMEs as well as other contractual modes, may enhance firm international performance.

Finally, this chapter has reviewed both objective and subjective measures of international performance. This study chooses as objective measures of performance the firm's international intensity, measured by the ratio between international sales and total sales, acknowledged by the literature as the most widely used measure of firm's scope of international activities. As subjective measures this study uses the degree of perceived satisfaction of the entrepreneur/CEO with some financial targets, in the main foreign market, once they may provide more meaningful comparators than "objective" data and "absolute" measures (Spanos and Lioukas, 2001).

In fact, it has been suggested that subjective measures of performance and profitability should be used in studies of SMEs (Spanos and Lioukas, 2001). Indeed, although managers' responses in survey research may be problematic due to the subjectivity of their perceptions, the alternative of collecting "objective" data has its own drawbacks. In fact, very often, financial data for SMEs is unavailable or unreliable due to differences in accounting procedures or managerial manipulation (Dess and Robinson, 1984). This managerial manipulation might be related quite often to the avoidance of firm or personal taxes from the owners. In addition, the heterogeneity of small firms and of their industries raises the question of the equivalence in the use of performance measures.

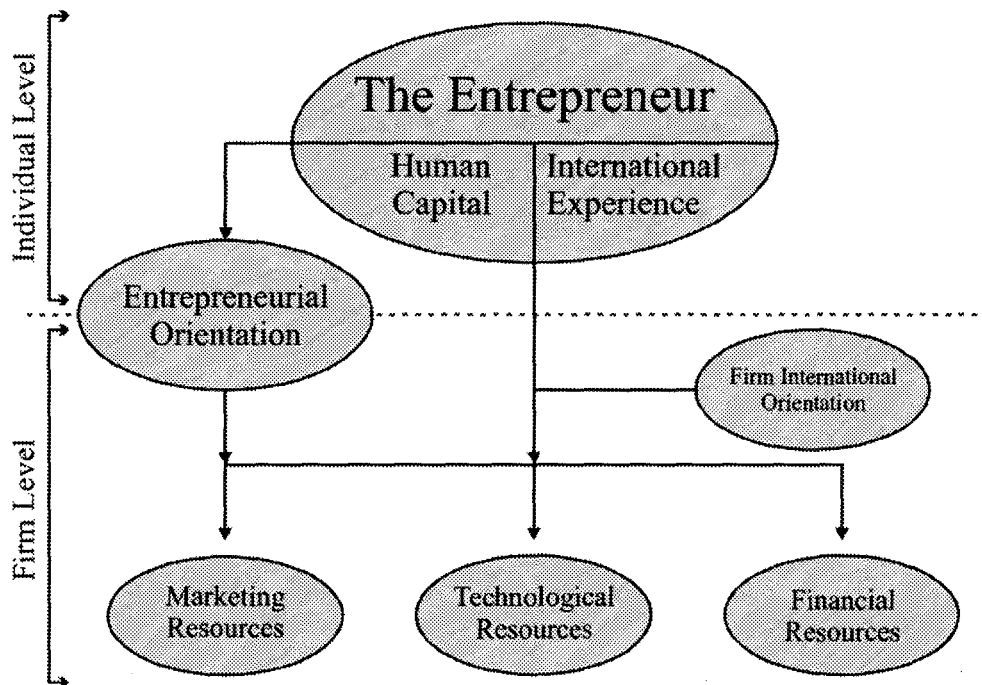
Overall chapter 4 emphasises the importance of foreign markets for high technology SMEs that need to recover from their high R&D expenditures operating in small niches in their domestic markets, which often are too small or almost inexistent to accommodate their business strategies. In this context, internationalisation for the growth and development of the high technology SME becomes more a necessity rather than a mere option. Moreover, the market environment, both domestic and international, shows an increasingly international pattern. Thus, aspects such as early internationalisation or strong international orientation give evidence to the importance that foreign markets represent for high technology SMEs even though in their early years of operation they may face shortages of different kinds of resources and capabilities.

In sum internationalisation of high technology SMEs may be strongly influenced by their skills and resource-base, both at firm and entrepreneur levels.

### 5.3 Research Framework

Based on a set of resources specific to high technology SMEs, at firm and entrepreneur (individual) levels presented in the previous sections, a resource chart has been developed and is presented in Figure 5.1.

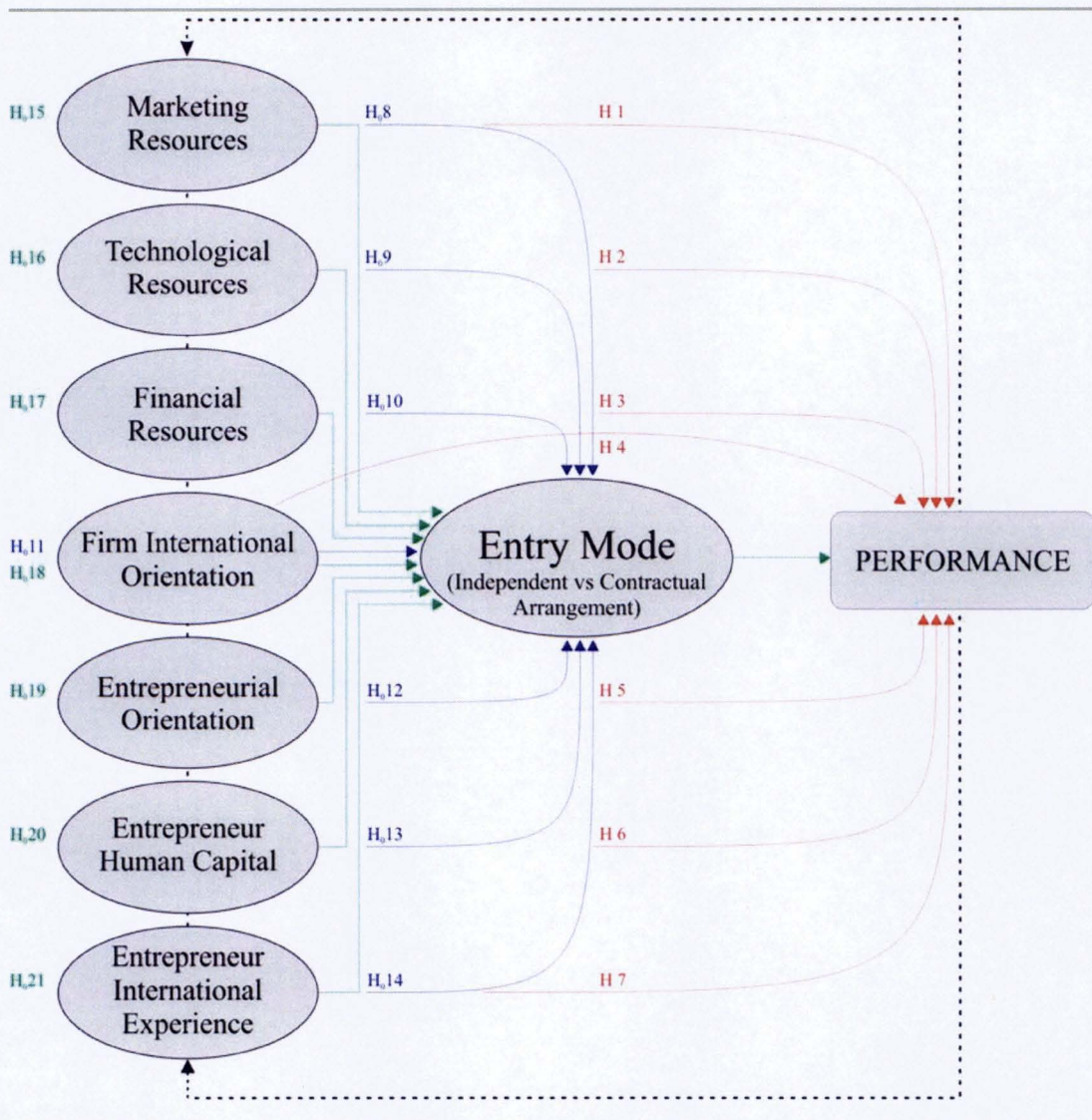
Figure 5. 1: A Resource Chart for the High Technology SME



Source: The Author

Building upon the identified resources a conceptual framework is presented in Figure 5.2. Such framework provides a basis upon which hypotheses will be stated relative to the research aims established in chapter 1.

Figure 5. 2: The Complete Set of Hypotheses Tested



Source: The Author

This framework, inherently dynamic, tries to identify and examine resources, specific to high technology SMEs, which may give to firms, which possess superior endowments of those resources, performance superiority vis-à-vis their competitors in foreign markets. In this context, the main focus of this study is to measure the impact of knowledge and proprietary-base resources, specific to high technology SMEs, on international performance.

Thus, this study intends to test the impact that those resources have on:

- Firm international performance measured by its international intensity.
- The type of entry mode in the main foreign market (independent vs. contractual). Types of entry modes which can be defined as *contractual* include international sales through agents/distributors and other contractual modes (e.g. licensing, contract R&D, joint ventures, etc.) in which the firm operates with a partner, that is contractually and involving, to some extent, cooperation from the prospective partner (Burgel and Murray, 2000; Sharma and Erramilli, 2004; Shrader, 2001). By contrast, independent entry modes also include sales direct to end customers, sales subsidiaries and wholly owned subsidiaries since based on internalisation of business activities in the target market (Shrader, 2001; Root, 1994).
- The use of a contractual mode, in the main foreign market, and performance in that same market, while considering the resources identified in Research Aims 1 to 3, as moderator influences in that relationship.

Currently, the literature on small firms, in high technology sectors, acknowledges the fact that over the years firms may face shortages of different kinds of resources. Therefore, depending on the endowment of internal resources, the high technology SME may internationalise through utilisation of predominantly independent vs. contractual arrangement modes.

Currently, for independent entry modes it is implicitly assumed that the high technology SME has, ideally, all the required resources to conduct business overseas independently of any partner (Burgel and Murray, 2000; Shrader, 2001). Furthermore, the literature on MNEs suggests that if the organisation wants to protect all its core competencies against any opportunistic behaviour from a potential partner, it will utilise independent modes, or internalised channels (Agarwall and Ramaswami, 1992; Hill, Hwang and Kim, 1990).

In the same vein, for contractual modes, it is implicitly assumed that firms which do not have all the required resources to independently conduct business abroad are more

likely to establish a contract with a partner in the host market in order to augment their own resource base with their partner's resources. Therefore, a contractual mode established with a partner may reduce the investment required and the uncertainty of having operations in an unknown environment allowing the firm to expand abroad more rapidly and into more foreign markets.

For example, a local partner, in the host market, may provide knowledge about the foreign country in terms of political and economic conditions, market potential, market segments, competition, distribution channels and other market conditions. Currently, these kinds of partnerships are even more important in high technology sectors considering that the geographical scope in which technology can be exploited is much wider than the firm's marketing expertise (Buckley and Casson, 1996). Under these conditions the firm can expand its activities to more geographical areas, faster with lower costs, risks and market uncertainty (Aulak, Kotabe and Sahay, 1996; Buckley and Casson, 1996; Contractor and Lorange, 1988).

Although establishing a contract with a partner offers important benefits to the firm TCE suggests (see section 4.5.2.1) that it is also very important to assess the costs. Currently, TCE indicates that both contractual modes vs. internalisation are associated with specific and considerable transaction costs. In this context, TCE argues that cost minimisation explains firm's strategic decisions.

When the foreseen transaction costs of a contractual mode are higher relative to the transaction costs of internalisation, firms should privilege internalised transactions within their hierarchical structures (Agarwall and Ramaswami, 1992; Anderson and Gatignon, 1986; Hill, Hwang and Kim, 1990). In other words a relevant part of the benefits of internalisation arise from avoiding the costs of contractual cooperation (Shrader, 2001). Obviously, the reverse is also true.

Internalisation costs may include costs associated with additional personnel and overheads, added equipment, administration costs as well as opportunity costs related to the ownership of specific assets allocated to internal transactions. By contrast, costs for contractual arrangements include the costs associated with establishing, monitoring and enforcing contracts with partners. In addition, according to TCE contractual costs are

related to the transfer of knowledge-based resources to partners as well as by contextual factors such as bounded rationality and opportunism. As presented in section 4.5.2.1, bounded rationality refers to the fact that individuals do not have access to all critical information to make decisions neither do they have full comprehension of the information made available to them. On the other hand, opportunism is related with the opportunistic behaviour of individuals who mainly pursue their own personal goals.

In these circumstances TCE points out to the transaction costs due to inefficiencies on the transfer of knowledge to external partners as well as in the minimisation of the effects of bounded rationality and opportunism. Furthermore, TCE also suggests that some forms of knowledge such as tacit knowledge, knowledge that is ill codified, embedded in organizational routines, it is very hard to transfer across firm boundaries and consequently involving higher transaction costs when transferred to outside partners (Anderson and Gatignon, 1986; Buckley and Casson, 1996). Moreover, TCE also argues that the transfer of knowledge to external partners increases the dissemination of risks. Dissemination of risk refers to the risk that some of the firm's resources, which might be source of competitive advantage, may be appropriated by the partners with whom the firm establishes a cooperative contract. These are very important issues since this study argues that, for high technology SMEs, knowledge-based resources constitute the basis for performance superiority.

Currently, internationalisation, in line with the RBV and TCE may be analysed, as a way to transfer resources from the parent company to the venture in the target market, in a cost effective and efficient way, while preserving the value of the transferred resources to that same market (Root, 1994). Moreover, the value of a resource stays on its contribution to firm's competitive advantage (Madhok, 1997). In this context, if key advantages are **difficult** to transfer to the host market it is expected that the firm will rely its business in that market through *exports directly to an end customer, generally another organisation, or via a sales subsidiary*. For example, in the case of high technology SMEs, intangible resources, often knowledge-based, are difficult to transfer to external partners, while involving considerable transaction costs. In addition, they may be subject to the opportunistic behaviour of a potential partner in the host country and therefore, both the RBV and TCE, suggest that hierarchical/company-owned modes

are more effective to transfer imperfectly imitable resources (Sharma and Erramili, 2004; Shrader, 2001).

In the same vein, if key advantages are **costly** to transfer to the host market, high technology SMEs may organise the business through exports via international distributors/agents (Sharma and Erramili, 2004). In fact, if the high technology SME is able to effectively and efficiently transfer its key resources to a partner in the target country without putting at risk its core competitive advantage it is likely that the high technology SME would choose a cooperative contractual entry mode (Sharma and Erramili, 2004; Shrader, 2001).

In line with the RBV, empirical studies on the internationalisation of high technology SMEs (Coviello and Munro, 1995; Oviatt and McDougal, 1994, 1995) suggest that high technology SMEs enter into foreign markets in order to recover from expenditures in R&D which may be too significant to recoup in their home markets (Oviatt and McDougall, 1994, 1995). Furthermore, because these products have a short life cycle, continuous investment in R&D is required in order to maintain competitive advantage. In this context, although proprietary and knowledge-based resources, gained from R&D, can be transferred to partners against the payment of royalties or other fees it seems very unlikely to do this transfer because knowledge-based resources are idiosyncratic by nature, complex and characterised by uncertainty. Thus, as already presented in section 4.5.6, *there are significant difficulties to transfer to external partners, technological resources of high technology SMEs.*

Similarly, entrepreneurial orientation is a construct, see chapter 3 section 3.6.2.1, characterised by three dimensions that are innovativeness (3 items), risk taking (2 items) and proactiveness (2 items).

Innovativeness refers to firm's attitudes and actions, which promotes and supports new ideas and processes that may lead to the launching of new products/ services integrating new technologies or technological processes in new or current markets (Lumpkin and Dess, 1996).



Risk taking is related to the propensity to allocate resources/assets to high risk projects but with chances of very high returns.

Finally, proactivity reflects firm's proclivity to go ahead of competitors in product novelty or speed of innovation in order to anticipate future market trends. Overall, the conceptualisation of entrepreneurial orientation suggests, in similar vein as technological resources that they are hard to transfer to external partners and therefore firms /chief executives with strong entrepreneurial orientation forgo contractual cooperation and should internalise foreign operations, instead.

*By contrast, firms may be keen to transfer to local partners marketing-based advantages through brand reputation and product differentiation (Shrader, 2001).* Since these latter advantages generally require a deep knowledge about local market demand, customers preferences and tastes, it is advisable for the high technology SME to find a suitable partner in the host market so that the new venture, in the foreign market, can obtain from the outset competitive advantage, for example, by establishing their products or services as industry standards ahead of competition (Jolly et al, 1992; Oviatt and McDougall, 1995). Similarly, firms with higher international orientation or with entrepreneurs/chief executives with greater international experience the firm will more likely look for potential partners in order to expand abroad quicker and to more locations (Shrader, 2001).

As already pointed out, high technology SMEs currently may not possess all the required resources to establish business activities overseas and consequently face the paradox of trying to protect their core competencies (e.g. technology knowledge, trade secrets, manufacturing skills) whilst and simultaneously trying to establish linkages with other firms to get access to external resources.

Moreover, the greater the endowment of firm's internal resources the more likely the firm is to be seen as an attractive partner by other firms. In addition, formal contractual cooperation may allow high technology SMEs to concentrate on a few core resources, often only protected by knowledge barriers, while getting access to resources from a partner located in the host market.

In short, high technology SMEs can leverage complementary resources from other firms in order to achieve competitive advantage in international markets. In this situation the high technology SME may adjust its resource base from its initial internal resources position to draw on potential synergetic resources from a selected partner.

#### **5.4 Research Aims and Stated Hypotheses**

Based on the conceptual framework (Figure 5.2) this section depicts some of its different elements providing a basis for establishing the research aims and the derived stated hypotheses. In this context, the following research aims are established:

##### **Research Aim 1**

To identify and examine resources, at the firm level, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets (see Figure 5.2).

##### **Research Aim 2**

To identify and examine resources, at the individual level, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets (see Figure 5.2).

##### **Research Aim 3**

To identify and examine resources, both at the firm and individual levels, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets (see Figure 5.2).

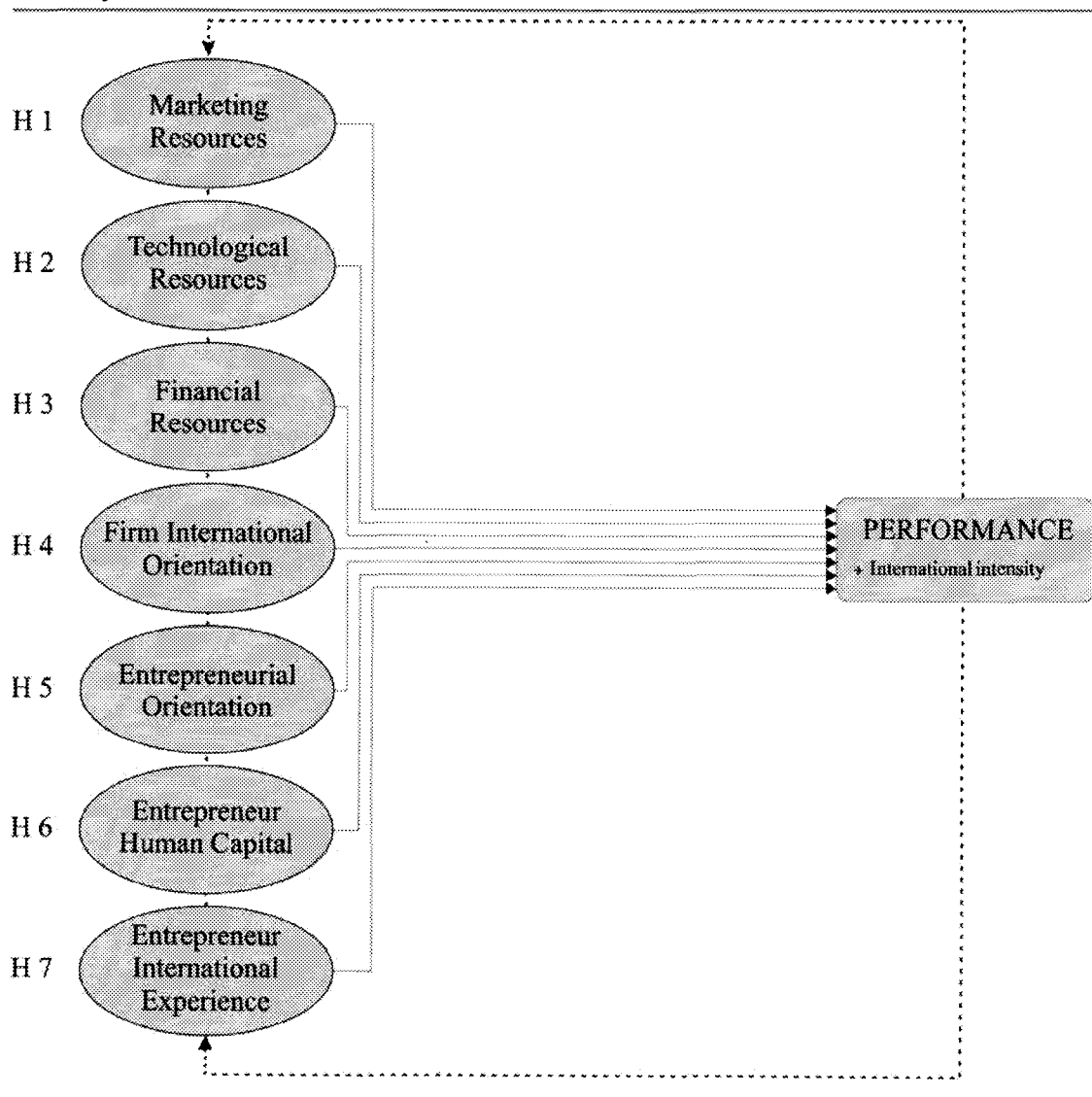
##### **Research Aim 4**

To identify and examine the impact that the resources identified in research aims 1 to 3 have on the international performance, measured by the international intensity of the high technology SME (see Figure 5.3).

As presented in chapter 4 high technology SMEs with a superior endowment of some resources, look for internationalisation as part of their long-term growth and profitability. Thus, firms with higher endowments of those resources might have higher international intensity compared with firms less endowed in such resources.

Therefore, *the predicted relationship in the hypotheses relating the direct impact that resources of high technology SMEs have on international intensity is expected to be positive.*

Figure 5. 3: Impact of the resources of high technology SMEs have on international intensity



Thus, the following hypotheses are stated:

**Hypothesis 1**

The greater the endowment of marketing resources of the high technology SME the higher its international intensity.

**Hypothesis 2**

The greater the endowment of technological resources of the high technology SME the higher its international intensity.

**Hypothesis 3**

The greater the endowment of financial resources of the high technology SME the higher its international intensity.

**Hypothesis 4**

The greater the international orientation of the high technology SME the higher its international intensity.

**Hypothesis 5**

The greater the entrepreneurial orientation of the high technology SME the higher its international intensity.

**Hypothesis 6**

The greater the human capital of the entrepreneur/chief executive of the high technology SME the higher its international intensity.

**Hypothesis 7**

The greater the international experience of the entrepreneur/chief executive of the high technology SME the higher its international intensity.

#### Research Aim 5

To examine the influence that resources of high technology SMEs, identified on Research Aims 1 to 3, have on the type of entry mode in the main foreign market (independent vs. contractual) (see Figure 5.4).

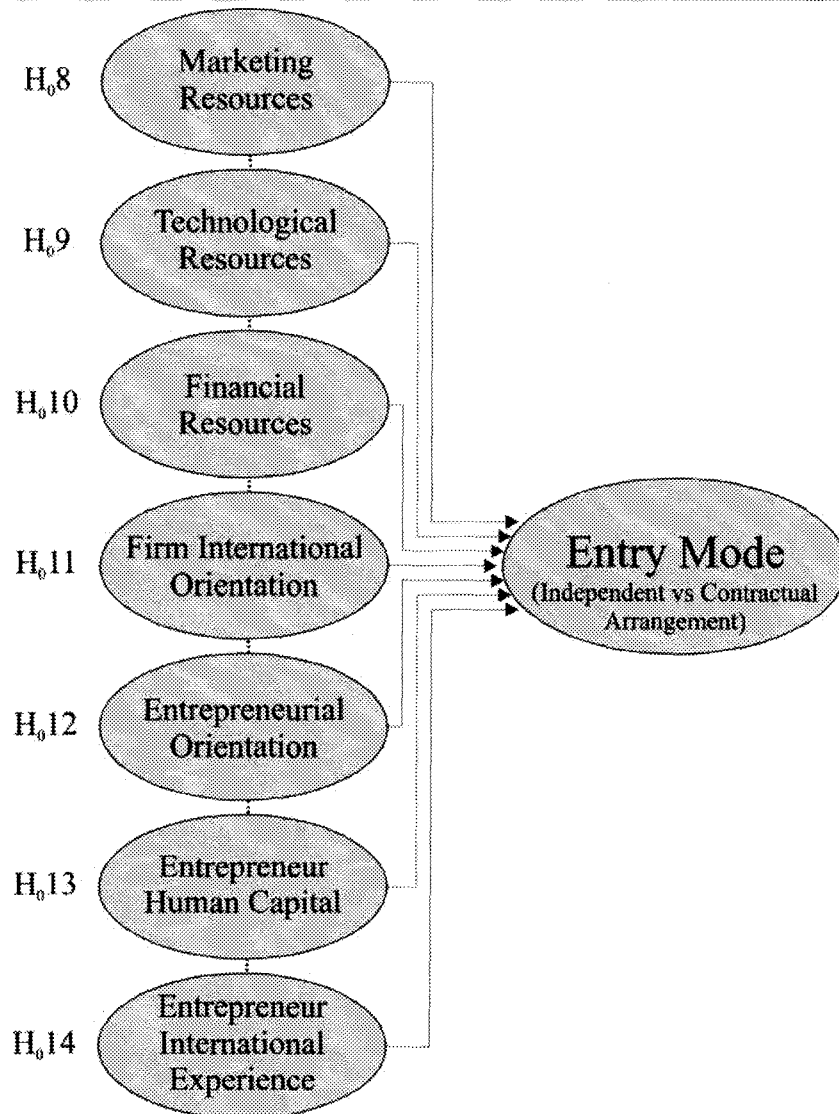
In order to examine research aim 5 it is reasonable to expect entrepreneurs/chief executives of high technology SMEs to be rational decision makers, although that rationality is bounded, and consequently they are conscious of both the costs and benefits of establishing a contractual arrangement in the target market relative to internalisation. In this context, as presented in chapter 4 in the Summary (section 4.6), high technology SMEs will be less likely *to transfer to external partners' entrepreneurial orientation advantages and technological resources and more likely to transfer to local partners marketing-based advantages. In the same vein, the greater the firm's international orientation and the higher the entrepreneur/chief executive international experience the more likely it is the firm will look for potential partners in order to expand abroad quicker and to more locations* (Shrader, 2001).

In sum, it is expected a negative relationship between, respectively, entrepreneurial orientation and technological resources with contractual cooperation in the main foreign market. In this context, firms with higher entrepreneurial orientation and technological resources are more likely to forgo any contractual mode with a partner and internalise business activities in foreign markets, instead (Anderson and Gatignon, 1986; Davidson and McFetridge, 1985) via direct exports to end customers as well as through sales and wholly owned subsidiaries (Sharma and Erramilli, 2004).

By contrast, firms characterised, respectively, by higher marketing resources greater international orientation and managers with stronger international experience are more likely to cooperate with partners in the host country, mainly in downstream value chain activities (Burgel and Murray, 2000; Reuber and Fischer, 1997; Shrader, 2001).

Last but not the least, for financial resources and the human capital of the entrepreneur of high technology SMEs it can not be anticipated *ex-ante* a decision whether the firm will use or not a contractual mode in the main foreign market. A decision may depend on the entrepreneur/chief executive cognitive style, previous living, working and industry experiences associated with the perceptions and vision about the business (Reuber and Fischer, 1997).

Figure 5. 4: Influence that resources of high technology SMEs, have on the main foreign market entry mode (independent vs a contractual).



Unit of Analysis: Firm Entry Mode in the Main Foreign Market

Source: The Author

In spite of the predicted relationships presented above all of the following research hypotheses are expressed in the null form, in order to facilitate statistical testing:

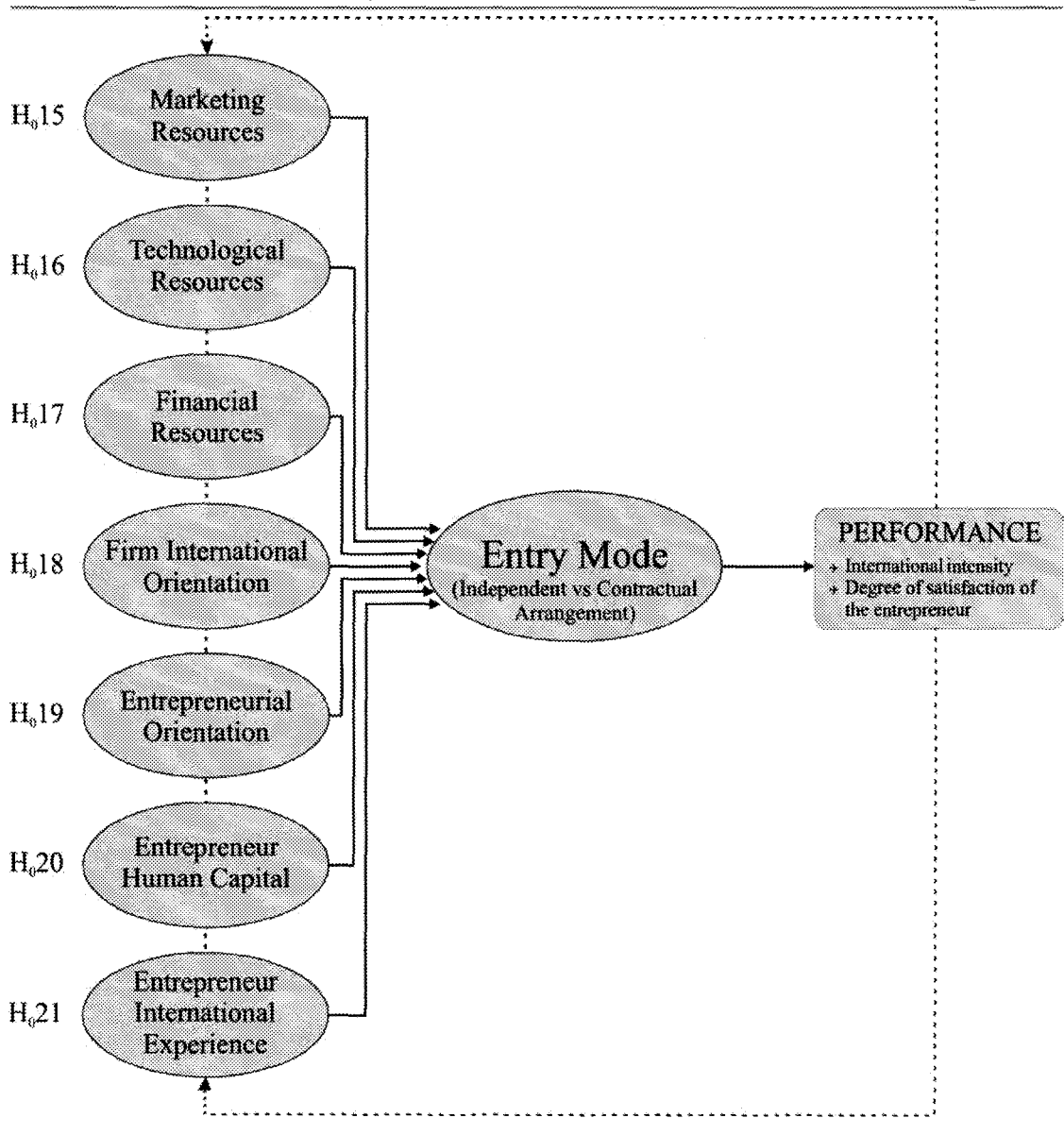
**Hypotheses H<sub>08</sub> - H<sub>014</sub>**

**That no relationship exists in respect to:**

<b>H<sub>08</sub></b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>marketing resources</i> .
<b>H<sub>09</sub></b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>technological resources</i> .
<b>H<sub>010</sub></b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>financial resources</i> .
<b>H<sub>011</sub></b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>international orientation</i> .
<b>H<sub>012</sub></b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>entrepreneurial orientation</i> .
<b>H<sub>013</sub></b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and <i>the human capital of the entrepreneur/chief executive</i> .
<b>H<sub>014</sub></b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and <i>entrepreneur's/ chief executive international experience</i> .

<b>Research Aim 6</b>
To examine the relationship between the use of a contractual mode in the main foreign market and performance in that same market, while considering the resources identified in Research Aims 1 to 3, as moderator influences in that relationship (see Figure 5.5).

Figure 5. 5: To examine the relationship between the use of a contractual entry mode, in the main foreign market, and performance in that same market, while considering the resources of the high technology SME, as moderator influences in that relationship.



Unit of Analysis: Firm Entry Mode in the Main Foreign Market

Source: The Author



In order to facilitate statistical testing all of the following hypotheses are expressed in the null form:

**Hypotheses H<sub>0</sub>15 - H<sub>0</sub>21**

**That for high technology SMEs no relationship exists in respect to:**

Performance Measured by International Intensity in the Main Foreign Market	<b>H<sub>0</sub>15</b>	The use of a contractual mode, in the main foreign market coupled with <i>marketing resources</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>16</b>	The use of a contractual mode, in the main foreign market coupled with with <i>technological resources</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>17</b>	The use of a contractual mode, in the main foreign market coupled with with <i>financial resources</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>18</b>	The use of a contractual mode, in the main foreign market coupled with with <i>international orientation</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>19</b>	The use of a contractual mode, in the main foreign market coupled with with entrepreneurial orientation, in relation to performance in that same market.
	<b>H<sub>0</sub>20</b>	The use of a contractual mode, in the main foreign market coupled with <i>the entrepreneur/chief executive human capital</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>21</b>	The use of a contractual mode, in the main foreign market coupled with the <i>entrepreneur/chief executive international experience</i> , in relation to performance in that same market.

## Hypotheses H<sub>0</sub>22 - H<sub>0</sub>28

That for high technology SMEs no relationship exists in respect to:

Performance Measured by the Degree of Satisfaction of the Entrepreneur/CEO with some financial targets in the Main Foreign Market	<b>H<sub>0</sub>22</b>	The use of a contractual mode, in the main foreign market coupled with <i>marketing resources</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>23</b>	The use of a contractual mode, in the main foreign market coupled with with <i>technological resources</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>24</b>	The use of a contractual mode, in the main foreign market coupled with with <i>financial resources</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>25</b>	The use of a contractual mode, in the main foreign market coupled with with <i>international orientation</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>26</b>	The use of a contractual mode, in the main foreign market coupled with with <i>entrepreneurial orientation</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>27</b>	The use of a contractual mode, in the main foreign market coupled with <i>the entrepreneur/chief executive human capital</i> , in relation to performance in that same market.
	<b>H<sub>0</sub>28</b>	The use of a contractual mode, in the main foreign market coupled with the <i>entrepreneur/chief executive international experience</i> , in relation to performance in that same market.

After synthesising the relevant literature to this study, developing the research framework and establishing the research aims and correspondent stated hypotheses the next chapter (chapter 6) will develop and present the applied methodology, research design and the operationalisation of the variables, belonging to each specific construct, of the discussed research framework. In addition, chapter 6 will also present the main findings of the exploratory interviews of this study that precede the development of the research design and the finalisation of the research instruments.

## **Chapter 6: Research Methodology**

### **6.1 Introduction**

In chapters 2 to 4, this study has reviewed the critical literature that encapsulates the topic of this thesis and in chapter 5 it developed the research framework, aims and corresponding stated hypotheses. In this context, the overall purpose of this chapter is to develop a sounding research design so that the research aims, formulated in chapter 5, will be addressed and examined.

Basically the research design consists of an overall plan that will be used to guide throughout the research from problem formulation till data collection and analysis in order to ultimately present the research report (Churchill and Iacobucci, 2002). Thus, the research design can be seen as the blueprint for the entire study ensuring that it will be adequate to the research problem, using economical and parsimonious procedures, while achieving the study objectives (Churchill and Iacobucci, 2002; Chisnall, 2001). In addition, the definition of an appropriate research design is also critical since it directs the researcher to the data that will be collected and the way that it will be collected.

In sum, depending on the research aims and objectives, research context, costs and timing aspects different research designs and its combinations can be used in order to accomplish the objectives of the study, successfully. Thus, a summary review of the different research techniques is provided and the main advantages and disadvantages of each technique are discussed.

However, this chapter is not intended to conduct an in depth review of research methods in business and management rather its overall purpose is to develop an appropriate research design, which addresses the specific aims of this study. Therefore, chapter 6 is structured as follows: Section 6.2 concisely discusses the main differences between propositions and hypotheses. Section 6.3 briefly describes the main research designs, research instruments and types of data available to the researcher, while pointing out their main strengths and weaknesses. Section 6.4 puts forward the operationalisation

and implementation of the chosen research design. Therefore, this section includes the relevant results of the exploratory part of this study, namely the exploratory interviews. Conclusions of those exploratory interviews are quite important, once their findings influence, to a great extent, the instruments and constructs used at later stages in the research process. Section 6.5 shortly outlines the concrete and specific actions, undertaken by the researcher, before conducting the analysis of data (see chapter 7). Sections 6.6 to 6.9 briefly describe the multivariate statistical techniques used, in this study, to address its research aims; that are: principal component analysis (section 6.6), multiple regression analysis (section 6.7), logistic regression analysis (section 6.8) and moderated multiple regression analysis (section 6.9). Finally, section 6.10 presents a brief summary of chapter 6 main conclusions.

## 6.2 Propositions and Hypotheses

A proposition is generally defined as a statement about observable phenomena that may be assessed as true or false, while a hypothesis, however also being considered as a proposition, is formulated for empirical testing (Cooper and Schindler, 2006). In addition, a hypothesis is presented as a declarative statement between two or more variables. Thus, a hypothesis could be described as a statement in which variables are assigned to the entity or thing that the hypothesis talks about (Cooper and Schindler, 2006).

Hypotheses could be classified either descriptive or relational. A descriptive hypothesis states the existence, size, form, or distribution of some variable. On the other hand, a relational hypothesis is a statement that describes a relationship between two variables, with regards to what the hypothesis talks about. In this context, when there is an implication that the existence of/or a change in one variable causes or leads to a change in the other variable, it is called an **explanatory/causal hypothesis** (Cooper and Schindler, 2006). Currently, the causal variable is called the independent variable and the other the dependent variable.

In research the role of hypotheses is quite important since it guides the direction of the study. Secondly, it identifies facts that are important and others which are not. Thirdly, it suggests which form of the research design is likely to be the most adequate. Fourthly, it provides the framework for organising the resulting conclusions (Cooper and Schindler, 2006).

In sum, hypotheses establish the boundaries of what the scope of the study is and what is not.

### **6.3 Research Designs: Overview and Adopted Approach**

Research designs can be classified in various ways. However, at a practical level, research designs, are classified, according to the fundamental objective of the research (Churchill and Iacobucci, 2002). Most categorisations broadly identify three non-mutually exclusive research designs (Churchill and Iacobucci, 2002; Chisnall, 2001; Kinnear and Taylor, 1996) that are:

- Exploratory research designs
- Descriptive research designs
- Causal or explanatory research designs

#### **6.3.1 Exploratory Research Designs**

The research is exploratory if little is known about the research problem or if the information that could assist on the specification of the study is currently not available. The objective of exploratory research designs is indeed on the generation of new insights and ideas about a specific problem (Churchill and Iacobucci, 2002; Chisnall, 2001; Kinnear and Taylor, 1996). In this context, exploratory research is appropriate when the research aims and objectives include the identification or the development in a more precise way of a vaguely formulated problem or opportunity. Thus, exploratory research is concerned with issues where limited knowledge exists and consequently the

research design is characterised by flexibility and sensitivity to unexpected situations. In this context, the generation of new ideas and new insights not previously acknowledged is critical.

Currently, exploratory research uses methods that include observations, focus groups, and interviews with experts as well as compiling and analysing selected case studies (Churchill and Iacobucci, 2002; Kinnear and Taylor, 1996). Exploratory research designs only seldom use detailed questionnaires or probability of sampling procedures (Churchill and Iacobucci, 2002).

Last but not the least; exploratory research is often used in the initial stages of studies focusing in new and emerging research areas.

### **6.3.2 Descriptive Research Designs**

In contrast to exploratory research, descriptive studies are characterised by the substantial knowledge already existent about a specific phenomenon (Chisnall, 2001). Thus, the main purpose of descriptive research designs is to describe the characteristic variables of the phenomenon under investigation, determining their frequencies and making predictions about its occurrence. Therefore, descriptive research may characterise the phenomenon under investigation and demonstrates an association among variables. However, it can not accommodate statements about cause and effect relationships between variables that may exist (Kinnear and Taylor, 1996).

A descriptive research design is used for the following purposes:

- To describe the characteristics of phenomena and determine the frequency of occurrence of certain groups in a specific population.
- To determine the degree to which variables are associated with phenomena.
- To make specific predictions regarding the occurrence of certain phenomenon.

(Churchill and Iacobucci, 2002)

In contrast with exploratory research, descriptive research designs are characterised by being less flexible and more rigid assuming much more prior knowledge about the phenomenon under investigation already existing. Thus, researchers conducting descriptive studies should have a clear knowledge about the “who’s”, “what’s”, “when’s”, “where’s”, “why’s” and “how’s” of the research (Churchill and Iacobucci, 2002).

### **6.3.3 Causal/Explanatory Research Designs**

The main purpose of causal/explanatory research designs is to understand the cause and effect relationships between variables. In causal/explanatory research designs the main issue is to establish the functional relationship between the variables that are the cause of the effect that has been predicted. Only causal research designs can establish inferences about cause and effect relationships since it cannot be done using exploratory or descriptive research designs.

Overall, explanatory research designs assume that one has enough knowledge about a specific area of enquiry where specific theories are known and where we want to test specific hypotheses established in advance in order to infer causality by using probability statistics (Hartman and Hedblom, 1979) as well as assessing relationships between variables and their possible interactions (Chisnall, 2001).

When conducting explanatory research the main sources of data are surveys and experiments. The former one can only determine the degree of association between variables and testing hypotheses; the latter allows establishing causality between variables (Kinnear and Taylor, 1996).

### **6.3.4 Types of Data**

In the preceding section the main research methodologies were outlined. This section focus on the main types of data and on the research instruments used. In this context,

there is a close coupling between the selected research design and the data needed to address the specific aims and objectives of the study.

In fact, the applicability of each of the three research designs (exploratory, descriptive or explanatory) or a combination of them in a specific investigation depends on the current knowledge existent in that field of inquiry as well as on the type of data needed to address the specific aims and objectives of the study. Thus, the collected data must be adequate taking into consideration the study aims, while conceptualising and implementing an appropriate research design (Kinnear and Taylor, 1996).

Data refers to information recorded with the intent to represent facts (Hair et al, 2003).

Data can be analysed using different approaches. Currently, the literature distinguishes objective vs. subjective data, qualitative vs. quantitative data and cross-sectional vs. longitudinal data.

#### **6.3.4.1 Objective vs. Subjective data**

Objective data is represented by numbers, which are difficult to dispute and not based on a single's person opinion. By contrast, subjective data represent individual's personal opinion. However, when aggregating the data collected from several persons, it becomes relatively more objective because not dependent on a particular person.

All perceptual data is subjective (Hair et al, 2003). For example, a manager's rating about firm performance or some of its resources/competences is also subjective.

#### **6.3.4.2 Qualitative vs. Quantitative Data**

Qualitative data represents descriptions of phenomena by using non-numerical representations (Hair et al, 2003).

Qualitative data provide in depth rich descriptions and explanations of processes, keeping chronological flows, assessing local causality, and extracting sounding explanations of the phenomena under investigation (Miles and Huberman, 1994). In addition, qualitative data try to describe, decode, translate and identify the meaning, not



the frequency, of phenomena in the social world by using a set of interpretative techniques (Van Maanen et al, 1982). Thus, qualitative data can produce findings, which are not achieved by the use of statistical techniques or either other quantification tools, and providing a richer representation of the phenomenon under investigation. In this context, qualitative data seems particularly suitable when the objective is to increase understanding and expand knowledge of phenomena allowing theory building, as well as exploring and explaining complex motivations, attitudes and behaviour (Hart, 1987).

On the other hand, a major drawback in the use of qualitative data relates to the fact that the methods of analysis are not well formulated as quantitative methods are (Miles and Huberman, 1994). In addition, while quantitative data is objective in nature, qualitative data, is subject to its interpretative nature. For the latter type of data, the researcher has very few guidelines for protection against the reaching of unreliable or invalid conclusions for the research. Furthermore, the researcher can be seen as a source of additional bias.

Nonetheless, as Hair et al (2003) point out that qualitative methods are particularly appropriate for:

- Discovery and exploratory analysis.
- Provision of in-depth information on a few characteristics of a phenomenon.
- Exploration of motivations and values in complex behaviour.

By contrast, quantitative data are measurements, which describe phenomena that exist in the business world presented in numerical format (Hair et al, 2003). Thus, it makes comparisons easier; data are standardised, visible and tangible, allowing the use of statistical analysis (Hart, 1987). In addition, the less labour intensiveness of collecting data allows, in quantitative data, the use of greater sample sizes, thus, enhancing the representativeness of the population from which it was drawn. This represents a boost in the acceptance of the reliability and generalisability of the research findings. Moreover, the use of very structured descriptive or inferential statistical techniques, giving less

room for subjective interpretations, will allow an easy assessment of the validity of the research findings.

According to Hair et al (2003) the purpose of quantitative data is for:

- Testing hypotheses summary.
- Providing descriptive summary information on many characteristics of the phenomena under investigation.
- Particularly useful in tracking trends.

In sum, both quantitative and qualitative methods have their own advantages and limitations. Currently, quantitative methods have two advantages in relation to qualitative approaches that are numerical measurement and overall research objectivity. Numerical measurements, using larger sample frames, allowing the use of different statistical techniques are obviously more objective, and give the research study the benefits of validity, reliability and generalisability. On the other hand, qualitative methods can provide a richer description and presentation of a phenomenon, fact that is difficult to achieve by using quantitative methods.

In acknowledging the limitations of either quantitative or qualitative methods several authors give support to the idea of using a combination of quantitative and qualitative methods (Easterby-Smith et al, 1999; Yin, 1994). In these circumstances quantitative and qualitative methods can be used in the same study by providing qualitative data to illustrate or clarify some quantitative findings and *ceteris-paribus* using quantitative data to acknowledge and validate some qualitative findings (Strauss and Corbin, 1990).

In short, this combination of methods minimises the drawbacks of each method alone and it is known when applied in a single study as methodological triangulation (Easterby-Smith et al, 1999).

Last but not the least, the concepts put forward about the conceptual definition of validity, reliability, and generalisability of constructs are seen as important when assessing the overall research design.

The conceptual definition for a construct is guided both by academic research and managerial aspects. In this study the former is based on prior research that is on current knowledge existent in this specific field of enquiry (see chapters 2 to 4) while the latter, is based on the exploratory interviews conducted with chief executives, experts and academics (see sections 6.4.2 and 6.4.3).

In addition, conceptual definition of a construct refers to the degree to which a measuring instrument accurately describes a construct. It includes:

- **Construct validity:** assesses what the construct or the scale is, in fact, measuring. To assess construct validity one must understand the theoretical rationale underlying the obtained measures. To assess construct validity the following checks are required:
  - **Convergent validity:** refers to the extent to which the construct is positively correlated with other measures of the same construct.
  - **Discriminant validity:** refers to the extent to which the construct does not correlate with other constructs that are different from it.
- **Content validity:** refers to the systematic but subjective assessment of a scale's ability to measure what is supposed to measure. Currently, validation involves consulting a sample frame of experts to assess on the suitability of the items chosen to represent the construct. In this thesis content validity was assessed, in the pre-test, by industry experts, academics and chief executives of Portuguese high technology SMEs (see sections 6.4.2 and 6.4.3).

**Reliability (internal consistency):** reflects the degree to which instruments are free from error and thereby yield consistently accurate representations of the construct.

Rigorous attention should be given at each stage of the research design and in particular the choice of the sample frame to be studied, the definition of the constructs, and the construction of the questionnaire in order to guarantee the validity, reliability and generalisability of the selected research approach. Moreover, at this stage the choice of using multiple research methods enhance validity, reliability and generalisability by minimising the unfavourable aspects of relying on a single research method.

#### **6.3.4.3. Cross-Sectional vs. Longitudinal Data**

The time frame focusing in the study is another key element in the same way as it is the chosen research design and the utilisation of qualitative or quantitative data in order to address the research aims and objectives of the study. This time frame currently requires the use of cross-sectional and/or longitudinal data. In this context, the research will be cross-sectional if the study of a specific phenomenon (or phenomena) is conducted at a particular point in time. By contrast, longitudinal research focuses in processes that take place over a certain period of time. Traditionally, in a longitudinal research, a set of considered variables defined quantitatively or qualitatively, are assessed at different periods of time across the same pre-defined sample of either individuals or organisations. In this context, the main issues that these models/frameworks try to answer are whether there have been significant changes in the variables (either independent or dependent) between the time periods t1 and t2. Due to the difficulties to measure changes in those variables traditional longitudinal research often focusing on process manifestations at particular points in time. In spite of the highly interest in understanding and disclosing processes that evolve over time, cross-sectional studies are typically the rule in marketing research (Kinnear and Taylor, 1996) as well as in international business research (Coviello and McAuley, 1999). This is probably due to difficulties in tracing respondents over time as well as in monitoring, in a rigorous way, the complexities of processes and their outcomes over several periods of time. In addition, these research processes are generally very expensive and time consuming. Thus, due to the limited amount of time and other resources currently allocated, namely to academic research, longitudinal studies are often very difficult to put in practice.

#### **6.3.5 Research Instruments**

As part of the research design, the researcher needs to focus on how the data needed to address the study aims can be gathered. One or a combination of the following methods can gather this data: observation, experimentation and communication collection methods (Churchill and Iacobucci, 2002).

### **6.3.5.1 Observation Collection Methods**

Observation techniques consist in systematically recording observations of people, events or objects by using human, mechanical or electronic observation.

Observational techniques depend, to a great extent, on the skills and objectivity of the researcher. In comparison with methods involving questioning, observational techniques have four main advantages. Firstly, observational techniques do not rely on the respondent's cooperation to provide the needed data. Secondly, the potential bias created in a process of interaction is strongly reduced or even eliminated. Thirdly, those behaviour patterns that the interviewee is not aware of can only be recorded by observation and fourthly, sometimes observation is the only research instrument that can be used to collect the required data. This is, for example, the case when respondents are unable or not keen on disclosing accurate data.

However, observational techniques also have two major weaknesses: firstly, unobservable phenomenon like attitudes, opinions and motivations cannot be evaluated using observation methods. Nonetheless, these are important factors when examining any decision-making process within an organisation. Secondly, the use of observational techniques is only easily applied when behaviour is frequent, repetitive or predictable. In other situations it will be costly and much time consuming.

Finally, in observational techniques results are presented in either narrative or numerical data. Narrative data is collected in a form of written descriptions of behaviour or recorded in audio or videotape. On the other hand, in the case of numerical data a skillful trained observer can be currently used whose function is to record events by means of a structured questionnaire or a device, which counts specific actions.

### **6.3.5.2 Experimentation**

An experiment consists in consciously manipulating and controlling the independent variables and measuring its impact on a pre-specified dependent variable, while controlling all other variables that may influence the relationship. In this context,

experimentation aims to develop theories and testing specific hypotheses. Thus, statements can be presented about cause and effect relationships. However, the ideal experimental conditions found in labs are almost impossible to happen in real-life conditions such as, the case in marketing and business research. Under these conditions experiments in marketing and business research should be conducted in such a way that the influence of uncontrollable variables stay at minimum levels throughout the research process.

### **6.3.5.3 Communication Collection Methods**

Communication is related to putting forward a set of research questions to respondents to obtain information, by using a data collection instrument called questionnaire or survey.

A survey is a procedure to collect primary data from a population (a sample or a census) by using a standardised set of instruments.

Surveys are applied when the research study involves collecting information from a large sample. Often research objectives request factual, attitudinal and behavioural data. These data, mainly of quantitative nature, can be collected through the use of surveys so that research objectives can be achieved (Kinnear and Taylor, 1996). Moreover, another great advantage of surveys refers to the fact that the researcher can collect large quantities of data from a population, while maintaining costs under control. On the other hand, the following disadvantages of surveys can be identified: non-response errors, which can invalidate research findings. Secondly, the influence of questioning since respondents may give “political correct” answers and therefore, introducing bias to the accuracy of data. Thirdly, to assess the ability of respondents to provide data, that is, targeting those members in the organisation with the required knowledge in answering about the subject under investigation.

In surveys the researcher can make one or several of the following standardised instruments available: personal, mail, telephone and computer surveys.

## **Personal Surveys**

Personal Surveys give the opportunity to the researcher to directly interact with the respondent. They are particularly adequate in gathering data when dealing with complex and/or sensitive issues and when open-ended questions are used to collect data. However, Kinnear and Taylor (1996) point out the following disadvantages:

- Respondents may introduce bias in their responses due to the desire to please or impress the interviewer.
- They are labour intensive and time consuming. Thus, they are costly in financial and management terms.

Personal Surveys can be distinguished in structured, unstructured and depth interviews.

### **Structured interviews**

Structured interviews are characterised by the fact that the interview follows a predetermined sequence of questions and answers recorded in a standardised format. For each interview the interviewer must use the same interview sequence and conducting the interview exactly in the same way in order to avoid biases often due to lack of skills in conducting interviews. Thus, the standardised questions format will ensure that responses are comparable between interviews. Structured interviews are based on the following principles:

- Firstly, questions have the same meaning for all respondents; once they are based on common vocabulary for all participants in the interview.
- Secondly, questions are relevant to all respondents.
- Thirdly, questions follow a logical sequence well understood by respondents, that is, the sequence of questions must be identical and preceding questions define the context of subsequent questions.

Despite the higher reliability of this technique in comparison with more informal types of interviewing, structured interviews are characterised by lack of flexibility and could be considered not appropriate techniques for probing and searching questions.

### Unstructured interviews

Unstructured interviews are conducted on the basis of an interview guide with a sequence of mainly open questions. This allows the researcher to gather information by encouraging the interviewee in free and open discussion of the topic of interest. In this context, the researcher has the opportunity to explore in depth specific issues risen during the interviews. Thus, researchers can obtain a deeper understanding of the critical issues involved.

This type of interview avoids the rigidity of structured interviews and assumes that all the key topics of the research investigation will be covered.

Therefore, they are in a better position to both define the research problem, and to develop a conceptual framework for the research. This will form the background for further empirical research to test the ideas, concepts and hypotheses that might emerge throughout the research process.

Unstructured interviews are based on the following principles: firstly, interviews are held with knowledgeable respondents. Secondly, it refers to situations that were been analysed prior to the interview. Thirdly, it precedes on the basis of an interview guide specifying topics related to the research objectives. Fourthly, it is often based on the subjective experiences of the interviewee in relation to the subject under investigation.

### Depth Interviews

Depth Interview is an unstructured interview between a skillful interviewer and a respondent. During the interview respondents are encouraged to talk freely about a rather broad subject of interest to the researcher. No pre-specified structure or set of questions is established. Thus, depth interviews have a more unstructured form than unstructured interviews. In this context, the role of the researcher is limited to clarifying responses and probing (Hart, 1987). The two-way communication established between



interviewer and interviewee will allow the information obtained to be both huge and rich; often revealing the personality of the respondent (Hart, 1987). Nonetheless, differences in collecting data between interviews might be significant and therefore, comparability and generalisability might be reduced.

### **The Mail Survey**

Mail surveys/questionnaires are very popular and common research techniques in business and management (Hair et al, 2003).

The mail questionnaire consists in a self-completion document, which the respondent completes without any direct help from the researcher. Therefore, it has to be meaningful to respondents both in terms of the nature of the questions as well as on terminology/language used.

It could be utilised as a scientific instrument for measurement of key characteristics of individuals, organisations or other phenomena.

Mail surveys are generally designed to gather large quantities of data in numerical format. Some of its main advantages include wider access and better coverage of the population, central control, no interviewer bias, relatively low cost, the use of large sample sizes and last but not the least, respondents' complete questionnaire without the researcher physical presence (Hair et al, 2003). On the other hand, there are important drawbacks such as:

- Problem of non-response. The researcher must assess if the non-respondents are in some way different from respondents, a factor in itself, which inhibit generalisation of the research findings.
- Questionnaires can only be used if the questions are simple and straightforward enough to be understood if necessary with the help of written instructions and definitions.
- Answers must be accepted as they are. In fact, there is no opportunity for checking beyond the answer given to clarify ambiguous answers or to assess the behaviour of non-respondents.
- The researcher cannot always be sure that the right person fills the questionnaire.

- The respondent can see all the answers before answering any of them. Thus, several answers cannot be assessed as independent.

(Nachmis and Nachmis, 1976)

Nonetheless, academic literature presents some recommendations to overcome other drawbacks such as how to pre-test questionnaires as well as to increase response rates (Reynolds et al, 1993).

### **The Telephone Interview**

To some extent the telephone interview resembles the structured interview mentioned above; once it has to be short, clear and direct to the point. In comparison to face-to-face structured interviews its main advantages lie in the fact that they are less costly and easier to administer. On the other hand, main drawbacks include:

- Long and complex questionnaires are not appropriate. Scaled questions are not advisable once visual aids cannot be used.
- There is a limited amount of data that can be collected.

Currently, telephone surveys are characterised by being just a pre-notification technique used in conjunction with other research subsequent research instrument.

### **The Computer Survey**

The use of computer surveys has become more widespread as the diffusion of ICT continues to increase.

Two sub-classes of computer surveys can be identified: e-mail surveys and world-wide-web-based surveys. The main advantage of computer surveys in comparison with other discussed methods is speed and cost. On the other hand, an obvious disadvantage relates to the fact that it can only reach individuals or organisations with email addresses or having access to the world-wide-web. In this context, although the great majority of organisations have access to this communication tool, it is expected that “low-level” adopters are less likely to respond.

Last but not the least, the same methodological advantages and disadvantages of indirect questioning also apply to computer surveys.

#### **6.4 Choice of a Suitable Research Design for this Thesis: Its Research Phases and its Instruments**

The above brief review of research methodologies suggests that no perfect methodology exists to address a research problem. In fact, there are always advantages and disadvantages when adopting a specific research design associated with its types of data and respective instruments. However, taking the research aims and hypotheses, stated in chapter 5 into consideration, they suggest the use of a combination of methodologies even though ultimately the study is characterised by its main descriptive and explanatory purposes. In fact, as acknowledged in section 6.2, the use of explanatory/causal hypotheses, already stated in chapter 5, may have the advantage of guiding the direction of the study based on the research framework put forward also in chapter 5. In addition, those hypotheses also identify the variables which have been assessed as relevant for this thesis while suggesting a suitable research design in order to accomplish these study objectives.

Overall the hypotheses specify **the object of this study**:

- Portuguese High Technology SMEs.

Second, **how to be studied**:

- In a context of internationalisation or in the type of entry mode that they use in the main foreign market.

Third, **what to examine**:

- The relationship between their key resources and international performance, key resources and the type of entry mode they utilise in the main foreign market and international performance.

Nonetheless, the identification and assessment of key resources of high technology SMEs on an early phase of the research has mainly an exploratory character based on the limited extant literature and on the exploratory interviews.

In sum, a combination of methodologies is recommended. This combination will enhance research output and will also allow achieving higher degree of validity, reliability and generalisability compared to a single one-stage approach. The objectives of the research require both rich qualitative data as well as quantitative data to be collected. Thus, a methodology, which combines quantitative and qualitative approaches, seems appropriate. As stressed above a qualitative approach is used during the early stages of the research while a quantitative methodology during the latter part of the study.

From a data collection perspective this study uses survey technique as the most appropriate method to collect data since taking into consideration its nature, observation and experimentation were considered not to be appropriate.

In fact, the survey approach has the advantage of offering a variety of specific data collection techniques. In this context, unstructured personal interviews are considered the most appropriate research technique in the early stages, qualitative phase of the research, knowing its advantages in gathering rich data with mostly open questions.

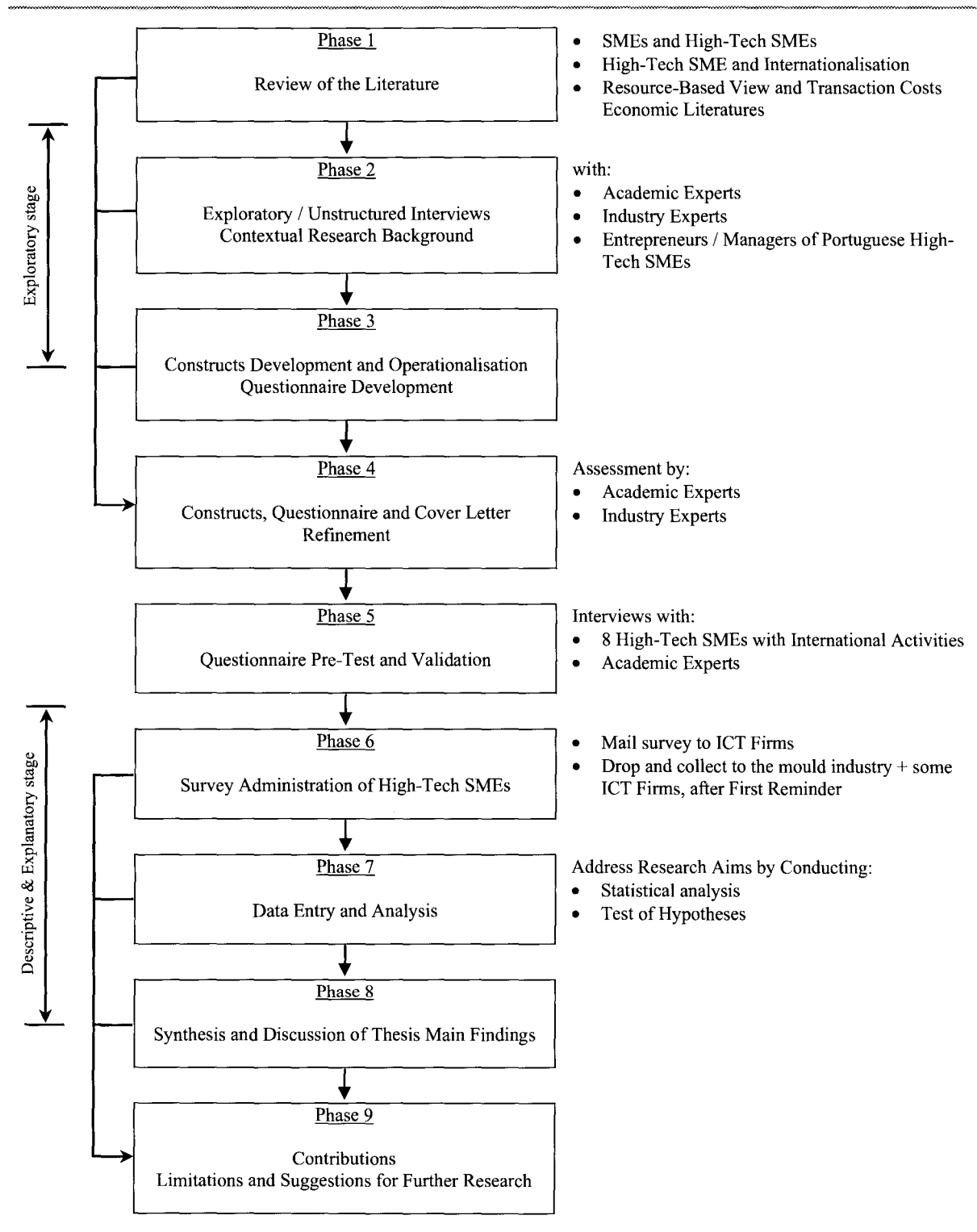
However, the exploratory unstructured interviews were based (see the Exploratory Interview Guides in Appendixes 6.1 and 6.2) on some research findings suggested on the academic literature that will be used for exploratory purposes.

By contrast, for the more descriptive and explanatory phases of the research design the mail questionnaire is chosen due to its advantages in terms of costs and coverage, allowing an evaluation of a larger sample of firms having the potential to generalise the research main findings. In addition, findings from exploratory stages, early phases will be integrated into further and subsequent phases in the research design. In fact, all the resources identified in the exploratory interviews with the chief executives of eight high technology SMEs and with experts/academics, along with other identified resources in the extant literature will be integrated in the specific resources' constructs, to be examined in the mail survey, and will be tested, using principal component analysis (PCA), for validity and reliability.

Figure 6.1 shows the overall research design and its stages.

The following sections will describe in depth each phase of the research design from the exploratory to the descriptive and explanatory research stages. A main emphasis will be given on how the key variables will be operationalised and research instruments implemented.

Figure 6. 1: Overall Research Design and Phases



Source: The Author

#### **6.4.1 Operationalisation and Implementation of the Selected Research Design**

This section presents the operationalisation and implementation process throughout the different phases of the chosen research design. It includes a brief summary of the exploratory research interviews since those findings have a great influence on the research design and its instruments.

##### **6.4.1.1 High technology SMEs: Chosen Country, Population and Sampling Design**

In phase 1 of the overall research design (see figure 6.1) this study has reviewed the core literature in the three research areas pertinent to this thesis, that are SMEs and high technology SMEs (chapter 2), the resource-based view of the Firm (chapter 3), high technology SMEs and internationalisation, international business and internationalisation models (chapter 4). Reviewing all the relevant literatures implies synthesising and analysing theories and empirical findings of all those three streams of research. In this context, this study examined, in chapter 2, the characteristics of SMEs and high technology SMEs and more specifically their current strengths and weaknesses. In chapter 3 drawing on the literature of the Resource-Based View of the Firm (RBV), mainly in a domestic context, it has examined some of those strengths and weaknesses, which may represent key resources, specific to high technology SMEs. Finally, chapter 4 has reviewed the literature on the RBV, in an international context, as well as international business and internationalisation models, which underpin key elements of this thesis, namely: transaction costs economics and behaviouristic models of internationalisation.

In order to investigate, in a systematic and rigorous way, the stated research aims to a population of high technology SMEs an adequate sampling frame is mandatory. However, before detailing the used sample frame and the sampling design the study presents the rationale for choosing Portuguese-based firms. In fact, studies investigating the internationalisation of Portuguese high technology SMEs are almost inexistent; an exception is Fontes and Combs (1997). Moreover, studies portraying a perspective of high technology SMEs in small and peripheral countries, within the E.U., are also

almost inexistent. In contrast, the available literature in Europe about high technology SMEs comes predominantly from Scandinavian countries, Finland, as well as from the U.K. The literature from Central Europe is still very patchy despite a growing number of studies were set out mainly in former eastern European countries.

In this context, this study by focusing Portuguese high technology SMEs tries to fill the gap in the current literature about this research topic.

#### **6.4.1.2. The Population and the Sampling Frame**

Currently, the identification of high technology firms is done either by SIC codes considered to be R&D intensive or by using the population of the generally small firms located in science parks.

In contrast with other studies (Brock, 2000) this study follows the SIC code approach. In Portugal, the number of firms located in science parks is quite limited. In fact, the study addresses the overall population of high technology SMEs irrespective of their location. Furthermore, the study is not intended to be biased to a population of small and young firms characterised by launching radical innovations on the market since this type of firms are almost inexistent in Portugal.

For the actual sampling frame the database of ANETIE “Associação Empresarial das Tecnologias de Informação, Electrónica e Comunicação” called “PORTUGAL HIGH TECH” was used. It lists all the Portuguese “technology-based” firms in the areas of information, and communication technologies and electronics. This list is available over the INTERNET at <http://www.portugalhightech.com>. However, the researcher has obtained and used an updated and more detailed version of PORTUGAL HIGH TECH database directly from ANETIE. In addition, due to the importance of the mould industry to Portuguese exports, this study also selected a sample of R&D intensive mould firms. This sample was selected from a database of CEFAMOL “Associação Nacional da Indústria de Moldes”. It lists all the Portuguese mould firms. However, the researcher picked up from this list only firms with “project engineering” capabilities. This list is available over the INTERNET at <http://www.cefamol.pt>.



#### **6.4.2 Exploratory Interviews with Entrepreneurs/Managers of High technology SMEs: Main Findings**

In order to increase the knowledge related to the specifics of this study, face-to-face interviews were conducted, in March 2002, with the chief executives (i.e. the most knowledgeable person within a firm) of eight high technology SMEs all of them with R&D and some international business operations.

These exploratory interviews confirmed the high level of education of all interviewed chief executives/entrepreneurs. All have a degree, with the exception of the mould industry CEO. In fact, in the remaining seven interviewees, one holds a PhD degree, three have a master's degree and the other three are graduated in science or engineering, giving support to the technical background of the entrepreneur/chief executive acknowledged in the literature.

The overall objective of the exploratory personal interviews was to qualitatively acknowledge and examine key resources, specific to high technology SMEs, conducting business activities in foreign markets, already emphasised in the relevant literature as well as to explore and uncover other potential valuable resources not addressed in the literature.

In more practical terms the objective of those interviews was to collect qualitative data as a part of this study's Research Aims 1, 2 and 3, put forward in chapter 1, in order to confirm variables previously identified in the relevant literature as well as to access new potential variables which may pertain to specific resources already noted or not in the limited extant literature.

In short, these qualitative findings play a key role in this study overall research design since all of those pertinent variables will be included in the resources' constructs for testing in the quantitative part of this study.

The interviewed firms conduct business activities in the following industry sectors: software (3 firms), hardware (1 firm), electronics/microelectronics (2 firms), telecommunications (1 firm) and moulds (1 firm). Their selection was not conducted at random rather the objective was to include firms with business activities in different industry sectors, spread all over the country, with different sizes and with international

activities, included in the chosen databases, respectively “PORTUGALHIGHTECH” and “CEFAMOL”. In addition, the interviewees were identified in these databases as well as by the assistance of ANETIE and CEFAMOL representatives.

The Head Quarters of those eight firms are located on Great Lisbon (5 firms) and in the in the centre and western areas of the country (3 firms).

The focus of the interviews was mainly on this study’s Research Aims put forward on chapter 1. Thus, the interviewees were asked several open-ended questions in order to collect the relevant data (see Appendix 6.1, Exploratory Interview Guide).

Confidentiality was ensured by an oral guarantee, given by the researcher, prior to the start of the interview.

The interviews were not taped due to cultural reasons and lasted for 2-3 hours.

The goals of these exploratory interviews were fourfold:

- First, to assess and evaluate if the main characteristics of the selected sample of high technology SMEs are in line with the used concept throughout the study (see Appendix 6.1, Exploratory Interview Guide, page 1, section1).
- Second, to get an understanding of the role and the importance that internationalisation has for high technology SMEs. Moreover, another key part is the assessment, over the internationalisation process, of what are the countries currently selected as well as on the types of foreign market entry modes chosen in those same markets.
- Third, to assess the strengths/weaknesses currently possessed by high technology SMEs, which may represent valuable resources in foreign markets. Furthermore, it is also discussed what resources high technology SMEs should possess, develop and/or acquire in order to be more successful in foreign markets. All these aspects are discussed at firm level.
- The fourth and final goal of these exploratory interviews was to investigate the interest of high technology SMEs in being involved in the pre-test of the questionnaire, in other words, their interest in this study.

Interviews main findings are the following:

### **Findings: Firms' organisational characteristics**

Table 6.1 shows the organisational characteristics of the interviewed firms considered important to this study. In addition, to maintain anonymity the interviewed firms are represented by letters ranging from A to H. These firms, as mentioned earlier, conduct business activities in the following industry sectors: software (3 firms), hardware (1 firm), electronics/microelectronics (2 firms), and telecommunications (1 firm) and moulds (1 firm). Their selection was not conducted at random rather the objective was to select firms with business activities in different industry sectors, spread all over the country, with different sizes and with different degree of international activities.

The majority of those firms are located on the greater Lisbon (5 firms), one in the centre region (Coimbra) and two in the western area (Ericeira and Marinha Grande). Moreover, the interviewed firm for the mould industry is located in a geographical cluster (Marinha Grande) one of the two geographical clusters for moulds currently existent in Portugal.

The number of employees of the interviewed firms ranges from 18 to 100 employees with an average of 40 employees.

In terms of age, interviewed firms range from 2 up to 14 years with an average of 7.4 years of age.

R&D intensiveness firms range from 1% to 40% R&D expenditures to turnover with an average of 21.6%.

International business activities to turnover that is international intensity are between a low 5% up to as high as 100% that is one firm has all business activities oriented towards foreign markets. It is worth noting the expected very high international intensity for the firms in the mould industry. Available literature for the Portuguese mould industry indicates international sales to turnover of above 80%, on average (CEFAMOL, 2002; ICEP, 2004).

Table 6. 1: Organisational Characteristics of the Interviewed Firms

Firm	Industry	Head Quarters	Nr. employees	Date of Foundation	%R&D to T.O.	Nr. People in R&D	% Int. Business to	T.O. (unit 1.000 PTE)
A	Electronics/microelectronics	TAGUSPARK Oeiras (science park)	100	1997	25%	20	100%	>1 million
B	Software	Coimbra	60	1998	12%	6	24%	300-500 thousand
C	Electronics/microelectronics	Lisbon	25	1992	20%	16	10	500-1 million
D	Hardware	Lisbon (science park)	18	2000	25%	12	25%	300-500 thousand
E	Software	Erceira	29	1997	30%	14	98%	300-500 thousand
F	Software	Algés	22	1996	40%	18	10%	300-500 thousand
G	Electronics	TAGUSPARK Oeiras (science park)	25	1988	20%	10	5%	300-500 thousand
H	Moulds	Marinha Grande	47	1989	3%	4	89%	>1 million

### Findings: Role and Importance of International Business Activities

All interviewed chief executives point out the importance for their firms of international activities. Furthermore, three of the firms interviewed are practically oriented to foreign markets since international business represents above 88% of their turnover arguing that the domestic market is too small to accommodate their business strategies. Moreover, chief executives of the remaining firms acknowledge that foreign markets will be more important in the future, since high technology markets are becoming more global. This is also the case of the firm in the mould industry since it has international activities practically from the outset. In fact, the Portuguese market for moulds is too small or almost inexistent. In addition, the international orientation of the mould industry is well documented (CEFAMOL, 2002; ICEP, 2004).

Nonetheless, for three firms with 10% or less of international intensity ratio, chief executives emphasise their lack of different types of resources as well as competitiveness to be active in foreign markets, giving support to the findings of the literature review (see chapter 4, section 4.5.4).

Not entirely surprising the great majority of the eight interviewed firms, with the exception of two, do not internationalise through stages starting from countries with short psychic distance; internationalisation could be seen not in terms of access to foreign markets, rather as a way how these firms conduct business, giving support to recent literature in this area (Jones, 2001). These firms start international activities in different countries such as the US, Norway or Germany. By contrast, the remaining two firms start having exports to countries characterised by short psychic or geographic distances such as Brazil, Macao and Spain, which suggests that the internationalisation pattern follows the stages models (Johanson and Vahlne, 1977).

The great majority (6 out of 8 firms) start internationalisation practically from inception as suggested from recent literature (see chapter 4, section 4.5.8).

For the eight firms interviewed only two types of foreign market entry modes were identified, they are “direct exports to end customers” (6 firms) and “direct exports via foreign distributor/sales agent” (2 firms). Furthermore, giving also support to the literature, a specific firm, could have different types of entry modes in different foreign markets.

### **Findings: Key resources that high technology SMEs currently possess and what resources should they possess or develop in order to be more successful in foreign markets**

This section of the personal Exploratory Interviews identifies and examines the qualitative findings pertaining to Research Aims 1, 2 and 3.

When the interviewees were asked to identify specific resources that would lead to the success of their firms in foreign markets a broad variety of responses was registered.

Nonetheless as Table 6.2 shows, interviewees put forward key resources that can be classified either at firm or individual/team levels. In fact, Table 6.2 exhibits disclosed answers under the headings of chief executive/management team, marketing, technological, finance, and managerial resources, along with the frequency of the identified resources. Nonetheless, when putting forward these, mainly knowledge-based resources, caution must be exercised due to the small sample sized of the interviewed firms. Thus, the frequency of the identified resources by the interviewees was not taken

as extremely relevant rather the research approach stayed in privileging just on the identification of a specific resource.

In fact, the role of the exploratory interviews was mainly to gain insights for the resources constructs, specific to high technology SMEs, conducting business activities in foreign markets and that will be assessed and examined in the survey administration phase of this study.

Moreover, resources presented in the table in italics mean that they have not been previously identified in the extant international resource-base literature for high technology SMEs.

Table 6. 2: Resources of High Technology SMEs that might be valuable in foreign markets

Identified Key Resources	ICT Firms N=7	Mould Firm N=1	Total Firms N=8
<b>Chief Executive/Management Team:</b>			
Industry Experience	3	1	4
International experience	4	1	5
<i>Risk taking and proactive behaviour regarding international opportunities</i>	2	0	2
Business vision	3	0	3
Mix of technical and managerial skills	3	1	4
<b>Marketing:</b>			
Qualified personnel in international sales	2	1	3
Access to international distribution channels	1	1	2
<i>Assessment of foreign market conditions (i.e. prospective customers, competitors and partners)</i>	2	0	2
Firm international customer-base	2	1	3
Firm international awareness and reputation	2	0	2
Participation in international exhibitions	3	1	4
Attendance to workshops and conferences	2	0	2
Advertising expenditures	1	0	1
<i>International networks of sales personnel (i.e. customers and/or distributors)</i>	2	1	3
<b>Technological:</b>			
High skilled personnel in R&D	3	0	3
Focus in R&D activities	2	0	2
Technology applicable world-wide	2	1	3
Continuous innovation due to products' short life cycle	3	0	3
Capitalise on technologies that are new to the market	1	0	1

**Finance:**

Availability of capital for firm's development	3	1	4
Current endowment of capital to run the firm	2	1	3

**Managerial:**

Human resources skills	2	0	2
<i>Entrepreneurial attitudes and behaviour of the personnel</i>	2	0	2
International orientation of the firm as a whole	2	1	3

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At chief executive/management team level five key knowledge-based resources were identified as particularly relevant to the success of high technology SMEs in foreign markets. First resource identified was “industry experience”, which supports the findings of Lee et al (2001).

Second, in line with Reuber and Fischer (1997) the “individual international experience of the chief executive or the members of the management team” was also assessed as very important since internationalisation is seen as risky and therefore the international experience of firm's top executives may reduce uncertainty and risk associated with international activities. Nonetheless, high technology firms should be managed with a sense of “*risk taking and proactive behaviour regarding international opportunities*” a newly identified resource as stressed by two CEOs of the ICT sample, which is not currently highlighted in the literature as a key resource even though it remains part of firm's entrepreneurial orientation (Miller, 1983; Covin and Slevin, 1989).

Third, “business vision” and “mix of technical and managerial skills” were also seen as highly influential by interviewees, which are consistent with findings of previous studies, respectively McDougall et al (1994) and Berry (1996).

For marketing resources, nine strengths/weaknesses (Wernerfelt, 1984) identified by the interviewees were of particular importance. In this context, “advertising expenditures”, “*participation in international exhibitions*”, “attendance to workshops and conferences” and “international awareness and reputation” can be grouped as part of the high technology SME promotion activities. Nevertheless, the “*participation in exhibitions/trade shows*” is not currently referred in the literature of high technology

*SMEs while advertising, attendance to workshops/conferences and brand awareness and reputation* supports the findings, respectively of Shrader (2001) and ENSR (2003). Other identified strengths/weaknesses related to firm's sales force (qualified personnel in international sales), distribution (access to international distribution channels), "*continuous international market research activities*" and "*international networks of sales personnel*" (*i.e. customers and/or distributors*). These latter two variables are not currently acknowledged in the extant literature since often high technology firms base their decisions in intuition and pragmatism rather than on a careful assessment of foreign markets conditions.

Finally, firm's "access to international distribution channels" supports the findings of Burgel and Murray (2000).

For technological resources five types of resources/strengths (Wernerfelt, 1984) identified by the interviewees were of particular importance that are "high skilled personnel in R&D", "focus in R&D activities", "technology applicable world-wide", "continuous innovation due to products' short life cycle" and "capitalise on technologies that are new to the market". The "high skilled personnel in R&D" and "focus in R&D activities" are often identified in the literature as proxies of technological resources/capabilities (Lee et al, 2001; Shrader, 2001) while the firm's "technology applicable world-wide" and firm's "capitalisation on technologies that are new to the market" supports the findings, respectively of McDougall and Oviat (1991) and Burgel and Murray (2000). Lastly, "continuous innovation is needed due to products' short life cycle" may also be part of firm's entrepreneurial orientation and it is consistent with the findings of Miller (1983) and Covin and Slevin (1989).

For finance, two types of resources were identified that is "the availability of capital for firm's development" and "the current endowment of capital to run the firm". In fact, high technology SMEs with higher endowments of financial capital can afford to hire high quality personnel not only in R&D but also in Marketing, International Sales and Finance as well as to conduct activities in key areas such as new product development, market research and promotion (Lee et al, 2001). Additionally, the variable "availability of capital for firm's development" supports the findings of Wicklund (1999).



For managerial resources, three strengths/weaknesses identified by the interviewees were of particular importance: they are “human resources skills”, “*entrepreneurial attitudes and behaviour of the personnel*” and “international orientation” of the firm as a whole. The “*entrepreneurial attitudes and behaviour of the personnel*” finding represents a newly identified variable since it acknowledges that not just top executives but all functions within the organisation should act with a sense of entrepreneurship. Thus, the quality of firm’s human resources seems critical to achieve this objective. Furthermore, another resource/strength is firm’s “international orientation” which basically means that firms should pursue foreign market opportunities with a high sense of commitment as a result of the knowledge and experience developed overtime through business activities in foreign markets (Johanson and Vahlne, 1977; 1990).

All the resources considered either strengths or weaknesses of high technology SMEs, put forward in Table 6.2, will be integrated in the respective resources-constructs, to be administered with the mail survey, and will be tested, using principal component analysis, for validity and reliability.

### **Findings: Additional Comments**

All the firms agreed to participate in the pre-test of the questionnaire. However the researcher perception is that they only agreed to participate because of their involvement in this exploratory interview phase and finding it quite interesting; otherwise some of the firms would not participate. They pointed out to the researcher that they receive questionnaires on a weekly basis and find them quite boring to fill out. Currently, all chief executives found the topic and the overall study worth attention and therefore, with some interest in the results.

Finally, the impact of both University of Glasgow and ISCTE as the sender was perceived as positive due to the good reputation of both universities. In addition, when one entity is international, as it is the case of University of Glasgow, it gives the enquiry an additional element of credibility.

### **6.4.3 Exploratory Interviews with Experts/Academics of High Technology SMEs: Main Findings**

As the knowledge of this topic is still very patchy exploratory unstructured, face-to-face interviews were also conducted with experts (2 interviews) and academics (2 interviews). In this context, prospective experts and academic interviewees were identified by their current involvement in the research of high technology firms, mainly in ICT and biotechnology sectors, who are acknowledged by their publications in national and international journals. These experts currently work at INETI and INESC (two Public Research Entities) while academics are Professors at Universities of reference in Portugal.

The goals of these exploratory interviews were threefold:

- First, to get an understanding of the role and the importance that internationalisation has for the overall population of Portuguese high technology SMEs. In addition, what are the countries currently selected as well as the activities conducted abroad.
- Secondly, to assess expert's opinions about current resources possessed by Portuguese high technology SMEs, and investigating what resources, at firm and individual levels, they should develop in order to be more successful in foreign markets.
- This procedure is conducted in order to evaluate potential discrepancies and uncover different view points between firms' entrepreneurs/managers and experts/academics in order to eventually incorporate new dimensions not foreseen before.

Similarly, to the interviewed chief executives of high technology SMEs the four interviewed experts/academics were asked some open-ended questions in order to collect unbiased data. Once again, the interviews focused, for the most part, on the study's Research Aims put forward in chapter 1.

## **Findings: Role and Importance of International Business Activities**

Exploratory interviews with experts/academics revealed some slightly new insights, as follows:

- High share of Portuguese high technology firms with the exception of the mould industry with only domestic activities. This was confirmed by the researcher throughout the analysis of the database PORTUGALHIGHTECH, which explicitly identifies firms with international activities.
- Relatively high share of firms although with some export activities are mainly oriented to the domestic market (exports represent less than 5% firm's turnover). Those firms export to different countries irrespective of following a pattern of short geographic/psychic distance or as a result of foreign unsolicited orders.
- Foreign market entry modes often used are direct exports to end customers and direct exports through international agents and distributors. Portuguese high technology SMEs only seldom use FDI in the foreign market entry mode.
- Currently, experts/academics acknowledge whenever firms are characterised by low international orientation, it may be due to lack of knowledge and experience about foreign markets. Thus, seeing internationalisation as high risk. Chief executives of those high technology SMEs use to term internationalisation as "*an adventure*" that is not taking it as a challenge rather as a move in to the "*unknown*" in firm's strategy.
- Contractual arrangements in the foreign market entry modes are much more common in downstream value chain activities (e.g. marketing and sales) rather than in upstream value chain activities (e.g. research and development) giving support to some recent literature (Burgel and Murray, 2000; Shrader, 2001).

**Findings: Key resources that high technology SMEs currently possess and what resources should they possess or develop in order to be more successful in foreign markets**

Currently, the four interviewees' experts and academics acknowledge the importance of technological, marketing and financial resources. They refer that, currently, Portuguese high technology SMEs do not possess high technological capabilities due to the relatively low investment in R&D as they run short of finance and human capital. Thus, they have significant limitations to compete with skillful players in foreign markets. In addition, Portuguese high technology SMEs are also weak in terms of marketing resources, since often they do not conduct market research and international promotion activities on a regular basis in order to respectively better addressing customer's needs and developing an international brand awareness and reputation. Furthermore, high technology SMEs also lack in establishing networks with suppliers, customers and other business partners in order to get access to different resources or to share costs and risks.

In sum, no significant differences were identified between disclosed responses from experts/academics and interviewed CEOs of Portuguese high technology SMEs.

**Findings: Key competences that chief executives/top management of high technology SMEs currently possess and what competences should they possess or develop in order to be more successful in foreign markets.**

Currently, all the interviewed experts/academics are unanimous arguing that most Portuguese chief executives of high technology SMEs are mainly technological oriented lacking marketing resources in order to make their firms successful market oriented organisations. In addition, currently the great majority do not possess a strong entrepreneurial orientation, since they are not very proactive and characterised by being very risk averse.

In addition, often, Portuguese chief executives of high technology SMEs lack international experience (e.g. travelling or working abroad) and therefore, lacking international contacts with potential partners and customers. Thus, Portuguese high

technology SMEs may not be perceived as very attractive international partners even though they may have relatively good technological skills.

In sum, there are, to some extent, much more pronounced differences between disclosed responses from interviewed CEOs and experts/academics. In fact, the latter give a much bigger emphasis to some weaknesses, of Portuguese high technology SMEs, at CEO/management team level, such as limited “international experience” and lack of “entrepreneurial orientation” than the former, who nevertheless acknowledge these issues as critical to firm’s international performance.

#### **6.4.4 Synthesis and Discussion of the Personal Exploratory Interviews**

Currently all the 8 firms involved in the exploratory interviews were highly suitable since they completely met the study criterion to be classed as international high technology SMEs belonging either to ICT or moulds industry sectors.

In addition, within the ICT sectors the selected firms encompassed different industries, spread all over the country, with different ages, sizes and with different degrees of international activities. In this context, the 8 interviewed chief executives may have different strategies for their firms. Thus, the highly suitability of the firms may allow to enhance an accurate identification of valuable resources for high technology SMEs operating in foreign markets.

In fact, these study interviewees led to the identification of a set of key resources that can be classified either at individual/team levels or at firm level. While the former relates mainly to entrepreneur/chief executive traits, the latter refers to resources that can be grouped across firm’s functional areas that are marketing, technological, finance, or managerial resources.

Entrepreneur/CEO traits refer to his/her vision, industry and international experiences coupled with his/her mix of technical and managerial skills who were found to be of particular importance to the international performance of the firm, which is consistent with Oviat and McDougall (1995) and McDougall and Oviat (1994) findings. In addition, the risk taking propensity and proactive behaviour regarding foreign market

opportunities by the chief executive/management team, however not explicitly acknowledged in the extant literature, seems critical important since high technology SMEs run short of different kinds of resources and therefore they should be completely committed and determined to overcome the obstacles and difficulties that surely encounter over their international activities.

As regards to marketing, the resources identified in the interviews broadly refer to promotion and distribution strategies. In addition, two other important resources were put forward by interviewees: the conducting of market research activities and the networks of sales personnel mainly with prospective international customers, distributors and other potential partners.

For technological resources the emphasis put by interviewees was in R&D activities in order to develop technologies that are new to the market as well as on continuous innovation if the firm wants to stay high technology. Furthermore, the firm's technology applicable world-wide represents that the scope of firm's technology goes beyond its marketing expertise, while acknowledging that foreign market opportunities, to some extent, arise from its core technology.

As regards to financial resources, firms possessing higher endowments of capital can afford to hire more skilled personnel with more industry and international experiences, which according to interviewees' opinions may be critical to firm's international performance.

Last but not the least, for managerial resources interviews revealed, once again, the importance of human resources skills not just in the technological area but also in other key functional areas such as Marketing and Sales, Finance, and Business Administration. Moreover, all the employees within the organisation should act with a sense of entrepreneurship that is, showing a high degree of involvement and commitment in firm's business activities.

Finally, firm's "international orientation" is identified in the interviews as being of particular importance since it shows the commitment to international markets as a result of the knowledge and experience developed overtime through international business activities (Johanson and Vahlne, 1977; 1990).

Last but not the least, all the resources considered earlier in section 6.4.2, as well as the more general assessment done by the interviewees' experts/academics, along with other identified resources in the extant literature will be integrated in the specific resources-constructs, to be examined in the mail survey, and will be tested, using principal component analysis, for validity and reliability (see chapter 7).

#### **6.4.5 Implications for Subsequent Research Phases**

The organisational characteristics allow, at this point, the conclusion that the sample frame complies with the definition of high technology SMEs presented for this study.

##### **6.4.5.1 The Survey of High technology SMEs**

The questionnaire development and implementation following the proceedings of the exploratory interviews can be divided in the following four steps:

1. The initial questionnaire.
2. The questionnaire review.
3. The pre-test.
4. Implementation.

###### **6.4.5.1.1 Initial Questionnaire Design**

Currently, in developing a questionnaire whether it is possible, it is advisable to use measurement scales validated by previous research, rather than developing original ones. In fact, if there are variables that have already been tested in previous studies, it is

possible to assess their empirical validity, that is, the Cronbach's alpha test for multi-item constructs. Furthermore, it allows direct comparison between findings from previous and present research. In this context, where possible dimensions and variables were operationalised by:

- Drawing on relevant existing theories and their suggested constructs.
- Applicable existing variables, scales or questions previously used in the relevant literature.

Applicable findings from the empirical pre-survey phase (exploratory interviews) were incorporated too.

In order to allow for statistical analysis structured questions with fixed response options were used.

In the pre-test open items were used for key dimensions with few or no applicable prior instruments in order to potentially capture additional variables from the population, as suggested by Reynolds et al (1993).

Attitudinal questions using 7-point rating scales will be used because it can increase the reliability of constructs (Churchill and Peter, 1984).

In the following sections measures of each construct and their origins are presented in more detail and in accordance with the research framework.

At this stage of the questionnaire development, the important question of questionnaire length was not considered.

The subsequent stages were seen as purification steps that will lead to a reduction of potential redundancies.

For more details regarding the structure of the cover letter, the questionnaire and the specific operationalisation of key constructs, see section 6.4.6, where the final version of the questionnaire is presented and discussed.

#### **6.4.5.2 Variables and Scales Used**

The vast majority of the variables used in this study are ordinal. Ordinal data refers to measurement scales where a positive difference between two points on the manifest



scale reflects a positive difference in the considered attribute. Furthermore, a large number of those variables also refer to the measurement of attitudes, that is, of unobservable variables. In this context, only restrictive statistical analysis is allowed for ordinal data.

The positivistic paradigm posits that using ordinal data violates parametrical statistical tests. The reason why different levels of measurement are fundamentally different and why they permit different types of statistical operations is because the measurement scale is an isomorphic image of the studied attribute. A consequence of this is that the logical and mathematical properties of the measurement scale are equivalent to those of the attribute. Therefore, both the measurement scale and the attribute have ordinal, interval or ratio properties.

In this context, measurement of unobservable phenomena such as attitudes is possible. Since attributes are unobservable phenomena their mathematical and logical properties are unknown. The researcher has to discover if any attribute is quantitative and measurable and assign numbers to the attribute that is to develop a suitable measurement scale for the studied attribute.

In social sciences the most interesting variables are often of this unobservable type. The attributes are assumed to be quantitative and continuous, but are manifested on ordinal measurement scales. A positive difference on this scale reflects a positive difference in the underlying attribute. The measurement scale is not an isomorphic image of the attribute. Thus, the measurement scale is not a perfect reflection of the attribute while containing a measurement error which should be treated, like other measurement errors; such is the case of normality deviation.

In fact, the important implication is that measurement scales designed to measure quantitative, continuous variables on an ordinal scale can be treated as interval scales in statistical operations. In other words, statistical procedures used for analysing interval or ratio data can also be used to analyse ordinal data.

#### **6.4.5.3 The Questionnaire Review**

At this stage the questionnaire was subject to a critical review by experienced academics in the Department of Business and Management of the University of Glasgow with either:

- Expert knowledge in the study's research area.
- Expert knowledge to the population and research instruments.

Prof. Luiz Moutinho, Prof. James Taggart, Dr. Marian Jones, Dr. Michael Meyer and Dr. Cleopatra Veloutsou and extra department, Dr. Pavlos Dimitratos, Prof. Victor Corado Simões, Prof. Luis Filipe Lages, Dr. Margarida Fontes and Ms. Carla Costa participated at this stage.

Feedback, comments and criticisms were collected, analysed and subsequently some of them incorporated in the updated and revised version of the questionnaire.

The updated questionnaire and cover letter were then translated into Portuguese by Ms. Teresa Lopes (a graduate in English Literature by the University of Lisbon) and checked by Dr. Margarida Fontes (a PhD by the University of Manchester) as an expert in high technology firms. The questionnaire was then back translated in English and retranslated again in Portuguese by the author. Dr. Margarida Fontes checked the Portuguese version of the questionnaire in order to further increase its quality.

#### **6.4.5.4 The Pre-Test**

The researcher decided to conduct the pre-test with the same eight firms where exploratory interviews were held.

The pre-test is only an instrument rather than a construct pre-test, which would imply a larger sample size.

The pre-test was conducted through face-to-face structured interviews (the questionnaire it self). It was intended to assess the following aspects (Reynolds, 1993):

- Length, layout and structure.
- Sequence of sections and questions.

- Wording, terminology and meaning categorisation.
- Cover letter content.
- General questionnaire guidelines.

Comments and feedback regarding the stated aspects of interest were collected, analysed and then incorporated into an updated and revised final version of the questionnaire.

#### **6.4.6. The Definitive Version of the Questionnaire and the Operationalisation of Key Constructs**

A copy of the cover letter and questionnaire are provided in Appendixes 6.3 and 6.4.

The cover letter issued with University of Glasgow and ISCTE letterhead suggests the academic and scientific nature of the study in order to increase response rate. It was directly addressed to firm's Chief Executive/Managing Director as considered the most knowledgeable person within a firm and more importantly, as part of this study to assess his/her human capital. In addition, it is also expected to increase response rate.

Other questionnaire guidelines to respondents mention the following issues:

- If they wish to receive a Summary Report of the Study, they are invited to fill out the Information Voucher on the last page.
- Assuring respondents that all returned questionnaires would be treated as confidential. Furthermore, findings will be only reported at an aggregate level and will make no mention of individuals or individual firms.
- For firms that are subsidiaries they should answer the questionnaire in relation to the subsidiary and not the company as a whole.
- For sections of the questionnaire that are not applicable to the firm, respondents should indicate where a section is not applicable and move on as appropriate.

Attitudinal suggestions taken from the literature were also adopted like confidentiality, the academic nature of the study as well as a short explanation in the cover letter.

The questionnaire was divided into an introduction and six sections. In the questionnaire there is a front page with general guidelines and a back page with an information

voucher, targeting those respondents, who want to receive an executive summary of the study main findings.

## **Introduction**

Question 1 distinguishes the responding firms according to the industry sector where they operate. The eight categories of industry sectors are in accordance to SIC codes considered to be technology intensive for firms existent in Portugal having international business activities. SIC codes are the following:

- Software
- Hardware
- Electronics/ microelectronics
- Telecommunications
- Moulds (only firms with “project engineering” capabilities)

The initial purpose was also to target biotechnology and pharmaceutical firms as potential respondents. However, the researcher was obliged to drop out this intent since among the roughly 10-15 biotech firms existent in Portugal only 2 or 3 are starting now exploring opportunities in foreign markets. In pharmaceuticals the situation is roughly the same and only a handful of firms currently have export activities and generally refuse to answer questionnaires...

Question 2 assesses the size of the respondent firms measured by the number of employees. This is to describe, group and compare different types of high technology SMEs.

## **Section 1: Entrepreneur/Chief Executive Characteristics**

Questions 1 to 6 assess the human capital of the entrepreneur through the investigation of his/her general human capital and specific human capital (Becker, 1975). While the former is assessed by the highest level of education achieved (Question 1) and the number of years of working experience (Question 2), the latter refers to the number of years of experience in the industry (Question 3) leadership experience in

managing/directing employees in international/multinational firms (Question 5), self-employment experience (Question 4) and parental self-employment (Question 6).

Question 7 (4 items) assesses the international business experience of firm's top management as an influential factor to firm's internationalisation. It is adapted and expanded from previous research by Reuber and Fischer (1997).

Finally, all these traits of the entrepreneur/chief executive have been identified in the exploratory interviews (see section 6.4.2).

## **Section 2: Managerial Perspectives**

This section presents the different types of resources of high technology SMEs that can give them resource superiority vis-à-vis their competitors in foreign markets, as suggested in the literature and in the exploratory interviews.

Question 1 (11 items) scales the perceived level of firm's marketing resources. This question assesses the importance, for the high technology SME, of having a highly skilled sales force, promotion expenditures, market research activities, access to international distribution channels or external links to social or business networks.

This scale is new and based on the insights of the exploratory interviews (see section 6.4.2) and on an existing scale of Spannos and Lioukas (2001).

Questions 2, 3 and 4 (items h) and i)) assess technological resources of high technology SMEs. While questions 2 and 3) represent basically input measures of technological intensity since they assess R&D intensity by measuring the percentage of R&D expenditures to annual turnover (question 2) and equivalent full time employees working in R&D (question 3). On the other hand, question 4 (items h) and i)) represent output measures of technological skills since they assess the innovativeness of the technology as well as if that technology was mainly developed in-house or by third parties. This new scale builds on the existent literature considering R&D as a proxy of technological resources (Shrader, 2001) as well as on the insights of the exploratory interviews (see section 6.4.2) and on Burgel and Murray (2000) study.

Question 4, items a) to g), attempts to capture the entrepreneurial orientation (EO) of the firm / entrepreneur on 7 points opposite statements scale. The literature posits (Lee et al, 2001) that EO influences, to a great extent, firm's management processes, methods and styles. As suggested by Miller (1983) entrepreneurial orientation is a composite construct characterised by three dimensions that are innovativeness items a),b),c) adapted from Miller and Friesen (1982) and Khandwalla, (1976/77), risk-taking items d)e) also adapted from Miller and Friesen (1982) and Khandwalla, (1976/77) and proactiveness items f)g) adapted from Covin and Slevin (1989). Overall, scale adapted from 7 point opposite statements scale used in Covin and Slevin (1989) study. In the same vein, the exploratory interviews have also identified the three different dimensions of the entrepreneurial orientation construct (see section 6.4.2).

Questions 4 (item j)) and 5 assess the financial resources of high technology SMEs. Question 4 (item j)) attempts to measure, in a 7 point opposite statements scale, the availability of capital within the firm over the last three years. This scale was developed in Wicklund (1999) study. Currently its focus is to assess if there is a balance between supply and demand for capital in medium term (throughout a 3 year period) for the development of the firm.

Question 5 is an original 1-7 point rating scale developed to assess firm's current endowment of capital for future development. This issue was identified as particular relevant in the exploratory interviews (see sections 6.4.2 and 6.4.3).

Question 6 (3 items) original 1-7 point rating scale was developed to assess firm's international orientation building from Johanson and Vahlne (1977) model and on the results of the exploratory interviews (see sections 6.4.2 and 6.4.3).

### **Section 3: Firm's International Business Activities**

This section requests specific information from respondents regarding the international business activities of the firm.

Question 1 is included to confirm, once again, if the firm currently develops international business activities, which is the core of the present study. This question is followed by a brief description of what it is understood in this study by international business activities. In fact, the questionnaire defines international business activities as involving all international business investments and business activities, which generate turnover. International business activities include indirect exports via domestic intermediaries, direct exports to agents/distributors abroad and/or customers abroad, licensing out, contract R&D for foreign firms, international joint ventures, international strategic alliances, foreign sales subsidiaries and foreign production subsidiaries.

Questions 2 to 5 assess firm's performance in foreign markets.

Question 2 assesses the international intensity for the firm, a single item measure for firm's degree of internationalisation, measured by its international income to turnover.

Question 3 addresses the internationalisation of the firm. It is presented in a matrix format based on previous research (Lindqvist, 1991). This matrix attempts to capture the following dimensions:

- Earliness of internationalisation operationalised by the time difference between firm foundation and date of first international activities.
- Speed of internationalisation operationalised as the time frame until the firm has business activities in three countries.
- Diversity of internationalisation operationalised by the number of countries where the firm currently has international business activities.

As respondents were not familiarised with the matrix a short example how to fill out the matrix was provided. The pre-test showed that there were not many cells to fill out by respondents since the exploratory interviews suggested that the sample of Portuguese high technology SMEs are currently entering in a small number of countries and using a small number of types of foreign market entry modes.

Question 4 asks respondents to rank the top three countries, in which the firm currently has international business activities as well as the respective participation, in terms of percentage, to firm's international income and turnover.

Finally, question 5 asks respondents to indicate company's change, in international business income, in each of the last three business years, by entering the percentage of change from the previous year.

#### **Section 4: International Business Activities in the Main Foreign Market**

Question 1 assesses the type of foreign market entry mode utilised by the firm in the main foreign market. It shows a list of seven of current types of entry modes more often used by SMEs and high technology SMEs in foreign markets. In answering this question is distinguished between an independent mode and a contractual arrangement mode. The former refers to direct exports to end customers, sales subsidiaries and wholly owned subsidiaries while the latter includes indirect exports via domestic intermediary, direct exports via foreign intermediary/ sales agent, contract R&D and contractual joint ventures.

Question 2 addresses firm international performance in the main foreign market. It is measured by the degree of satisfaction of the entrepreneur/chief executive with some financial goals, in the business year 2001, in the main foreign market (a subjective measure of performance and it is a construct with 5 items). In fact, objective profitability measures were not considered in order to avoid a trigger for non-response.

#### **Section 5: Firm Background**

This section attempts to describe, distinguish and group high technology SMEs.

Question 1 addresses the status of the respondent within the firm, which will assess if the respondent is eligible to answer the questionnaire that is if he/she is the entrepreneur/ chief executive or a venture co-founder and member of the senior management team. Currently, only the CEO or a member of the founding team, in an executive position, may be the only informants, within the firm, with the necessary knowledge to accurately assess the firm's resource-base with respect to performance.

Question 2, 3, 5, 6 focuses on the influential effects of the entrepreneur/senior management team to the venture firm. In this context, Question 2 asks if the respondent



is a firm founder. Question 3 asks about firm number of founders, Question 5 asks if firm founder(s) is/are still in the firm and especially in senior executive positions (Question 6).

Question 4 addresses firm's year of foundation, thus, it allows determining firm's age.

Question 7 asks about the way that the firm was founded. Basically it checks if the firm is a start-up or evolution or spin-off from another firm/university.

Finally Question 9 addresses the issue of firm ownership. In this context, it is critical important to check if each firm meets the eligibility criteria mentioned in chapter 2.

## **Section 6: Firm Data**

Question 1 assesses firm turnover. Turnover categories were adopted from those used at IAPMEI (Instituto Português de Apoio às Pequenas e Médias Empresas) to classify registered firms.

Question 2 assess overall firm performance by asking respondents turnover and profitability evolution over the last three years. Despite being objective financial measures it is expected that they do not represent a major trigger for non-response, since they are asked only in percentage evolution and not in absolute figures.

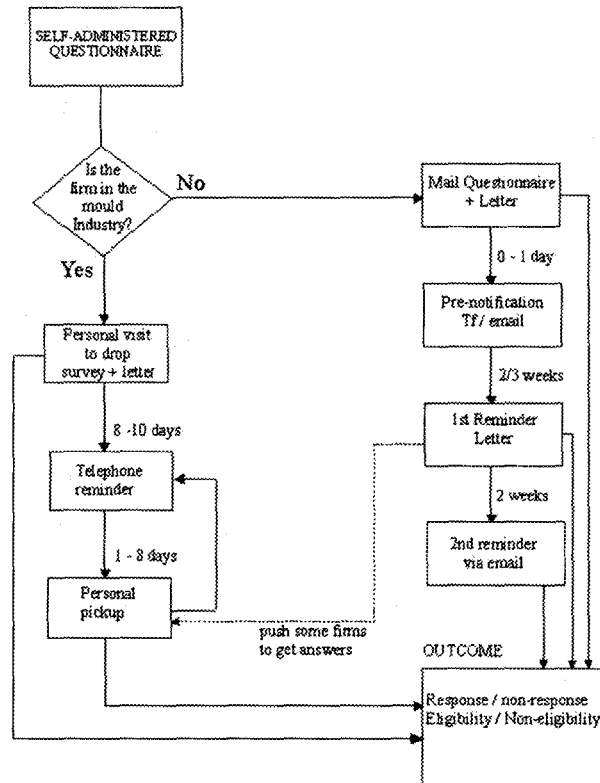
The questionnaire closes with an information voucher to fill-out by interested respondents in receiving a summary report. It was off-set printed on blue cardboard with both logos of University of Glasgow and ISCTE in an "A3-folded to A4 booklet" format to give it a professional appeal and doubled-sided printing gave it a less lengthy appearance. The title of the questionnaire is presented in bold letters at mid of the front page.

General questionnaire guidelines and researcher contacts are also presented in the cover page in order to provide guidance for respondents.

### **6.4.7 Survey Implementation**

The survey was implemented from September to mid December 2002. It follows the decision and activity flow showed in Figure 6.2:

Figure 6. 2: Self-Administered Questionnaire  
(Decisions Taken and Flow of Activities)



Source: The Author

The gathered data was entered in an EXCEL sheet and subsequently imported into SPSS in order to conduct the statistical analysis addressing the research aims and hypotheses.

#### 6.4.8 The Empirical Study

The high- technology SME in this study fits the following criteria:

- Firms up to 250 employees.
- Conducting R&D activities with at least 1% expenditures to turnover, in 2001 (Jones, 1998).
- Located or not in science parks.

- In SIC codes considered technology intensive that is in NACE 29 Manufacture of machinery and equipment, 30 Manufacture of office machinery and computers, 32 Manufacture of radio, television and communication equipment, 72-Computer and related activities and 73-Research and Development.
- With international income in 2001 of at least 1% to firm's turnover (Jones, 1998).
- Companies with HQ in Portugal.
- Both independent companies and companies owned by other firms once the latter can be managed in an autonomous and entrepreneurial way.
- Portuguese subsidiaries of MNEs are excluded.

Firms fitting the high-tech SME criteria were found in the following databases:

- Portugal High-Tech
- CEFAMOL

## 6.5 Preparing for Data Analysis

At this point and before conducting the analysis of data, three types of actions are necessary to accomplish that are: editing, coding and processing the data (Roughton, 1986). In this study all these steps were performed manually and introduced directly in the database. In fact, these tasks started with editing, which refers to the process of examining returned questionnaires in order to assess if the data provided is reliable. Currently, the editing process includes the *field edit* and the *central office edit*. In the *field edit* the researcher tries to detect straightforward omissions and inequaracies in the returned questionnaires. On the other hand, *central office edit* assesses in a deeper and rigorous way the completed returned questionnaires (Churchill and Iacobucci, 2002). At this stage *central office editing* efforts currently focus on analysing the completeness, legibility, consistency, accuracy and response qualification of the data (Kinnear and Taylor, 1996).

The close stages before data analysis are coding and processing the data. Coding refers to the procedure by which answers are translated into class membership as well as into symbolic representation of that membership through a conversion process (de Vaus, 1991). On the other hand, processing the data refers to its final presentation. At that point data can be analysed by using appropriate statistical techniques (Moutinho and Evans, 1992).

Currently, 136 returned questionnaires were closely checked to ensure that they were properly filled by the entrepreneur/ chief executive or by a venture co-founder and member of the senior management team and if no relevant omissions existed. In this context, the overwhelming majority of respondents were the chief executive and in the few remaining cases they were members of the senior management team and also firms' co-founders.

In addition, it was critical important to analyse whether the returned partially filled in questionnaires looked OK for statistical analysis. However, 31 questionnaires were excluded since they answered **No** to question 3.1 when firms were asked if they currently conducted or not international business activities. A definition of what constitutes international business activities was provided in the questionnaire (see section 6.4.6 and Appendix 6.4). Thus, these firms were not eligible for this study since the aims are about the **internationalisation** of high technology SMEs. In addition, 6 questionnaires arrived partially filled in, since some questions were left unanswered and it was acknowledged that respondents simply overlooked some questions rather than deliberately omitted to answer them. In this context, the researcher contacted those firms again to complete unanswered questions all of them not asking sensitive issues.

However, in relation to question 4 of Section 3 ("International Business Activities of your Company") related with firm's current foreign markets, presented in a matrix format (Brock, 2000; Lindqvist, 1991) a significant part of respondents did not fill the matrix, maybe because they found it too much time consuming or maybe because that overall they choose as foreign market entry mode that used in the main foreign market. This fact came to the researcher as a surprise since exploratory interviews revealed that

it was not an issue for respondents. In addition, in question 6, also in Section 3, a great number of respondents did not answer it maybe because related with a relatively sensitive issue as it is international sales growth, or may be because chief executives, need to look to the accounts book before providing a reliable answer...Moreover, as other studies point out (Brock, 2000) target respondents suffer from “research fatigue”, that is, they are requested to answer far too many questionnaires and sometimes asked about issues, which they need to conduct prior consultation to, before providing the requested information. In this context, questions 4 and 6 of Section 3, which could be considered as measures of international performance, were excluded from data analysis.

Overall, a total of 106 questionnaires, 69 from the ICT sample frame and 36 from the mould industry, all of them filled in by the entrepreneur/ chief executive or a member of the senior management team/board of directors, are eligible for further statistical analysis (see Appendix 7.1).

In this context, in order to address this study main aims the use of structural equation modelling (SEM) would be preferable since SEM, conversely to other multivariate techniques, can examine a series of dependence relationships among multiple variables, simultaneously. In fact, SEM examines the relationships among constructs accommodating measurement error in the estimation of the dependent and independent variables expressed in a serie of equations involved in the analysis. In addition, *“it is the best multivariate procedure for testing both the construct validity and theoretical relationships among a set of concepts represented by multiple measured variables”* (Hair et al, 2006:705). Moreover, SEM allows assessing measurement properties while testing key theoretical relationships in one single technique (Hair et al, 2006).

However, SEM was not used due to the limited number of cases for the two populations (ICT and moulds). In fact, a total of just 106 observations is a too small sample for using SEM adequately. Therefore the following multivariate statistical techniques were conducted:

- Principal components analysis (Research Aims 1 to 3).
- Multiple regression analysis (Research Aim 4).

- Logistic regression analysis (Research Aim 5).
- Moderated multiple regression analysis (Research Aim 6).

Nonetheless, these techniques are quite robust and powerful to adequately address this thesis research aims as it will be emphasised throughout sections 6.6 to 6.9.

### **6.6 Principal Components Analysis (Research Aims 1 to 3)**

Principal components analysis (PCA), in this study, is used in order to address research aims 1 to 3. It encompasses the development and assessment of multi-item measurement scales for resources of high technology SMEs, both at firm and individual levels. At the firm level this study identified, in chapters 3 and 4, marketing and technological resources, firm international orientation, and financial resources. On the other hand, at individual level this study identified, also in chapters 3 and 4, entrepreneur/ chief executive international experience and human capital and entrepreneur/firm entrepreneurial orientation.

PCA is a multivariate statistical technique characterised by its simplicity to describe a large number of variables or objects through a small number of dimensions. Principal components represent different dimensions in the structure of a data matrix, while determining the extent to which each variable is explained by each dimension. Once those dimensions are obtained data summarisation and data reduction can be conducted.

Through PCA, this study assesses if all the underlined variables presented, in section 6.4.6, can be summarised in a small number of dimensions. Such dimensions, presented at the beginning of this section, have been identified as key resources of high technology SMEs and may give to firms that possess those resources, competitive advantage over their competitors in foreign markets.

Overall, data summarisation and data reduction allows the data analyst to identify the underlying dimensions and the contribution (called loading) of each initial variable to each dimension. These dimensions will substitute the original variables in further

statistical analysis. Nevertheless, **“the quality and meaning of the derived factors reflects the conceptual underpinnings of the variables included in the analysis (Hair et al, 1998: 97).”**

The initial decision regarding the number of principal components to be extracted is done based on Kaiser’s criteria that is only principal components having eigenvalues greater than 1 will be extracted. The use of the eigenvalue criteria for establishing a cut-off point is most reliable when the number of variables is between 20 and 50 (Hair et al, 1998), which is the case in this study. In addition, in order to increase interpretability of the extracted principal components they are subjected to “transformation” by a mathematical process known as “rotation”. The ultimate goal of rotation is to redistribute the variance of the extracted principal components thus, maximising the variability of the loadings in order to achieve better interpretability of the dimensions.

In this study orthogonal rotation (VARIMAX) was used. The advantage of orthogonal rotation lies on the fact that dimensions stay unrelated and therefore, eliminating collinearity even though they may not be accurate in their representation of the “real world” since they are forced to be unrelated. However, this study follows Hair et al (1998) recommendation to use VARIMAX if the objective of the research is to reduce a large number of variables to a smaller set of uncorrelated variables for subsequent use of other multivariate statistical techniques.

Finally, the principal components obtained through PCA were further used to address research aims 4 to 6 through the application, respectively of multiple regression (research aim 4), logistic regression (research aim 5) and moderated multiple regression analysis (research aim 6).

Last but not the least, in this study the consistency of each scale was assessed with Cronbach’s alpha. The literature suggests a lower limit of 0.60 for exploratory research and of 0.70 for descriptive and causal research (Hair et al, 1998).

## 6.7 Multiple Regression Analysis (Research Aim 4)

Multiple regression analysis (MRA) is used in order to address research aim 4. MRA is a multivariate statistical technique used to analyse the effect of several independent (predictor) variables on a single dependent (criterion) variable.

**Equation 6. 1: Multiple regression analysis to examine the effects of resources on international intensity.**

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7$$

Where:

- $X_1, X_2, X_3, X_4, X_5, X_6,$  and  $X_7$  are interval-level independent variables.
- $Y$  is the dependent variable
- $b_1, b_2, b_3, b_4, b_5, b_6,$  and  $b_7$  are the partial slopes or partial regression coefficients

In this study the independent variables are: marketing ( $X_1$ ), technological resources ( $X_2$ ), financial resources ( $X_3$ ), firm's international orientation ( $X_4$ ), entrepreneur/chief executive human capital ( $X_5$ ), international experience ( $X_6$ ), and last but not the least entrepreneurial orientation ( $X_7$ ).

The dependent variable  $Y$  is firm international intensity that is the percentage of international sales to total sales.

In this context, it is expected that the introduction of several independent variables into the equation will improve the predictive power of the dependent variable.

Currently, the most straightforward interpretation in multiple regression analysis is to ascertain of the relative importance of each independent variable to explain or predict the dependent variable. The identification and selection of independent variables should be based on theoretical grounds in the relationships to the dependent variable. Thus, regression analysis assesses simultaneously the magnitude and direction (positive or negative) in the relationship between each independent variable and the dependent variable. Moreover, multiple regression analysis is also meaningful in the assessment of the relationships among independent variables in their prediction of the dependent



variable. This type of assessment may be important since correlation among the independent variables may turn some of the variables redundant in terms of prediction.

In using multiple regression analysis, key issues to be considered include sample size the nature of the independent variables, and the potential new variables/factors that represent relationships between independent and dependent variables.

In fact, sample size impacts directly on the statistical power of significance testing as well as on the generalisability of the results. Statistical power in multiple regression analysis is the probability of detecting as statistically significant a specific level of the coefficient of determination ( $R^2$ ) at a specified significance level for a specific sample size. In this context, the coefficient of determination ( $R^2$ ) refers to the proportion of the variance of the dependent variable that is explained by the independent (predictor) variables. This coefficient ranges from 0 to 1. The higher the value of  $R^2$  the greater the explanatory power of the regression model that is the better the prediction of the dependent variable.

On the other hand, sample size also affects the generalisability of the results by the minimum ratio of the number of observations in the sample frame to the number of independent variables. This study adopted Hair et al (1998) recommendation by using at least a 5:1 ratio; that is for each independent variable at least 5 observations are considered.

Secondly, in these study objectives the independent variables are assumed to be both “predictor” and “explanatory” variables. In fact, for prediction purposes the objectives of MRA are to maximise the predictive power to the criterion variable within a set of predictor variables as well as to compare two or more sets of independent variables and examining the predictive power of each variable. In addition, in this study it is also assumed that the independent variables have an explanatory purpose, by explaining variation in the dependent variable.

In short, multiple regression analysis can be especially helpful when a single dependent variable is presumed to be a function of other independent variables, which is the case in addressing research aim 4.

The focus of MRA is on a statistical not a functional relationship among independent and dependent variables, because there will always be some random component on the examined relationship.

Finally, the sample size is also relevant to the acceptance of the number of variables in the regression equation. In fact, the inclusion of too many variables in a model may reduce the level of explanation on the effect on the dependent variable. Thus, some specific partial correlation coefficients become lower. In this situation, those independent predictor variables can be dropped from the equation in order to provide a more parsimonious model that is a model in which a variable may be added or deleted from the model in relation to its contribution to the adjusted coefficient of determination (adjusted  $R^2$ ).

Thirdly, in multiple regression analysis the relationship between independent and dependent variables is assumed to be linear and additive. The assumption of linearity refers that, for each independent variable, the amount of change in the mean value of the dependent variable associated with a unit increase in the independent variable, occurs regardless of the level of the independent variable, holding that all other independent variables remain constant. On the other hand, additivity is related to the fact that for each independent variable the amount of change is the expected value of the dependent variable associated with a unit increase in the independent variable, holding that other independent variables remain constant. In this context, it is fundamental to the researcher to assess, which independent variables have greater influence upon the dependent variable. The answer to this question lies on obtaining the “*partial slopes*”/partial regression coefficients known as beta coefficients. Once these coefficients are standardised, they can be compared between each other and it is possible to assess the relative impacts of predictor variables on the criterion variable. The higher the beta coefficient, the stronger the impact of that predictor/independent variable has on the criterion/dependent variable (Hutcheson and Soffroniou, 1999).

Last but not the least, in MRA the explanatory power of the regression model is assessed not by the coefficient of determination rather by the adjusted coefficient of determination. In fact, when adding more independent variables the  $R^2$  always rises, but

the adjusted coefficient of determination may fall if the added independent (predictor) variables have little explanatory power and if the degrees of freedom become too small. This is the situation when the total number of observations becomes too small in relation to the estimated parameters.

The adjusted coefficient of determination is used to identify the proportion of the linear variance in the dependent variable that can be explained by the impact of all the independent variables since it is quite useful to establish the comparison between equations with different number of independent variables differing sample sizes or both (Hair et al, 1998).

Overall, the predictive or explanatory power of a model is a function of the selected variables. Thus, when building a model the researcher must be aware of all the variables that it should encapsulate.

All this conceptualisation, procedures and recommendations were adopted and applied, in chapter 7, section 7.6, throughout multiple regression analysis in order to address research aim 4.

### **6.8 Logistic Regression Analysis (Research Aim 5)**

Logistic regression analysis is used in order to address research aim 5.

In this context, it is used to explore relationships between the independent variables that are resources of high technology SMEs and the dependent variable that is the use of independent vs. contractual cooperation in the main foreign market entry mode. This statistical technique is appropriate for analysing the effects on a dichotomous dependent (response) variable and the results are straightforward and easy to interpret (Hair et al, 1998).

Logistic regression estimates the dependent variable using a log-linear transformation of that dependent variable. In this context, it estimates an S-shaped dependent variable. At

very low levels of the independent variable the probability approaches zero. As the independent variable increases the probability also increases up the curve approaching one but never exceeding it.

In the same vein as multiple regression, logistic regression allows the interpretation of the simultaneous effects of different independent variables. Nonetheless, multiple regression analysis requires an interval level dependent variable, which for the statistical significance of the coefficients to be assessed is assumed to be normally distributed in relation to the categories of the independent variables.

In sum, regression analysis techniques represent linear models and cannot accommodate the relationship presented in logistic regression, which is basically non-linear. Those estimates used in logistic regression analysis provide a much better fit when the dependent variable is a dummy variable assuming the values of 0 and 1. Moreover, the beta coefficients obtained by this procedure give the change in the logarithmic-odds of obtaining the dependent variable when there is a change of one unit in the predictor variable. If the beta for a variable is significant and positive then the variable increases the odds of the outcome. Conversely, if significant and negative then the odds of the outcome are decreased (Dickson and Weaver, 1997).

## **6.9 Moderated Multiple Regression Analysis (Research Aim 6)**

Hypotheses H<sub>015</sub> to H<sub>021</sub> suggest that the relationships between the independent variable (contractual cooperation in the main foreign market) and the dependent variable (international intensity / degree of satisfaction of the entrepreneur/ CEO with some financial targets in the main foreign market) are contingent upon the resources put forward in Research Aims 1 to 3.

According to Covin and Slevin (1989) and Schoonhoven (1981) moderated multiple regression is an appropriate technique for testing hypothesised contingency relationships since it includes all the interaction terms between the independent variable

and all the moderators, taken each one per se, being directly examined. In addition, moderated multiple regression analysis “*provides the most straightforward and the most general method for testing contingency hypotheses in which an interaction is clearly considered*”, Arnold (1982:170). Moreover, moderated multiple regression analysis is assumed as a conservative method for assessing interaction effects in a perspective that interaction terms are tested for significance only after other independent variables and moderators are entered in the regression equation. Therefore, interaction effects are found to be significant only if they explain a significantly greater portion of the variance in the dependent variable than the portion already explained by the independent variable and moderators. In moderated multiple regression analysis the statistical significance of interaction effects is tested on regressing the dependent variable on the main variables that are the independent variable and the hypothesised moderator variables and the cross product of those main variables (Sharma et al, 1981). The moderated multiple regression equation, in this study, has the following form:

**Equation 6. 2: Moderated multiple regression equation to examine the relationship between cooperation and performance, while considering resources, as moderator influences in that relationship.**

$$Y = a + cZ + b_1X_1 + b_2X_2 + \dots + b_nX_n + d_1ZX_1 + d_2ZX_2 + \dots + d_nZX_n$$

Where:

- Y is the dependent variable (international intensity/degree of satisfaction of the entrepreneur/CEO with some financial targets in the main foreign market).
- Z is the dichotomous independent variable (cooperation in the main foreign market), which it is assumed to be 0-No and 1-Yes.
- $X_1, X_2, X_3, \dots, X_n$  are the moderators (resources of the high technology SME put forward in Research Aims 1 to 3).
- $ZX_1, ZX_2, \dots, ZX_n$  are the interaction terms.

Finally, if the addition of the interaction term significantly increases the power of the regression equation to explain the variance in the dependent variable, an interaction effect exists.

## **6.10 Summary**

This chapter has developed, presented and justified the adopted research design. The operationalisation and implementation of the adopted multi-stage and multi-method approach has also been presented, including the influential exploratory findings, from exploratory interviews with entrepreneurs/CEO of Portuguese high technology SMEs, industry experts and academics even though taking into consideration the research aims and hypotheses, stated in chapter 5. Ultimately the study is characterised by its main descriptive and explanatory purposes.

Chapter 7 will present the empirical findings of this research, based on the mail questionnaire administered to the sample frame of Portuguese high technology SMEs, by addressing the research aims and hypotheses, stated in chapter 5.

## **Chapter 7: Study Main Findings**

### **7.1 Introduction**

The main goal of this chapter is to present the empirical findings of the mail survey, and to address the research aims stated in chapter 5. In this context, section 7.2 presents the empirical results of the mail survey. Subsections 7.2.1 and 7.2.2 assess, respectively, survey response rate and potential response bias. Subsection 7.2.3 describes the characteristics of the sample. Then the assessment of the research aims and the test of hypotheses will follow.

A summary of the empirical findings will close this chapter, which will be discussed in more detail in chapter 8.

### **7.2 The Mail Survey of Portuguese High Technology SMEs**

The following subsections present response rate, potential response bias, and the characteristics of the sample.

#### **7.2.1 Survey Response Rate**

The first sample frame of 245 firms was filtered from a population of 455 firms listed in the PORTUGALHIGHTECH database. The PORTUGALHIGHTECH database lists the firms that have business activities in the following industry sectors: information technologies (hardware and software), electronics and telecommunications. This database only presents full business entities and therefore it does not include temporary, non-commercial organisations and free lancers.

The selected 245 out of the 455 firms were then accessed through a mail survey already presented in chapter 6. In fact only 245 firms are technology intensive SMEs and

therefore were considered the potential sample frame. Thus, 210 firms were excluded since 186 firms are pure service firms conducting only consulting and training activities, and the remaining 24, of excluded firms, are subsidiaries of large MNE's or Portuguese firms with more than 250 employees (see Appendix 7.1).

Out of those 245 firms 46 were excluded either because they said they had no international business activities or because they no longer exist. Additionally, 130 did not answer and therefore only 69 valid questionnaires were obtained.

In fact, the majority of the 130 that did not answer the questionnaire, according to the complete ANETIE database made available to the researcher (see chapter 6, subsection 6.3.1.2) either because their focus was on the domestic market or because they did not get any international income, at the time of the mail survey, despite pursuing foreign market opportunities. In addition, the researcher checked throughout the process of the questionnaire administration that only fourteen high technology SMEs included in the ANETIE database and report getting income from their international activities did not answer the mail survey.

The overall response rate was 47% and the net response rate was 35% a good response rate in international business survey research.

The second sample frame of 43 Portuguese firms in the mould industry was filtered from a population of 300 firms listed in the CEFAMOL database (see section 6.3.1.2). In fact, the focus of this study is not on the 300 firms in the mould industry but on those 43 firms that have "project engineering" capabilities (see Appendix 7.1).

The overall response rate from the mould industry was a very high 84% and the net response rate was also 84%. All the received questionnaires were valid.

The overall number of 106 eligible respondents (69 in ICT sectors and 37 in the mould industry) however small in absolute figures is higher than expected, taking into consideration the overall population of eligible Portuguese firms with international



activities. In addition, the sample can still be considered large enough to allow the use of most multivariate techniques (Hair et al, 1998).

### **7.2.2 Response Bias**

The proportion of non-respondents was very low. However, in order to assess potential response bias it was decided to try to compare respondents and non-respondents.

The only relevant and known variable for all sample frame members was their location identifiable by their 4-digit postcode. Since this 4-digit postcode is not truly metric, the non-parametric *Mann-Whitney U test* was used, only for the ICT sample frame and the grouped postcodes were tested for differences across the two groups (respondents and non-respondents). The results suggest that a significant response bias, based on location, did not exist. Thus, the responses can be treated as representative and generalisable to the whole target population of ICT Portuguese SMEs with international business activities.

The same procedure was not conducted for the mould industry sample frame, since all these firms are located in two geographical clusters that are Marinha Grande and Oliveira de Azemeis. Therefore no location difference exists between respondents and non-respondents.

### **7.2.3 Characteristics of the Sample**

In the following two subsections this study presents the characteristics of both the ICT and the mould collected samples.

### 7.2.3.1 Characteristics of the ICT Sample

Main characteristics of the ICT sample firms are summarised in Table 7.1:

Table 7. 1: Main Characteristics of the ICT Sample

Variable	Mean	Std. Dev.	Min.	Max.	N	Remarks
Age	10.22	7.073	1	30	69	Age of the firm in years
Size	63.81	75.921	3	250	69	Size of the firm in no. of employees
R&D expenditures	19.529	19.5779	1	87	69	R&D Intensity: R&D expenditures in % of turnover
R&D personnel	0.2588	0.22213	0	0.92	69	R&D Intensity: R&D personnel in % of total personnel
International Intensity	21.899	23.4835	1	100	69	International sales ratio: int. sales to turnover

The classification of firms by annual turnover is as follows:

Table 7. 2: Classification by Annual Turnover of the ICT Sample

Turnover Category in cts.	Turnover category equivalent in K £ (£1=0.3 cts.)	Sample share in % (N=69)
< 50.000	< 166	11.6
50.000 – 99.999	166 – 333	11.6
100.000 – 299.999	333 – 999	21.7
300.000 – 499.999	1.000 – 1.599	15.9
500.000 – 1 million	1.600 – 3.300	7.2
> 1 million	> 3.300	31.9

All these 69 firms have international activities. On average these firms have ten years of age, 64 employees; they invest on average 19.5% of their turnover on R&D while having 25.9% of the number of employees working also on R&D. Finally, their international intensity is, on average, 21.9%.

Table 7.3 gives an overview of the entry modes used by firms in the main foreign market, for the ICT sample, based on the criteria used by extant literature on entry mode choice (Root, 1994; Young et al, 1989):

Table 7. 3: Types of entry modes in the main foreign market for the ICT Sample

Entry mode in the main foreign market	Number of Firms	%
<u>Export Modes</u>		
Direct to End Customers	30	43.5
Direct via Foreign Distributor	14	20.3
Direct Sales Subsidiary	7	10.1
Indirect via Domestic Distributor	3	4.3
Other	2	2.9
TOTAL	56	81.1
<u>Intermediate Modes</u>		
Contract R&D	6	8.7
Contractual Joint Venture	5	7.2
Licensing	1	1.5
TOTAL	12	17.4
<u>Investment Modes</u>		
Production and Sales Subsidiary	1	1.5
TOTAL	1	1.5
TOTAL	69	100.0

According to Table 7.3 for the great majority of the firms in the ICT sample, the entry mode, in the main foreign market, is through exports (81%), followed by intermediate modes (17%) that are Contract R&D (9%), Contractual Joint Ventures (7%) and Licensing (1%). Market entry modes that required some form of foreign direct investment were very limited since only 1 firm (1.5%) used a wholly owned subsidiary. Overall, the preferred current entry mode in the main foreign market is direct exports to end customers (43.5%) followed by direct exports via foreign agents/distributors (20.3%) and use of sales subsidiaries (10.1%).

It is worth mentioning that the study includes in the analysis 3 firms in which the current entry mode is *indirect exports through domestic distributors* since the researcher confirmed directly, from the manufacturer and the distributor that the purpose of the contracting parts was to conduct sales in foreign markets.

In a completely different perspective the types of entry modes used by firms, in the main foreign market, can also be divided in independent vs. contractual arrangements modes (see section 4.5.5). In fact, as presented in chapter 5, section 5.3, types of entry

modes which can be defined as independent include a large spectrum of entry modes ranging from direct sales to end customers, sales subsidiaries and wholly owned subsidiaries since based on internalisation of business activities in the target market (Shrader, 2001; Root, 1994). On the other hand, *contractual arrangements* also include a large sequence of entry modes ranging from exports through agents/distributors and other contractual modes (e.g. licensing, contract R&D, contractual joint venture etc.) established/based on contracts and involving, to some extent, cooperation from partners (Burgel and Murray, 2000; Root, 1994; Sharma and Erramilli, 2004; Shrader, 2001). In this context, Table 7.4 presents the entry modes used by firms of the ICT sample employing this criterion:

Table 7. 4: Independent vs. Contractual Arrangements used by firms of the ICT Sample in the main foreign market

Entry mode in the main foreign market	Number of Firms	%
<u>Independent</u>		
Direct Exports to End Customers	30	43.5
Sales Subsidiaries	7	10.1
Production and Sales Subsidiaries	1	1.5
TOTAL	38	55.1
<u>Contractual Arrangements</u>		
Direct Exports via Foreign Distributor	14	20.3
Indirect Exports via Domestic Distributor	3	4.3
Contract R&D	6	8.7
Licensing	1	1.5
Contractual Joint Venture	5	7.2
Other	2	2.9
TOTAL	31	44.9
TOTAL	69	100.0

Overall, 38 firms (55%) have independent entry modes in the main foreign market; they are firms that export directly to end customers as well as those firms which establish sales and production and sales subsidiaries. By contrast, 31 firms (45%) have contractual arrangement modes in the main foreign market: they are those firms, which export directly through distributors as well as establishing other cooperative contractual

modes such as contract R&D (6 firms), contractual joint ventures (5 firms), licensing (1 firm) and piggybacking (2 firms).

### 7.2.3.2 Characteristics of the Mould Sample

Main characteristics of the sample are the following:

Table 7. 5: Main Characteristics of the Mould Sample

Variable	Mean	Std. Dev.	Min.	Max.	N	Remarks
Age	18.62	6.352	4	30	37	Age of the firm in years
Size	51.22	31.418	14	140	37	Size of the firm in nr. of employees
R&D expenditures	4.081	7.3575	1	45	37	R&D Intensity: R&D expenditures in % of turnover
R&D personnel	0.058	0.0512	0.01	0.21	37	R&D Intensity: R&D personnel in % of total personnel
International intensity	83.432	20.0798	10	100	37	International sales ratio: int. sales to turnover

The classification of firms by annual turnover is as follows:

Table 7. 6: Classification by Annual Turnover of the Mould Sample

Turnover category in cts.	Turnover category equivalent in K £ (£1=0.3 cts.)	Sample share in % (N = 37)
< 50.000	< 166	0.0
50.000 - 99999	166 - 333	2.7
100.000 - 299999	333 - 999	32.4
300.000 - 499999	1000 - 1599	21.6
500.000 -1 million	1600 - 3300	27.0
> 1 million	> 3300	16.2

All the selected 37 firms with “project engineering” capabilities have international activities. On average these firms have 19 years of age, 51 employees; they invest on average 4 % of their turnover on R&D while having 5.8 % of the number of employees working also on R&D. Finally, their international intensity, on average is 83.4 %.

Table 7.7 gives an overview of the entry modes used by firms in the main foreign market, for the mould sample, based on the criteria used by extant literature on entry mode choice (Root, 1994; Young et al, 1989):

Table 7. 7: Types of entry modes in the main foreign market for the Mould Sample

Entry mode in the main foreign market	Number of Firms	%
<u>Export Modes</u>		
Direct to End Customers	24	64.9
Direct via Foreign Distributor	3	8.1
Direct Sales Subsidiary	2	5.4
Indirect via Domestic Distributor	7	18.9
TOTAL	36	97.3
<u>Investment Modes</u>		
Production and Sales Subsidiary	1	2.7
TOTAL	1	2.7
TOTAL	37	100.0

According to Table 7.7, for the overwhelming majority of the firms in the mould sample, the entry mode, in the main foreign market, is through exports (97%); Market entry modes that required some form of foreign direct investment had a marginal role since only 1 firm (2.7%) used a wholly owned subsidiary.

Overall the preferred entry mode in the main foreign market is by far direct exports to end customers (64.9%) followed by indirect exports via domestic distributors (18.9 %), direct exports via foreign agents/distributors (8.1 %) and use of sales subsidiaries (5.4%).

Similarly to the ICT sample it is worth mentioning that the study includes in the analysis 7 firms in which the current entry mode is *indirect exports through domestic distributors* since the researcher confirmed directly, from the manufacturer (the mould maker) and the distributor (the mould trader) that the purpose of the contracting parts was in conducting sales in foreign markets. In addition, this issue is well documented in relevant literature about Portuguese mould firms (Sopas, 2000).

In a similar vein, types of entry modes used by firms, in the main foreign market, can also be divided in independent vs. contractual arrangements. In this context, Table 7.8 presents the entry modes used by firms of the mould sample employing this criterion:

Table 7. 8: Independent vs. Contractual Arrangements used by firms of the Mould Sample in the main foreign market

<b>Entry mode in the main foreign market</b>	<b>Number of Firms</b>	<b>%</b>
<u>Independent</u>		
Direct Exports to End Customers	24	64.9
Export Sales Subsidiaries	2	5.4
Production and Sales Subsidiaries	1	2.7
TOTAL	27	73.0
<u>Contractual Arrangements</u>		
Direct Exports via Foreign Distributor	3	8.1
Indirect Exports via Domestic Distributor	7	18.9
TOTAL	10	27.0
TOTAL	37	100.0

Overall 27 firms (73 %) have independent entry modes in the main foreign market: they are those firms, which export directly to end customers as well as those firms which establish sales and wholly owned subsidiaries. By contrast, only 10 firms (27 %) of the sample have contractual arrangements modes in the main foreign market; they are those firms, which export directly through foreign agents/distributors or indirectly through domestic distributors. No firms in this sample are characterised by establishing other contractual modes such as R&D Contracts, joint ventures, licensing or piggybacking, as it was the case for the ICT sample frame.

### **7.2.3.3 Comparison between the Two Populations (ICT and moulds)**

Inference based on the two collected samples regarding organisational characteristics, mainly: size, age, R&D expenditures and international intensity are shown in the following table:

Table 7. 9: Differences for Key Variables between ICT and Moulds Populations

Variable	T value	Sig.	95% Confidence Interval for the difference between the means of the two populations
Age	-6.04	0.000	(-11.17; -5.64)
Size	1.20	0.233	(-8.24; 33.43)
R&D expenditures	5.83	0.000	(10.19; 20.71)
International intensity	-13.50	0.000	(-70.6; -52.49)

As expected there are significant differences between the two populations in terms of firms' age, R&D expenditures and international intensity. By contrast, there are no significant differences in terms of firm's size. These significant differences are due to industry effects. In fact, firms in the mould industry are generally older, less research intensive and with a higher international intensity (see 95% confidence interval on table 7.7). In this context, due to the significant differences between the two industry sectors a dummy variable (IND) will be created so that in further statistical analysis findings will be controlled by industry sector influences.

The next sections will address each one per se, all of the research aims stated in chapter 5.

### 7.3 Research Aim 1

Research Aim 1
To assess and examine Marketing, Technological, Financial and International Orientation as Key Resources, at Firm Level, of High Technology SMEs in Foreign Markets.

This section addresses research aim 1 by examining separately and jointly the resources, at firm level, expected to give the high technology SME resource-superiority vis-à-vis their competitors in international markets. Furthermore, it includes the development and assessment of measurement scales for those resources.



In this context, principal components analysis (PCA) will be used. Principal components analysis is a multivariate statistical technique characterised by its simplicity to describe a large number of variables or objects through a small number of dimensions (see chapter 6, section 6.6).

The fact that the Kaiser-Meyer-Olkin measure of sample adequacy reached a “meritorious” level of 0.829 indicates that the correlation matrix revealed appropriated for principal components analysis (see Appendix 7.4). In addition, the significance level of the Bartlett’s Test of (0.000) suggests that the correlation matrix is not an identity matrix; rather there are significant correlations between the elements of the matrix.

As expected PCA revealed four principal components (see Table 7.10) that are resources of high technology SMEs, at firm level, including marketing, technological and financial resources and firm international orientation. All those factor loadings are above the suggested cut-off point of 0.50 (Hair et al, 1998).

Table 7. 10: Dimensions of Firm Resources (obtained by Performing PCA)

	Extracted Principal Components			
	1	2	3	4
<b>Firm Marketing Resources</b>				
Access to international distribution channels.	.742			
International Sales Force resources.	.724			
The international social contact networks of firm's sales people.	.815			
The international social contact networks of firm's sales people to foreign sales agents and distribution networks.	.825			
International Promotion expenditures.	.773			
Firm's links with international social networks.	.834			
Firm's links with international business networks.	.793			
Establishment of a Customer base.	.715			
Analysis of competitors in foreign markets.	.728			
Analysis of potential foreign customers.	.747			
Analysis of potential foreign partners for co-operation...	.717			
<b>Firm Technological Resources</b>				
Research Intensiveness (R&D expenditures to turnover)			.796	
Research Intensiveness (R&D personnel to total work force)			.823	
Firm products integrate new technologies not yet implemented on the market			.614	
Firm products are largely developed in-house			.730	
<b>Firm Financial Resources</b>				
The availability of capital for the firm's development				.832
The current endowment of firm's financial resources				.840
<b>Firm International Orientation</b>				
Firm international experience.		.814		
Firm commitment to international markets.		.863		
Firm's knowledge about foreign markets.		.859		
TOTAL VARIANCE EXPLAINED (Cumulative values in %) : 68.5				
Values represent correlations between initial variables and extracted principal components (PC)				
PC 1: Firm Marketing resources				
PC 2: Firm international orientation				
PC 3: Firm technological resources				
PC 4: Firm financial resources				

In terms of dimensionality all the items/variables within each construct, are unidimensional, strongly associated with each other and representing a single concept. In addition, all the items loaded high on their hypothesised constructs and low on the others, giving support for the convergent and discriminant validity of each specific construct. Furthermore, the reliability of each construct should also be determined.

Reliability represents an assessment of the degree of consistency between multiple measures of the same construct/ concept. It is measured by the internal consistency of a construct/concept. In this thesis the consistency of each scale was assessed with Cronbach's alpha.

Appendix 7.6 presents the Cronbach's alpha for each construct. They are all above the lower limit of 0.60 for exploratory research and of 0.70 for descriptive and causal research (Hair et al, 1998).

Finally, as presented in Table 7.10 the factors explain roughly 68.5% of the original variance, a good level in social sciences (Hair et al, 1998).

### **7.3.1 Marketing Resources**

The eleven variables used to measure the marketing resources construct on a rating scale from one ("much weaker compared to your major international competitors") to seven ("much stronger compared to your major international competitors") are listed in Appendix 7.2. It shows that the mean scores for all the eleven indicators of the marketing resources construct range between 2.86 and 3.41 out of a possible score of 7. In addition, roughly 80% among the firms in this sample (see Appendix 7.9) score below the scale central value in terms of marketing resources relative to their direct competitors in foreign markets. Thus, Portuguese high technology SMEs are not generally market oriented organisations irrespective of their performance in foreign markets.

In fact, both internal aspects of Portuguese high technology SMEs such as sales force skills, promotion expenditures, market research activities, access to international distribution channels or external links to social or business networks high technology SMEs in this sample rank low in comparison to their direct competitors.

The weakest indicator of marketing resources refers to promotion expenditures with a mean of 2.86. It was explicitly stated in the questionnaire that promotion expenditures referred to those made "in advertising over the media or the Internet, promotional

activities, direct marketing, public relations, participation in workshops, exhibitions, symposiums, conferences, and other international meetings”. This fact also suggests that generally Portuguese high technology SMEs are not marketing oriented organisations even though they may achieve high performance in foreign markets (e.g. measured by their international intensity).

Finally, the reliability of the marketing resources construct has a very high Cronbach’s alpha of 0.941 (see Appendix 7.6), which is not completely surprising since it is sensitive towards the number of indicators (Hair et al, 1998).

### **7.3.2 Technological Resources**

Appendix 7.2 lists the four variables used to measure the technological resources construct. There are two “input” measures of technological resources measured on ratio scales that are R&D intensity measured respectively by the percentage of R&D expenditures to turnover and by the percentage of R&D full-time employees to total employees. On the other hand, the two “output” measures are the innovativeness of the technology and if the main product/service was developed within the firm. These latter variables are measured on 1-7 ordinal opposite statements scales. They are original and based on the insights of the exploratory interviews (see section 6.4.2) and on Burgel and Murray (2000) study.

With regards to R&D intensity as measured R&D by expenditures in % of turnover significant differences exist, between ICT and mould firms In fact, the mean value for ICT firms is 19.5% versus only 4% for mould firms (see Tables 7.1 and 7.3). In the same vein significant differences also exist, between ICT and mould firms, for R&D intensity as measured in percentage of R&D personnel to total personnel, which accounts respectively, 25.5% to the former and just 5.8% to the latter (see Tables 7.1 and 7.3). For the overall sample, the R&D intensity measured by R&D expenditures in % of turnover has a mean value of 14% and has a percentage of the work force has a mean value of 19%. In addition, roughly 56% of the overall sample spends less than 10% of their turnover in R&D activities and just half of the total sample also has less

than 10% of the work force allocated to R&D function (see Appendix 7.10). Thus, high technology SMEs in this sample are not particularly research intensive specially those that operate in the mould industry.

Nevertheless, these indicators suggest that this sample of Portuguese high technology SMEs are at once more and less research intensive reported in previous studies. In fact, R&D intensity as measured in percentage of sales can be compared with Lindqvist (1991) with 8.6% and Burgel and Murray (2000) with 16.7%. In the same vein, R&D intensity as measured in percentage of the work force can also be compared with Lindqvist (1991) with 25% and Burgel and Murray (2000) with 30.7%.

One “output” indicator of technological resources, measured on 1-7 ordinal opposite statements scale, is the innovativeness of the technology, which ranks below the scale central value (see Appendix 7.2). This conclusion is in line with previous research about Portuguese small high technology firms, which points out that these firms are not oriented to the introduction of radical new technologies rather on the adaptation and improvements of technologies developed by international firms (Laranja and Fontes, 1998). The other “output” indicator of technological resources proposed in this study, also measured on 1-7 ordinal opposite statements scale, is the development within the firm of their products and services. In fact, Portuguese high technology SMEs acknowledge that their products/services are developed or rather adapted within the firm according to the needs of the home market (Laranja and Fontes, 1998).

Appendix 7.2 also shows that the minimum indicator for the percentage of R&D full-time employees to total employees is currently 0. This fact, relates to one small firm in the sample where the number of equivalent full-time employees is less than one. In addition, that firm currently conducts R&D in measurable fashion as a percentage of R&D expenditures to total sales.

Finally, the reliability of the technological resources construct has a Cronbach’s alpha of 0.771 (see Appendix 7.6), exceeding the minimum of 0.7 recommended for explanatory research (Hair et al, 1998).

### **7.3.3 Financial Resources**

The two variables used to measure the financial resources construct are listed in Appendix 7.2.

One measure borrowed from Wicklund (1999) assesses the availability of capital for firm's development over the last three years on 1-7 ordinal opposite statements scale. Another measure, constructed for this study, presented on a 1-7 rating scale, assesses the current endowment of firms' financial resources for future development. This issue was identified as particular relevant in the exploratory interviews (see sections 6.4.2 and 6.4.3).

While the availability of capital can be considered as a flow, the endowment of capital is a stock.

As shown in Appendix 7.2 the availability of capital for firms' development fell below the scale central value while the endowment of capital ranks just over the scale central value. In addition, the availability of financial resources for firm's development as well the current endowment of capital the overall results, presented in Appendix 7.9, suggest that roughly 60% among the firms in this sample score below the scale central value. This finding confirms previous qualitative studies, which refer shortages of financial resources as a strong limitation for the internationalisation of Portuguese high technology firms (Fontes and Combs, 1997).

Finally, the reliability of financial resources construct has a Cronbach's alpha of 0.737 (see Appendix 7.6), exceeding the minimum of 0.7 recommended for explanatory research (Hair et al, 1998).

### **7.3.4 Firm International Orientation**

Respondents were asked to assess the importance, in year 2001, to their firms' "*international experience*", "*knowledge about foreign markets*" and "*commitment to international markets*" on a 7 point rating scale, 1-7 (where 1= "none" and 7= "very substantial").

The overall mean scores, for all the three variables, presented in Appendix 7.2, range between 4.58 and 5.30 out of a possible score of 7 that is they fell slightly above the respective scale central value. The highest score is “*commitment to international markets*”. This fact may represent both the commitment of assets but also firm’s attitudes and behaviour to pursue foreign market opportunities irrespective to the resources controlled or owned by the small high technological firm (Fontes and Combs, 1997).

Overall these findings may suggest that the most successful Portuguese high technology SMEs in foreign markets firms, are those characterised by higher “knowledge”, “experience” and “commitment” to international markets.

The reliability of the firm international orientation construct has a Cronbach’s alpha of 0.878 (see Appendix 7.6), exceeding the minimum of 0.7 recommended for explanatory research (Hair et al, 1998).

Finally, in order to assess the nomological validity of the firm international orientation scale (Peter, 1981) its surrogate variable (INTOR) should exhibit according to internationalisation theory Joanhson and Vahlne (1977) a significant and positive correlation with international intensity.

Table 7. 11: Nomological Validity of Firm International Orientation

	<b>International intensity</b>
INTOR (Surrogate variable: summed average scores)	.375**

Pearson correlation, significant at the 0.01 level (1-tailed significance)

## 7.4 Research Aim 2

### Research Aim 2

To assess and examine Human Capital and International Experience of the Entrepreneur/Chief Executive as Key Resources, at Individual Level, of High Technology SMEs in Foreign Markets

This section addresses research aim 2 by examining separately and conjointly the resources, at individual level, which are expected to give the high technology SME resource-superiority vis-à-vis their competitors in international markets.

In the same vein as for Research Aim1 this study conducted first PCA in order to summarise and reduce a large number of variables in a small number of principal components. In addition, in performing PCA this section also includes “entrepreneurial orientation” a knowledge-based resource, which can be conceptualised both at firm and individual levels and addressed on research aim 3.

Moreover, PCA also includes the entrepreneur/chief executive satisfaction with the financial performance in the main foreign market in 2001 (5 items). This is clearly a subjective measure of performance. The main intent of including these variables in the principal components analysis is to assess if all these five items load or not in one single factor.

This procedure could be established since PCA differs from other multivariate techniques once it is an interdependence technique, that is, all variables are simultaneously considered irrespective of being independent/predictor or dependent/criterion variables (Hair et al, 1998).

The fact that the Kaiser-Meyer-Olkin measure of sample adequacy reached a “middling” level of 0.719 indicates that the correlation matrix revealed appropriated for principal components analysis (see Appendix 7.5). In addition, the significance level of the Bartlett’s Test of (0.000) suggests that the correlation matrix is not an identity matrix; rather there are significant correlations between the elements of the matrix.



As expected PCA revealed four principal components (see Table 7.12) that are resources of high technology SMEs, at individual level, including entrepreneur/chief executive perception of firm financial performance in the main foreign market, entrepreneur/chief executive international experience and human capital and entrepreneur/firm entrepreneurial orientation. All the factor loadings but one are above the suggested cut-off point of 0.50 (Hair et al, 1998).

In fact, the variable proactiveness *II* of the entrepreneurial orientation construct ranging from “*our relationship to our competitors is characterised by the fact that... we try to cooperate and co-exist with competitors*” to “*our relationship to our competitors is characterised by the fact that... we pursue a tough undo the competitors philosophy*”, measured on a 1-7 ordinal opposite statements reverse scale, is clearly below the cut-off point of 0.50 (Hair et al, 1998).

While the decision to drop proactiveness *II* could be further supported by its semantic content - Why should not high technology SMEs try to cooperate and co-exist with competitors?-dropping this item of the entrepreneurial orientation construct would have a positive effect of increasing the overall reliability of the scale from a Cronbach's Alpha of 0.759 to 0.773 (see Appendix 7.7).

At this point the researcher decided to drop this item and re-estimate the model.

Overall the re-estimated model exhibits a better fit. The Kaiser-Meyer-Olkin measure of sample adequacy, increased slightly to 0.724. The explained variance increased also slightly from 66.9% to 69.8%. Nonetheless the current factor structure was very similar to the initial model.

All the items loaded high on their hypothesised constructs and low on the others giving support for the convergent and discriminant validity of each specific construct.

Finally, the factors explain roughly 69.8% of the original variance, a good level in social sciences (see Appendix 7.4).

Principal components analysis (PCA) was performed using exactly the same procedures as to address Research Aim 1 (see section 7.2.4)

Table 7. 12: Dimensions of the Entrepreneur/Chief Executive Resources and Manager's Satisfaction with Performance in the Main Foreign Market (obtained by Performing PCA)

	Extracted Components			
	1	2	3	4
<b>Entrepreneur/Chief Executive Human Capital</b>				
Working experience				.928
Industry experience				.919
<b>Entrepreneur/Chief Executive International Experience</b>				
Of working abroad		.889		
Of living abroad		.787		
Marketing and sales experience of products/services in foreign markets.		.823		
Individual links with international social networks.		.835		
<b>Entrepreneurial Orientation</b>				
<b>Innovativeness I</b> (introduction by the firm of a very large number of new lines of products)				.636
<b>Innovativeness II</b> (Changes in firm product lines have been quite dramatic).				.653
<b>Innovativeness III</b> (firm emphasis on R&D, technological leadership and innovation).				.646
<b>Risk taking I</b> (strong proclivity to high risk projects with chances of very high returns)				.738
<b>Risk taking II</b> ( bold wide-ranging acts are viewed as useful and common practice).				.689
<b>Proactiveness</b> (firm tries to go ahead of competitors in product novelty or speed of innovation and usually succeeds).				.579
<b>Manager's satisfaction with the performance in the main foreign market</b>				
Foreign Sales	.798			
Growth of Foreign Sales	.853			
Profitability of Foreign Sales	.923			
Net Income	.937			
Return on Capital Employed	.850			

TOTAL VARIANCE EXPLAINED (Cumulative values in %): 69.8

Values represent correlations between initial variables and extracted principal components (PC)

- PC 1: Entrepreneur/Chief Executive satisfaction with performance in the main foreign market
- PC 2: Entrepreneur/Chief Executive international experience
- PC 3: Entrepreneur/Firm entrepreneurial orientation
- PC 4: Entrepreneur/Chief Executive human capital

After performing factor analysis the study will develop and assesses measurement scales of resources of high technology SMEs, at individual level, that are entrepreneur/chief executive international experience, and human capital.

Finally, these factors obtained by factor analysis were further used to address research aims 4 to 6 through the application of multiple regression analysis and logistic regression.

#### **7.4.1 Entrepreneur/ Chief Executive International Experience.**

Chief executives were asked to indicate either their level or the management team's international experience on a 7 point rating scale, 1-7 (where 1= "very low" and 7= "very high"). The overall mean scores, as indicated in Appendix 7.3, suggest that chief executives/ management teams international experience of Portuguese high technology SMEs is quite limited since the mean scores for "*working abroad*" (2.81), "*living abroad*" (2.61) as well as the "*marketing and sales experience of products/services in foreign markets*" (3.83) are below the scale central value. Only the item "*links with international social networks*" (4.23) ranks slightly above the scale central value. In fact, just over 80% of chief executives/ management teams among the firms in this sample score below the scale central value for "living or working abroad" (see Appendix 7.9). Thus, the great majority of Portuguese chief executives of high-technology SMEs, among the firms in this sample have limited international social experience since they have been living and working most of their lives in Portugal. Nevertheless most of them acknowledge the importance of their personal contacts with "international social networks" may be for accessing technologies developed by international firms. (Fontes and Combs, 1997; Laranja and Fontes, 1998).

The reliability of the entrepreneur/ chief executive international experience construct has a Cronbach's alpha of 0.833 (see Appendix 7.7), exceeding the minimum of 0.7 recommended for explanatory research (Hair et al, 1998).

#### 7.4.2 Entrepreneur/Chief Executive Human Capital.

Previous research suggests that for small businesses the firm is an extension of the entrepreneur (Lee et al, 2001; Cooper et al, 1994). Thus, the characteristics of the entrepreneur merit the focus of attention due to his or her key role to the venture's success. In this context, entrepreneurs/chief executives were assessed about their level of education, working and industry experiences and family background.

In fact, it is reasonable to expect that entrepreneurs/chief executives with higher level of education, higher working and industry experiences and with origin in business-owning backgrounds may be better prepared to deal with market opportunities irrespective of being in domestic or foreign markets (Westhead et al, 2001).

Table 7.13 shows the empirical results regarding the level of education of entrepreneurs/chief executives of Portuguese high technology SMEs both for the ICT and moulds sample frames:

Table 7. 13: Highest level of education achieved by entrepreneurs/chief executives of ICT and Mould firms

<b>Level of Education</b>	<b>ICT</b>	<b>MOULDS</b>
Secondary School	6 (9% )	24 (65%)
Bachelor Degree	5 (7% )	5 (13%)
University Graduate	34 (49%)	7 (19%)
Master's Degree	17 (25%)	1 (3%)
PhD	7 (10%)	---
<b>TOTAL</b>	<b>69 (100%)</b>	<b>37 (100%)</b>

From Table 7.13 it seems quite clear that significant differences exist, in the highest level of education achieved, between entrepreneurs/chief executives of ICT and mould firms. In fact, in 91% of the ICT firms the CEO has a university degree while for the mould firms this figure only reaches 35%. In addition, for roughly half of the ICT firms their CEOs are university graduate and 35% are postgraduate, where 10% hold a PhD.

On the other hand, for the CEOs of the mould firms just 19% are university graduate and only 1 CEO (3%) have a master's degree.

Roughly 80% of the CEOs for both ICT and moulds revealed that they had never owned a business or held a senior executive position, in international/multinational firms prior to founding/joining the firms where they are currently working. In the same vein, just over 70% of the CEOs for both ICT and moulds indicated that their parents had never owned a business.

Moreover, the analysis of data shows that no significant differences exist in the responses of the CEOs of ICT and mould firms.

In sum, the vast majority of CEOs of Portuguese high technology SMEs in this sample did not accumulate overtime management know-how from previous business ventures or from backgrounds where their parents owned a business or acted as role models (Westhead et al, 2001). In addition, the vast majority did not hold either previous managerial positions in international/multinational firms. Thus, they may be less aware of the possibilities of exploiting foreign market activities when compared with chief executives with managerial experience in international/multinational firms (Westhead, 1995).

Finally, chief executives were asked to indicate both the number of years of working experience and the number of years of experience within the industry where their firms operate (see Appendix 7.3).

As shown in Appendix 7.3 on average chief executives of Portuguese high technology SMEs have 20 years of working experience and 18 years of experience within the industry where their firms conduct business activities while their firm's age is, on average, 13 years old.

The analysis of data shows that, taking the respective firm's age into consideration, no significant differences exist in the responses of the CEOs of ICT and mould firms.

Overall these results may suggest that entrepreneurs/chief executives of Portuguese high technology SMEs often have extensive working and specific industry experience even

before founding or joining the firm that they currently run. Moreover, sometimes their working and industry experiences are higher than their respective firm's age. To some extent, these facts were revealed to the researcher throughout the preliminary interviews phase with chief executives of Portuguese high technology SMEs.

The reliability of the entrepreneur/ chief executive human capital construct has a Cronbach's alpha of 0.934 (see Appendix 7.7).

### 7.5 Research Aim 3

<b>Research Aim 3</b>
To assess and examine Entrepreneurial Orientation, a Knowledge-Based Resource, both at Firm and Individual Levels, of High Technology SMEs in Foreign Markets

In section 7.4 this study has performed principal component analysis for key resources of high technology SMEs, at individual level and including the "entrepreneurial orientation" construct (see Table 7.11).

The concept of entrepreneurial orientation used in this study follows conceptualisations that have been suggested by Miller (1983) and further developed in other studies (Lee et al, 2001; Lumpkin and Dess, 1996; Covin and Slevin, 1989).

The entrepreneurial orientation construct has three dimensions: they are innovativeness (3 items), risk taking (2 items) and proactiveness (2 items).

Innovativeness refers to firm's attitudes and actions, which promotes and supports new ideas and processes that may lead to the launching of new products/ services integrating new technologies or technological processes in new or current markets (Lumpkin and Dess, 1996).

Risk taking is related with the propensity to allocate resources/assets to high risk projects but with chances of very high returns.

Finally, proactivity reflects firm's proclivity to go ahead of competitors in product novelty or speed of innovation in order to anticipate future market trends.

In this context, Appendix 7.3 lists the various variables used to measure the entrepreneurial orientation construct. It shows that the sample of Portuguese high technology SMEs exhibits a slightly above average (the scale central value) “*innovativeness*”. In fact, all the indicators for this construct fell above the scale central value. These results are not surprising since, as pointed out on chapter 1, high technology SMEs compete in markets characterised by short life cycles, in which technologies become fast obsolete. Moreover, they face high technological risks and operate in industries subject to dramatic structural changes (Coviello and Munro, 1995). Thus, it is reasonable to expect that business activities of the great majority of high technology SMEs are characterised by the introduction, in recent years, in their product portfolio, of a very large number of new lines of products. Furthermore, those changes in product lines may have been quite dramatic.

In sum, the business strategy of high technology SMEs is oriented by a very strong emphasis on R&D, technological leadership and innovation if they want to survive and compete in very dynamic and often hostile market environments.

With regards to “firm/entrepreneur risk taking” one indicator “risk-taking I” (“*we have a strong proclivity to high risk projects with chances of very high returns...*”) fell slightly above the scale central value while the other item “risk-taking II” (“*Owing the nature of the environment bold wide-ranging acts are viewed as useful and common practice...*”) fell below the scale central value. Results of “risk-taking I” may suggest that high technology SMEs compete in industry sectors characterised by high financial and technological risks. In addition, this result, as pointed out in chapter 3, could be explained by the fact that these firms are seen as risky and consequently they must pay a premium for cash or other credit lines obtained from banks, venture capitalists or other investors. In this situation compared with bigger and more established firms high technology SMEs are charged with higher interest rates by financial institutions. Thus, they must generate higher returns for investors/venture capitalists or entrepreneurs due to the risks they face (Coviello and Munro, 1995). On the other hand, results for “risk-taking II” may reveal that since high technology SMEs operate in very unpredictable

and dynamic international market environments it is best to explore them gradually via timid, incremental behaviour, through small incremental steps mainly in aspects related to geographical diversification. This approach makes sense in a way that high technology SMEs may face uncertainty in foreign markets, but risks should stay at a manageable level. In addition, they could not afford to take potential poor decisions, which may cause irreparable damages to their survival and long term future.

In sum, “firm/entrepreneur risk taking” refers to firm’s large commitment of resources to high-risk uncertain business in order to achieve high returns through the identification of opportunities both in domestic and foreign markets.

Last but not the least with regards to firm’s proactiveness “*our firm always tries to go ahead of competitors in product novelty or speed of innovation and usually succeed*” ranks above the scale central value. This finding may suggest that for high technology SMEs the introduction of new products, systems and services ahead of the competition is quite important in order to increase firm’s long term growth and profitability. Moreover, proactive firms very often influence market trends, creating new market segments or beating existing and established firms through the introduction of new products and services.

The reliability of the entrepreneur/firm entrepreneurial construct has a Cronbach’s alpha of 0.773 (see Appendix 7.7), which could be compared with other studies such as 0.79 Knight (2000), 0.75 Zahara and Covin (1995), 0.74 Miller (1983) and clearly above 0.64 in Wicklund (1998) study.

Research aim 4 will assess the impact of all the identified resources, on research aims 1 to 3, on international performance, measured by the international intensity of the high technology SME. Empirical studies suggest a significant and positive association between EO and performance (Lee et al, 2001; Wicklund, 1999), mainly when EO is assessed overtime (Wicklund, 1999).



## 7.6 Research Aim 4

### Research Aim 4

To assess the impact that the resources identified in Research Aims 1 to 3 have on the international performance, measured by the international intensity of the high technology SME

In order to address research aim 4 multiple regression will be used.

Multiple regression analysis is a multivariate statistical technique used to analyse the effect of several independent (predictor) variables on a single dependent (criterion) variable.

However, in order to conduct MRA in a rigorous way some assumptions must be tested and satisfied. In this context, the testing of the assumptions was performed.

The first assumption is *the normal distribution of the error terms*. The histogram of the standardised residuals of the fitted model as well as the normal probability plot shows a slightly potential deviation from normality (see Appendix 7.11). In fact, at the univariate level, the data distribution for some variables fairly approximated a normal distribution while others showed a more pronounced departure from normality, as determined by histograms, normal probability plots and Kolmogorov-Smirnov tests. Data transformation (e.g. inverse, square root and logarithms) were used in an attempt to improve the normality of several variables. However, no substantial improvements were observed, fact that is not uncommon. Since the departures from normality were not extreme and MRA has been shown to be quite robust relative to deviations from normality, the variables were maintained in their original form (Hair et al, 1998).

The second assumption is of *homoscedasticity*, which means constant variance of the error terms.

The analysis of the scatter plot of the studentised residuals of the model against the standardised predicted dependent values of the fitted model shows no evidence of a

consistent pattern. This fact implies a lack of *heteroscedasticity*, and consequently satisfying this assumption (see also Appendix 7.11).

The third assumption is *linearity*, expressing the linear relationship or correlation between the independent variables and the dependent variable. Analysis of partial regression plots making possible the examination of residual patterns for individual independent variables to the dependent variable indicated the presence of linear relationships. In this context, no nonlinear relationships were observed and therefore the linear assumption was satisfied (see Appendix 7.11).

As already presented in chapter 5, section 5.4 the independent variables to address Research Aim 4 are: marketing, technological and financial resources, firm's international orientation, entrepreneur/chief executive human capital and international experience and last but not the least entrepreneurial orientation. On the other hand, the dependent variable is firm international intensity.

Currently, it is reasonable to expect that, high technology SMEs with a superior endowment of some resources, look for foreign market opportunities as part of their strategies for growth and profitability, both in short and medium term. Thus, firms with higher endowments of those resources may have higher international intensity compared with firms less endowed in such resources.

Therefore, the predicted relationship in the hypotheses relating the direct impact that resources of high technology SMEs, identified on research aims 1 to 3, have on the international performance, measured by their respective international intensity is expected to be positive.

In sum, as presented in chapter 4 the RBV suggests that it is likely that differences between high technology SMEs, at firm and management levels, exist and that these differences may lead to significant variation among high technology SMEs in their international intensity.

Table 7.14 provides variable correlations. No correlation is greater than 0.55, and only 4 plus 2 of the 28 correlations are significant at  $p^{**} \leq 0.01$  and  $p^* \leq 0.05$ , respectively. Note that the VIF calculations reveal that multicollinearity between independent variables does not seem to be a problem in statistical analysis since the VIF values range between 1.02 and 2.1 that is, they are well below 10 and the tolerance values (the amount of variability of the selected independent variable not explained by the other independent variables) range between 0.98 and 0.48 are well above 0.2 (Hair et al, 1998; Field, 2000).

Table 7. 14: Correlation Matrix for the Entire Sample

	1	2	3	4	5	6	7	8	9
1. International intensity	1								
2. Firm Size	-.13	1							
3. Marketing Resources	.23*	-.02	1						
4. Technological Resources	-.36**	-.27**	.00	1					
5. Financial Resources	.02	.12	.00	.00	1				
6. Firm International Orientation	.33**	.01	.00	.00	.00	1			
7. Entrepreneur Human Capital	.60**	.07	.15	-.41**	-.06	.20*	1		
8. Man. International Experience	.12	-.07	.55**	.07	.04	.35**	.00	1	
9. Entrepreneurial Orientation	-.10	-.02	.08	.46**	.05	-.07	.00	.00	1

N = 106  
 $p^* \leq 0.05$   
 $p^{**} \leq 0.01$

Table 7.14 also shows that the observed correlation between firm size and international intensity is very low and negative (-0.13). From theory, a positive correlation would be expected between the two variables suggesting larger companies to have higher international intensity. In this study this not the case; size does not matter.

A scatter plot displaying the two variables reveals no linear relationship exists (see Appendix 7.8). For these reasons firm size will not be considered a control variable.

As presented in section 7.2.2 both the ICT and mould sample frames have, to some extent, different characteristics. Therefore in multiple regression this study uses industry sector as a control variable. Industry sector (IND) is a dummy variable, which is assumed to be 0 for the ICT sample frame and 1 for the mould sample.

Table 7.15 presents the results of the multiple regression models for international intensity. Table 7.15 also shows that the two models are highly significant predictors of international intensity ( $p < 0.001$ ).

Table 7. 15: Results of Multiple Regression for International Intensity

	Model 1	Model 2
Intercept	***	***
Industry	0.77***	0.77***
Marketing Resources		0.07
Technological Resources		0.19*
Financial Resources		0.00
Firm International Orientation		0.14*
Entrepreneur Human Capital		0.19**
Entrepreneur International Experience		-0.02
Entrepreneurial Orientation		0.02
(Values are standardised beta estimates)		
F	191.10***	32.39 ***
Adjusted R <sup>2</sup>	0.63	0.70
Change in Adjusted R <sup>2</sup>	-	0.07 ***
	+ p ≤ 0.10	
	* p ≤ 0.05	
	** p ≤ 0.01	
	*** p ≤ 0.001	

Model 1 is the base model and includes only the control variable industry. In model 2 the study variables (marketing and technological resources, financial resources, firm's international orientation, entrepreneur/chief executive human capital and international experience and last but not the least entrepreneurial orientation) are included. The model has a good fit ( $F=32.39$ ,  $p < 0.001$ ) with an adjusted R<sup>2</sup> of 0.70.

The following independent variables are significant:

- Technological Resources ( $p < 0.05$ )
- Firm's International Orientation ( $p < 0.05$ )
- Entrepreneur/Manager Human Capital ( $p < 0.01$ )

Table 7.16 summarises the above empirical results. It shows that technological resources, entrepreneur/chief executive human capital and firm international orientation

are strong predictors of international intensity while marketing resources, financial resources, entrepreneurial orientation and entrepreneur/management team international experience are not.

Table 7. 16: Hypotheses relating the direct impact that resources of high technology SMEs, have on the international performance, measured by its international intensity.

Hyp.	Independent Variables	Predicted Relationship	Result
H <sub>1</sub>	The greater the endowment of <i>marketing resources</i> of the high technology SME the higher its international intensity.	Positive	Not supported
H <sub>2</sub>	The greater the endowment of <i>technological resources</i> of the high technology SME the higher its international intensity.	Positive	Supported
H <sub>3</sub>	The greater the endowment of <i>financial resources</i> of the high technology SME the higher its international intensity.	Positive	Not supported
H <sub>4</sub>	The greater the <i>international orientation</i> of the high technology SME the higher its international intensity.	Positive	Supported
H <sub>5</sub>	The greater the <i>entrepreneurial orientation</i> of the high technology SME the higher its international intensity.	Positive	Not supported
H <sub>6</sub>	The greater the <i>human capital of the entrepreneur/chief executive</i> of the high technology SME the higher its international intensity.	Positive	Supported
H <sub>7</sub>	The greater the <i>international experience of the entrepreneur/chief executive</i> of the high technology SME the higher its international intensity.	Positive	Not supported

In the next chapter (chapter 8) this study will discuss both resources in depth, for Portuguese high technology SMEs, which are significant predictors of international intensity as well as those which are not.

## 7.7 Research Aim 5:

### Research Aim 5

To examine the influence that resources of high technology SMEs, identified on Research Aims 1 to 3, have on the type of entry mode in the main foreign market (independent vs. contractual).

In this study logistic regression was used to explore relationships between the independent variables that are resources of high technology SMEs and the dependent variable that is the use of an independent vs. contractual mode in the main foreign market. This statistical technique is appropriate for analysing the effects on a dichotomous dependent variable and the results are straightforward and easy to interpret (Hair et al, 1998).

As already pointed out, in section 7.2.3, for the entire sample, 65 firms (61 %), in total, have independent entry modes, in the main foreign market, that are those firms, which export directly to end customers or through sales subsidiaries as well as those which establish wholly owned subsidiaries. On the other hand, the remaining 41 firms (39 %), in total, establish contractual arrangements in the main foreign market entry mode, that are those firms, which export through agents/distributors or by means of other contractual modes (e.g. licensing, contract R&D, contractual joint ventures, etc.) since they involve contractual cooperation from partners (Shrader, 2001; Root, 1994).

In fact, this study, in chapter 4, section 4.5.5, pointed out that high technology ventures may establish cooperative relationships, with prospective partners, which are detailed in contracts, which settle those relationships, however imperfectly, and can be crudely called *contractual cooperation*. Thus, throughout this study the terms *contractual arrangements* and *contractual cooperation* are, interchangeably, used.

In these circumstances, both the high technology and the prospective partner/distributor need to recognise the contractual arrangement as a base to move cooperation forward in the target market, while sharing revenues, costs and risks.

Logistic regression is very similar to multiple regression since they use the same variations of regression techniques, but differs in the way it is interpreted.

Table 7. 17 presents the results of the logistic regression.

Table 7. 17: Results of Logistic Regression for the Use of an Independent vs. Contractual Mode in the Main Foreign Market.

	Model 1	Model 2
Intercept	-0.46	-0.52
Industry	0.87	0.99
Size	- 0.01**	-0.01**
Marketing Resources		-0.32
Technological Resources		-0.03
Financial Resources		-0.11
Firm International Orientation		-0.29
Entrepreneur Human Capital		0.24
Entrepreneur International Experience		0.22
Entrepreneurial Orientation		0.24
(n=106. Values are standardised beta estimates)		
-2log likelihood	129.28	126.34
Chi Square	12.19**	15.13+
	+ p < 0.10	
	* p < 0.05	
	** p < 0.01	
	*** p < 0.001	

Model 1 is the base model and includes only the control variables *industry* and *size*. The study variables were added to model 2. Model 1 is significant (Chi-square=12.19; p<0.01) while model 2 is only *slightly significant* (Chi-square=15.13; p<0.1). Model 2 does not represent an improvement over model 1, since the level of significance decreased dramatically.

A measure of the effect of all explanatory variables in this study that have on the response variable, can be obtained by comparing the *-2log likelihood* for the model with only the control variables (model 1) with the *-2log likelihood* for the model which includes all explanatory variables. The difference in the *-2log likelihood* between these two models (models 1 and 2) represents the effect that this study explanatory variables

have; that is the improvement in the model fit which can be attributed to the explanatory variables. In addition, the amount, by which the *-2log likelihood* decreases when additional variables are added to the model indicates the size of the effect that these variables have (Hutcheson and Sofroniou, 1999). The significance of the change in *-2log likelihood* is determined by the chi-square test of (chi-square =2.94; df=7; P=0.1095). In this case it is very straightforward to conclude that the addition of the explanatory variables does not result in a significant improvement to the model.

Overall, results of the full model (model 2) show that the use of a contractual entry mode in the main foreign market is only negatively related to firm *size* ( $p < 0.05$ ). Thus the study variables were not related to contractual cooperation in the main foreign market, among the firms in this sample. Thus, results provide support for hypotheses H<sub>08</sub> to H<sub>014</sub> and non-support for hypotheses H<sub>8</sub> to H<sub>14</sub>.

Tables 7.18 and 7.19 summarise the above empirical results.

In fact, while Table 7.18 shows the stated hypotheses with the predicted relationships as presented in chapter 4 section 4.5.6, Table 7.19 establishes the hypotheses, for Research Aim 5, in the null form.



Table 7. 18: Hypotheses relating the influence that resources of high technology SMEs, have on the type of entry mode in the main foreign market (independent vs. contractual).

Hyp.	Independent Variables	Predicted Relationship	Result
H <sub>8</sub>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>marketing resources</i> .	Positive	Not supported
H <sub>9</sub>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>technological resources</i> .	Negative	Not supported
H <sub>10</sub>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>financial resources</i> .	?*	Not supported
H <sub>11</sub>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>international orientation</i> .	Positive	Not supported
H <sub>12</sub>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>entrepreneurial orientation</i> .	Negative	Not supported
H <sub>13</sub>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and <i>the human capital of the entrepreneur/chief executive</i> .	?*	Not supported
H <sub>14</sub>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and <i>entrepreneur's/ chief executive international experience</i> .	Positive	Not supported

\* The relevant literature on TCE and the RBV do not allow predicting the type of relationship that exists among the variables.

Table 7. 19: Hypotheses relating the influence that resources of high technology SMEs, have on the type of entry mode in the main foreign market (independent vs. contractual).

**Hypotheses H<sub>0</sub>8 - H<sub>0</sub>14**

**That no relationship exists in respect to:**

Hyp.	Description	Result
H <sub>0</sub> 8	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>marketing resources</i> .	Supported
H <sub>0</sub> 9	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>technological resources</i> .	Supported
H <sub>0</sub> 10	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>financial resources</i> .	Supported
H <sub>0</sub> 11	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>international orientation</i> .	Supported
H <sub>0</sub> 12	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>entrepreneurial orientation</i> .	Supported
H <sub>0</sub> 13	The use of a contractual entry mode, in the main foreign market, by the high technology SME and <i>the human capital of the entrepreneur/chief executive</i> .	Supported
H <sub>0</sub> 14	The use of a contractual entry mode, in the main foreign market, by the high technology SME and <i>entrepreneur's/ chief executive international experience</i> .	Supported

Results presented in tables 7.18 and 7.19 suggest that the mainly knowledge-based resources of the high technology SME did not affect the use or non-use of a contractual arrangement in the main foreign market. Indeed, the only significant predictor of contractual cooperation is the control variable firm size. This finding however consistent with previous research (Shrader, 2001) is not in line with TCE, which suggests that the use of contractual cooperation vs. internalisation in the foreign market entry mode by the high technology SME is dependent upon the type of knowledge to be transferred to a potential partner in the host country. In addition, and in a different perspective, it is not in line either with the general literature on small firms, which emphasises that in order to overcome the lack of resources small firms may develop

cooperative foreign market entry modes for example through a contractual arrangement in order to pursue their growth strategies (Jones, 1998, 1999).

Establishing cooperative arrangements with other firms may allow high technology SMEs to get access to resources that otherwise would require considerable time and money, that they currently could not afford (Lu and Beamish, 2001; McDougall, Shane and Oviatt, 1994; Oviatt and McDougall, 1994; Zacharakis, 1997).

Overall, in this study, as indicated above, 61% of the firms have independent entry modes while the remaining 39% involve contractual arrangements in the main foreign market entry mode.

## 7.8 Research Aim 6

### Research Aim 6

To examine the relationship between the use of a contractual entry mode and performance, in the main foreign market, while considering the resources identified in Research Aims 1 to 3, as moderator influences in that relationship.

In this study moderated multiple regression was used to examine the relationship between the use of a contractual entry mode and performance, in the main foreign market, while considering the resources identified in Research Aims 1 to 3, as moderator influences in that relationship.

As already emphasised in chapter 4, section 4.5.5, and high technology SMEs, are dependent upon their resource endowments and may conduct business in the *foreign market entry mode, either independently via subsidiaries or international sales direct to end customers or by means of contractual arrangements with partners through agents/distributors and other contractual modes*. In other words, high technology SMEs may have the choice when going international to establish some form of contractual cooperation or rather to select a sole venture.

Similarly to Research Aim 4, in order to conduct moderated multiple regression in a rigorous way, some assumptions must be tested and satisfied. In this context, the study tested the following assumptions:

- Firstly, *the normal distribution of the error terms*. The histogram of the standardised residuals of the fitted model as well as the normal probability plot shows a slightly potential deviation from normality (see Appendixes 7.12 and 7.13). In fact, at the univariate level, the data distribution for some variables fairly approximated a normal distribution while others showed a more pronounced departure from normality, as determined by histograms, normal probability plots and Kolmogorov-Smirnov tests. Data transformation (e.g. inverse, square root and logarithms) were used in an attempt to improve the normality of several variables. However, no substantial improvements were observed, fact that is not uncommon. Since the departures from normality were not extreme and moderated multiple regression has been shown to be quite robust relative to deviations from normality, the variables were maintained in their original form (Hair et al, 1998).
- Secondly, *homoscedasticity*, which means constant variance of the error terms. In fact, the analysis of the scatter plot of the studentised residuals of the model against the standardised predicted dependent values, respectively international intensity and degree of satisfaction of the CEO of the fitted models shows no evidence of a consistent pattern. This fact implies a lack of *heteroscedasticity*, and consequently satisfying this assumption (see Appendixes 7.12 and 7.13).
- Thirdly, *linearity*, expressing the linear relationship or correlation between the independent variables and the dependent variables, respectively international intensity and degree of satisfaction of the CEO. Analysis of partial regression plots making possible the examination of residual patterns for individual independent variables to the dependent variable indicated the presence of linear relationships. In this context, no nonlinear relationships were observed and therefore the linear assumption was satisfied (see Appendixes 7.12 and 7.13).

International performance is defined by both objective and subjective measures. For objective measures international intensity in the main foreign market was used. On the other hand, as subjective measures degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market was proposed.

For each performance variable, four regression equations were tested. The first contained only the control variable industry sector. The use/non-use of contractual cooperation in the main foreign market was introduced in the second. Resources of high technology SMEs presented in Research Aims 1 to 3 were added in model 3, so that variables main effects could be assessed. Finally, interaction terms are presented in the fourth and complete model.

Overall, if a particular independent variable is a pure moderator, the main effects would not be significant, but the corresponding interaction term would be. Significant main effects and interaction terms together would indicate that the variable is a quasi moderator. A significant main effect and insignificant interaction term would indicate that the variable was simply a predictor variable not a moderator (Sharma et al, 1981).

Before running the model Table 7.20 provides variable correlations. No correlation is greater than 0.55, and only 4 plus 1 of the 28 correlations are significant at  $p^{**} \leq 0.01$  and  $p^* \leq 0.05$ , respectively.

Note that the VIF calculations reveal that multicollinearity between independent variables does not seem to be a problem in statistical analysis since the VIF values range between 1.03 and 2.1 that is they are well below 10 and the tolerance values (the amount of variability of the selected independent variable not explained by the other independent variables) range between 0.97 and 0.47 are well above 0.2 (Hair et al, 1998; Field, 2000).

Table 7. 20: Correlations Matrix

	1	2	3	4	5	6	7	8	9
1. International intensity	1								
2. Cooperation use / non use	-0.15	1							
3. Marketing Resources	0.23*	-0.11	1						
4. Technological Resources	0.36**	0.17	0.00	1					
5. Financial Resources	0.02	-0.09	0.00	0.00	1				
6. Firm International Orientation	0.33**	-0.12	0.00	0.00	0.00	1			
7. Entrepreneur Human Capital	0.60**	-0.09	0.15	-0.41**	-0.06	0.20*	1		
8. Man. International Experience	0.12	-0.03	0.55**	0.07	0.04	0.35**	0.00	1	
9. Entrepreneurial Orientation	-0.10	0.06	0.08	0.46**	0.05	-0.07	0.00	0.00	1

N = 106  
 p\* ≤ 0.05  
 p\*\* ≤ 0.01

### 7.8.1 Performance Measured by the International Intensity in the Main Foreign Market

Table 7.21 present results of those four models for international intensity in the main foreign market:

Table 7. 21: Results of Moderated Multiple Regression for International Intensity in the Main Foreign Market

	Model 1	Model 2	Model 3	Model 4
Intercept	***	***	***	***
Industry	0.80***	0.80***	0.77***	0.83***
Contractual Cooperation		- 0.01	- 0.01	0.01
Marketing Resources			0.06	- 0.05
Technological Resources			0.19 *	0.18*
Financial Resources			- 0.01	- 0.02
Firm International Orientation			0.14 *	0.16*
Entrepreneur Human Capital			0.19 **	0.16*
Entrepreneur International Experience			- 0.02	0.11
Entrepreneurial Orientation			0.02	0.05
Marketing Resources X Cont. Cooperation				0.19*
Technological Resources X Cont. Cooperation				
Financial Resources X Cont. Cooperation				0.51
Firm International Orientation X Cont. Cooperation				
Entrepreneur Human Capital X Cont. Cooperation				
Entrepreneur Int. Experience X Cont. Cooperation				-0.23*
Entrepreneurial Orientation X Cont. Cooperation				-0.05
F	191.10***	94.72***	28.52***	20.93***
Adjusted R <sup>2</sup>	0.63	0.63	0.69	0.70
Change in Adjusted R <sup>2</sup>			0.06	0.01

p<sup>+</sup> < 0.10  
 p\* < 0.05  
 p\*\* < 0.01  
 p\*\*\* < 0.001

All these four models are highly significant ( $p < 0.001$ ). As mentioned earlier model 1 was the base model and included only the control variable industry sector. As shown in model 2 the use or non-use of contractual cooperation in the main foreign market was introduced. It is not significant, and no additional variance is explained by this variable (adjusted  $R^2$  remain at 0.63). These results suggest that if other variables were not included there is no relationship between contractual cooperation in the main foreign market and international intensity in that same foreign market. In model 3 the study variables (resources of high technology SMEs) were added. The results were significant ( $F=28.52$ ,  $p < 0.001$ ) and showed positive main effects for technological resources ( $p < 0.05$ ) firm international orientation ( $p < 0.05$ ) and entrepreneur/ chief executive human capital ( $p < 0.01$ ).

In sum, among the entire sample of high technology SMEs, including both firms, which use contractual arrangements and those which have independent entry modes in the main foreign market its international intensity, is positively associated with technological resources, firm international orientation and entrepreneur/ chief executive human capital.

Finally, model 4 is the full model and has a good fit ( $F=20.93$ ,  $p<0.001$ ) presenting a slight improvement over model 3. The adjusted  $R^2$  also increased from 0.69 to 0.70. It includes the interactions of all the study variables and the use/non-use of contractual cooperation in the main foreign market. However, results suggest that including interaction terms evolving variables that are significant in terms of predicting international intensity, weakens their main effects.

At this stage the researcher decided, for model 4 in Table 7.21, to take off from the model the interactions with variables that have significant main effects and only consider the interactions between contractual cooperation and the remaining independent variables without significant main effects. In this context, Table 7.19 shows the interaction terms *contractual cooperation \* marketing resources* and *contractual cooperation \* entrepreneur/management team international experience* have significant effects on performance. In this context, the former interaction is positive while the latter, quite surprisingly, is negative.

According to Sharma et al (1981) the interactive influence of contractual cooperation, in the main foreign market, respectively, with marketing resources and entrepreneur/management team international experience on international intensity, in the main foreign market, are significant at the  $p<0.05$ . In addition, marketing resources and entrepreneur/management team international experience are pure moderators since main effects found in the analysis are not significant but the interaction terms are, indeed, significant.

Moreover, in model 4 technological resources ( $p<0.05$ ), firm international orientation ( $p<0.05$ ) and entrepreneur/ chief executive human capital ( $p<0.05$ ) are significant and



positively associated with international intensity in the main foreign market. Thus, technological resources, firm international orientation and entrepreneur/ manager human capital could be considered as predictor variables not as moderators since they are characterised by their significant main effects and insignificant interaction terms (Sharma et al, 1981).

Because the correlation between the interaction terms, respectively, *marketing resources \* contractual cooperation and firm international orientation \* contractual cooperation* was .55 ( $p < .01$ ) and *marketing resources \* contractual cooperation and chief executive international experience \* cooperation* was .52 ( $p < .01$ ), tests similar to those reported above were conducted while running the full model (model 4) with the interaction terms entered separately step by step in the regressed equation. Results of these tests were practically identical to those presented in Table 7.21

Overall, Table 7.21 suggests that technological resources, firm international orientation and entrepreneur/ chief executive human capital) are significant independent predictors of international performance. In fact, they explain about 69% of the variance on international intensity, while *the interactive influence of contractual cooperation, in the main foreign market*, respectively, with *marketing resources* and *entrepreneur/management team international experience* explaining the remaining 1% of the variance on international intensity in the main foreign market even though they are statistically significant.

In sum, these results provide support for the null hypotheses, Ho16 to Ho20, presented in chapter 5, since there is no association between different resources of high technology SMEs and contractual cooperation in the main foreign market with international intensity in that same market.

However, these results provide support to reject the null hypotheses of Ho15 and Ho21, presented in chapter 5, since there is association between marketing resources ( $p < 0.05$ ) and entrepreneur international experience ( $p < 0.05$ ), respectively, of high technology SMEs and cooperation in the main foreign market with performance (the international intensity) in that same market.

Table 7. 22 summarises the above empirical results.

Table 7. 22: Hypotheses relating the relationship between the use of a contractual mode and performance, in the main foreign market, while considering the resources of the high technology SME, as moderator influences in that relationship.

**Hypotheses H<sub>0</sub>15 - H<sub>0</sub>21**

**That no relationship exists in respect to:**

Hyp.	Description	Result
H <sub>0</sub> 15	The use of a contractual mode, in the main foreign market coupled with <i>marketing resources</i> , in relation to performance in that same market.	Not Supported
H <sub>0</sub> 16	The use of a contractual mode, in the main foreign market coupled with with <i>technological resources</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 17	The use of a contractual mode, in the main foreign market coupled with with <i>financial resources</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 18	The use of a contractual mode, in the main foreign market coupled with with <i>international orientation</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 19	The use of a contractual mode, in the main foreign market coupled with with <i>entrepreneurial orientation</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 20	The use of a contractual mode, in the main foreign market coupled with <i>the entrepreneur/chief executive human capital</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 21	The use of a contractual mode, in the main foreign market coupled with the <i>entrepreneur/chief executive international experience</i> , in relation to performance in that same market.	Not Supported

In the next chapter (chapter 8) this study will discuss in depth both the relationship between contractual cooperation and performance, in the main foreign market, while considering the resources of the high technology SME, which are significant moderator influences in that relationship.

## 7.8.2 Degree of Satisfaction of the Entrepreneur/Chief Executive with Performance in the Main Foreign Market

Table 7. 23 presents the results of those four models for international performance (financial satisfaction in the main foreign market).

Table 7. 23: Results of Moderated Multiple Regression for Entrepreneur/CEO Satisfaction with Financial Performance in the Main Foreign Market

	Model 1	Model 2	Model 3	Model 4
Intercept				
Industry	- 0.08	- 0.08	- 0.13	- 0.24+
Contractual Cooperation		- 0.05	- 0.00	0.01
Marketing Resources			0.40**	0.45***
Technological Resources			0.22	0.27
Financial Resources			0.07	- 0.14
Firm International Orientation			0.1**	0.31**
Entrepreneur Human Capital			0.05	0.09
Entrepreneur International Experience			-0.35**	-0.40**
Entrepreneurial Orientation			- 0.15	- 0.13
Marketing Resources X Cont. Cooperation				
Technological Resources X Cont. Cooperation				-0.09
Financial Resources X Cont. Cooperation				0.36 **
Firm International Orientation X Cont. Cooperation				
Entrepreneur Human Capital X Cont. Cooperation				-0.01
Entrepreneur Int. Experience X Cont. Cooperation				
Entrepreneurial Orientation X Cont. Cooperation				-0.11
F	0.62	0.44	2.52 *	2.70**
Adjusted R <sup>2</sup>	0.01	0.01	0.11	0.17
Change in Adjusted R <sup>2</sup>			0.10	0.06

p<sup>+</sup> < 0.10  
 p\* < 0.05  
 p\*\* < 0.01  
 p\*\*\* < 0.001

Only models 3 and 4 are significant respectively at ( $p < 0.05$ ) and ( $p < 0.01$ ). As mentioned earlier model 1 was the base model and included only the control variable industry sector. As shown in model 2 the use and non-use of contractual cooperation in the main foreign market was introduced. It is not significant, and no additional variance is explained by this variable (adjusted R<sup>2</sup> remain at 0.01). These results suggest that if other variables were not included there would be no relationship between contractual cooperation in the main foreign market and financial satisfaction in that same foreign market. In model 3 this study variables (resources of high technology SMEs) were

added. The results were significant ( $F=2.52$ ,  $p<0.05$ ) and showed positive main effects for marketing resources ( $p<0.01$ ) and firm international orientation ( $p<0.05$ ). By contrast, it shows negative main effects for entrepreneur/ chief executive international experience ( $p<0.05$ ). The results also indicated a dramatic improvement in the adjusted  $R^2$  from 0.01 to 0.11.

In sum, among the entire sample of high technology SMEs, including both firms, which use contractual arrangements in the main foreign market and those which have independent entry modes in that same market the degree of satisfaction of the entrepreneur/chief executive is positively associated with marketing resources and firm international orientation, and negatively associated with entrepreneur/ chief executive international experience.

Finally, model 4 is the full model and has a good fit ( $F=2.70$ ,  $p<0.01$ ) presenting a strong improvement over model 3. The adjusted  $R^2$  also increased dramatically from 0.11 to 0.17. It includes the interactions of all the study variables and the use or non-use of contractual cooperation in the main foreign market. However, results suggest that including interaction terms involving variables that are significant in terms of predicting the degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market weakens their main effects.

At this stage the researcher decided, for model 4 in Table 7.21, to take off from the model the interactions with variables that have significant main effects and only consider the interactions between contractual cooperation and the remaining independent variables without significant main effects. In this context, Table 7.21 shows that the interaction term *contractual cooperation\*financial resources* has a statistically significant and positive effect on performance, that is with the perceived satisfaction of the entrepreneur/ chief executive with some financial targets in that same market ( $p<0.01$ ). Thus, financial resources could be considered as a pure moderator since main effects found in the analysis are not significant but the interaction terms are indeed significant (Sharma et al, 1981).

Moreover, model 4 similarly to model 3 indicates that marketing resources ( $p < 0.001$ ) and firm international orientation ( $p < 0.01$ ) are positively associated with performance in the main foreign market. In addition, performance is negatively associated with entrepreneur/ chief executive international experience ( $p < 0.01$ ). Thus, marketing resources, firm international orientation, and entrepreneur/ chief executive international experience could be considered as predictor variables not as moderators since they are characterised by their significant main effects and non-significant interaction terms (Sharma et al, 1981).

In similar vein, as for performance measured by international intensity (see section 7.8.1) due to the fact that the correlation between the interaction terms, respectively, *marketing resources \* contractual cooperation and firm international orientation \* contractual cooperation* was 0.55 ( $p < .01$ ) and *marketing resources \* contractual cooperation and chief executive international experience \* contractual cooperation* was 0.52 ( $p < .01$ ) tests similar to those reported above were conducted while running the full model (model 4) with the interaction terms entered separately step by step in the regressed equation. Results of these tests were practically identical to those presented in Table 7.23.

Overall, Table 7.23 suggests that marketing resources, firm international orientation, and entrepreneur/ chief executive international experience are significant independent predictors of international performance. In fact, they explain about 10% of the variance on satisfaction of the entrepreneur/ chief executive with financial performance, while the interaction term *contractual cooperation\*financial resources* explains the remaining 6% of the variance on satisfaction with financial performance in the main foreign market.

Overall these results provide support for the null hypotheses,  $H_{015}$  to  $H_{021}$ , presented in chapter 5, since there is no association between different resources of high technology SMEs and contractual cooperation in the main foreign market with performance ( the perceived financial satisfaction of the entrepreneur/CEO) in that same market.

However, results do not provide support for H<sub>017</sub> once there is an association between financial resources of high technology SMEs and contractual cooperation in the main foreign market with financial performance in that same market.

Table 7. 24 summarises the above empirical results:

Table 7. 24: Hypotheses relating the relationship between the use of a contractual mode and performance, in the main foreign market, while considering the resources of the high technology SME, as moderator influences in that relationship.

**Hypotheses H<sub>022</sub> - H<sub>028</sub>**

**That no relationship exists in respect to:**

Hyp.	Description	Result
<b>H<sub>022</sub></b>	The use of a contractual mode, in the main foreign market coupled with <i>marketing resources</i> , in relation to performance in that same market.	Supported
<b>H<sub>023</sub></b>	The use of a contractual mode, in the main foreign market coupled with with <i>technological resources</i> , in relation to performance in that same market.	Supported
<b>H<sub>024</sub></b>	The use of a contractual mode, in the main foreign market coupled with with <i>financial resources</i> , in relation to performance in that same market.	Not Supported
<b>H<sub>025</sub></b>	The use of a contractual mode, in the main foreign market coupled with with <i>international orientation</i> , in relation to performance in that same market.	Supported
<b>H<sub>026</sub></b>	The use of a contractual mode, in the main foreign market coupled with with <i>entrepreneurial orientation</i> , in relation to performance in that same market.	Supported
<b>H<sub>027</sub></b>	The use of a contractual mode, in the main foreign market coupled with <i>the entrepreneur/chief executive human capital</i> , in relation to performance in that same market.	Supported
<b>H<sub>028</sub></b>	The use of a contractual mode, in the main foreign market coupled with the <i>entrepreneur/chief executive international experience</i> , in relation to performance in that same market.	Supported

In the same vein as performance measured by international intensity (see section 7.8.1) in chapter 8 this study will discuss in depth both the relationship between contractual cooperation and performance, in the main foreign market, while considering the

resources of the high technology SME, which are significant moderator influences in that relationship.

## **7.9 Summary of Main Findings**

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### **Research Aim 1: To Examine Marketing, Technological, Financial and International Orientation as Key Resources, at Firm Level, of High Technology SMEs in Foreign Markets**

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1. Portuguese high- technology SMEs are not generally market oriented organisations irrespective of their performance in foreign markets (e.g. measured by their international intensity). Roughly 80% among the firms in this sample (see Appendix 7.9) score below the scale central value in terms of marketing resources relative to their direct competitors in foreign markets.
2. Portuguese high technology SMEs are characterised by shortages of financial resources. Roughly 55% among the firms in this sample (see Appendix 7.9) scores below the scale central value in terms of the availability and current endowment of capital.
3. High technology SMEs in this sample are characterised by an R&D intensity as measured in percentage of sales has a mean value of 14% and has a percentage of the work force has a mean value of 19%. These indicators show that Portuguese high technology SMEs are both more and less research intensive reported in previous studies.
4. Firms among the mould industry sample frame are not particularly research intensive (R&D expenditures in % of turnover is only 4%).
5. The innovativeness of the technology, among the firms in this sample, ranks below the scale central value. This conclusion is in line with previous research about

Portuguese small high technology firms which points out that these firms are not oriented to the introduction of radical new technologies rather on the adaptation and improvements of technologies developed by international firms.

6. Portuguese high technology SMEs in this sample are characterised by development or adaptation in-house for the products/services delivered mainly to the domestic market. In fact, the sample exhibits a slightly above average (the scale central value) for this issue.
  
7. Various indicators of firm “*International Orientation*” construct such as “international experience”, “knowledge about foreign markets” and “commitment to international markets” all of them rank slightly above the respective scale central value. The highest score, among the firms in this sample, is “*commitment to international markets*”. This fact may represent both the commitment of assets but also firm’s attitudes and behaviour to pursue foreign market opportunities.

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**Research Aim 2: To Examine Human Capital and International Experience of the Chief Executive/Management Team as Key Resources, at Individual Level, of High Technology SMEs in Foreign Markets.**

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1. Results suggest that chief executives/ management teams international experience among the firms in this sample is quite limited since the mean scores for all the indicators of this construct with the exception of the item “*links with international social networks*” fell below the scale central value. In fact only this latter item ranks slightly above the scale central value.
  
2. Roughly 80% of chief executives/ management teams among the firms in this sample score below the scale central value for “living or working abroad” (see Appendix 7.9). Thus, the great majority of Portuguese chief executives of high-technology SMEs, have very limited international social experience since they have been living and working most of their lives in Portugal.



3. Chief executives of Portuguese high technology SMEs, among the firms in this sample have, on average, 20 years of working experience and 18 years of experience within the industry where their firms conduct business activities while firm's age is on average 13 years (see Appendix 7.3). These results suggest that entrepreneurs/chief executives of Portuguese high technology SMEs often have extensive working and specific industry experience even before founding or joining the firm that they currently run.

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**Research Aim 3: To Examine Entrepreneurial Orientation, a Knowledge-Based Resource, both at Firm and Individual Levels, of High Technology SMEs in Foreign Markets.**

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1. The population of Portuguese high technology SMEs exhibits a slightly above average "*innovativeness*". In fact, all the indicators for this construct fell above the scale central value. Business activities of the majority of high technology SMEs may be characterised by the introduction, in recent years, in their product portfolio, of a very large number of new product lines. Furthermore, those changes in product lines might have been quite dramatic.
2. The population of Portuguese high technology SMEs displays a slightly above average (the scale central value) "strong proclivity to high risk projects with chances of very high returns". These results may suggest that high technology SMEs compete in industry sectors characterised by high financial and technological risks. Thus, they must generate higher returns for shareholders/venture capitalists or entrepreneurs due to the risks they face.
3. Results show a slightly below average (the scale central value) propensity for "bold wide-ranging acts" as "common practice". These results may reveal that since high technology SMEs operate in very unpredictable and dynamic international market environments, it is best to explore them gradually via timid, incremental behaviour, through small incremental steps, mainly in aspects related to internationalisation.

4. The population of Portuguese high technology SMEs exhibits a slightly above average “proactiveness”. This finding may suggest that for high technology SMEs the introduction of new products, systems and services ahead of the competition is quite important in order to differentiate from them while increasing firm’s long term growth and profitability.

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**Research Aim 4: To assess the impact that the resources identified in Research Aims 1 to 3 have on the international performance, measured by the international intensity of the high technology SME.**

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1. Results show that the observed correlation between firm size and international intensity is very low and negative (-0.13) even though from theory a positive correlation would be expected between the two variables, suggesting larger companies having higher international intensity.
2. Results suggest that for the population of Portuguese high technology SMEs technological resources ( $p < 0.05$ ), firm international orientation ( $p < 0.05$ ) and entrepreneur/chief executive human capital ( $p < 0.01$ ) are strong predictors of international intensity giving support for hypotheses H<sub>2</sub>, H<sub>4</sub> and H<sub>6</sub>.
3. Results suggest that for the population of Portuguese high technology SMEs marketing resources, financial resources, entrepreneurial orientation and entrepreneur/management team international experience are not strong predictors of international intensity giving no support for hypotheses H<sub>1</sub>, H<sub>3</sub>, H<sub>5</sub> and H<sub>7</sub>.

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**Research Aim 5: To Examine the Influence that Resources of High Technology SMEs, have on the Type of Entry Mode in the Main Foreign Market.**

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1. Results indicate that for the population of Portuguese high technology SMEs its resources/capability base did not affect the use of contractual cooperation in the main foreign market giving support for the null hypotheses H<sub>08</sub> to H<sub>014</sub>.

2. Results show that the only significant predictor of contractual cooperation in the main foreign market is the control variable firm size. This finding however consistent with previous research (Shrader, 2001) is not in line with the general literature on small firms, which suggests that in order to overcome different shortages of resources small firms may develop cooperative linkages with partners in order to pursue their growth strategies namely in foreign markets (Jones, 1998, 1999).

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**Research Aim 6: To Examine the Relationship between the use of Contractual Cooperation and Performance, in the Main Foreign Market, while considering the Resources identified in Research Aims 1 to 3, as Moderator Influences in that Relationship.**

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As stated in chapter 5 this study uses both objective and subjective measures of international performance. For objective measures international intensity in the main foreign market was used. On the other hand, as a subjective measure of international performance degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market was proposed.

In this context, using international intensity in the main foreign market as a measure of international performance main conclusions are as follows:

1. Results suggest, in the same vein as for research aim 4, that for the population of Portuguese high technology SMEs technological resources ( $p < 0.05$ ), firm international orientation ( $p < 0.05$ ) and entrepreneur/ chief executive human capital ( $p < 0.05$ ) are positively associated with international intensity in the main foreign market. Thus, these resources could be considered as predictor variables not as moderators since they are characterised by their significant main effects and insignificant interaction terms (Sharma et al, 1981). Furthermore, results provide support for the null hypotheses,  $H_016$  to  $H_020$ , since there is no association between those resources and cooperation in the main foreign market with performance.
2. Results show that for the population of Portuguese high technology SMEs the interactions, between contractual cooperation in the main foreign market and

respectively with marketing resources and entrepreneur international experience are also significant. Thus, marketing resources and entrepreneur international experience could be considered as pure moderators since the main effects are not significant, but the corresponding interaction terms are, indeed significant (Sharma et al, 1981). Moreover, results provide support to reject the null hypotheses of H<sub>0</sub>15 and H<sub>0</sub>21, since there is association, respectively, between marketing resources ( $p < 0.05$ ) and entrepreneur international experience ( $p < 0.05$ ) of high technology SMEs and contractual cooperation in the main foreign market with performance (the international intensity) in that same market.

Using degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market as a measure of international performance main conclusions are as follows:

1. Results suggest that for the population of Portuguese high technology SMEs the degree of satisfaction of the entrepreneur/chief executive is positively associated with marketing resources and firm international orientation, and negatively associated with entrepreneur / chief executive international experience. Thus, these resources could be considered as predictor variables not as moderators since they are characterised by their significant main effects and insignificant interaction terms (Sharma et al, 1981). Furthermore, results provide support for the null hypotheses, H<sub>0</sub>15 to H<sub>0</sub>21, since there is no association between those resources and contractual cooperation in the main foreign market with performance, measured by the degree of satisfaction of the entrepreneur/chief executive with some financial targets in that same market.
2. Results show that for the population of Portuguese high technology SMEs the interaction, between contractual cooperation in the main foreign market and financial resources is also significant. Thus, financial resources could be considered a pure moderator since the main effects are not significant, but the corresponding interaction term is, indeed significant (Sharma et al, 1981). Moreover, results provide support to reject the null hypotheses H<sub>0</sub>17, since there is association

between financial resources ( $p < 0.01$ ) of high technology SMEs and contractual cooperation in the main foreign market with performance in that same market.

In the next chapter (chapter 8) this study will discuss in depth both the relationship between contractual cooperation and performance, in the main foreign market, while considering the resources of the high technology SME, which are significant moderator influences in that relationship.

## **Chapter 8: Conclusions - Study Findings Synthesis and Discussion**

### **8.1 Introduction**

As presented in chapter 2 high technology SMEs can play an important role to a country's economic growth and development contributing to a substantial share of current qualified employment. In addition they are well suited in introducing both product and process innovations achieving global leading positions in international market niches. In fact, often geographical diversification has become part of their strategies practically since their foundation (McDougall, Shane and Oviatt, 1994). Domestic markets may be not broad enough and sometimes are almost inexistent to support their needs in R&D, marketing, finance and distribution of these niche players. Therefore, high technology SMEs try to develop international activities at the earliest stages of the organisation.

In this context, this study has identified and examined the resources, specific to high technology SMEs, which may give to firms, which possess higher endowments of those resources, performance superiority vis-à-vis their competitors in foreign markets. Currently, this study, in chapter 3, based on Miller and Shamsie (1996) typology of resources, on the literature of high technology firms combined with preliminary interviews with Portuguese entrepreneurs/chief executives of high technology SMEs experts and academics suggested the critical importance, at firm level, of the following resources as potential sources of competitive advantage and it is also suggested that these are likely to potentially influence firm's international performance; they are marketing, technological and financial resources, entrepreneurial orientation, and international orientation. Moreover, this study identified, respectively, in chapters 2 and 4 that for small high technology firms the entrepreneur/management team, at individual level, plays a critical role in firm's strategy. Thus, the human capital and international experience, respectively, of the entrepreneur/CEO and the entrepreneur/management team were also put forward.

Overall it is assumed that other things being equal, high technology SMEs with higher endowments of those resources may have higher international performance.

International performance in this study was measured by firm's international intensity that is the percentage of international sales to total sales.

In sum, a superior endowment of those resources by the high technology SME will lead to a higher international intensity in relation to competitors which do not possess such resources. Moreover, as presented in chapter 4, the RBV suggests that differences are likely to exist between high technology SMEs, at firm and management levels and these differences may lead to a significant variation in their international intensity even though for the vast majority of high technology SMEs internationalisation has become a necessity for survival and growth rather than a mere strategic option.

Nonetheless, high technology SMEs are characterised by resource shortages and often they may lack the resources to be successful in foreign markets. Thus for firms, which have access to appropriate resources or which develop adequate capabilities it is assumed that they will have a higher degree of international intensity vis-à-vis their competitors in foreign markets.

In short, this study examined how the internal resource-base of high technology SMEs affects the extent of their international business activities and ultimately their international performance.

In short, this chapter will synthesise and discuss the study main findings throughout all the investigated research aims put forward in chapter 1.

## **8.2 Synthesis of these Study Main Findings**

In chapter 1 of this thesis six research aims were put forward. These research aims, after reviewing the relevant literature about the topic and conducting exploratory interviews with Portuguese entrepreneurs/chief executives of high technology SMEs as well as with prospective experts and academics, were further explored and analysed. All these issues were tackled through a mail survey, in order to statistically test the hypotheses

pertaining to Research Aims 4, 5 and 6 and draw inferences for the Portuguese populations of high technology SMEs (ICT and moulds). The following subsections present a synthesis and discussion of the key findings for each research aim.

### **8.2.1 Research Aim 1**

The goal of research aim1 was to identify and assess resources, at the firm level, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets.

As indicated in section 8.1 this study identified the importance, at the firm level, of marketing, technological and financial resources and firm international orientation. With the exception of financial resources, all these resources may represent, for high technology SMEs, sources of competitive advantage since they are valuable, scarce, imperfectly imitable and imperfectly tradable. Nonetheless, financial resources can be used to create, acquire or develop over time other types of assets and capabilities.

#### **8.2.1.1 Marketing Resources**

Marketing resources reflect how the high technology SME targets customers in foreign markets and positions/differentiates itself in relation to its international competitors. At the operating level marketing resources consist of firms' effective international performance on distribution, promotion and market research activities. By contrast, high technology SMEs very often do not rely on price as a competitive tool since they are characterised by strategies focusing on differentiation from competitors by targeting narrow international markets even though they may use price for the establishment and further broadening of a customer base; mainly in foreign markets (Cavusgil and Zou, 1994).

The study identified in the exploratory interviews (see chapter 6 sections 6.4.2 and 6.4.3) the importance for the high technology SME of having a highly skilled sales force, promotion expenditures, market research activities, access to international



distribution channels or external links to social or business networks. More specifically, as also presented in chapter 6 promotion expenditures include those made in advertising over the media or the Internet, promotional activities, direct marketing, public relations, participation in workshops, exhibitions, symposiums, conferences, and other international meetings. In addition, the participation in these events is some of the most common methods used by European SMEs for the development of the competence-base of their human resources (E.N.S.R., 2003).

Empirical findings (see Appendix 7.9) showed that just over 80% among the firms in this sample for all indicators of marketing resources score below the scale central value relative to their direct competitors in foreign markets. In fact, irrespective of being distribution, promotion or market research activities Portuguese high technology SMEs in this sample rank low in comparison to their direct competitors (see Appendix 7.2). These issues have also been depicted in the exploratory interviews with both chief executives of high technology SMEs and prospective experts and academics (see chapter 6 sections 6.4.2 and 6.4.3). Moreover, the E.N.S.R. (2003) report indicates that the group of Southern European countries, including Portugal exhibits the lowest involvement, within the E.U., in competence development activities such as the participation in workshops, exhibitions, symposiums and conferences.

In sum, Portuguese high technology SMEs are not generally market oriented organisations irrespective of their performance in foreign markets (measured by international intensity).

Nonetheless, overall the exploratory interviews and the extant literature acknowledge the importance of the development and accumulation of marketing resources because marketing is mainly about how the firm identifies and addresses consumers' needs and interacts with potential customers in domestic or foreign markets. In this context, the objective of marketing resources is to achieve for the firm growth and profitability through the skilful distribution and promotion of superior products and services. In addition, consumers' needs evolve overtime due to changing market conditions. Thus, marketing resources will lead the high technology SME to develop its technology base

in order to create new products, improving existing ones in order to address customers' needs irrespective of being in domestic or foreign markets.

In sum, the relevant literature emphasises the importance of a superior marketing strategy as one of the most important requirements for success (Knight, 2000).

#### **8.2.1.2 Technological Resources**

Technological resources refer to efforts of the high technology SME to develop technologies and innovation mainly through R&D activities and/or cooperation with partners to achieve firm objectives. This is done by the delivery, in specific foreign target markets, of innovative and highly differentiated products/services superior to those of competitors, while meeting or exceeding customers' expectations.

In this context, technological resources in this study were assessed as follows: firstly by the R&D intensity measured respectively by the percentage of R&D expenditures to turnover and by the percentage of R&D full-time employees to total employees. Secondly, by the innovativeness of the technology integrated in firms' products/services delivered in foreign markets and thirdly if the products/services marketed in those markets are largely developed or not in-house.

Empirical results, see chapter 7 section 7.3.2, revealed that R&D intensity as measured in percentage of sales has a mean value of 14% and as a percentage of the work force has a mean value of 19%. These values are below other studies recently set out (Brock, 2000).

With regards to the innovativeness of the technology incorporated in firms' products/services delivered in foreign markets and not yet implemented on the market it ranks below the scale central value (see Appendix 7.2). This conclusion is in line with previous research about Portuguese small high technology firms which points out that these firms are not oriented to the introduction of radical new technologies rather on the

adaptation and improvements of technologies developed by international firms (Laranja and Fontes, 1998). On the other hand, with regards to the products/services delivered in those markets they can be largely developed or not in-house; it ranks clearly above the scale central value (see Appendix 7.2). This result suggest that the products/services marketed, in this sample of high technology SMEs, are developed mainly within the firm may be according to the needs of the home market and later adapted to the specific needs of foreign target markets (Laranja and Fontes, 1998).

Overall, innovation arisen within the developed technology by the high technology SME is a key element for obtaining competitive advantage in very dynamic and unpredictable market environments (Knight, 2000).

In addition, technological resources may enable the high technology SME to increase its competitiveness to market new or adapted products/services faster than competitors according to the specific needs of the foreign target markets.

Nonetheless, entrepreneurs/chief executives of Portuguese small high technology firms have revealed greater resources to address technological issues rather than marketing aspects, especially those concerned to geographical diversification (Fontes and Combs, 1997).

### **8.2.1.3 Financial Resources**

The possession of an adequate amount of financial resources may be considered a prerequisite for the high technology SME to internationalise. As already stressed in chapter 3 financial resources can be exchanged by other types of resources offering the most flexibility for firms to redeploying them (Chatterjee, 1990). In addition, they are clearly the easiest type of resources to transfer to foreign markets (Elango, 2000).

The empirical investigation in this study, in terms of financial resources, suggests that the availability of financial resources for firm's development as well the current endowment of capital, shown in Appendix 7.9, indicate that only roughly 23% among the firms in this sample score above the scale central value. As pointed out in chapter 7,

section 7.3.3, this finding confirms previous qualitative studies, which emphasise the lack of financial resources as a strong barrier for the internationalisation of Portuguese high technology firms (Fontes and Combs, 1997).

Nevertheless, the management literature acknowledges the fact that firms with higher endowments of financial resources could expand more quickly and to more geographical areas (Elango, 2000). In doing so high technology SMEs may invest a high proportion of their available financial capital in product and market development (Lee et al, 2001). In fact, the increasing market globalisation drives forward high technology firms to develop products/services to suit global markets often through massive financial investments in R&D while increasing the technological base of the firm. In fact, high technology ventures with sufficient financial capital can afford to hire very skillful personnel in key areas such as in R&D, Marketing, International Sales, which may be critical to firm's future development.

#### **8.2.1.4 Firm International orientation**

International orientation, in this study, is related to firm efforts to expand business activities into foreign markets. Internationalisation may allow the high technology SME to have access to new and potentially more profitable markets, new product ideas, innovation in products/processes, brand new technologies while increasing its overall competitiveness (Cavusgil and Zou, 1994).

The study's findings show that the sample of Portuguese high technology SMEs exhibits a slightly above average (the scale central value) "*international orientation*" (see Appendix 7.2). In fact, all the indicators for this construct fell above the scale central value. The highest score is "commitment" to foreign markets, which may represent not just the commitment of assets but also firm's current attitudes and behaviour to pursue foreign market opportunities regardless the resources controlled or owned by the small high technological firm (Fontes and Combs, 1997).

Overall the study's findings suggest that the majority of Portuguese high technology SMEs are characterised, to some extent, by high "experience", "knowledge", and "commitment" to international markets (see Appendix 7.9) even though they do not conduct market research activities on a regular basis (e.g. the analysis in foreign markets of target customers, competitors and potential partners) as assessed on the marketing resources construct (see Appendixes 7.2 and 7.9).

Overall it is reasonable to expect that as firms operate internationally they accumulate experience and knowledge about international operations. Therefore, they change the routines previously used in the domestic market for new routines that is new resources in order to detect the opportunities and to minimise the threats of establishing foreign market operations (Ericksson et al, 1997). In this context, increasing experiential knowledge by the high technology SME about overseas activities may trigger its resource commitment in a form of human, financial and other resources (Johanson and Vahlne, 1977). In this situation the high technology SME is better able to deal with target customers, intermediaries, suppliers, potential partners or even governmental entities in the host country.

### **8.2.2 Research Aim 2**

The goal of Research Aim 2 was to identify and assess resources, at the individual level, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets.

In Chapters 2 and 4 and in the exploratory interviews with Portuguese entrepreneurs/chief executives of high technology SMEs (see section 6.4.2) this study identified the importance, at individual/management team level, of human capital of the entrepreneur/ chief executive as well as his/her or the management team international experience.

### **8.2.2.1 Human Capital of the Entrepreneur/ Chief Executive**

The entrepreneur/ chief executive is the cornerstone in small business internationalisation (Miesenbock, 1988). In fact, the skills and competencies of the entrepreneur/ chief executive that is his/her human capital are generally acknowledged as key factors for business survival and future growth irrespective of being in domestic or foreign markets (Storey, 1994). Previous research acknowledges that those skills, competencies and problem-solving abilities are presumably related to the level of education, working and industry experiences of the entrepreneur (Cooper et al, 1994).

In this context, with regards to the level of education results, presented in chapter 7, section 7.4.2 show that significant differences exist, between entrepreneurs/chief executives of ICT and mould firms. In fact, in 91% of the ICT firms the CEO has a university degree while for the mould firms this figure only reaches 35%. This fact comes without surprise to the researcher since the backgrounds from most entrepreneurs of the ICT firms are from universities or research institutes while for the mould industry the vast majority were former workers of the glass industry, which collapsed in Marina Grande area in the late seventies. In this situation, entrepreneurs of the mould industry have launched since the early eighties new ventures as they assessed, at that time, moulds for the plastic industry as a business opportunity, mainly for foreign markets since the domestic market was and still it is almost inexistent.

In addition, empirical results gave clear that just over 80% of the CEOs, for both ICT and moulds, revealed that had never owned a business or held a senior executive position, in international/multinational firms prior to founding/joining the firms where they currently work. In the same vein, just over 70% of the CEOs for both ICT and moulds indicated that their parents had never owned a business.

These findings are, to some extent, disappointing since the literature acknowledges the importance for entrepreneurs/managers of management know-how accumulated from previous business ventures, from holding managerial positions in

international/multinational firms as well as from their parental backgrounds who owned a business or having a self-employment experience (Westhead et al, 2001).

In fact, this management know how accumulated from previous experiences may enable the entrepreneur to deal with different issues and problems on his/her current activities. Thus, all those skills and resources may increase the problem-solving ability of the firm through the development and implementation of adequate business strategies and the use of better management methods suitable to the market environments and the industry where his/her firm currently competes (Westhead et al, 2001).

In this context, the systematic and continuous scanning and assessment of the international environment can affect firm performance through the timely identification of opportunities in foreign markets (Westhead et al, 2001).

With regards to the working and industry experiences, empirical results show that chief executives of Portuguese high technology SMEs, both for ICT and mould firms, in this sample, have extensive working and industry experiences often even before founding or joining the firm that they currently run. Furthermore, as stressed in chapter 7, section 7.4.2, sometimes their working and industry experiences are higher than their respective firm's age. This is a very important issue since, for example, industry specific know how can affect firm's performance through a deep understanding of the key success factors in an industry sector, knowledge about products, processes and technologies as well as the access to international social and business networks, which characterises the background of the entrepreneur/ chief executive. Thus, entrepreneurs might be able to capitalise on those networks for starting and further developing firm foreign market activities (Westhead, 1995).

In addition, it is reasonable to expect that entrepreneurs with previous experience in the same industry as their current firm provide the venture with detailed knowledge about the market conditions, products, systems, processes and technologies. For example, Chandler (1996) found that industry-specific experience contributed to entrepreneurs to establish a customer base locally, nationally and internationally often in narrow market niches. Moreover, entrepreneurs with industry specific experience might have the skills

to identify resources and opportunities in foreign markets to ensure the survival and growth over time of their ventures (Westhead et al, 2001).

### **8.2.2.2 Entrepreneur/ Management Team International Experience**

International experience of the entrepreneur/management team is viewed as a characteristic of the entrepreneur or management team of the high technology SME rather than a characteristic of the firm itself (Reuber and Fischer, 1997). Therefore, the conceptualisation and operationalisation of this construct is different from “firm international orientation” construct, presented in section 8.1 (Johanson and Vahlne, 1977, 1990).

International experience of the entrepreneur/ management team results indicate that just over 80% of the entrepreneurs/ management teams among the firms in this sample score below the scale central value for “living or working abroad”. Thus, the great majority of Portuguese entrepreneurs of high- technology SMEs, in this study at least have limited international social experience since they have been living and working most of their lives in Portugal. Nevertheless most of them acknowledge the importance of their personal contacts with “international social networks” may be for accessing technologies developed by international firms. (Fontes and Combs, 1997; Laranja and Fontes, 1998).

### **8.2.3 Research Aim 3**

To identify and assess resources, both at firm and individual levels, which may give to the high technology SME resource superiority vis-à-vis their competitors in foreign markets, was the main goal of Research Aim 3.

This study identified, in chapter 3, entrepreneurial orientation (EO) as a key resource of a high technology SME and characterised it as a process by which a firm led by an entrepreneur or chief executive detects an opportunity and pursues it regardless of the



resources that the firm currently controls (Timmons, 1994). In addition to opportunity seeking, EO is also characterised by innovativeness, risk taking and proactive attitudes and decisions from an entrepreneur/chief executive within an organisation possessing a particular corporate culture (Dess, Lumpkin and Covin, 1997).

In this context, the sample of Portuguese high technology SMEs, in this study, exhibits a relatively high level of “*innovativeness*” since the means of all the variables score slightly above the scale central value (see Appendix 7.3). These results are expected since high technology SMEs compete in markets characterised by short and shorter life cycles where technologies fast become obsolete in industry sectors characterised by dramatic structural changes.

Empirical results for “*risk-taking I*” may suggest that the majority of firms in this sample show “*a strong proclivity to high risk projects with chances of very high returns*”. Since high technology SMEs are seen as risky they must pay a premium for cash or other credit lines obtained from banks, venture capitalists or other investors. Thus, they must generate higher returns for investors/venture capitalists or entrepreneurs due to the risks they face. In contrast, results for the other variable (“*risk-taking II*”) may suggest that since high technology SMEs operate in very unpredictable and dynamic international market environments “*it is best to explore them gradually via timid, incremental behaviour, through small incremental steps*” mainly in aspects related to geographical diversification. Therefore, high technology SMEs may face uncertainty in foreign markets, but risks should stay at a manageable level. Moreover, they are characterised by resource constraints and can not afford to make potential mistakes over the decision making process, which may cause irreparable damages to their survival and future prospects.

Finally, the proactive dimension of EO scores above the scale central value. This finding may suggest that it is quite important for high technology SMEs the introduction of new products, systems and services ahead of the competition in order to increase firm’s survival in short term, but also long term growth and profitability.

Overall, firms with an entrepreneurial orientation become involved in product/processes and/or market innovations, taking on their own high risky ventures with a high sense of proactive behaviour relative to their competitors.

Nonetheless, EO is only relevant if it reflects decisions and actions taken by the firm that is if entrepreneurial orientation leads to entrepreneurial behaviour. Entrepreneurial behaviour refers to an operationalisation of behaviour by new ways of combining resources, which have impact on firm performance. For example, Lumpkin and Dess (1996) suggest “*new entry*” as the fundamental of entrepreneurial behaviour. This involves entering a new market, the development of a new product/service or the launching of a new venture. More specifically, the focus of this study is on examining the influence of the resource-base of the firm on the use or non-use of cooperation in the foreign market service mode, in the main foreign market, and what its impact is on international performance. Thus, internationalisation is part of the EO of the high technology SME.

Overall, several empirical studies point out that a strong entrepreneurial orientation is particularly important for firms active in very complex, turbulent and unpredictable market environments (Lee et al, 2001; Dess, Lumpkin and Covin, 1997; Lumpkin and Dess, 1996; Covin and Slevin, 1989). This is the situation currently faced by high technology SMEs. Thus, it is expected that those firms with a high entrepreneurial posture that is with high sense of innovativeness, risk taking and proactiveness will perform better relative to their direct counterparts, which lack such an orientation (Knight, 2000).

In sum, high technology SMEs with a strong entrepreneurial orientation may be more endowed to leverage their strategies for entering new geographical areas and dealing with complex and very dynamic market environments (Knight, 2000).

In the next section research aim 4 will assess, between other resources, the impact of entrepreneurial orientation on international performance, measured by the international intensity of the high technology SME. Previous empirical studies suggest a significant

and positive association between EO and performance (Lee et al, 2001; Wicklund, 1999), mainly when conducting a longitudinal assessment (Wicklund, 1999).

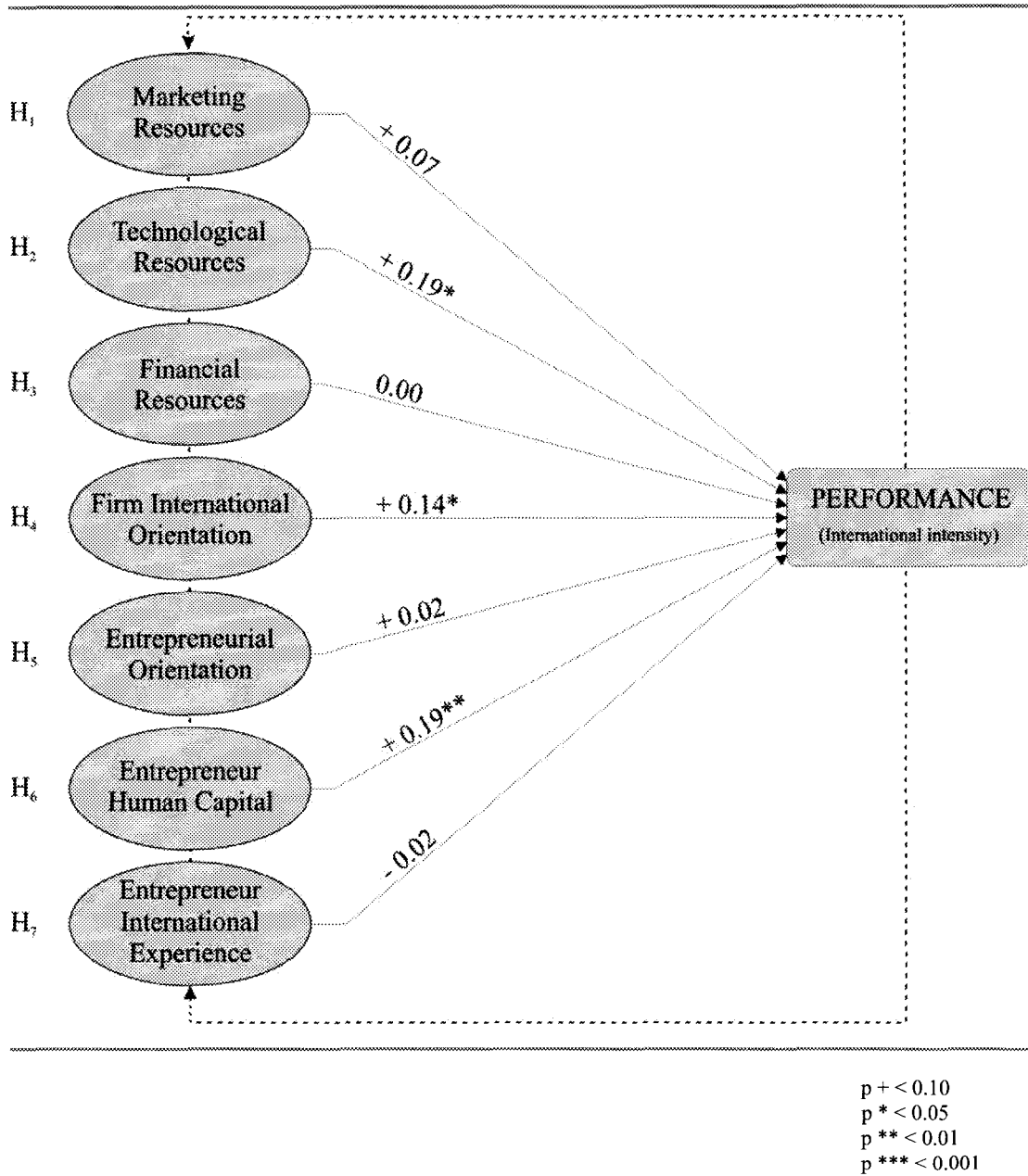
#### **8.2.4 Research Aim 4**

The goal of research aim 4 was to assess and examine the impact that the resources, identified in Research Aims 1 to 3, that are marketing, technological and financial resources, firm international orientation, entrepreneur/chief executive human capital, entrepreneur/chief executive/management team international experience and entrepreneurial orientation have on the international performance of the high technology SME, measured by its international intensity. In this context, the corresponding established hypotheses, relating resources and international intensity, will be discussed.

In fact, those resources, may give to high technology SMEs possessing them, higher international intensity vis-à-vis, their competitors in foreign markets, which may be less endowed of such resources.

Figure 8.1 presents the multiple regression model with standardised regression coefficients and significance levels:

Figure 8. 1: The impact or resources of the high technology SME on international intensity.



Multiple regression model with standardised regression coefficients and significance levels

Source: The Author

As presented in chapter 4, the RBV suggests that it is likely that differences between high technology SMEs, at firm and management levels, exist and that these differences may lead to significant variation among high technology SMEs in their international intensity.

However, the literature on high technology SMEs acknowledges the fact that they are characterised by resource shortages and often lacking the resources to be successful in foreign markets. Thus, firms which have access to appropriate resources or which develop adequate capabilities will have a higher degree of international intensity vis-à-vis their international competitors.

Nonetheless, the active presence of SMEs in foreign business activities suggests that they have at least a critical mass in terms of the resources that they possess in order to overcome potential size disadvantages in supporting their foreign market activities. In this context, quite an interesting finding of this study, shown in chapter 7, section 7.6, Table 7.12 and Appendix 7.8, is the observed correlation between firm size and international intensity, which is very low and negative. In fact, larger firms in this sample are not characterised by higher international intensity.

Overall it is assumed that, other things being equal, high technology SMEs with higher endowments of the resources, put forward in Research Aims 1 to 3, will have higher international intensity.

The results of the stated hypotheses relating the impact of resources of high technology SMEs on international intensity, conducted in chapter 7, section 7.6, are summarised in Table 8.1:

Table 8. 1: Hypotheses relating the impact that resources of the high technology SME, have on the international performance, measured by its international intensity.

Hyp.	Independent Variables	Predicted Relationship	Result
H <sub>1</sub>	The greater the endowment of <i>marketing resources</i> of the high technology SME the higher its international intensity.	Positive	Not supported
H <sub>2</sub>	The greater the endowment of <i>technological resources</i> of the high technology SME the higher its international intensity.	Positive	Supported
H <sub>3</sub>	The greater the endowment of <i>financial resources</i> of the high technology SME the higher its international intensity.	Positive	Not supported
H <sub>4</sub>	The greater the <i>international orientation</i> of the high technology SME the higher its international intensity.	Positive	Supported
H <sub>5</sub>	The greater the <i>entrepreneurial orientation</i> of the high technology SME the higher its international intensity.	Positive	Not supported
H <sub>6</sub>	The greater the <i>human capital of the entrepreneur/chief executive</i> of the high technology SME the higher its international intensity.	Positive	Supported
H <sub>7</sub>	The greater the <i>international experience of the entrepreneur/chief executive</i> of the high technology SME the higher its international intensity.	Positive	Not supported

All firms in this study have some degree of international presence; but their international activities are relatively limited in terms of geographical scope. In fact, exploratory interviews and the mail survey, presented, respectively, in chapter 6, section 6.4.2 and 6.4.3, and chapter 7, indicate that some high technology SMEs have only significant business activities in only 1 or 2 geographical close countries or with short cultural distance where they get their overall international income. Nevertheless, some of the firms internationalise in an opportunistic way since they look for foreign market opportunities irrespective of both the resources they own and the potential high risks they often take in very distant and unknown market environments.

In fact, firms in this study do not spread out their international activities into multiple countries, simultaneously. This finding is consistent with previous research (Preece et al, 1998) however beyond the scope of this thesis. In fact, operating globally is likely to represent complex challenges for SMEs, which are very difficult to manage. In this context, high technology SMEs may internationalise in a very short period. However, to reach global diversity they need to develop their resource and capability-bases over a longer period of time.

As shown in chapter 7, section 7.6, (Table 7.15) the model has a good fit with an adjusted  $R^2$  of 0.70 suggesting that the variables in this study model explain, to a great extent, the high technology SME international intensity. In fact, *technological resources, firm international orientation and entrepreneur/chief executive human capital* explain over seventy percent in international intensity among the firms in this sample. This latter variable refers to the degree to which firms conduct business activities in foreign markets. Although firms may have cross-border business activities using different entry modes, the focus of this research aim is on the level of international involvement (international intensity), regardless of the type of foreign market service mode currently used. Thus, internationalisation is related with the scope of foreign markets expansion, which could be conducted using different types of foreign market entry modes, in one or several value chain activities (Jones, 1998, 1999). Nevertheless, in line with previous research (Burgel and Murray, 2000; Lindqvist, 1991; Bell, 1995) in chapter 7, sections 7.2.3.1 and 7.2.3.2, in Tables 7.3 and 7.6, revealed that direct exports to end customers or via agents/distributors were the most common type of entry modes used by firms in this study.

Overall, results shown in, chapter 7, section 7.6, Table 7.15, indicated that *technological resources* ( $p < 0.05$ ), *entrepreneur/chief executive human capital* ( $p < 0.01$ ) and *firm international orientation* ( $p < 0.05$ ) are significant and strong predictors of international intensity giving support to hypotheses H2, H4, and H6 (see Table 8.1), while *marketing resources, financial resources, entrepreneurial orientation and entrepreneur/management team international experience* are not, giving no support to H1, H3, H5 and H7 (see Table 8.1).

In the next subsections 8.2.4.1 to 8.2.4.4 this study discusses both resources, for Portuguese high technology SMEs, which are significant predictors of international intensity as well as those which are not.

#### **8.2.4.1 Discussion on Resources, which are Significant Predictors of International Intensity.**

##### **8.2.4.1.1 Technological Resources (H<sub>2</sub>)**

As presented in section 8.2.4 and consistent with previous research (Shrader, 2001) this study reveals that *technological resources* ( $p < 0.05$ ) have a significant and positive relationship with international intensity for the firms in this sample, giving support to hypothesis 2.

Currently, no generally accepted approach to the measurement of technological resources exists or has been developed. In fact, previous studies generally assess firm's capability-base by objective measures such as R&D expenditures or by the number of registered patents (Shrader, 2001; Lee et al, 2001). Despite the fact that those studies do not follow unified criteria on how to measure firm technological aspects, all of them agree on the key role, to high technology firms, of technological resources, which are reflected in the knowledge embedded in their differentiated offer for innovative, products, services and systems ahead of competitors. This is specially the case of high technology SMEs, which need to look very closely for profitable market niches characterised by high technological standards and not occupied by larger and more established firms.

For example, Autio, Sapienza and Almeida (2000) found that SMEs are obtaining increasing reputation for technological excellence characterised by inimitability. This finding is consistent with the RBV (see chapter 3), which posits that a capability to give competitive advantage should be scarce, valuable, imperfectly tradable and imperfectly imitable. In this context, a capability, which is knowledge based, is very difficult to



imitate and it is associated with causal ambiguity (Reed and DeFillipi, 1990). Causal ambiguity renders imitability difficult even for those most aware of the technology. Thus, high technology SMEs can be endowed of certain technological strengths allowing their presence in international markets. In fact, as the exploratory interviews revealed that for firms whose technology is applicable world-wide, foreign market opportunities may arise from its core technology (see chapter 6, sections 6.4.2 and 6.4.3).

In recent years, the technological gap between large MNEs and SMEs in international markets has narrowed (Oviatt and McDougall, 1994). In fact, high technology SMEs might have leading positions in certain industry sectors in specific market niches. The development of their technological resources is basically driven by the need to survive in very dynamic and unpredictable market environments, which push them ahead to look for new opportunities in the market, irrespective of being domestic or international. Often domestic markets are almost inexistent as it happens in this study with the mould industry and international markets have become a strategic option in terms of survival and growth. Accordingly, this study's findings are in line with previous research, which points out that high technology SMEs with greater technological resources have higher international expansion that is, a higher international intensity, giving support to hypothesis 2.

#### **8.2.4.1.2 Firm International Orientation (H<sub>4</sub>)**

As presented in section 8.2.4, *firm international orientation* ( $p < 0.05$ ) has a statistically significant and positive relationship with international intensity among the firms in this sample.

Although this stated hypothesis may be considered at first glance as tautological, it represents the manifestation of attitudes and behaviour by the high technology SME to proactively pursue foreign market opportunities and not as a mere intention to go international without any correspondent action to move forward.

Generally, high technology SMEs proceed in small incremental steps in order to gradually increase their international involvement in a process characterised by the development of market knowledge, experience and increasing commitment to foreign markets. This approach makes sense in a way that high technology SMEs may face uncertainty in foreign markets, but risks should stay at a manageable level. In addition, high technology SMEs should learn from some possible poor decisions they made, but avoiding potential mistakes, which may cause irreparable damages to their survival and long term future.

Throughout the internationalisation process high technology SMEs will create, develop and accumulate knowledge about foreign market operations associated with the subsequent reduction of market uncertainty, which may led to firm's higher commitment to foreign markets and therefore to a higher international intensity.

In sum, firm's increasing knowledge about foreign markets will impact on its experience and commitment to international markets enhancing the scope of firm's international activities. Therefore, firm's international intensity depends, to a great extent, on its accumulation of foreign organised knowledge- base (Eriksson et al, 1997; Johanson and Vahlne, 1977, 1990).

In short, the results of this study are that the high technology SME knowledge, experience and commitment to foreign markets, in other words the *international orientation* is an important predictor of international intensity, giving support to hypothesis 4 (see Table8.1).

#### **8.2.4.1.3 Entrepreneur/Chief Executive Human Capital (H<sub>6</sub>)**

As showed in section 8.2.4, the *human capital of the entrepreneur/chief executive* ( $p < 0.01$ ) has also a statistically significant and positive relationship with international intensity among the firms in this sample.

In fact, some authors emphasise the entrepreneur as the most valuable resource within the firm (Bruderl and Preisendorfer, 2000; Bruderl et al, 1992; Lee et al, 2001).

The results of this study are also consistent with previous empirical studies, which acknowledge the human capital of the entrepreneur as critical for the entrepreneurial firm growth and profitability (Bates, 1985; Bruderl, et al, 1992; Cooper et al, 1994; Lee et al, 2001).

Currently, entrepreneurs of high technology firms may have a high sense of achievement with high motivation, high skills and resources and possessing a network of personal contacts, both national and international, based on his/her own previous experience (Cooper et al, 1994; Lee et al, 2001). Very often this network of contacts represent firm's initial customer base (Smith and Fleck, 1987).

Entrepreneurs of high technology SMEs with higher human capital are able to detect profitable market niches both domestically and internationally not yet covered by other competitors (Bates, 1985). Moreover, they might have the knowledge on how to start and run a business successfully through the assessment of all relevant information and consequently all opportunities, irrespective of being domestic or international.

Results of this study suggest that, other things being equal, high technology SMEs with entrepreneurs/chief executives with greater human capital might have higher international expansion that is a higher international intensity, giving support to hypothesis 6 (Table 8.1).

#### **8.2.4.2 Discussion on Resources, which are not Significant Predictors of International Intensity**

##### **8.2.4.2.1 Marketing Resources (H<sub>1</sub>)**

In addressing this research aim the results did not find *marketing resources* as a significant predictor of international intensity, giving no support for hypothesis 1. In fact, roughly 80% among the firms in this sample score below the scale central value in terms of marketing resources relative to their direct competitors in foreign markets. In other words the great majority of the Portuguese high technology SMEs included in this

study, irrespective of their international intensity, are characterised by low marketing resources that is by a low market orientation and customer focus.

However, these results are not completely surprising since previous research, in a qualitative study, (Fontes and Combs, 1997), as well as the exploratory interviews have acknowledged that Portuguese high technology SMEs are characterised, in general, by lacking marketing resources to pursue foreign market opportunities. In addition, these firms foresee foreign market expansion as a much more complex issue than the access to technologies, developed and introduced internationally, later adapted to the needs of the Portuguese market (Fontes and Combs, 1997; Laranja and Fontes, 1998).

Nonetheless, those firms however focusing their business on the Portuguese market where they get the most part of their sales, currently pursue foreign market opportunities as the preliminary interviews have revealed (see chapter 6, sections 6.4.2 and 6.4.3).

#### **8.2.4.2.2 Financial Resources (H<sub>3</sub>)**

The great majority of Portuguese high technology SMEs in this study are characterised by shortages of financial resources, which may limit their market expansion and consequently their international intensity.

In fact, as shown in Appendix 7.2 the availability of capital for firms' development fell below the scale central value, which basically represents that for the majority of high technology SMEs in this study, financial resources, over the last three years, were insufficient and, to some extent, a significant impediment for firm's development. This finding also corroborates previous research about Portuguese small high technology firms, which points out their shortages in human and financial resources, which makes the consistent development of international activities, particularly difficult (Fontes and Combs, 1997). Nonetheless, internationalisation has become, in recent years, a key issue for Portuguese high technology firms since, in most industry sectors; the domestic market is too small to secure their survival and growth (Fontes and Combs, 1997). In fact, in Fontes and Combs (1997)'s study managers of Portuguese NTBFs stress that the

national market is too small to recover from the high R&D investments that they need to make if their firms want to stay technology intensive.

Finally, empirical results did not find *financial resources* as a significant predictor of international intensity, giving no support for hypothesis 3.

#### **8.2.4.2.3 Entrepreneur/Management Team International Experience (H<sub>7</sub>)**

Consistent with Reuber and Fischer (1997) the construct *international experience of the entrepreneur/management team* is viewed in this study as a characteristic of the entrepreneur or management team of the high technology SME.

In fact, for small firms, which are generally characterised by a poverty of resources, the skills and resources of entrepreneurs/management teams may represent significant predictors of international intensity, for those firms pursuing foreign market activities (Reuber and Fischer, 1997; Oviatt and McDougall, 1994).

In this study, however the great majority of Portuguese entrepreneurs/management teams of high technology SMEs have limited living and working international experience. Therefore, there is a small amount of variance in the sample frame to explain international intensity, giving no support for hypothesis 7.

#### **8.2.4.2.4 Entrepreneurial Orientation (H<sub>5</sub>)**

In addressing this research aim the results did not find *entrepreneurial orientation* as a significant predictor of international intensity for the firms in this sample, giving no support for hypothesis 5.

In fact, entrepreneurs/ chief executives of Portuguese high technology SMEs may orientate their efforts in terms of innovativeness, risk taking and proactiveness in order to first address the needs of the home market and only later progress towards foreign markets (Fontes and Combs, 1997). Furthermore, the current level of innovativeness, risk taking and proactiveness may only raise firm's international intensity significantly

in a time period longer than 2-3 years. In fact, taking into consideration the fact that new product development may take at least 12 to 18 months; it may take more than 2 years for entrepreneurial orientation behaviour to enhance firm's international intensity assuming that in the meantime the Portuguese high technology SME significantly increases its efforts towards foreign markets.

Previous research about Portuguese small high technology firms, mainly in ICT industry sectors, although acknowledging them as technology-led, emphasise "*that their innovative role is less concerned with the introduction of radical new technologies and more with creative adaptive improvements based upon new technologies first developed and introduced elsewhere*" (Laranja and Fontes, 1998: 1023). Thus, their adaptation practices are often triggered to address the domestic market needs. In this context, Portuguese high technology firms may not be characterised by high risk behaviour or proactiveness. Even their innovativeness efforts, since directed to the domestic market, represent a huge limitation in terms of future market expansion (Fontes and Combs, 1997).

### **8.2.5 Research Aim 5**

The goal of research aim 5 was to assess the influence that the resources identified on Research Aims 1, 2, and 3 that are marketing, technological and financial resources, entrepreneurial orientation, firm international orientation, the human capital of the entrepreneur/chief executive and the international experience of the entrepreneur/management team have on the type of entry mode of the high technology SME in the main foreign market (independent vs. contractual).

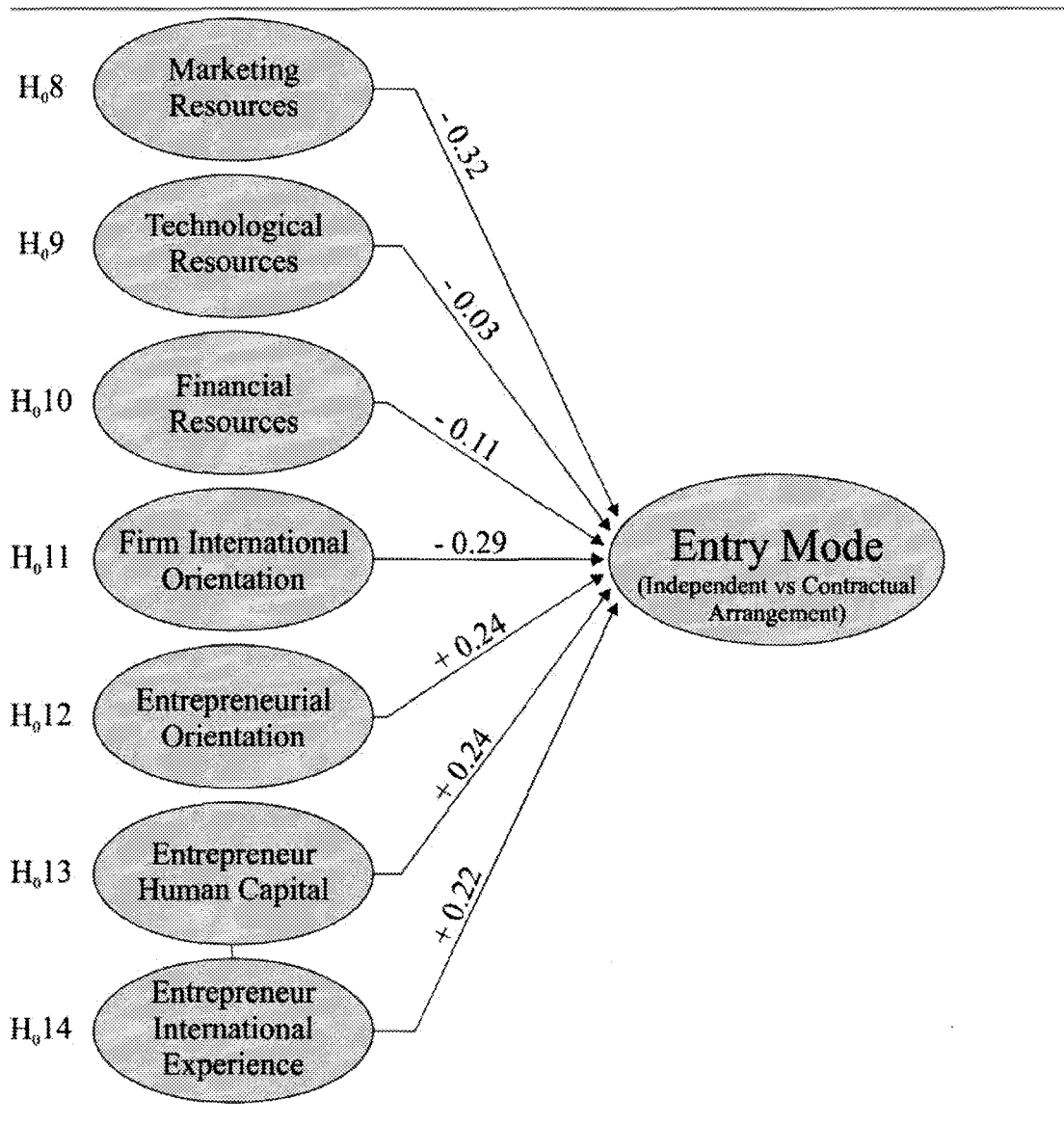
As showed in chapter 5, section 5.4, the relationship between resources and the use or non-use of contractual cooperation in the main foreign market and the corresponding stated hypotheses were presented in Figure 5.4.

Results of logistic regression, presented in chapter 7 Table 7.17, show that the study variables were not related to the use of a contractual mode in the main foreign market among the firms in this sample. Thus, results provide support for the null hypotheses

H<sub>08</sub> to H<sub>014</sub> and non-support for hypotheses H<sub>8</sub> to H<sub>14</sub>. In addition, results also show that contractual cooperation is only negatively associated to firm *size* ( $p < 0.05$ ). In fact, this latter result suggests that larger firms, in this sample, choose, predominantly, independent entry modes in the main foreign market.

Figure 8.2 presents the logistic regression model with standardised coefficients and significance levels:

Figure 8. 2: Relationship between the resources of the high technology SME and the use of an independent vs. a contractual mode, in the main foreign market.



p + < 0.10  
 p \* < 0.05  
 p \*\* < 0.01  
 p \*\*\* < 0.001

Logistic regression model with standardised coefficients and significance levels

Source: The Author



Table 8. 2: Hypotheses relating the influence that resources of high technology SMEs, have on the use of an independent vs. contractual mode, in the main foreign market.

**Hypotheses H<sub>0</sub>8 - H<sub>0</sub>14**

**That no relationship exists in respect to:**

Hyp.	Description	Result
<b>H<sub>0</sub>8</b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>marketing resources</i> .	Supported
<b>H<sub>0</sub>9</b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>technological resources</i> .	Supported
<b>H<sub>0</sub>10</b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>financial resources</i> .	Supported
<b>H<sub>0</sub>11</b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>international orientation</i> .	Supported
<b>H<sub>0</sub>12</b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and its <i>entrepreneurial orientation</i> .	Supported
<b>H<sub>0</sub>13</b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and <i>the human capital of the entrepreneur/chief executive</i> .	Supported
<b>H<sub>0</sub>14</b>	The use of a contractual entry mode, in the main foreign market, by the high technology SME and <i>entrepreneur's/ chief executive international experience</i> .	Supported

Results, presented in chapter 7, section 7.7, in Table 7.19, and Figure 8.2 above indicated that the resources/capability-base of the high technology SME did not affect the use of contractual cooperation in the main foreign market. As shown, also in Table 7.17, the only significant predictor of contractual cooperation is the control variable firm size. Thus the RBV and TCE do not have predictable power to identify the selection, by the high technology SME, of the entry mode, either through a contractual arrangement or independent, in the main foreign market.

Furthermore, as presented in chapter 4, section 4.5.5.1, TCE is particularly suitable to explain dichotomous entry modes. In fact, the purpose of research aim 5 was to discriminate between dichotomous entry modes that are independent entry modes characterised by full ownership, by the entrant, and contractual arrangements entry

modes characterised by only partial ownership. Moreover, TCE is a very influential approach and most often used theory to explain the entry mode decision, by a MNE, in a specific foreign target market (Williamson, 1975, 1985). In fact, the vast majority of empirical studies using TCE address the issue whether MNEs use in the foreign market entry mode wholly owned subsidiaries or rather selecting contractual cooperative modes such as joint ventures, licensing or other cooperative agreements (Hennart, 1991).

In addition, the use of TCE provides a very suitable theory to investigate the relative costs and benefits of cooperation on the foreign market entry mode (Hennart, 1991; Beamish and Banks, 1987).

Broadly speaking, the choice between a contractual arrangement and an independent entry mode is a choice between a transaction with a partner in a host market and a transaction within the firm.

According to TCE different entry modes have both advantages and disadvantages and consequently involving trade-offs that need to be discussed in terms of costs and benefits (Anderson and Gatignon, 1986). In these circumstances, TCE argues that entry modes depend on the costs and the benefits of contractual cooperation relative to internalisation (Beamish and Banks, 1987). For example, the benefits of contractual cooperation depend on both the earnings-enhancing such as more rapid penetration in the foreign target market, and cost-reduction benefits achieved in current business activities relative to internalisation.

In the same vein, transaction costs can also have impact in firm's profitability whether the choice is internalisation or contractual cooperation, instead. The former, for example, may include higher administration costs and overheads while the latter may relate to higher costs due to legal expenses for writing and enforcing contracts with a partner in the host country.

Overall, when the foreseen transaction costs of contractual cooperation are higher relative to the transaction costs of internalisation firms should privilege internalised transactions within their hierarchical structures. In other words a relevant part of the benefits of internalisation arise from avoiding the costs of contractual cooperation. Obviously, the reverse is also true (Shrader, 2001).

Although TCE, as indicated above, is mainly used in a context of MNEs, several empirical or conceptual studies, for entrepreneurial SMEs, in high technology sectors or not, were recently set out (Nakos and Brouthers, 2002; Shrader, 2001; Burgel and Murray, 2000; Zacharakis, 1997). Overall, these studies acknowledge the good contribution of TCE in predicting the entry mode choice for entrepreneurial SMEs even though these firms only seldom use FDI as a way to penetrate foreign markets.

In fact, this study confirms previous research, which acknowledges that direct exports to end customers and direct exports through international distributors/agents as the most common entry modes for entrepreneurial SMEs (Shrader, 2001; Burgel and Murray, 2000; Bell, 1995). In fact, the preferred entry modes of this type of firms are characterised by relative low risk low resource commitment and directed towards down stream value chain activities (marketing, sales and services) rather than up stream value chain activities (R&D and production).

In this context, the basic assumption of direct exports to end customers is that entrepreneurs/management teams of high technology SMEs establish direct contacts with customers, generally firms, in the target market, and conduct sales (transactions) based upon price mechanisms prevailing in that market. In fact, this approach minimises costs and the threat of opportunism by a partner in the host market, while assuming that the high technology SME has access to its target customers in that market.

On the other hand, direct exports through international distributors/agents are also a very common entry mode for entrepreneurial firms since they are characterised by shortages of different types of resources and consequently they need to leverage their endowment of resources in order to increase the speed of foreign market expansion.

In fact, the general literature on small entrepreneurial firms, suggests that in order to overcome different shortages of resources small firms may develop cooperative linkages with partners in order to pursue their growth strategies namely in international markets (Jones, 1998, 1999). Establishing linkages with other firms, may allow high technology SMEs to get access to resources that otherwise would require considerable time and money, that currently they could not afford (Lu and Beamish, 2001; McDougal, Shane and Oviatt, 1994; Oviatt and McDougalll, 1994; Zacharakis, 1997).

Overall in the two sample frames of this study 61% of the firms have independent entry modes (e.g. international sales direct to end customers) while the remaining 39% involve contractual arrangements (e.g. international sales through distributors/agents) in the main foreign market entry mode. Although some relevant literature (Burgel and Murray, 2000) argues about the more prevalent use of direct exports to customers over exports through international distributors may be explained by the fact that selling through distributors represents a more complex and skilful management arrangement due to the necessary requirements to hire, train, motivate and monitor a partner in the host country. However, results in this study do not confirm previous research; acknowledging the use of exports through international distributors mainly for larger SMEs. On the contrary, *this study found a significant and negative effect of firm size on the propensity to use a contractual arrangement in the main foreign market entry mode* (see chapter 7, Table 7.17). In other words, larger firms in this sample use predominantly independent modes in the main foreign market.

This option by larger SMEs among the firms in this sample may be explained by the fact these firms may have higher endowments of resources and consequently do not need to cooperate, at least in the main foreign market. For example, as it will be discussed in the following section (section 8.2.6), for Research Aim 6, results suggest that firms characterised by having higher technological resources, stronger international orientation and entrepreneurs/chief executives with higher human capital while using contractual cooperation have lower performance. Thus, instead of enhancing performance contractual cooperation, it restrains it.

In this context, several researchers propose a modified Transaction-Cost analysis approach for predicting entry mode decisions, which are contingent upon firm-specific factors such as resources, the type of product/service to be sold in the foreign market as well as on country-specific factors (Burgel and Murray, 2000; Erramilli and Rao, 1993). In the same vein, other researchers also argue that distinct entry modes represent different managerial choices based on product/service and firm-specific factors (Andersen, 1997; Leonidu and Katsikeas, 1996).

In sum, the RBV and the traditional TCE approach, may not explain the selection, by the high technology SME, on the choice of the entry mode in the main foreign market (contractual cooperation or independent). Thus, a modified Transaction-Cost analysis approach as suggested by Erramilli and Rao, (1993) may be more suitable for explaining the entry mode decision (independent or not), in the foreign market service mode by the high technology SME, although they are beyond the scope of this thesis.

## **8.2.6 Research Aim 6**

### **8.2.6.1 Introduction**

The goal of research aim 6 was to examine the relationship between the use of contractual cooperation and performance, in the main foreign market of the high technology SME, while considering the resources identified on Research Aims 1, 2 and 3, that are marketing, technological and financial resources, entrepreneurial orientation, firm international orientation, the human capital of the entrepreneur/chief executive and the international experience of the entrepreneur/management team as moderator influences in that relationship.

This study considers as performance measures the international intensity (an objective measure) that is the sales in the main foreign market in percentage of total sales, and degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market (a subjective measure of performance).

As emphasised in section 8.2.5, for the analysis of Research Aim 5, the use of TCE (Williamson, 1975, 1985) provides a very suitable theory to investigate the relative costs and benefits of cooperation on the foreign market entry mode and the associated type of knowledge to be transferred between partners.

In this context, key resources, specific to high technology SMEs, mentioned above, which may give the high technology SME performance superiority vis-à-vis its competitors, with the exception of financial resources, are knowledge-based resources.

Therefore, the selection of a contractual mode with a partner in a foreign market is, to some extent, related to the transfer of knowledge between the firm and the selected partner (Shrader, 2001). In this situation, the high technology SME might establish and utilise a contractual mode with a partner to augment its own resource-base leveraging in its partner resources. In addition, contractual cooperation may reduce the investment required and the uncertainty of having operations in an unknown environment allowing the firm to expand abroad more rapidly and into more foreign markets. By contrast, if a firm wants to protect all its core competencies against any opportunistic behaviour from a potential partner, it will utilise independent modes, or internalised channels (Agarwall and Ramaswami, 1992; Hill, Hwang and Kim, 1990).

Currently, for the choice of internalisation or contractual cooperation the TCE argument is that both represent particular and considerable transaction costs (Shrader, 2001). For example, when transaction costs of contractual cooperation are higher than transaction costs of internalisation performances advantages are achieved by firms, which internalise foreign market operations (Shrader, 2001).

Moreover, the transaction costs and the benefits of contractual cooperation are dependent upon to the type of knowledge to be transferred between the firm and a partner as well as contextual factors such as *opportunism* that is people are characterised by self interested behaviour with guile (Seth and Thomas, 1994) and *bounded rationality*, that is, people neither have access to all relevant information nor can they fully comprehend all needed information (Seth and Thomas, 1994). Thus, the more important advantages of internalisation are related to avoiding the impacts of opportunism and bounded rationality on the transfer of knowledge between partners.

Furthermore, some forms of knowledge such as tacit knowledge, that is, knowledge that is ill codified, are more subject to opportunism and/or bounded rationality, and therefore involving higher transaction costs if transferred to a partner in the foreign target market. Overall, TCE approach allows the investigation on the relative costs and benefits of contractual cooperation and understanding how these costs and benefits vary taking into consideration the type of knowledge to be transferred between partners.

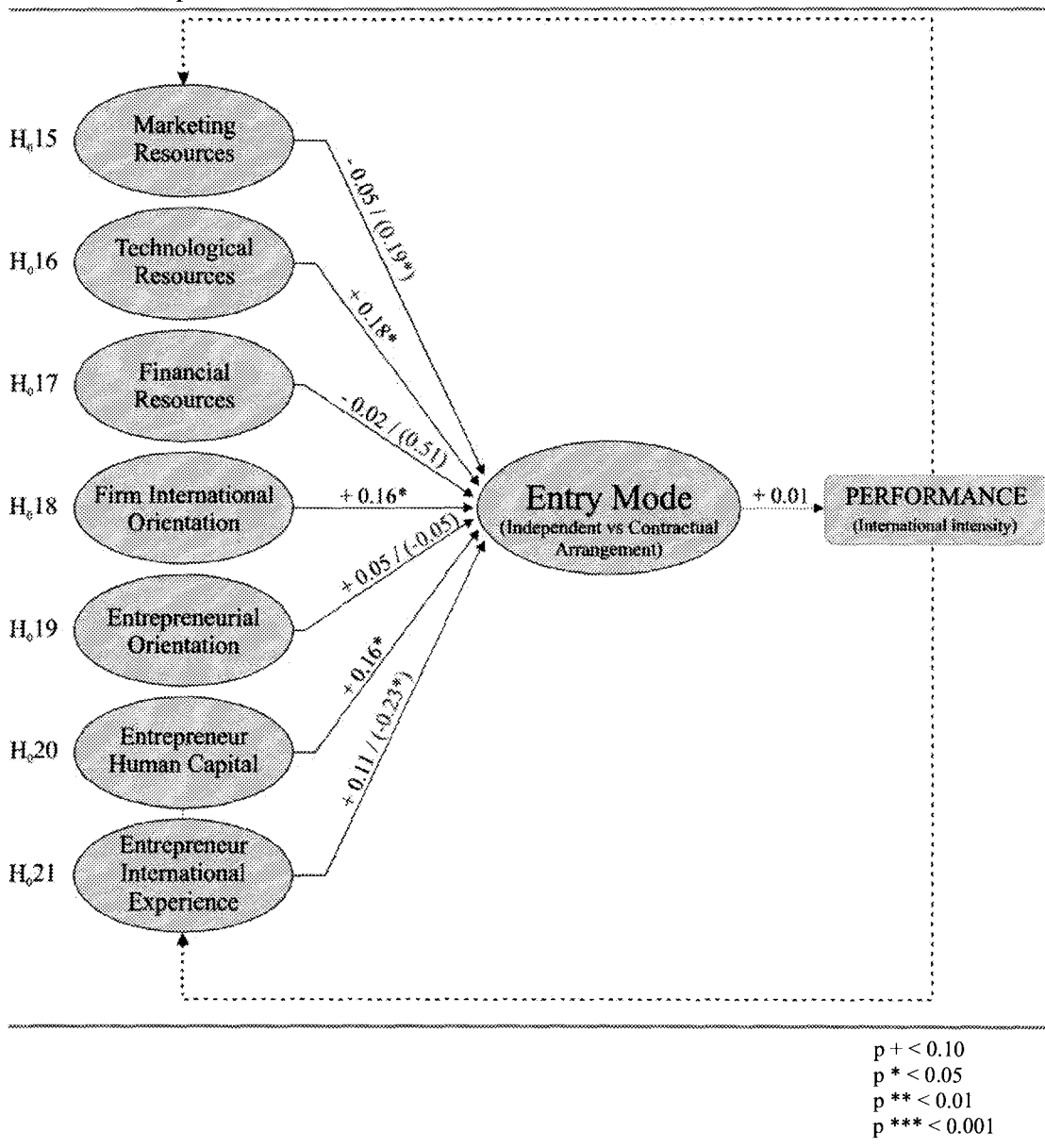
In the next subsections this study discusses how contractual cooperation, in the main foreign market, impacts on performance, measured respectively, by international intensity and degree of satisfaction of the entrepreneur/chief executive with some financial targets, through the analysis of the resources of high technology SMEs, which moderate the relationship.

#### **8.2.6.2 Performance Measured by International Intensity**

In order to address this research aim, this study has investigated how contractual cooperation impacts on performance through the analysis of the resources of high technology SMEs, presented on research aims 1 to 3, which moderate the relationship.

Figure 8.3 presents the moderated multiple regression model with standardised regression coefficients and significance levels for the independent variable (contractual cooperation) and moderators in the dependent variable (international intensity). In addition, Figure 8.3 also presents the standardised regression coefficients and significance levels for interaction terms.

Figure 8. 3: Relationship between the use of a contractual mode and international intensity in the main foreign market, while considering the resources, which moderate the relationship.



Moderated multiple regression model with standardised regression coefficients and significance levels for the independent variable (contractual arrangement) and moderators in the dependent variable. In brackets standardised regression coefficients and significance levels for interaction terms.

Source: The Author

The results of the stated hypotheses conducted in chapter 7, section 7.8, are summarised in Table 8.3:



Table 8. 3: Hypotheses relating the relationship between the use of a contractual mode, in the main foreign market and performance, while considering the resources of the high technology SME, as moderator influences in that relationship.

**Hypotheses H<sub>0</sub>15 - H<sub>0</sub>21**

**That no relationship exists in respect to:**

Hyp.	Description	Result
<b>H<sub>0</sub>15</b>	The use of a contractual mode, in the main foreign market coupled with <i>marketing resources</i> , in relation to performance in that same market.	Not Supported
<b>H<sub>0</sub>16</b>	The use of a contractual mode, in the main foreign market coupled with with <i>technological resources</i> , in relation to performance in that same market.	Supported
<b>H<sub>0</sub>17</b>	The use of a contractual mode, in the main foreign market coupled with with <i>financial resources</i> , in relation to performance in that same market.	Supported
<b>H<sub>0</sub>18</b>	The use of a contractual mode, in the main foreign market coupled with with <i>international orientation</i> , in relation to performance in that same market.	Supported
<b>H<sub>0</sub>19</b>	The use of a contractual mode, in the main foreign market coupled with with <i>entrepreneurial orientation</i> , in relation to performance in that same market.	Supported
<b>H<sub>0</sub>20</b>	The use of a contractual mode, in the main foreign market coupled with <i>the entrepreneur/chief executive human capital</i> , in relation to performance in that same market.	Supported
<b>H<sub>0</sub>21</b>	The use of a contractual mode, in the main foreign market coupled with the <i>entrepreneur/chief executive international experience</i> , in relation to performance in that same market.	Not Supported

The results shown in chapter 7, section 7.8.1, Table 7.21, suggest that there is no direct relationship between the use of contractual cooperation and performance (international intensity) in the same foreign market.

In fact, the positive impact of some the independent variables/moderators such as technological resources, firm international orientation and entrepreneur human capital seems to mask the negative impact of others such as marketing and financial resources so that the overall relationship remains non-significant.

However, in order to fully address Research Aim 6, tests for the interactions between each of the study variables and contractual cooperation were considered. Results suggest that including interactions terms involving variables that are significant in terms of predicting international intensity weakens their main effects. In other words, firms that have higher technological resources, stronger international orientation and entrepreneurs/chief executives with higher human capital and use contractual arrangements have lower performance. Thus, instead of enhancing performance contractual cooperation restrains it. In this context, as pointed out in chapter 7, section 7.8.1, the researcher decided, for model 4 (Table 7.21) to take off from the model the interactions with variables that have significant main effects and only consider the interactions between contractual cooperation and the remaining independent variables without significant main effects. From Table 7.21, it could be depicted that the interaction terms *contractual cooperation \* marketing resources* and *contractual cooperation \* entrepreneur/management team international experience* have significant effects on performance. The former interaction is positive while the latter, quite surprisingly, is negative.

In addition, Table 7.21 also shows that *technological resources*, *firm international orientation* and *entrepreneur/chief executive human capital* are significant and positive predictors of international intensity in the main foreign market. That is among the entire sample of Portuguese high technology SMEs (including those that use contractual arrangements and those that do not in the entry mode in the main foreign market) international intensity was positively associated with *technological resources*, *firm international orientation* and *entrepreneur/chief executive human capital*.

In sum, from model 4, Table 7.19, it is possible to conclude that *technological resources* ( $p < 0.05$ ), *firm international orientation* ( $p < 0.05$ ) and *entrepreneur/chief executive human capital* ( $p < 0.05$ ) are significant, positive and independent predictors of international intensity giving support for the null hypotheses,  $H_016$ ,  $H_018$  and  $H_020$ , respectively. In fact, there is no relationship in respect to the use of contractual arrangements, coupled with technological resources, or firm international orientation or either entrepreneur/chief executive human capital, in the main foreign market, in relation to performance (international intensity) in that same market.

By contrast, *marketing resources* ( $p < 0.05$ ) and *entrepreneur international experience* ( $p < 0.05$ ) are considered pure moderators, since their main effects are non-significant but the corresponding interaction terms are indeed significant, giving no support for the null hypotheses  $H_{015}$  and  $H_{021}$ . In fact, there is a statistical significant relationship in respect to contractual cooperation, coupled with marketing resources, or entrepreneur international experience, in the main foreign market, in relation to performance (international intensity) in that same market.

Nevertheless, although these interaction effects are found to be significant they only explain an additional portion of 0.1 of the variance in the dependent variable since the adjusted  $R^2$  only increased from 0.69 to 0.70.

Finally, *financial resources* and *entrepreneurial orientation* are neither independent predictors nor moderators giving also support for the null hypotheses,  $H_{017}$ , and  $H_{019}$ , respectively. Thus, there is no relationship in respect to contractual cooperation, coupled with financial resources, or entrepreneurial orientation, in the main foreign market, in relation to performance (international intensity) in that same market.

Subsection 8.2.6.2.1 will discuss the variables that moderate the relationship between the use or non-use of contractual arrangements in the main foreign market and international intensity. Subsections 8.2.6.2.2 and 8.2.6.2.3 will give a quick overview of, respectively, the variables that are independent predictors of international intensity as well as those that are neither independent predictors nor moderators of international intensity in the main foreign market, since all of them have been already examined in Research Aim 4 (subsection 8.2.4.2) and main conclusions are roughly the same.

Finally, subsection 8.2.6.2.4 will contrast marketing and technological resources in a context of the use of independent or contractual arrangement modes in foreign markets.

#### **8.2.6.2.1 Resources that Moderate the Relationship between Contractual Cooperation in the Main Foreign Market and International Intensity**

According to Sharma et al (1981) marketing resources and entrepreneur/management team international experience are pure moderators since no indication of main effects, but *the interaction between marketing resources with contractual cooperation was significantly positive ( $p < 0.05$ )*, while *the interaction between entrepreneur/management team international experience with contractual cooperation was significantly negative ( $p < 0.05$ )*. In this context, although firms with higher endowment of marketing resources were no more likely to establish contractual cooperation in the main foreign market (see chapter 7, Table 7.17), high endowment of marketing resources among those that establish contractual cooperation, in the main foreign market, was positively related to international intensity. Consistent, with TCE this fact suggests that firms seeking to expand more quickly and differentiate from competitors in foreign markets can benefit by accessing the market knowledge from partners in the host country. In addition, marketing resources may be less complex than technological resources and may be subject to fewer risks of erosion and more manageable transaction costs when transferred to local partners.

On the other hand, *entrepreneurs/management teams with higher international experience* that establish contractual cooperation have significantly lower performance (international intensity). This may be due to the conflicting interests and different viewpoints respectively from the entrepreneur/chief executive and the partner in the host country. In fact, managers who have lived or worked abroad may often not need to rely on the market knowledge of a partner in the foreign country to sell their products/services overseas (Burgel and Murray, 2000). Managers may have their own personal networks and therefore conflicting interests with foreign partners may arise conducting to lower international sales and therefore to a lower international intensity.

#### **8.2.6.2.2 Resources that are Independent Predictors of International Intensity in the Main Foreign Market**

From Table 7.21 it can be concluded that *technological resources* ( $p < 0.05$ ), *firm international orientation* ( $p < 0.05$ ) and *entrepreneur/chief executive human capital* ( $p < 0.05$ ) are independent predictor variables of international intensity in the main foreign market, not moderators since only main effects are significant not the interaction terms (Sharma et al, 1981).

Overall, among all the firms in this sample, technological resources, firm international orientation and entrepreneur/chief executive human capital were significant and positively associated with international intensity in the main foreign market. These facts suggest that the relationship, respectively between technological resources, firm international orientation and entrepreneur/chief executive human capital and performance among firms that establish independent entry modes in the main foreign market was strong enough to more than compensate the relationship among those which establish contractual arrangements entry modes.

For example, technological resources, embedded in tacit knowledge are difficult and characterised by high risk of appropriation and costly to transfer to external partners. In this context, and in line with previous research (Shrader, 2001), conclusions from this study may suggest that high technology SMEs with higher endowment of technological resources should avoid transferring technological knowledge to external partners in foreign operations. Given these results, technological resources enhance firm international performance that is its international intensity. However, when associated with contractual cooperation technological resources do not enhance performance in the main foreign market. On the contrary, contractual cooperation decreases performance. Thus, high technology SMEs with higher endowment of technological resources should use independent entry modes in foreign markets.

Secondly, it would be expected that high technology SMEs showing a stronger *international orientation* would privilege cooperation with partners in the target markets in order to move more quickly and into more locations since often these firms may lack the resources to do so through internalisation. Therefore, those firms can achieve higher

international intensity, with reduced costs and market uncertainty. Moreover, high technology SMEs could leverage in foreign markets on partners resources rather than committing their own assets to the international venture. However, this study only found *international orientation* as a strong predictor of international intensity for the entire sample of Portuguese high technology SMEs including firms that establish independent entry modes and those that establish contractual arrangements entry modes in that same market and not that the *international orientation* was stronger among firms that choose contractual cooperation in relation to firms that choose independent entry modes.

In the same vein, this study found *entrepreneur/chief executive human capital* as also an independent predictor of international intensity in the main foreign market. In fact, the decision of the *entrepreneur/chief executive* to establish contractual cooperation or not in foreign markets may be contingent upon the situation and may be consistent with TCE approach presented earlier in section 8.2.6.1.

#### **8.2.6.2.3 Resources that are Neither Independent Predictors nor Moderators of International Intensity in the Main Foreign Market**

From Table 7.21 it can also be concluded that *financial resources and entrepreneurial orientation* are neither independent predictor variables nor moderators since both main effects and interaction terms are not significant (Sharma et al, 1981).

In fact, as stressed in this chapter, subsection 8.2.4.2.2, the great majority of Portuguese high technology SMEs in this study currently lacking *financial resources*. This fact may limit their foreign market strategies and consequently their international intensity even though managers of Portuguese NTBFs stress that the Portuguese market is too small to recover from the high R&D investments. They need to make those investments if their firms want to stay technology intensive (Fontes and Combs, 1997).

Moreover, as shown in Appendix 7.2 the availability of capital for firms' development fell below the scale central value, which basically represents that for the majority of

high technology SMEs in this study, financial resources, over the last three years, were insufficient and, to some extent, a significant impediment for firm's development. In this context, just over 60% among the firms in this sample indicate insufficient financial resources, irrespective of using contractual cooperating or not in the main foreign market, and there may be not enough variation to provide explanatory power to financial resources or its interaction with contractual cooperation.

In the same vein, results did not find *entrepreneurial orientation* as a significant predictor and/or moderator of international intensity for the firms in this sample.

In fact, as stressed, in subsection 8.2.4.2.3, for entrepreneurs/ chief executives of Portuguese high technology SMEs the current level of innovativeness, risk taking and proactiveness may only raise firm's international intensity significantly in a time period of at least 2-3 years. In this context, assuming that new product development may take roughly 12 to 18 month; entrepreneurial behaviour may represent more than 2 years to enhance firm's international intensity, while considering that in the meantime the Portuguese high technology SME significantly directs its efforts towards foreign markets.

#### **8.2.6.2.4 Assessing Marketing and Technological resources on the Use or Non-Use of Contractual Cooperation in Foreign Markets.**

Overall, the results for this research aim suggest that depending on the type of knowledge to be transferred to the potential partners in the foreign market entry mode (technological vs. marketing) costs should be considered relative to potential benefits and decisions for the use of contractual cooperation should be made only when the foreseen benefits outweigh the costs. However, Table 7.17 also shows that the use of contractual cooperation in the main foreign market was not affected by the resources of the high technology SME. In fact, the only significant predictor of contractual cooperation in the main foreign market is the control variable firm size. Thus, entrepreneurs/chief executives of high technology SMEs do not take into consideration the foreseen transaction costs when deciding whether to cooperate or not in the main foreign market. Nevertheless, high technology SMEs with higher endowment of

marketing resources cooperate in the main foreign market in order to increase the international intensity of their firms in that same market.

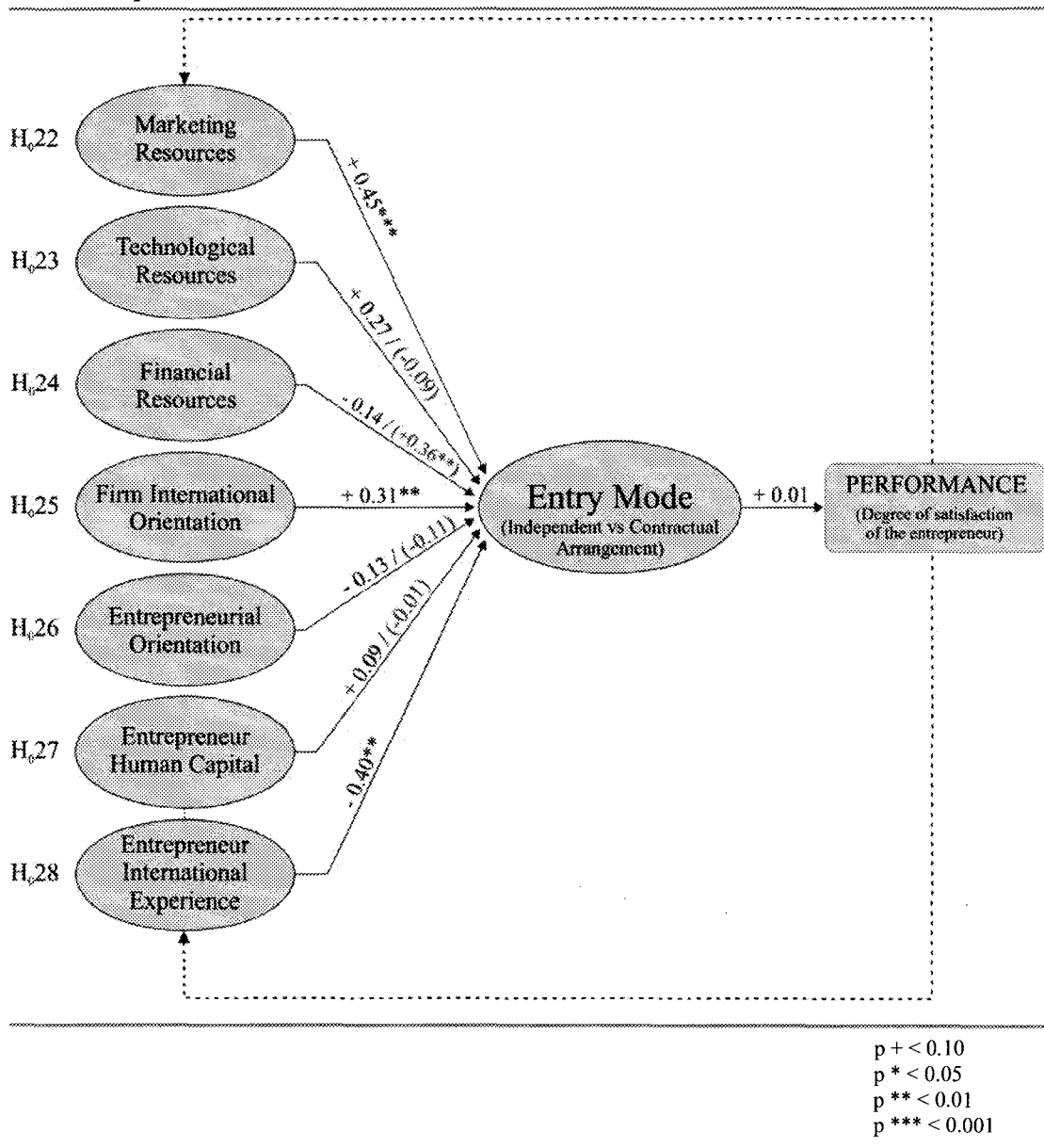
### **8.2.6.3 Performance Measured by the Degree of Satisfaction of the Entrepreneur/Chief Executive with some Financial Targets in the Main Foreign Market**

In order to address this research aim this study investigated how contractual cooperation impacts on the degree of satisfaction of the entrepreneur/chief executive with some financial targets, in the main foreign market, through the analysis of the resources of high technology SMEs, presented on research aims 1 to 3, which moderate the relationship.

Figure 8.4 presents the moderated multiple regression model with standardised regression coefficients and significance levels for the independent variable (contractual cooperation) and moderators in the dependent variable (the degree of satisfaction of the entrepreneur/chief executive with some financial targets, in the main foreign market). In addition, Figure 8.4 also presents the standardised regression coefficients and significance levels for interaction terms.



Figure 8. 4: Relationship between the use of contractual cooperation, in the main foreign market entry mode and degree of satisfaction of the entrepreneur/chief executive with some financial targets, while considering the resources, which moderate the relationship.



Moderated multiple regression model with standardised regression coefficients and significance levels for the independent variable (the use or non-use of a contractual arrangement, in the main foreign market entry mode.) and moderators in the dependent variable. In brackets standardised regression coefficients and significance levels for interaction terms.

Source: The Author

Table 8. 4: Hypotheses relating the relationship between the use of a contractual entry mode and the degree of satisfaction of the entrepreneur/chief executive with some financial targets, in the main foreign market, while considering the resources of the high technology SME, as moderator influences in that relationship.

**Hypotheses H<sub>0</sub>22 - H<sub>0</sub>28**

That no relationship exists in respect to:

Hyp.	Description	Result
H <sub>0</sub> 22	The use of a contractual mode, in the main foreign market coupled with <i>marketing resources</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 23	The use of a contractual mode, in the main foreign market coupled with with <i>technological resources</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 24	The use of a contractual mode, in the main foreign market coupled with with <i>financial resources</i> , in relation to performance in that same market.	Not Supported
H <sub>0</sub> 25	The use of a contractual mode, in the main foreign market coupled with with <i>international orientation</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 26	The use of a contractual mode, in the main foreign market coupled with with <i>entrepreneurial orientation</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 27	The use of a contractual mode, in the main foreign market coupled with <i>the entrepreneur/chief executive human capital</i> , in relation to performance in that same market.	Supported
H <sub>0</sub> 28	The use of a contractual mode, in the main foreign market coupled with the <i>entrepreneur/chief executive international experience</i> , in relation to performance in that same market.	Supported

In the same vein, as performance measured by the international intensity in the main foreign market, presented in the previous section, the results for performance measured by the degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market (see chapter 7, Table 7.21) also suggest that there is no direct relationship between the use of contractual cooperation and performance in the same foreign market.

In fact, the positive impact of some of the independent variables/moderators such as marketing resources and firm international orientation seems to mask the negative

impact of others such as entrepreneur/management team international experience in so that the overall relationship remains non-significant.

Table 7.21 also shows that *marketing resources* ( $p < 0.001$ ) and *firm international orientation* ( $p < 0.01$ ) are significant and positively associated with performance in the main foreign market. By contrast *entrepreneur/management team international experience* ( $p < 0.0$ ), however significant, is negatively associated with performance.

Moreover, in order to fully address this research aim, tests for the interactions between each of the study variables and cooperation were considered. Results suggest that including interaction terms involving variables that are significant in terms of predicting the degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market weaken their main effects. In other words, firms that have higher marketing resources and stronger international orientation and use contractual cooperation are characterised by a lower degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market. Similarly, entrepreneurs/management teams with higher international experience, for the entire sample of Portuguese high technology SMEs, (including those that have both independent and contractual arrangements in the main foreign market entry mode) had a lower degree of satisfaction.

In this context, as pointed out in chapter 7, section 7.8.2, the researcher decided, for model 4 (Table 7.21) to drop from the model the interactions with variables that have significant main effects and only consider the interactions between contractual cooperation and the remaining independent variables without significant main effects. From Table 7.21, it could be depicted that the interaction term *contractual cooperation\*financial resources* has a statistically significant and positive effect on performance.

In sum, from model 4 in Table 7.21 it is possible to conclude that *marketing resources* ( $p < 0.001$ ) and *firm international orientation* ( $p < 0.01$ ) are significant, positive and independent predictors of international performance giving support for the null

hypotheses,  $H_{022}$  and  $H_{025}$ , respectively while *entrepreneur/management team international experience* ( $p < 0.01$ ) is also significant, negative and independent predictor of international performance giving also support for the null hypotheses  $H_{028}$ . In fact, there is no relationship in respect to contractual cooperation, coupled with marketing resources, or firm international orientation or either entrepreneur/management team international experience, in the main foreign market, in relation to performance (the degree of satisfaction of the entrepreneur/chief executive with some financial targets) in that same market.

By contrast, *financial resources* ( $p < 0.01$ ) is considered pure moderator, since the main effects is non-significant but the corresponding interaction term is indeed significant, giving no support for the null hypotheses  $H_{024}$ . In fact, there is a statistical significant relationship in respect to contractual cooperation, coupled with financial resources, in the main foreign market, in relation to performance (the degree of satisfaction of the entrepreneur/chief executive with some financial targets) in that same market.

In addition, this interaction effect is found to be highly relevant since it explains an additional portion of 0.06 of the variance in the dependent variable once the adjusted  $R^2$  increased from 0.11 to 0.17.

Finally, *technological resources, entrepreneurial orientation and entrepreneur human capital* are neither independent predictors nor moderators giving support for the null hypotheses, respectively,  $H_{023}$ ,  $H_{026}$  and  $H_{027}$ . Thus, there is no relationship in respect to contractual cooperation, coupled with technological resources or entrepreneurial orientation or either entrepreneur human capital, in the main foreign market, in relation to performance (the degree of satisfaction of the entrepreneur/chief executive with some financial targets) in that same market.

Subsection 8.2.6.3.1 will discuss financial resources that are the variable that moderates the relationship between the use and non-use of contractual cooperation in the main foreign market and international performance. Finally, subsections 8.2.6.3.2 and 8.2.6.3.3 will give a quick overview of the variables, which are independent predictors of international performance in the main foreign market This study will not further

discuss the variables that are neither independent predictors nor moderators of international performance, in the main foreign market, since all of them have been already examined in subsection 8.2.4.2 and main conclusions are roughly the same.

#### **8.2.6.3.1 Variables that Moderate the Relationship between Contractual Cooperation in the Main Foreign Market and Degree of Satisfaction of the Entrepreneur/Chief Executive with some Financial Targets**

According to Sharma et al (1981) financial resources are pure moderator since main effects found are not significant but the interaction term is, indeed, significant. In this context, although firms with higher endowment of financial resources were no more likely to establish contractual arrangements in the main foreign market (see Table 7.21), high endowment of financial resources among firms that use contractual arrangements, in the main foreign market, was positively related to a higher degree of satisfaction of the entrepreneur/CEO with financial goals in that same market. This finding may suggest that Portuguese high technology SMEs with higher endowment of financial resources may look for a potential high profile partner, in the main foreign market, in order to obtain legitimacy and market power in that same market (Eisenhardt and Schoonhoven, 1996). In similar vein, high technology SMEs with higher endowment of financial resources may be seen attractive partners by firms, which pursue growth strategies irrespective of being in domestic or foreign markets (Eisenhardt and Schoonhoven, 1996).

#### **8.2.6.3.2 Variables that are Independent Predictors of Degree of Satisfaction of the Entrepreneur/Chief Executive with some Financial Targets in the Main Foreign Market**

Overall, among all the firms in this sample, *marketing resources* ( $p < 0.001$ ) and *firm international orientation* ( $p < 0.01$ ) are significant, positive and independent predictors of international performance. By contrast, *entrepreneur//management team*

*international experience* ( $p < 0.05$ ) is significant, negative and independent predictor of international performance.

Although, firms in this sample with higher endowment of marketing resources may not have, for the time being, higher international intensity, in the main foreign market, since marketing resources were not significant relative to international intensity (see previous section 8.2.6.2), entrepreneurs/chief executives of Portuguese high technology SMEs are satisfied with current trends and future prospects in terms of sales and/or profitability and/or return on investment. This fact, may suggest the importance, for high technology SMEs, of the main foreign market, in developing over time business activities through the establishment and implementation of a strong marketing capability-base reflecting how the high technology SME targets customers and positions itself in relation to its competitors in that same market. As presented earlier, in section 8.2.6.1, it might be important to emphasise, at the operating level, firms' effective international performance, in international markets, on distribution, promotion and market research activities.

Secondly, in the same vein, as for international intensity (see section 8.2.6.2), it would be expected high technology SMEs showing a stronger *international orientation* to privilege cooperation with partners in the target markets in order to move more quickly and into more locations. Moreover, high technology SMEs could leverage in foreign markets on partners resources rather than committing their own resources to international business activities. However, this study only found *international orientation* as a strong predictor of *degree of satisfaction* for the entire sample of Portuguese high technology SMEs (including both those firms who have independent and contractual entry modes in the main foreign market) and not that firm's *international orientation* was stronger among those firms which have independent modes compared with those that establish contractual modes.

Thirdly, entrepreneurs/management teams with higher international experience are characterised by having a lower degree of satisfaction with financial goals in the main foreign market. This may be due, once again, to the conflicting interests and different viewpoints respectively from the entrepreneur/chief executive and a potential partner in

the target market. In fact, managers who have lived or worked abroad may often not need to rely on the market knowledge of a potential partner in the foreign country to sell their products/services overseas (Burgel and Murray, 2000). In addition, managers may have their own personal networks and therefore conflicting interests with current or potential foreign partners may arise conducting to a lower performance in the main foreign market, which may be quite important since high technology SMEs concentrate most of their business overseas in a limited number of foreign countries (Preece et al, 1998).

#### **8.2.6.4 Summary of Findings for Research Aim 6**

The goal of research aim 6 was to examine the relationship between contractual cooperation and performance, in the main foreign market, while considering the resources of the high technology SME, that are marketing, technological and financial resources, firm international orientation, entrepreneur/chief executive human capital, entrepreneur/chief executive/management team international experience and entrepreneurial orientation as moderator influences in that relationship.

As performance measures, this study have considered international intensity (an objective measure) that is, the sales in the main foreign market in percentage of total sales, and degree of satisfaction of the entrepreneur/chief executive with some financial targets in the main foreign market (a subjective measure of performance). Due to the fact that these two performance measures have a completely different reasoning and scope of analysis, variables which moderate the relationship between cooperation and performance, in the main foreign market differ.

Table 8.5 summarises variables that are significant moderators or predictors in the relationship between cooperation, in the main foreign market, and performance in that same market measured, respectively, by international intensity and degree of satisfaction of the entrepreneur/CEO with some financial goals.

Table 8. 5: Variables that are Significant Moderators or Predictors in the Relationship between Contractual Cooperation, in the Main Foreign Market, and Performance in that Same Market.

Independent Variables	International Intensity	Degree of Satisfaction
<b>Moderators</b>	<ul style="list-style-type: none"> <li>• Marketing Resources</li> <li>• International Experience</li> </ul>	<ul style="list-style-type: none"> <li>• Financial Resources</li> </ul>
<b>Predictors</b>	<ul style="list-style-type: none"> <li>• International Orientation</li> <li>• Technological Resources</li> <li>• Human Capital</li> </ul>	<ul style="list-style-type: none"> <li>• Marketing Resources</li> <li>• International Orientation</li> <li>• International Experience</li> </ul>
<b>Neither Predictors nor Moderators</b>	<ul style="list-style-type: none"> <li>• Financial Resources</li> <li>• Entrepreneurial Orientation</li> </ul>	<ul style="list-style-type: none"> <li>• Technological Resources</li> <li>• Human Capital</li> <li>• Entrepreneurial Orientation</li> </ul>

Source: The Author

In fact, main findings are the following:

#### **Performance measured by international intensity in the main foreign market**

- *Marketing resources ( $p < 0.05$ ) and entrepreneur international experience ( $p < 0.05$ ) moderate the relationship between contractual cooperation and international intensity, since their main effects are non-significant but the corresponding interactions terms are indeed significant, giving no support for the null hypotheses  $H_{015}$  and  $H_{021}$  despite the fact that the former interaction is positive while the latter is negative. In fact, there is a *statistical significant relationship in respect to the use of contractual arrangements, coupled with marketing resources, or chief executive/management team international experience, in the main foreign market, in relation to performance (international intensity) in that same market.**
- *Technological resources ( $p < 0.05$ ), firm international orientation ( $p < 0.05$ ) and entrepreneur/chief executive human capital ( $p < 0.05$ ) are significant, positive and independent predictors of international intensity giving support for the null hypotheses,  $H_{016}$ ,  $H_{018}$  and  $H_{020}$ , respectively. In fact, there is *no relationship in respect to the use of contractual arrangements, coupled with technological resources, or firm international orientation or either entrepreneur/chief**



*executive human capital, in the main foreign market, in relation to performance (international intensity) in that same market.*

- *Financial resources and entrepreneurial orientation are neither independent predictor variables nor moderators since both main effects and interaction terms are not significant giving support for the null hypotheses, H<sub>0</sub>17 and H<sub>0</sub>19, respectively. In fact, there is no relationship in respect to the use of contractual arrangements, coupled with financial resources and entrepreneurial orientation, in the main foreign market, in relation to performance (international intensity) in that same market.*

**Performance Measured by the Degree of Satisfaction of the Entrepreneur/Chief Executive with some Financial Targets in the Main Foreign Market**

- *Financial resources ( $p < 0.01$ ) moderate the relationship between contractual cooperation and performance, since the main effect is non-significant but the corresponding interaction term is indeed significant, giving no support for the null hypotheses H<sub>0</sub>24. In fact, there is a statistical significant relationship in respect to the use of contractual arrangements, coupled with financial resources, in the main foreign market, in relation to performance in that same market.*
- *Marketing resources ( $p < 0.001$ ), firm international orientation ( $p < 0.01$ ) and entrepreneur/management team international experience ( $p < 0.01$ ) are significant, and independent predictors of international performance, although for marketing resources and firm international orientation the relationship is positive while for entrepreneur/management team international experience the relationship is negative giving support for the null hypotheses, H<sub>0</sub>22, H<sub>0</sub>25 and H<sub>0</sub>28, respectively. In fact, there is no relationship in respect to the use of contractual arrangements, coupled with marketing resources, firm international*

*orientation or entrepreneur/management team international experience, in the main foreign market, in relation to performance in that same market.*

- *Technological resources, entrepreneurial orientation and entrepreneur human capital are neither independent predictor variables nor moderators since both main effects and interaction terms are not significant giving support for the null hypotheses, respectively, H<sub>0</sub>23, H<sub>0</sub>26 and H<sub>0</sub>27. In fact, there is no relationship in respect to the use of contractual arrangements, coupled with technological resources, entrepreneurial orientation and entrepreneur human capital, in the main foreign market, in relation to performance in that same market.*

## **Chapter 9: Contributions, Limitations and Suggestions for Further Research**

### **9.1 Introduction**

This chapter will address the study implications and contributions for academics, practitioners and public policy. A presentation of the study's limitations and suggestions for further research will close this chapter. Thus, this chapter is organised as follows: section 9.2 discusses the implications and contributions for theory, public policy and practitioners. The limitations of this study will be put forward in section 9.3. Then in section 9.4 suggestions for further research will be presented. Last but not the least, a brief summary in section 9.5 will close the chapter and this thesis.

### **9.2 Contributions**

#### **9.2.1 Theoretical Implications**

A primary contribution of this study lies in advancing an understanding of the extent to which SMEs are involved in foreign operations considering their limited internal resource-base.

This study contributes to the SME internationalisation, entrepreneurship and strategic management literatures. For the SME internationalisation and entrepreneurship literatures few empirical studies have so far identified and examined resources, scarce, imperfectly imitable and valuable in unpredictable and uncertain market environments where high technology SMEs currently conduct business activities, which may impact upon their international intensity.

In addition, scales, for measuring those resources, have been developed or refined from existent scales validated in previous research. In so doing the study has the potential for strengthening the theoretical grounds of the SME internationalisation and international entrepreneurship research. In this context, this study has developed new scales, based on

the findings of the exploratory interviews along with other identified resources in the extant literature and then they have been integrated in the specific resources-constructs. Later these resources-constructs have been examined in the mail survey, and have been tested, using principal component analysis, for validity and reliability.

In this context, the *marketing resources scale* has been developed on the insights of the exploratory interviews findings, which emphasised the importance of promotion and distribution strategies, the conducting of market research activities and the establishment of networks of sales personnel mainly with prospective international customers, distributors and other potential partners as well as on Spannos and Lioukas (2001) existing scale characterised by output-based competencies in terms of the international marketing programme, market research, linkages to social or business networks and strong “installed customer base”.

The *technological resources scale* builds on the extant literature considering R&D as a proxy of technological resources (Shrader, 2001) as well as on the findings of the exploratory interviews and on Burgel and Murray (2000) study that are on competencies necessary to convert inputs into outputs.

The *financial resources scale* resemble Wicklund (1999) to assess the balance between supply and demand for capital over the last three years for the development of the firm and on the findings of the exploratory interviews to assess firm’s current endowment of capital for future development.

The *international business experience of the chief executive/senior management team scale* is based on the exploratory interviews findings and on Reuber and Fischer (1997) study and was measured with such items as living and/or working abroad, marketing and sales experience in foreign markets as well as individual links to international networks.

The *human capital of the chief executive/ member of the senior management team scale* also based on the insights of the exploratory interviews is similar, to Becker (1975)

study and was measured by two items that are the number of years of working experience and the number of years of experience in the industry.

Finally, *firm international orientation scale* was measured by three items that are knowledge, experience and commitment to foreign markets and was derived from Johanson and Vahlne (1977) model and on the results of the exploratory interviews.

As regards content validity for all the above scales no relevant measures currently exist. Thus, specific items were developed based on the mentioned above, exploratory interviews and theoretical contributions, as well as from the discussions with academics, and the eight interviewed chief executives of the high technology SMEs during the pre-testing phase of questionnaire development.

In terms of construct validity, this study tested the construct validity of measures by employing principal components analysis (PCA). In fact, this study did not employ confirmatory factor analysis (CFA) due to the small sample size used. CFA would allow a stricter assessment regarding the construct validity of a set of measures as well as a more objective interpretation of validity than PCA does (Gerbing and Anderson, 1988).

Last but not the least, in this study the reliability of each scale was assessed with Cronbach's alpha. The reliability of each scale, see Appendix 7.6, is clearly above the lower limit of 0.70 for descriptive and causal research (Hair et al, 1998).

Relative to existing scales this study used Covin and Slevin (1989) scale for measuring the *entrepreneurial orientation* construct. It has a Cronbach's alpha of 0.773 (see Appendix 7.7), which can be compared with other studies such as 0.79 Knight (2000), 0.75 Zahra and Covin (1995), 0.74 Miller (1983) and clearly above 0.64 in Wicklund (1998) study.

For the strategic management literature this study may contribute by putting forward resources that can allow high technology SMEs to obtain sustainable competitive

advantage, by suggesting to practitioners the resources that they need to develop/deploy or acquire in order to achieve superior performance, mainly in foreign markets.

Second, another theoretical contribution of this study relates to proposing the use in combination of TCE and the RBV to predict and explain entry mode choice of high technology SMEs. In fact, the overwhelming majority of studies set out to predict entry mode choices of high technology entrepreneurial firms use predominantly internationalisation theories and only seldom TCE or the eclectic paradigm. In addition, studies using both TCE and the RBV are almost inexistent.

In this context, since TCE takes a market-based view of the firm that is an outside-in view of the firm and the RBV describes and explains firm's decisions from a perspective of the endowment and deployment of its resources that is an inside-out view of the firm it is expected that these two perspectives enhance explanations and the predictive power for the choice of the foreign market entry mode: independent or through contractual arrangements.

Nonetheless, empirical results, presented in chapter 7 section 7.7, show that resources did not affect the use or non-use of contractual cooperation in the main foreign market. Thus, further research is needed in order to confirm or not this finding.

Third, another contribution of this study stays on understanding and empirically identifying and examining the relationship between the use or non-use of contractual arrangements and international performance in the main foreign market. Results of this study indicate that there is no relationship between contractual cooperation and international performance.

In sum, only a few studies, emerging within the field of international entrepreneurship have focused on the firm's resource-base, particularly in technology intensive sectors, and their potential direct or moderated effects on international performance (Coviello and McAuley, 1999; McDougall and Oviatt, 1996). Moreover, the internationalisation literature has traditionally tended to examine small firms as a homogeneous sector characterised by resource shortages, which act as inhibitors to geographical diversification (Buckley, 1989; Miesenbock, 1988). Thus, this study, tries to give a

contribution to enhance the current knowledge on internationalisation and SMEs as well as on the RBV integrated in an international context.

### **9.2.2 Managerial Implications**

In a context, of market globalisation and economic integration and the constraint of the high technology SME internal resource-base, often their entrepreneurs/senior managers need to make decisions on the degree to which their firms should engage in foreign operations. Therefore, entrepreneurs/ senior managers of high technology SMEs should carefully analyse the study's resources identified as critical to the international performance of their firms and develop and implement business strategies building on those resources in order to enhance the likelihood of international success.

Moreover, entrepreneurs/managers of high technology SMEs should consider foreign market activities from an early stage of their existence if they want to be successful (McDougall et al, 1994). In so doing they benefit from incorporating an international perspective in their plans and business activities.

The findings of this study, based on quantitative analysis, suggest that high technology SMEs with stronger international orientation currently achieve higher levels of international performance. In this context, although entrepreneurs/chief executives of high technology SMEs can face numerous barriers and obstacles throughout international activities, the study has found that firms can overcome those obstacles and challenges through determination and commitment while going on to successfully marketing their products and services internationally. This involves the increasing knowledge of foreign markets by conducting on going market research activities in target markets about market demand, prospective customers, competitors and potential partners in order to enhance firm's international competitiveness. Additionally, the firm as a whole should have an international goal driven behaviour in order to increase its penetration in foreign markets. Moreover, firm's international orientation to succeed requires high skilled personnel in key areas such as Marketing and Sales, Finance and R&D, with a strong entrepreneurial culture and believing that their firms can achieve

success in foreign markets. In these circumstances entrepreneurs/chief executives of high technology SMEs should direct their efforts to create and develop an entrepreneurial culture that will promote the firm's orientation towards the achievement of ambitious international goals, while encouraging complete employee participation and involvement in business activities, and rewarding them relative to their performance, along firm's success in foreign markets.

The empirical findings also suggest that entrepreneurs/chief executives with higher working and industry experiences increase the likelihood of success of their ventures. In fact, entrepreneurs/chief executives with higher working experience generally have a high sense of achievement, leadership and motivation although they may face strong barriers and obstacles while running the business. Similarly, entrepreneurs/chief executives with higher industry experience normally possess extensive innovation and technological skills, a network of business contacts with prospective customers and partners associated with a deep knowledge about the industry sector and its market trends, business segments, customers and competitors, which might allow the reduction of market uncertainty for the high technology SME.

This industry experience might also be relevant to the overall personnel of the high technology SME in areas such as R&D, Marketing and Sales and Business Administration where either previous experience in the same industry sector before joining the firm or an extensive experience within the firm are also suitable.

The findings also recommend that higher levels of performance by the high technology SME can be achieved by building a stronger technological-base through a greater emphasis on R&D activities, by hiring very skilled personnel as well as by capitalisation on continuous innovation based on technologies that are new to the market. In this context, the high technology SME should be characterised by delivering innovative products/services, on an ongoing basis, while engaging in continuous innovation, due to the products/services short life cycles. Thus entrepreneurs/chief executives of high technology SMEs need to take these facts into consideration and allocating resources in key areas while developing and implementing appropriate strategies.



Nevertheless, a focus only on technology development will be not enough to business survival and future prospects. In this context, entrepreneurs/chief executives of high technology SMEs should direct efforts towards international rather domestic products and services and developing awareness that geographical diversification may help recoup mainly from high R&D costs and building profits since high technology SMEs compete in markets characterised by short and shortening life cycles, in which technologies become fast obsolete. In fact, often domestic markets may be too small to accommodate the technology-based niche strategies that they typically pursue.

In short, due to the high R&D costs for example in the ICT industry sector geographical diversification may be a preferable strategy to the growth and development of the high technology SME rather than product diversification. In the same vein, for firms in the mould industry internationalisation is also key for future prospects since the Portuguese market is almost inexistent.

Secondly, high technology SMEs may focus their efforts towards specific geographic areas, which seem to hold the greatest business potential rather than maintaining activities in foreign markets with low attractiveness even though they may be characterised by low geographical or psychic distances. In fact, a not neglectable part of Portuguese high technology SMEs internationalises mainly to the former Portuguese colonies (e.g. Angola and Mozambique) markets characterised by low potential in short and medium term and even in the long run.

Nonetheless, it is not advisable either, mainly for the smaller group of high technology SMEs to embrace expansion simultaneously for different geographical areas since according to recent research it seems to require greater resources that generally this group of high technology SMEs do not possess and that could only develop overtime as their size increases (Preece et al, 1998).

Thirdly, although the results of the quantitative analysis of this study did not find marketing resources as a significant predictor of international intensity it is important to bear in mind that roughly 80% among the firms in this sample score below the scale central value in terms of marketing resources relative to their direct competitors in

foreign markets (see chapter 7, section 7.3.1). In other words the great majority of Portuguese high technology SMEs in this study, irrespective of their international intensity, are characterised by low marketing resources that is by a low market orientation and customer focus. Nevertheless, in the exploratory interviews chief executives, experts and academics emphasised the importance for the firm of having a very skilled sales force, conducting promotion and market research activities on a regular basis and by the access to international distribution channels. In this context, in the assessment of promotion expenditures within the marketing resources construct this study gives evidence that the participation in workshops, exhibitions, symposiums, conferences, and other international meetings of Portuguese high technology SMEs is quite limited as the ENSR (2003) study also corroborates. This is indeed a key issue since the participation in these events is some of the most common methods used by European SMEs for the development of the competence-base of their human resources (E.N.S.R., 2003). Thus, entrepreneurs/ chief executives of Portuguese high technology SMEs must dedicate some time and resources to the active participation of key personnel in those workshops, conferences etc. in order to enhance firm's capability-base.

Similarly to marketing resources the results of the quantitative analysis of the study did not find the international experience of the entrepreneur/chief executive of the high technology SME as a significant predictor of international intensity.

Nevertheless, the mail survey revealed that top managers of Portuguese high technology SMEs have very limited international experience since, for example, roughly 80% among the firms in this sample score below the scale central value in items such as "living or working abroad" even though the exploratory interviews emphasised the importance of international experience as a key resource for the high technology SME. In fact, it is reasonable to expect that entrepreneurs/chief executives with greater international business experience are more likely to having an international vision for their firms, being more open-minded, while showing a greater commitment to foreign market operations.

In sum, this section provided general advice for entrepreneurs/chief executives of high technology SMEs based on empirical evidence. However, the applicability of the identified resources and particular variables are dependent upon each specific firm and industry sector since resources are heterogeneously distributed across firms and those differences may be lasting for long periods of time (Barney, 1991).

Another important issue for entrepreneurs/managers of high technology SMEs relates to the foreign market entry mode. Entry mode choice is a strategic decision of major importance, which can influence the long-term prospects of the firm in the host country. In addition, foreign market entry modes are difficult and costly to change.

In this context, the study, on chapter 4 section 4.5.6, suggested that the use of contractual cooperation vs. internalisation in the foreign market entry mode is dependent upon the situation (Shrader, 2001). Thus the rationale for choosing a contractual arrangement mode is conferred when the tradeoffs between costs and benefits for a contractual cooperative mode are optimised in relation to an internalised choice. The reverse is also true. Therefore, entrepreneurs/managers of high technology SMEs need to analyse carefully the situation in the target country both in terms of market conditions and firm's competitive position before deciding for a contractual arrangement with a local partner or a sole venture, instead. However, sometimes high technology SMEs are resource constrained and therefore a cooperative relationship with a distributor in the target market may be the only option available if the firm wants to venture abroad. In this context, a contractual arrangement with a distributor, where the terms of the contract may establish the main issues addressed in the foreseen cooperation between partners, may be a good option for the resource constrained firm, which nevertheless may be characterised by delivering competitive products/services on the market.

### **9.2.3 Policy Implications**

Governments on a world-wide basis acknowledge the importance of high technology SMEs to the wealth of their respective countries, by creating technological innovations,

skillful employment and raising living standards (ENSR, 2002; OECD, 2005). Thus, with the increasing world globalisation and economic integration this study of high technology SMEs is expected to be relevant for both national and international public policy-makers.

Currently, the study findings have the following implications for policy-makers:

Firstly and above all, attitudes and behaviour of the great majority of Portuguese entrepreneurs/managers of high technology SMEs need to change. In fact, taking the different degree of international intensity among the firms in this study it appears to be a significant difference between those, which pursue foreign markets due to reactive actions (e.g. outside pressures) and those which address foreign operations as a strategic choice for developing their business. In this context, government efforts should be directed to enlightening entrepreneurs/managers regarding the benefits and opportunities of pursuing international business activities. Once entrepreneurs/managers integrate the internationalisation perspective then foreign markets expansion and development tend to follow.

The second implication is concerned with the need to establish and promote assistance programmes based on the findings of the study, both on the qualitative and on the quantitative analysis, in order to build or leverage firm's resources assessed as particularly valuable, mainly in foreign markets.

The study findings suggest the importance, for the high technology SME, in building a strong technology-base through a greater emphasis on R&D activities, and on continuous innovation. Thus, policy-makers could launch effective incentive programmes allowing SMEs to claim enhanced tax relief of, for example 150%, the costs of their R&D expenditures. This scheme is currently implemented in the UK and apparently, according to a press release with the title "*UK companies missing out R&D tax break millions*" from the consulting firm Deloitte & Touche LLP published on July 10<sup>th</sup>, 2006, without great success since "three-quarters of the firms that have made a claim reported that the introduction of the relief had not caused to change their R&D investment decisions, and five per cent had reduced their R&D spend. This is particularly disappointing given that the tax credits were specifically designed as an

incentive to increase the levels of business expenditure on R&D by SMEs...” Thus **effective** incentive programmes allowing SMEs to claim enhanced tax relief of the costs of their R&D expenditures are urgently needed.

Another key area that needs further assistance and training programmes relates to the development, for high technology SMEs, of management and marketing skills since in the exploratory interviews chief executives, experts and academics emphasised the importance for the firm of having a very skilled sales force, conducting promotion and market research activities on a regular basis and by the access to international distribution channels. Thus policy-makers could provide appropriate support programmes such as management training as well as market intelligence and advice in order to enhance the level of information within high technology SMEs so that they can make appropriate decisions.

The third implication, which may represent a strong impediment to development of the human resources of Portuguese high technology SMEs, relates to the lack of their involvement and active participation in international workshops, exhibitions, symposiums, conferences, etc. Thus, government support programmes must provide incentives (e.g. financial) to the attendance and active involvement of high technology SMEs in this type of events. This is a key area that policy-makers should consider in their action plans. Furthermore based, but not exclusively, in this type of events policy-makers need to promote a platform of international business relationships, mainly for the more resource-constrained high technology SMEs which wish to sell their products/services in foreign markets. In fact, policy-makers could endorse, often indirectly, close international relationships so that high technology SMEs could overcome resources shortages and skills deficiencies in order to market their products internationally. Sometimes these relationships between customers, suppliers, competitors and potential partners are reinforced through international partnerships sponsored, for example, by EU programmes as well as through the active participation and involvement in international conferences, workshops, trade fairs, exhibitions, etc.

Finally, a recurring issue about SMEs relates to funding their business activities since as the study findings suggest finance often represents a strong impediment for firm's future

development. Thus, there is a real need for policy-makers to promote the availability of both long term bank loans and venture capital funding.

### **9.3 Limitations**

Currently, it is acknowledged by the researcher that this study has its own limitations. Firstly due to the applied methodology and secondly due to the sample frame of firms used in the study, that is, its empirical base and data issues.

The main methodological limitation of this study refers to its cross-sectional nature. Despite some time related aspects were clearly and explicitly highlighted in the mail questionnaire, an assessment of international performance is not achievable in a cross-sectional design. In fact, the study assessed the resources among the firms in this sample at the end of year 2001 and performance for that same year. Although there is a time lag since international performance is only known in the end of the first quarter of 2002, it appears difficult to distinguish between cause and effect for the majority of the firms. In addition, there is some empirical evidence to suggest that the impact of firm's resource-base on international performance will take 2-3 years to materialise (Shrader, 2001; Whesthead et al, 2001). Thus, however not manageable with a time frame of a PhD, it would be preferable to collect the data regarding resources (the independent variables) and 2-3 years later the data concerned with outcomes (international intensity, international sales growth, degree of satisfaction of the CEO, etc.). In this situation the time lag between collecting the explanatory variables and the corresponding outcome variables would make it possible to infer causality.

Secondly, this study has also limitations due to its limited empirical base. In fact, this limitation relates to the small sample sizes for both populations ICT and Moulds even though the overall usable good response rates of 35% for the ICT sample and 84% for the mould sample. Nonetheless, as stressed in section 6.5, the use of larger samples would be preferable and would strengthen the findings since it would allow the use of structural equation modelling (SEM). Using SEM, a series of dependence relationships

among all the model variables could be tested, simultaneously. However, SEM was not used, as emphasised in section 6.5, due to the limited number of cases for the two populations. Indeed, a total of just 106 observations is a too small sample for using SEM satisfactorily.

Thirdly, the empirical base is also limited because it uses data from a sample of Portuguese high technology SMEs, in ICT and moulds industry sectors, to test the model and hypotheses. In fact as shown in chapter 7 section 7.2.3.3, there are significant differences between the two populations in the characteristics of firms, in each sector, in terms of age, research intensiveness and international intensity. Nevertheless, in order to reach a larger sample size and making possible the use of multivariate statistical techniques the firms were analysed together even though analysis of findings were controlled by industry sector influences.

Fourthly, the generalisability to other high technology sectors such as biotechnology, chemical (including pharmaceuticals) and mechanical engineering is questionable. In addition, the generalisability of the results to other countries or to non-technological SMEs is also questionable. Thus, further research is needed.

Finally, for examining findings pertaining to Research Aims 5 and 6 the study referred, crudely, to contractual arrangements those cooperative relationships that high technology SMEs may establish with partners, through exports (e.g. indirect, direct through distributors), contractual modes (e.g. licensing, contract R&D) and FDI (e.g. joint ventures), in the entry mode in the main foreign market. Conversely, to the traditional literature to entry mode choice the study considered contractual cooperation in broad terms irrespective of the entry mode used in the main foreign market.

Currently, the perspective of this research is: for high technology ventures, the foreign market entry mode is mainly based on exports either independently or through distributors, as the empirical results, in chapter 7 section 7.2.3, clearly show and that contractual cooperation may be analysed together irrespective of the entry mode being conducted through exports, contractual modes or FDI.

Nevertheless, an alternative perspective to that taken in this study would be of comparing just high technology SMEs using only export modes, which represent just over 80% among the firms in this sample, either independently or through distributors.

In sum, as already emphasised in chapter 4 section 4.5.5, contractual arrangements may establish the framework of relationships with prospective partners, although imperfectly, irrespective of being developed in a context of exports, contractual or joint ventures entry modes. In fact, contractual arrangements often represent only a limited part of the cooperation that may be established among potential partners.

Nevertheless, credible contracting is often an exercise in foreseeing potential developing relationships, whereby parties look ahead, recognise risks, and set up mitigation responses to those risks and in so doing realizing mutual gain. In addition, these mechanisms of governance involve information disclosure, discussion, settlement of potential diverse options allowing partners to work through their differences while pushing cooperation forward (Williamson, 1999).

In these circumstances, both the high technology SME and the prospective partner/distributor need to recognise the contractual arrangement as a base to move cooperation forward in the target market, while sharing revenues, costs and risks.

Overall, the discussed limitations of this study open up the doors for further research addressing these limitations.

#### **9.4 Suggestions for Further Research**

Section 9.3 has described the main limitations of this study. This section presents areas of further research to deal with those limitations. In this context, eight avenues of enquiry are suggested by this study.

First, one limitation of this study, as stressed in section 9.3, relates to the small sample sizes, for both populations ICT and Moulds. Future studies should use larger samples in order to strengthen the findings once they would allow the use of structural equation modelling (SEM). Using SEM a series of dependence relationships among all the model



variables can be tested, simultaneously. In fact, the use of a confirmatory study would enable a more reliable assessment of the constructs used; since most of these study findings are based on constructs of an exploratory nature. Despite their validity and reliability were accepted in all cases, unidimensionality could only be assumed not tested. As already emphasised in section 9.2.1 future confirmatory studies should employ stricter construct assessments like confirmatory factor analysis in order to assess the unidimensionality of measures (Gerbing and Anderson, 1988).

Second, the empirical findings of this study provide some insights. However, caution should be exerted when generalising its findings. In fact, as stated in the previous section, the results of this study are derived from a sample of Portuguese high technology SMEs and in so doing it raises the concerns that its findings may be country specific. Thus, studies with comparative samples from other countries are called for to test and eventually confirm and extend the generalisability of the findings of this study.

Third, the study cross-sectional nature did not allow an assessment of firms' resource accumulation and capability development process and their impact on international performance, using, for example, different measures for this latter construct. In addition, as already presented in the previous section, section 9.3, future studies can collect the data regarding resources at one point in time and 2-3 years later the data concerned with international performance (international intensity, international sales growth, degree of satisfaction of the CEO, etc.). In this situation the time lag existent in collecting the explanatory variables and the outcome variables allows to infer causality.

Thus, there is a clear need for longitudinal studies since they are very patchy in previous research.

A fourth limitation relates to the significant differences between the two populations, ICT and moulds, in the characteristics of firms, in each sector. Future studies should seek a large sample of firms, with international activities, in the ICT sector, in order to strengthen the findings, while for the mould sector a qualitative study would be more appropriate due to the limited number of firms, in this sector, which are research intensive. Furthermore, for the mould industry another avenue of enquiry would be a

comparative study between research intensive firms and the remaining population of firms, which currently do not conduct R&D activities. Moreover, future studies should examine other industry sectors, such as biotechnology, chemical (including pharmaceuticals) and mechanical engineering, in order to achieve a deeper understanding of other high-tech industries.

Fifth, this study used a broad perspective of contractual arrangements including exports, contractual modes and joint ventures. Future studies can compare only high technology SMEs using export modes, which represent the great majority of the firms in this study and in previous studies (Lindqvist, 1991; Bell, 1995; Burgel and Murray, 2000; Shrader, 2001), either independently or through distributors.

Sixth, this study only controlled industry effects due to the completely different characteristics of the two sample frames. Further research could control the results by including other variables such as foreign market growth as well as market growth in the main foreign market. In these circumstances, foreign markets are characterised by varying economic conditions and consequently representing different opportunities for firms. Thus, high technology SMEs entering more attractive markets should have performance advantages over firms entering less attractive markets.

Other control variable that can be included in further research is firm age at entry. In fact, the amount of time that firms' have been involved in international operations is very variable since dependent upon their organisational histories. In this context, it is important to control the number of years each firm has been active in a specific market, once it may affect its international intensity. Data needs to be collected regarding the age of each firm at the time of each foreign market entry (Autio, Sapienza and Almeida, 2000).

Seventh, future research could investigate the dynamic relationship between resources and international intensity as well as between resources the use/non-use of contractual arrangements in foreign markets and international intensity by using longitudinal data. Longitudinally, that research could uncover the effects that the development overtime of firm's resource/capability-base has on its performance. In addition, other measures of

performance could be used such as foreign sales growth, foreign assets as percentage of total assets or geographic scope of sales.

Lastly, further research could extend the scope of this study by focusing in factors, beyond firm resources, which may be important to the internationalisation of high technology SMEs such as industry dynamics, product/service characteristics and specific country conditions where firms intend to establish foreign operations.

## **9.5 Summary**

This thesis has identified, and examined the resources, specific to high technology SMEs, at firm and entrepreneur/ manager levels, explaining why, in the same industry, some firms consistently outperform others in international markets.

However, the literature on small firms in high technology sectors acknowledges their shortages of different kinds of resources. Thus, depending on the endowment of internal resources, the high technology SME will internationalise through utilisation of predominantly independent vs. contractual arrangements entry modes.

Another research aim addressed in this study was to assess the resources of the high technology SME that moderate the relationship between contractual cooperation and performance in the main foreign market. In this context, chapter 1 presented an introduction to the topic of this thesis and the broad research aims of the study. Chapters 2 to 4 have reviewed in some depth the core literature, theoretical and empirical, to this thesis. In fact, chapter 2 has examined the characteristics of SMEs and high technology SMEs and more specifically it has identified high technology SMEs current strengths and weaknesses. Chapter 3, drawing on the literature of the Resource-Based View of the Firm (RBV), mainly in a domestic context, has examined some of those strengths and weaknesses, which may be understood as representing key resources, specific to high technology SMEs. Chapter 4 has reviewed the literature on the RBV, in an international context, as well as international business and internationalisation models, which underpin key elements of this thesis, namely: TCE and behaviouristic models of

internationalisation. Chapter 5 integrated those three areas of academic research and a conceptual framework was developed from a synthesis of the literature presented in chapters 2 to 4. The resulting conceptual framework provided the basis upon which the research aims of the study were further refined to establish the stated hypotheses. An appropriate research methodology was developed in chapter 6 to address the objectives of this study. Chapter 7 presented and summarised the study main findings arising from a questionnaire administered to the selected sample. Chapter 8 presented study findings synthesis and discussion.

Finally, the purpose of chapter 9 was to examine the implications of this research with respect to management practice, government policy-making and existing academic theory. In addition, the limitations of this study have been assessed and suggestions for further research have also been proposed.

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## Appendix 6. 1: Exploratory Interview Guide (Firms)

Date:

Place:

### 1. Firm Background

- Name of interviewee:
- Function:
- Company name:
- Industry sector:
- Address:
- Year of foundation: \_\_\_\_\_ Firm age: \_\_\_ years old
- Firm size: \_\_\_\_\_ full time employees
- Estimate % IB to T.O. for your firm in Year 2001? \_\_\_\_\_ %
- Estimate T.O. in Year 2001:
  - < 50.000 cts  300.000-499.999 cts
  - 50.000-99.999 cts  500.000-1 mio. cts
  - 100.000-299.999 cts  >1 mio. cts
- Estimate % R&D expenditures to T.O. in year 2001: \_\_\_\_\_ %
- Estimate % of full-time R&D employees in year 2001: \_\_\_\_\_ %

### 2. Firm Internationalisation

- In what year did your firm start IB activities? \_\_\_\_\_
- What role does IB play in your firm's operations?
  
- What kind of activities does your firm currently conduct abroad, in what countries and what is/are the foreign market entry mode(s) currently used?
  
- What are your firm's main internationalisation motives and reasons for internationalisation?

### **3. Firm Resources**

#### **Entrepreneur/Manager resources**

- Please state your firm's current resources, which represent, respectively, strengths and weaknesses in competing in your firm's foreign markets.
  
- Please state for the Managing Director/CEO/ Senior Management Team of your firm their current strengths and weaknesses as individuals in performing activities in foreign markets.
  
- Please state what types of resources should your firm possess /develop in order to be more successful in foreign markets.
  
- Please state what type of characteristics should the Managing Director/CEO/ Senior Management Team of your firm possess /develop as individuals in order to be more successful in foreign markets.

### **4. Miscellaneous**

- Would you agree to participate in a pilot study for this project?

## **Appendix 6. 2: Exploratory Interview Guide (Academics and experts)**

Date:

Place:

### **1. Interviewee Background**

- Name of interviewee:
- Function:
- University/ Institution:
- Industry sector:
- Address:

### **2. Internationalisation Issues**

- Broadly speaking what role does IB play for Portuguese High technology SME'S, in this industry sector?
  
- Broadly speaking what kind of activities do Portuguese High technology SME'S, in this industry sector perform abroad, in what countries and what are the main foreign market entry mode(s) currently used?
  
- Broadly speaking what are for Portuguese High technology SME'S, in this industry sector the main motives and reasons for internationalisation?

### **3. Firm Resources**

#### **Entrepreneur/Manager resources**

- Broadly speaking for Portuguese High technology SME'S, in this industry sector, what are their current resources, which represent, respectively, strengths and weaknesses in competing in foreign markets?
  
- Broadly speaking for Managing Directors/CEO's/ Senior Management Teams of Portuguese High technology SME'S, in this industry sector, what are their current strengths and weaknesses as individuals in performing activities in foreign markets?
  
- Broadly speaking what types of resources should Portuguese High technology SME'S, in this industry sector, possess/develop in order to be more successful in foreign markets?
  
- Broadly speaking what type of characteristics should the Managing Directors/CEO's/ Senior Management Teams of Portuguese High technology SME'S, in this industry sector, possess /develop as individuals in order to succeed in foreign markets?

## Appendix 6. 3: Survey Cover Letter



Firm name  
"Title", "Name manager", "Position"  
Street name  
Zip code, City  
PORTUGAL

Lisbon, 16 September 2002

### Survey on the role of resources and co-operation in the internationalisation of High Technology SME's

Dear "Title" "Name manager"

I am a Lecturer at ISCTE-Instituto Superior das Ciências do Trabalho e da Empresa and I am currently doing a PhD at the University of Glasgow in Scotland, United Kingdom, about the above mentioned topic.

**Throughout the thesis it is clearly assumed, that firms and mainly in High Technology sectors, are different in their endowments of resources and those differences might influence their competitiveness and consequently their international performance. In this context, the purpose of the research is to make recommendations to firms on how best to deploy and develop their resources to help improve their international competitiveness.**

So that you participate in this study I would very much appreciate if you filled in the attached Questionnaire and when you finish please return it to the researcher.  
Please note **that this investigation critically depends on the responses that we get from firms like yours in order to guarantee the representativity and validity of the research results.**

**Completing the Questionnaire should take no longer than 25 minutes and I am absolutely confident that it will represent a very good opportunity to you to assess your firm's resources when competing internationally.**

I assure you that your response will be treated with the strictest confidentiality. Findings will be reported only at an aggregate level and will make no mention of individuals or individual firms. Interested respondents could get a summary of the main findings of the study by filling out the Information Voucher provided on the last page of the Questionnaire.

In this context, I would very much appreciate if you please:

- I. Fill out the Questionnaire.
- II. When you finish the Questionnaire please return it to the researcher by using the freepost envelope enclosed.

**Or:**

- III. keep the original of the Questionnaire with you so that you conduct overtime a regular and continuous assessment of your firm's resources that is of your firm's competitiveness, and
  - A. Return to the Researcher a photocopy of the Questionnaire, or
  - B. Ask me for another form of the Questionnaire and I will be very happy to post it to you.

Thank you very much for your support in advance.

Luis Alberto Bernardino  
(Assistant Professor at ISCTE)

## Appendix 6. 4: Original Survey



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## Survey on the Role of Resources in the Internationalisation of High Technology SMEs

### QUESTIONNAIRE

#### General Questionnaire Guidelines

1. If you wish to receive a Summary Report of this Study please fill out the Information Voucher on the last page.
2. All returned questionnaires would be treated as Confidential. Findings will be reported at an aggregate level and will make no mention of individuals or individual firms.
3. If your firm is a subsidiary of another, please answer questions in relation to the subsidiary and not the Company as a whole.
4. Not all sections of the Questionnaire will be applicable to your firm. Please indicate where a section is not applicable and move on as appropriate.
5. If you have any further questions regarding this questionnaire or the study please do not hesitate to contact Luis Bernardino on Tf. 212190544, Tm. 966036073 or e-mail: [luis.bernardino@socsci.gla.ac.uk](mailto:luis.bernardino@socsci.gla.ac.uk).
6. When you finish the Questionnaire please return it to the Researcher by using the freepost envelope enclosed.

Thank you very much for your time and co-operation



**Introduction**

1. In what industry mainly has your firm business activities: (Please tick one only)

- Biotechnology
- Chemical industry (including Pharmaceuticals)
- Information Technology (SW)
- Electronics/ microelectronics
- Other industry
- Information Technology (HW)
- Moulds for the plastic industry
- Mechanical Engineering
- Telecommunications
- Please specify: \_\_\_\_\_

2. How many employees including executive directors and managers does your firm currently have on the payroll?

**Section 1: Manager/Entrepreneur characteristics and Firm**

1. What is the **highest level of education** that you have completed so far:

- Secondary School
- College Diploma
- Bachelor's Degree
- Other
- Master's Degree
- PhD
- Please specify: \_\_\_\_\_

2. How many **years of working experience** did you have prior to founding/joining this company?

3. How many **years of experience in this industry** did you have prior to founding/joining this company?

4. Have you ever owned a business prior to founding/joining this company?  
 Yes     No    If Yes, for how many years?

5. Have you held a **senior executive position, in International/Multinational firms**, prior to founding/joining this company?  
 Yes     No    If Yes, for how many years?

6. Have either/both of your parents ever owned a business?  
 Yes     No

7. Please describe your firm's management team last year (**YEAR 2001**) by ticking a box on the scale next to each statement:

	Very Low			Neutral			Very High
	1	2	3	4	5	6	7
Degree of International experience as result of <b>working abroad</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Degree of International experience as result of <b>living abroad</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Degree of <b>marketing and sales experience</b> of products/services in foreign markets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Individual links with <b>international social networks</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Section 2: Managerial Perspectives

1. Please assess your company's **marketing resources in foreign markets** last year (**YEAR 2001**) compared to your major two international competitors:

<b>MARKETING RESOURCES INTERNATIONALLY</b>	Much weaker in comparison			Neutral			Much stronger in comparison
<b>Marketing resources of your firm in relation to major two international competitors</b>	1	2	3	4	5	6	7
Access to international distribution channels.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
International Sales Force resources.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The international social contact networks of your firm's sales people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The international social contact networks of your firm's sales people to foreign sales agents and distribution networks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
International Promotion expenditures. (*)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm's links with international social networks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm's links with international business networks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establishment of a Customer base.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Analysis of competitors in foreign markets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Analysis of potential foreign customers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Analysis of potential foreign partners for co-operation...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(\*) Are considered **Promotion expenditures** those made in advertising over the media or the Internet, promotional activities, direct marketing, public relations, participation in workshops, exhibitions, symposiums, Conferences, and other international meetings.

2. What percentage of your annual turnover did you invest, last year (YEAR 2001), in **R&D**, if any? .

3. How many full-time equivalent employees were mainly working in **R&D** activities in your firm last year (YEAR 2001), if any?

4. This question consists of pairs of statements, in a scale 1-7, about your firm's **management practices over the period 1998-2001** in international markets. Please mark which **position** between the statements **best describes the situation in your Firm**:

Neutral						
1	2	3	4	5	6	7

**a) During the past three years our firm has marketed, excluding mere minor variations...**

...No new lines of products or services in the past three years

...A very large number of new lines of products in the past three years

**b) During the past three years our firm has marketed, excluding mere minor variations...**

...Changes in product lines have been quite dramatic

...Changes in product lines have been of minor nature

**c) In our firm...**

... There is a very strong emphasis on R&D, technological leadership and innovation

... There is a very strong emphasis on the marketing of true and tried products or services

**d) Our firm...**

... Has a strong proclivity to low risk projects (with normal and certain rates of return)

... Has a strong proclivity to high risk projects (with chances of very high returns)

**e) Owing the nature of the environment...**

... Bold wide-ranging acts are viewed as useful and common practice.

... It is best to explore it gradually via timid, incremental behaviour

**f) In our firm...**

... There is a strong tendency to follow competitors in introducing new things and ideas

... We always try to go ahead of competitors in product novelty or speed of innovation and usually succeed.

**g) Our relationship to our competitors is characterized by the fact that...**

... We pursue a tough "undo the competitors" philosophy

... We try to co-operate and co-exist with competitors

**h) Our firm is characterized by the fact that...**

...Our products integrate existing and tested technologies

...Our products integrate new technologies not yet implemented on the market

**i) The products or services we market...**

...Are largely developed in-house

...Are based on ideas developed by third parties

**j) The availability of capital has during the past three years...**

...Insufficient and a great impediment for our development

...Fully satisfactory for the firm's development"

5. How would you categorise, last year (YEAR 2001), your firm's **endowment of financial resources**:

<b>Resources and Resources</b>	Very Weak			Neutral			Very Strong
	1	2	3	4	5	6	7
Financial Resources.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. How would you rate the importance for your firm of each of the following issues during last year (YEAR 2001):

<b>Issues List</b>	None			Moderate			Very Substantial
	1	2	3	4	5	6	7
Firm international experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm commitment to international markets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm's knowledge about foreign markets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Section 3: International Business activities of your Company (\*\*)

1. Is your firm currently engaged in any international business activities?

Yes       No

If No go to **SECTION 5**.

(\*\*) Includes all international business investments and business activities, which generate turnover. These include indirect exports via domestic intermediaries, direct exports to agents/distributors abroad and/or customers abroad, licensing out, contract R&D for foreign firms, international joint ventures, international strategic alliances, foreign sales subsidiaries and foreign production subsidiaries.

2. What percentage of your firm's last year (YEAR 2001) turnover is generated from international business activities?  %

3. Following the example on Table A below, please indicate in **TABLE B** your **current foreign markets**, the first year your firm generated turnover from or invested in any of the listed international business activities:

**Table A (EXAMPLE)**

Country	Enter First Year						
	Direct export via foreign intermediary	Direct export to customer	Licensing out	Contract R&D	Joint Venture	Sales Subsidiary	Other
Spain	1995					1998	
Brazil		1997			1999		
Germany				1996	1997		

Please enter now your firm's activities overseas in the table below:

**Table B (Your Firm)**

Country	Enter First Year						
	Direct export via foreign intermediary	Direct export to customer	Licensing out	Contract R&D	Joint Venture	Sales Subsidiary	Other

4. Please rank **the top three countries, in Year 2001**, in which your firm currently has international business activities as well as the respective participation, in terms of percentage, to your company's international income and turnover:

Country	% Total annual International Income	% Total annual Turnover
	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %
	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %
	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %

5. Please indicate your company's change, in **international business income**, in each of the last three business years, by entering the percentage of change from the previous year. (Please consider index 100 for year 1998).

Percentage change previous year  
(Please indicate + or -)

1998	<input type="text"/> <input type="text"/> <input type="text"/> %
1999	<input type="text"/> <input type="text"/> <input type="text"/> %
2000	<input type="text"/> <input type="text"/> <input type="text"/> %
2001	<input type="text"/> <input type="text"/> <input type="text"/> %

**Section 4: International Business activities in your firm main foreign market/country**

1. Please indicate in last year (YEAR 2001) the type of **FOREIGN MARKET ENTRY MODE** currently utilized by your firm in the main foreign market/country (please tick only one box):

- Direct exports to end customer.
- Direct exports via Foreign Intermediary/ sales Agent.
- Indirect exports via Domestic Intermediary.
- Contract R&D.
- Other.
- Joint Venture.
- Sales Subsidiary.
- Production and Sales Subsidiary.
- Please specify: \_\_\_\_\_

2. How you categorise at the end of last year (YEAR 2001) the DEGREE OF SATISFACTION with the international performance of your firm in the main foreign market/country:

Performance in the Main Foreign Market (End of Year 2001)	Degree of Satisfaction									
	Not Satisfied at all	1	2	3	Neutral	4	5	6	7	Very Satisfied
Targets										
Foreign Sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Growth of Foreign Sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Profitability of Foreign Sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Net Income	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Return on Capital Employed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Section 5: Firm Background**

1. What is your position in the firm? \_\_\_\_\_
2. Are you a founder of the firm?  Yes  No
3. How many people were involved in founding the firm?
4. In what year was your firm founded?
5. How many of the founders are still in the firm?
6. How many of the founders are currently on the senior management team of your firm?
7. In what way was your firm founded?
  - New start-up** (The firm did not evolve / emerge from another organisation)
  - Evolution** (Spin-off from another firm / university)
  - Other, please specify:** \_\_\_\_\_

8. How many persons are currently on the senior management team of your firm?

9. Please indicate the description which best describes your firm by ticking the appropriate box:

- Wholly independent
- Up to 20% of the capital is held by another firm
- From 20% to 50% of the capital is held by another firm(s).
- More than 50% of the capital is held by another firm(s)
- Wholly owned subsidiary
- Other, please specify: \_\_\_\_\_

**Section 6: Company Data**

1. Please estimate your total annual turnover in the last business year:

- |  |  |                          |
|--|--|--------------------------|
| <input type="checkbox"/> < 50.000 cts        | <input type="checkbox"/> 300.000-500.000 cts | <input type="checkbox"/> |
| <input type="checkbox"/> 50.000-100.000 cts  | <input type="checkbox"/> 500.000-1 mio. cts  | <input type="checkbox"/> |
| <input type="checkbox"/> 100.000-300.000 cts | <input type="checkbox"/> >1 mio. cts         | <input type="checkbox"/> |

2. Please indicate your company's change, in **turnover**, and **profitability** in each of the last three business years, by entering the percentage of change from the previous year. (Please consider index 100 for year 1998).

YEAR	Percentage change previous year (Please indicate + or -)	
	TURNOVER	PROFITABILITY
1998	<input type="text"/> 1 <input type="text"/> 0 <input type="text"/> 0 %	<input type="text"/> 1 <input type="text"/> 0 <input type="text"/> 0 %
1999	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %
2000	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %
2001	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %

I have participated in your study and I would like to receive an Executive Summary of this Study's main findings.

Please send the summary to the following email address:

Firm: \_\_\_\_\_

E-mail: \_\_\_\_\_

Thank you very much for your time and co-operation

## Appendix 6. 5: Survey (Portuguese version)



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### Estudo Relativo ao Papel dos Recursos / Capacidades e à Cooperação Interorganizacional na Internacionalização de PME's de Alta Tecnologia

## QUESTIONÁRIO

### Instruções Gerais

1. Se pretender receber uma síntese das principais conclusões e recomendações do presente estudo é favor preencher o cupão que se junta na última página.
2. Todas as respostas serão tratadas confidencialmente. Todas as conclusões serão apresentadas de forma agregada, e nenhuma menção será efectuada a nível individual, de pessoas ou empresas.
3. Caso a sua empresa seja uma filial de outra, solicita-se o favor das respostas às questões colocadas serem apresentadas ao nível da filial e não da empresa no seu conjunto.
4. Na eventualidade de nem todas as partes do Questionário serem aplicáveis à sua empresa, indique por favor aquelas que não o são e responda apenas às partes aplicáveis.
5. Em caso de qualquer questão adicional relativamente ao Questionário ou ao presente estudo por favor não hesite em contactar para Luis Bernardino nos Tel. 212190544, Tm. 966036073 ou para o e-mail: [luis.bernardino@socsci.gla.ac.uk](mailto:luis.bernardino@socsci.gla.ac.uk)
6. Após completar o preenchimento do Questionário agradeço a sua devolução, utilizando para o efeito o **envelope com porte pago**.

Desde já o meu muito obrigado pelo seu tempo e valiosa colaboração.



## Introdução

1. Indique por favor o sector onde a sua empresa desenvolve a actividade empresarial (assinale **apenas um** quadrado):

- |   |                          |   |                          |
|---|--------------------------|---|--------------------------|
| a. Biotecnologia                                      | <input type="checkbox"/> | 3. Tecnologias de Informação (Hardware) | <input type="checkbox"/> |
| a. Indústria Química (Sector Farmacêutico, inclusivé) | <input type="checkbox"/> | 4. Moldes p/ a indústria de plásticos   | <input type="checkbox"/> |
| a. Tecnologias de Informação (Software)               | <input type="checkbox"/> | 5. Engenharia Mecânica                  | <input type="checkbox"/> |
| a. Electrónica / Microelectrónica                     | <input type="checkbox"/> | 6. Telecomunicações                     | <input type="checkbox"/> |
| a. Outro Sector                                       | <input type="checkbox"/> | Explicite, por favor: _____             |                          |

2. Qual o **número de trabalhadores que actualmente trabalham na sua empresa**, incluindo cargos executivos de Gestão e Direcção? (No caso de a sua empresa ser uma filial de outra indique apenas o número de trabalhadores da sua organização)

## Secção 1: Características do Empreendedor / Gestor

1. Quais as suas **habilitações literárias**:

- |                        |                          |                           |                          |
|------------------------|--------------------------|---------------------------|--------------------------|
| • 9º Ano Escolaridade  | <input type="checkbox"/> | • MBA/Mestrado            | <input type="checkbox"/> |
| • 12º Ano Escolaridade | <input type="checkbox"/> | • Doutoramento            | <input type="checkbox"/> |
| • Licenciatura         | <input type="checkbox"/> |                           |                          |
| • Outra                | <input type="checkbox"/> | Indique, por favor: _____ |                          |

2. Qual o número de anos de **experiência profissional antes** de ter fundado ou começado a trabalhar nesta empresa?

3. Qual o número de anos de **experiência específica neste sector** que possuía **antes** de ter fundado ou começado a trabalhar nesta empresa?

4. Teve **algum negócio** antes de ter fundado ou começado a trabalhar nesta empresa?  
 Sim  Não Se respondeu **sim** qual o número de anos?

5. Desempenhou funções de **gestão / direcção**, em empresas internacionais/multinacionais, **antes** de ter fundado ou começado a trabalhar na empresa?  
 Sim  Não Se respondeu **sim** qual o número de anos?

6. Foram / são **o seu pai / mãe proprietários de um negócio**?  
 Sim  Não

7. Como caracterizaria o **perfil dos elementos da Direcção** da sua empresa, **no último ano (ANO 2001)**, relativamente aos seguintes atributos:

	Nenhuma 1	2	3	Moderada 4	5	6	Substantial 7
Grau de experiência a nível internacional resultante de terem <b>trabalhado</b> no estrangeiro.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grau de experiência internacional resultante de terem <b>vivido</b> no estrangeiro.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grau de experiência em funções de <b>marketing e vendas</b> de produtos/serviços, a nível internacional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Rede de contactos</b> , a nível internacional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Secção 2: Perspectivas da Gestão

1. Como caracterizaria **no último ano (ANO 2001)**, as **capacidades de marketing da sua empresa**, a **nível internacional**, relativamente aos seus dois principais concorrentes internacionais:

CAPACIDADES DE MARKETING DA SUA EMPRESA A NÍVEL INTERNACIONAL	Muito mais fraca em comparação			Nem mais forte Nem mais fraca			Muito mais forte em comparação
	1	2	3	4	5	6	7
<b>Capacidades de marketing em relação aos dois principais concorrentes internacionais</b>							
Acesso a canais de distribuição internacionais.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Capacidades da Força de Vendas, a nível internacional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Redes de contacto internacionais, a nível individual, dos elementos da Força de Vendas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Redes de contacto internacionais, a nível individual, dos elementos da Força de Vendas, c/ Agentes/Distribuidores.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Investimentos em comunicação a nível internacional. (*)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inserção da empresa em redes de contacto, a nível internacional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inserção da empresa em redes empresariais, a nível internacional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Estabelecimento de uma base de clientes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Análise da concorrência, a nível internacional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Análise de potenciais clientes, a nível internacional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Análise de potenciais <i>partners</i> , a nível internacional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(\*) Consideram-se investimentos em **comunicação** os realizadas em publicidade através dos media ou da Internet, actividades promocionais, marketing directo, relações públicas, participação em workshops, exposições, symposiums, feiras, congressos e outras reuniões internacionais, etc.

2. Que percentagem do valor anual das vendas investiu a sua empresa, no último ano (ANO 2001), em I&D? . %
3. Qual o número equivalente de trabalhadores a tempo integral em funções de I&D durante o último ano (ANO 2001)?
4. Cada uma das seguintes questões contém duas afirmações de sentido oposto, numa escala de 1-7, sobre as **práticas gestão da sua empresa, no período 1998-2001 em mercados internacionais**. Assinale, para cada questão, apenas num dos quadrados a posição relativa, entre cada par de afirmações, que melhor descreve essas mesmas práticas:

Neutro						
1	2	3	4	5	6	7

a) Ao longo dos últimos três anos a nossa empresa, excluindo pequenas alterações...

...não lançou no mercado novas linhas de produtos e serviços.        ...lançou no mercado um grande número de novas linhas de produtos e serviços.

b) Ao longo dos últimos três anos as alterações nas linhas de produtos, comercializados pela nossa empresa...

...foram radicais        ...foram pouco significativas

c) Na nossa empresa...

...Existe uma elevada focalização em I&D, liderança tecnológica e inovação.        ...Existe uma elevada focalização na comercialização de produtos.

d) A nossa empresa...

...Tem uma forte propensão por projectos de baixo risco caracterizados por taxas de retorno do investimento normais e certas.        ...Tem uma forte propensão por projectos de elevado risco com probabilidade de obtenção de elevadas taxas de retorno.

e) Dada a natureza do meio envolvente...

...Práticas de gestão que reflectem um comportamento arrojado são vistas como muito úteis e de utilização habitual.        ...É melhor explorar as oportunidades de forma gradual / incremental através de pequenos passos.

f) Na nossa empresa...

...Existe uma forte tendência em seguir os concorrentes na introdução de novos conceitos e ideias.        ...Tentamos estar à frente dos concorrentes na introdução de novos produtos e rapidez de inovação e geralmente conseguimos-lo.

g) As nossas relações com os nossos concorrentes são caracterizadas pelo facto de...

...Pormos em prática uma linha de grande agressividade competitiva, independentemente da postura da concorrência.        ...Tentamos cooperar e coexistir com os nossos concorrentes.

h) A nossa empresa caracteriza-se pelo facto de...

...Os nossos produtos integram tecnologias existentes e testadas.        ...Os nossos produtos integram novas tecnologias ainda não implementadas no mercado.

i) Os produtos e serviços que colocamos no mercado...

...São, em larga medida, desenvolvidos na empresa.        ...São baseados em ideias desenvolvidas por terceiros.

j) A disponibilidade de recursos financeiros ao longo dos últimos três anos...

...Foi insuficiente e um grande impedimento para o desenvolvimento da empresa.        ...Totalmente satisfatório para o desenvolvimento da empresa.

5. Como caracterizaria, a sua empresa relativamente à respectiva dotação de **recursos financeiros no final do último ano (ANO 2001)**:

<b>Recursos</b>		Muito Baixo			Nem baixo Nem elevado			Muito Elevado
		1	2	3	4	5	6	7
Recursos Financeiros.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Avalie por favor a importância de cada um dos seguintes factores ao longo do último ano na actividade da sua empresa (**Ano 2001**):

<b>Importância dos Factores no Ano 2001</b>		Nada Importante			Neutro			Extremamente Importante
		1	2	3	4	5	6	7
Experiência internacional da sua empresa.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Empenhamento da empresa relativamente aos mercados internacionais.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conhecimento da empresa relativamente aos mercados internacionais.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Secção 3: Actividade internacional da sua empresa

1. A sua empresa tem actualmente actividade internacional (\*\*)?

Sim       Não

Se respondeu **NÃO** passe directamente, p/ a **Secção 6** na página 12 do Questionário, por favor.

(\*\*) Inclui todos os investimentos e todas as actividades de negócio que visem gerar vendas/proveitos, a nível internacional. Nestas incluem-se exportação indirecta através de distribuidores existentes em Portugal, exportação directa através de agentes / distribuidores, existentes nos países de destino, ou directamente para clientes finais; contractos de Licenciamento e/ou I&D para empresas sediadas no estrangeiro; e ainda Joint Ventures e Alianças Estratégicas, a nível internacional. Finalmente, são ainda consideradas como parte da actividade internacional as filiais comerciais e as filiais integradas (com actividade produtiva) criadas fora de Portugal.

2. Que percentagem das vendas anuais da sua empresa **no último ano (ANO 2001)** resultou de negócios a nível internacional?  %

3. De acordo com o **exemplo** apresentado no **Quadro A** indique no **QUADRO B** os **principais mercados internacionais** onde a sua empresa tem actividade, indicando o ano em que pela primeira vez a sua empresa realizou vendas ou investiu nesse mercado:

**Quadro A (EXEMPLO)**

Mercado Internacional / País	Primeiro ano:						
	Exportação através de distribuidor do País de destino	Exportação directa p/ cliente final	Licenciamento a empresa estrangeira	Contracto de I&D	Joint Venture	Filial Comercial	Outra
França	1995					1998	
Brasil		1997			1999		
Alemanha				1996	1997		

**INTERNACIONALIZAÇÃO DA SUA EMPRESA: QUADRO B**

Quadro B (A sua empresa)

Mercado Internacional / País	Primeiro ano:						
	Exportação através de distribuidor do País de destino	Exportação directa p/ cliente final	Licenciamento a empresa estrangeira	Contracto de I&D	Joint Venture	Filial Comercial	Outra

4. Apresente numa listagem, **por ordem de importância, no último ano (ANO 2001), dos três principais países** onde a sua empresa tem actividade internacional bem como as taxas de participação respectivamente para as vendas / proveitos resultantes da actividade internacional bem como para o volume de negócios global da empresa.

País	% Total Proveitos Act. Internacional	% Total Volume Anual Negócios
	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %
	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %
	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %

5. Indique por favor, ao longo dos últimos três anos, a taxa de variação das vendas/proveitos, em percentagem, referente à **actividade internacional da sua empresa**, em cada ano, relativamente ao respectivo ano anterior. Considere o índice 100 p/ o ano de 1998. (Nos casos em que a tx. crescimento seja negativa apresente sinal (-) antes da taxa de variação).

Variação percentual em relação ao ano anterior  
(+ ou -)

1998	<input type="text" value="1"/> <input type="text" value="0"/> <input type="text" value="0"/> %
1999	<input type="text"/> <input type="text"/> <input type="text"/> %
2000	<input type="text"/> <input type="text"/> <input type="text"/> %
2001	<input type="text"/> <input type="text"/> <input type="text"/> %

**Secção 4: Actividade Internacional da sua Empresa no Principal Mercado Internacional/País.**

1. Indique por favor **no último ano (ANO 2001)** a forma de internacionalização utilizada pela sua empresa no **Principal Mercado Internacional / País** (assinale apenas um quadrado):

- |  |                          |   |                          |
|--|--------------------------|---|--------------------------|
| • Exportação directa p/ o cliente final                                | <input type="checkbox"/> | • Joint Venture.                                | <input type="checkbox"/> |
| • Exportação directa através de Agente/Distribuidor no País de Destino | <input type="checkbox"/> | • Filial comercial                              | <input type="checkbox"/> |
| • Exportação indirecta através de distribuidor existente em Portugal   | <input type="checkbox"/> | • Filial integrada (produção e comercialização) | <input type="checkbox"/> |
| • Contrato de I&D  | <input type="checkbox"/> | • Licenciamento a empresa estrangeira           | <input type="checkbox"/> |
| • Outra.   | <input type="checkbox"/> | Indique por favor: _____                        |                          |

2. Avalie por favor o **GRAU DE SATISFAÇÃO c/ a performance atingida pela sua empresa no principal Mercado Internacional / País, no final do último ano (ANO 2001):**

Performance no principal mercado Internacional / País (Final do ANO 2001)	Nada Satisfeito		Nem Satisfeito Nem Insatisfeito		Muito Satisfeito		
	1	2	3	4	5	6	7
<b>Objectivos</b>							
Vendas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Taxa de crescimento das vendas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rendibilidade das vendas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lucro Líquido	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Retorno do capital investido	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Secção 5: Características da empresa

1. Qual o cargo que ocupa na empresa? \_\_\_\_\_
2. É membro fundador? Sim  Não
3. Qual o número de pessoas envolvidas na fundação da empresa?
4. Em que ano foi fundada a empresa?
5. Qual o número de sócios fundadores que ainda trabalham na empresa?
6. Quantos sócios fundadores fazem parte da Direcção da empresa?
7. De que modo foi fundada a empresa?  
 “Start-up” (a empresa foi criada apartir dum projecto de raiz)  
 Evolução (“Spin-off” de outra empresa / universidade)  
 Outra, indique sff: \_\_\_\_\_
8. Quantas pessoas fazem actualmente parte da Direcção da empresa?
9. Indique por favor, no quadrado respectivo, o modo como se encontra actualmente distribuído o capital social da empresa:  
 Empresa 100% independente  
 Até 20% do capital é detido por outra organização  
 Entre 20% e 50% do capital é detido por outra(s) organização(ões).  
 Mais de 50% do capital é detido por outra(s) organização(ões)  
 Filial de outra empresa, que anteriormente era uma empresa 100% independente.  
 Outra. Indique, por favor: \_\_\_\_\_

## Secção 6: Dados da empresa

1. Indique por favor no quadro seguinte o **valor estimado do volume de negócios** da sua empresa no **ANO 2001**:

<input type="checkbox"/> < 50.000 cts	<input type="checkbox"/> 300.000-499.999 cts	<input type="checkbox"/>
<input type="checkbox"/> 50.000-99.999 cts	<input type="checkbox"/> 500.000-1 mio. cts	<input type="checkbox"/>
<input type="checkbox"/> 100.000-299.999 cts	<input type="checkbox"/> >1 mio. cts	<input type="checkbox"/>
2. Indique por favor, ao longo dos últimos três anos, a **taxa de variação do volume de negócios bem como do lucro da sua empresa, em percentagem, em cada ano, relativamente ao respectivo ano anterior**. Considere o índice 100 p/ o ano de 1998. (Nos casos em que a tx. crescimento seja negativa apresente sinal – antes da taxa de variação).

Taxa de Variação Relativamente ao Ano Anterior  
( Indique por favor + ou - )

ANO	VOL. NEGÓCIOS	LUCRO
1998	<input type="text" value="1"/> <input type="text" value="0"/> <input type="text" value="0"/> %	<input type="text" value="1"/> <input type="text" value="0"/> <input type="text" value="0"/> %
1999	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %
2000	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %
2001	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/> <input type="text"/> %

Participei no presente estudo e gostaria que me fosse enviada uma síntese das principais Recomendações e Conclusões p/ o seguinte endereço de e-mail:

Nome: \_\_\_\_\_

Empresa: \_\_\_\_\_

e-mail: \_\_\_\_\_

**Muito obrigado pelo seu tempo e colaboração**



## Appendix 7. 1: Populations, Samples and Response Rates

### A) Population of firms in ICT sectors in Portugal

Population of firms in ICT sectors in Portugal	455	100%			
Firms non-eligible (excluded ex-ante)	210	46%	Pure service firms (Consulting and training)	186	89%
			Subsidiaries of MNE's	16	8%
			Portuguese High technology firms with more than 250 employees	8	3%
Potential sample frame	245	54%			
Firms non-eligible (excluded ex-post)	46	19%	Moved or no-longer exist	15	6%
			No international activity	31	13%
Non-Respondents	130	53%			
Respondents (eligible)	69	28%			
<b>Total Response Rate</b>	<b>47%</b>				
<b>Net Response Rate</b>	<b>35%</b>				

$$TRS = \frac{(Total - Non-respondents)}{Total} = \frac{245-130}{245}$$

$$NRS = \frac{Respondents}{(Total - Non-eligible)} = \frac{69}{245-46}$$

### B) Population of firms in the Mould Industry in Portugal

Population of firms in the Mould Industry in Portugal	300	100%			
Firms non-eligible (excluded ex-ante)	257	86%	Firms without "project-engineering"	257	100%
Potential Sample Frame	43	14%			
Firms non-eligible (excluded ex-post)	0	0%			
Non-Respondents	7	16%			
Respondents (eligible)	36	84%			
<b>Total Response Rate</b>	<b>84%</b>				
<b>Net Response Rate</b>	<b>84%</b>	36/43			

$$TRS = \frac{(Total - Non-respondents)}{Total} = \frac{43-7}{43}$$

$$NRS = \frac{Respondents}{(Total - Non-eligible)} = \frac{36}{43}$$

## Appendix 7. 2: Descriptives: Firms' Resources

### Firms' Marketing Resources

Variable	Mean	Std. Dev.	Minimum	Maximum	N	Meaning
s2_1a	3.16	1.76	1	7	106	Access to international distribution channels
s2_1b	3.01	1.60	1	7	106	International sales force skills
s2_1c	3.26	1.72	1	7	106	International social network of sales people
s2_1d	3.12	1.65	1	7	106	International social network contacts of sales people to foreign agents/distributors
s2_1e	2.86	1.73	1	7	106	International promotion expenditure
s2_1f	3.25	1.68	1	7	106	Firm's links with international social networks
s2_1g	3.03	1.71	1	7	106	Firm's links with international business networks
s2_1h	3.40	1.63	1	7	106	Establishment of a customer base
s2_1i	3.18	1.55	1	7	106	Market research: Analysis of competitors
s2_1j	3.41	1.57	1	7	106	Market research: Analysis of potential foreign customers
s2_1k	3.33	1.64	1	7	106	Market research: Analysis of potential foreign partners

### Firms' Technological Resources

Variable	Mean	Std. Dev.	Minimum	Maximum	N	Meaning
s2_2	0.14	0.18	0.01	0.87	106	R&D intensity: % of R&D expenditures to TO
s2_3_i_s	0.19	0.21	0.5	0.92	106	R&D intensity: % of R&D full-time employees to total employees
s2_4h	3.79	1.75	1	7	106	Innovativeness of Technology
s2_4ir	5.10	1.85	1	7	106	Product / Service development within the firm

### Firms' International Orientation

Variable	Mean	Std. Dev.	Minimum	Maximum	N	Meaning
s5_3f	4.58	1.82	1	7	106	Firm international experience
s5_3g	5.30	1.50	1	7	106	Firm commitment to foreign markets
s5_3h	5.03	1.558	1	7	106	Firm knowledge about foreign markets

### Firms' Financial Resources

Variable	Mean	Std. Dev.	Minimum	Maximum	N	Meaning
s2_4j	3.86	1.86	1	7	106	Availability of capital for firm's development
s5_2e	4.07	1.38	1	7	106	Endowment of firm's financial resources

### Appendix 7. 3: Decriptives: Entrepreneurs/CEOs' Resources

#### Firm/Entrepreneur entrepreneurial orientation

Variable	Mean	Std. Dev.	Minimum	Maximum	N	Meaning
s2_4a	4.78	1.75	1	7	106	Firm Innovativeness I
s2_4br	4.09	1.62	1	7	106	Firm Innovativeness II
s2_4cr	4.36	1.76	1	7	106	Firm InnovativenessIII
s2_4d	4.50	1.33	2	7	106	Entrepreneur risk-taking I
s2_4er	3.51	1.47	1	7	106	Entrepreneur risk-taking II
s2_4f	5.04	1.56	1	7	106	Firm proactivity
s2_4gr	3.71	1.49	1	7	106	Entrepreneur risk-taking III

#### Entrepreneur/Chief Executive Human Capital

Variable	Mean	Std. Dev.	Minimum	Maximum	N	Meaning
s1_2	20.0	8.2	5	36	106	Number of years of entrepreneur/chief executive working experience
s1_3	18.0	8.9	2	36	106	Number of years of entrepreneur/chief executive industry experience

#### Entrepreneur/Chief Executive International Experience

Variable	Mean	Std. Dev.	Minimum	Maximum	N	Meaning
s1_7a	2.81	2.19	1	7	106	International experience as a result of working abroad
s1_7b	2.61	2.07	1	7	106	International experience as a result of living abroad
s1_7c	3.83	1.90	1	7	106	Marketing and sales experience of products/services in foreign markets
s1_7d	4.23	1.77	1	7	106	Individual links with international social networks

## Appendix 7. 4: Principal Components Factor Analysis (PCA): Firm Resources Factors

**Principal Components Factor Analysis  
(PCA): Firm Resources Factors**  
Rotated Component Matrix <sup>a</sup>

	Component			
	1	2	3	4
s2 1a	.742	.207	-.042	.222
s2 1b	.724	.244	-.101	.234
s2 1c	.615	.118	.073	-.093
s2 1d	.625	.042	-.016	-.108
s2 1e	.773	.233	-.031	.117
s2 1f	.634	.069	.101	.076
s2 1g	.793	.214	.116	.171
s2 1h	.715	.295	.100	.264
s2 1i	.726	.111	.157	.258
s2 1j	.747	.269	.122	.203
s2 1k	.717	.064	.278	.205
s2 2	.011	.149	.796	.035
s2 3 i s	.052	.038	.823	.049
s2 4h	.337	.136	.614	-.076
s2 4ir	-.026	-.085	.730	.032
s2 4j	.235	-.139	.084	.832
s5 2e	.221	.136	-.028	.840
s5 3f	.281	.814	.108	.018
s5 3g	.202	.863	.008	.083
s5 3h	.235	.850	.092	-.082

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization  
 a. Rotation converged in 5 iterations.  
 Factor 1: Firm Marketing resources  
 Factor 2: Firm international orientation  
 Factor 3: Firm technological resources  
 Factor 4: Firm financial resources

### KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		<b>.829</b>
Bartlett's Test of Sphericity	Approx. Chi-Square	1398.60
	Df	190
	Sig.	<b>.000</b>

### Total Variance Explained

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.223	41.117	41.117	6.849	34.245	34.245
2	2.261	11.303	52.420	2.616	13.079	47.324
3	1.891	9.453	61.873	2.417	12.087	59.411
4	1.321	6.606	68.479	1.814	9.068	<b>68.479</b>

Extraction Method: Principal Component Analysis

## Appendix 7. 5: Principal Components Factor Analysis (PCA): Entrepreneur/Chief Executive Resources

### Principal Components Factor Analysis (PCA): Entrepreneur/Chief Executive Resources

Rotated Component Matrix <sup>a</sup>

	Component			
	1	2	3	4
s1 2	.090	-.003	-.190	<b>.930</b>
s1 3	.073	.013	-.205	<b>.919</b>
s1 7a	.187	<b>.808</b>	.072	-.237
s1 7b	.189	<b>.785</b>	.044	-.189
s1 7c	.054	<b>.827</b>	.066	.223
s1 7d	.015	<b>.838</b>	.198	.124
s2 4a	-.050	.168	<b>.635</b>	-.307
s2 4br	-.099	.059	<b>.651</b>	-.284
s2 4c r	.307	-.072	<b>.648</b>	-.129
s2 4d	-.037	.011	<b>.739</b>	.186
s2 4e r	.063	.136	<b>.689</b>	-.062
s2 4f	.154	.285	<b>.577</b>	-.362
s4 6a	<b>.817</b>	.142	.109	.113
s4 6b	<b>.886</b>	.089	.019	.040
s4 6c	<b>.913</b>	.117	.041	-.003
s4 6d	<b>.910</b>	.083	-.004	.015

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Factor 1: Entrepreneur/ Chief Executive satisfaction with performance in the main foreign market

Factor 2: Entrepreneur/ Chief Executive International Experience

Factor 3: Entrepreneur/Firm Entrepreneurial Orientation

Factor 4: Entrepreneur/ Chief Executive Human Capital

#### KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		<b>.724</b>
Bartlett's Test of Sphericity	Approx. Chi-Square	1094.65
	df	136
	Sig.	<b>0.000</b>

### Total Variance Explained

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.361	25.653	25.653	3.374	19.847	19.847
2	3.344	19.671	45.324	2.870	16.883	36.730
3	2.197	12.926	58.250	2.740	16.116	52.846
4	1.458	8.577	66.827	2.377	13.981	<b>66.827</b>

Extraction Method: Principal Component Analysis

## Appendix 7. 6: Reliability: Firms' Resources Scales

### Reliability: Firm Marketing Resources

	Cronbach's Alpha if Item Deleted	Overall Scale Reliability
s2_1a	.935	Alpha = .941 (Standardised)  Number of items: 11
s2_1b	.936	
s2_1c	.936	
s2_1d	.937	
s2_1e	.935	
s2_1f	.934	
s2_1g	.933	
s2_1h	.935	
s2_1i	.937	
s2_1j	.934	
s2_1k	.938	

### Reliability: Firm Technological Resources

	Cronbach's Alpha if Item Deleted	Overall Scale Reliability
s2_2	-	Alpha = .774 (Standardised) Number of items: 4
s2_3_i_s	-	
s2_4h	-	
s2_4ir	-	

### Reliability: Firm Financial Resources

	Cronbach's Alpha if Item Deleted	Overall Scale Reliability
S2_4J	-	Alpha = .737 (Standardised) Number of items: 2
S5_2E	-	

### Reliability: Firm International Orientation

	Cronbach's Alpha if Item Deleted	Overall Scale Reliability
S5_3F	.831	Alpha = .878 (Standardised) Number of items: 3
S5_3G	.825	
S5_3H	.824	



## Appendix 7. 7: Reliability: Entrepreneur/CEOs' Resources Scales

### Reliability: Entrepreneur/Chief Executive International Experience

	Cronbach's Alpha if Item Deleted	Overall Scale Reliability
S1_7A	.790	Alpha = .833 (Standardised) Number of items: 4
S1_7B	.801	
S1_7C	.790	
S1_7D	.775	

### Reliability: Entrepreneur/Chief Executive Human Capital

	Cronbach's Alpha if Item Deleted	Overall Scale Reliability
S1_2	-	Alpha = .934 (Standardised) Number of items: 2
S1_3	-	

### Reliability: Entrepreneur/Firm Entrepreneurial Orientation

	Cronbach's Alpha if Item Deleted	Overall Scale Reliability
S2_4A	.726	Alpha = .773* (Standardised) Number of items: 6
S2_4BR	.736	
S2_4C_R	.745	
S2_4D	.752	
S2_4E_R	.740	
S2_4F	.734	

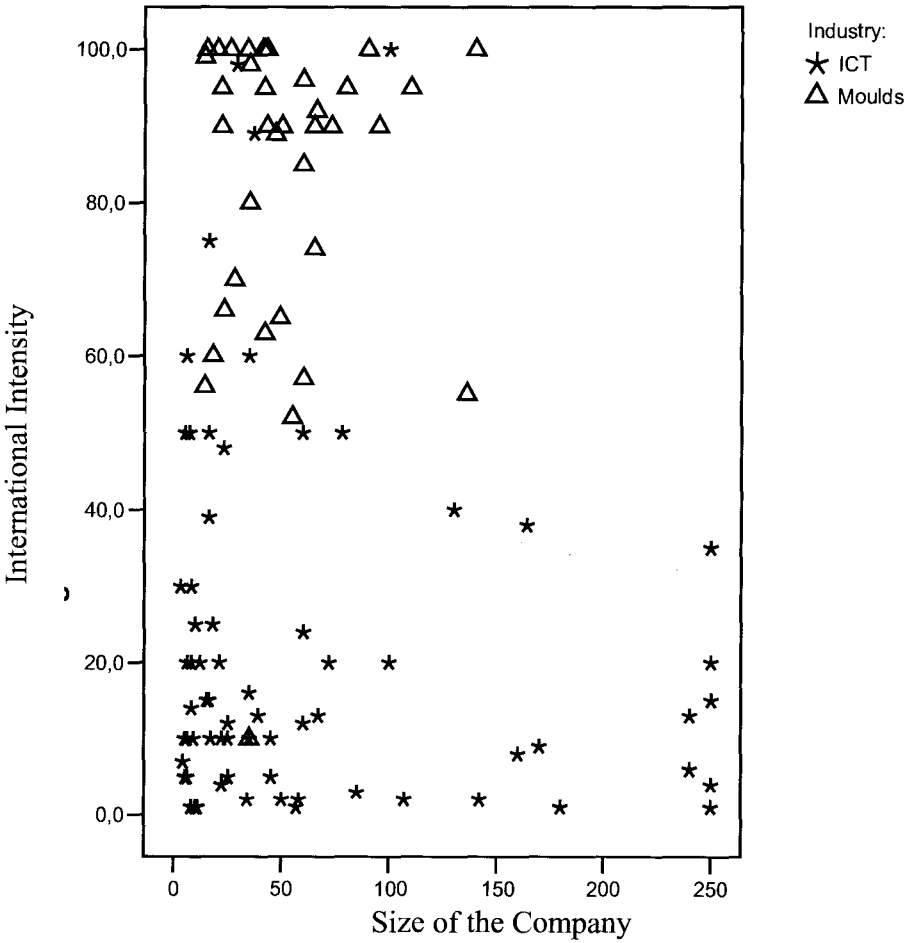
\* Variable NORMAL of S2\_4G\_R dropped after Factor Analysis. This increased overall scale reliability from .759 to .773.

### Reliability: Entrepreneur satisfaction with performance in the main foreign market.

	Cronbach's Alpha if Item Deleted	Overall Scale Reliability
S4_6A	.921	Alpha = .925 (Standardised) Number of items: 5
S4_6B	.911	
S4_6C	.895	
S4_6D	.891	
S4_6E	.916	

## Appendix 7. 8: Relationship between Firms' size and International Intensity

Relationship between Firms' size and International Intensity



## Appendix 7. 9: Descriptives: Firms' Resources. Response Categories

### Firms' Marketing Resources

#### Marketing Resources

Scale Item ▼ Variable – Meaning		Response Category						
		1	2	3	4	5	6	7
S2_1A: Access to international distribution channels	N	24	23	12	22	13	8	4
	N %	22.6	21.7	11,3	20,8	12,3	7,5	3,8
	Cum %	22.6	44.3	55,7	76,4	88,7	96,2	100,0
S2_1B: International sales force skills	N	23	23	19	21	14	3	3
	N %	21.7	21.7	17,9	19,8	13,2	2,8	2,8
	Cum %	21.7	43.4	61,3	81,1	94,3	97,2	100,0
S2_1C: International social network of sales people	N	18	25	19	15	18	6	5
	N %	17.0	23.6	17,9	14,2	17,0	5,7	4,7
	Cum %	17.0	40.6	58,5	72,6	89,6	95,3	100,0
S2_1D: International social network contacts of sales people to foreign agents/distributors	N	20	27	13	24	14	4	4
	N %	18.9	22.5	12,3	22,6	13,2	3,8	3,8
	Cum %	18.9	44.3	56,6	79,2	92,5	96,2	100,0
S2_1E: International promotion expenditures	N	32	24	9	20	12	7	2
	N %	30.2	22.6	8,5	18,9	11,3	6,6	1,9
	Cum %	30.2	52.8	61,3	80,2	91,5	98,1	100,0
S2_1F: Firm's links with international social networks	N	21	21	14	24	16	7	3
	N %	19.8	19.8	13,2	22,6	15,1	6,6	2,8
	Cum %	19.8	39.6	52,8	75,5	90,6	97,2	100,0
S2_1G: Firm's links with international business networks	N	28	21	12	21	14	9	1
	N %	26.4	19.8	11,3	19,8	13,2	8,5	,9
	Cum %	26.4	46.2	57,5	77,4	90,6	99,1	100,0
S2_1H: Establishment of a customer base	N	14	23	21	18	17	11	2
	N %	13.2	21.7	19,8	17,0	16,0	10,4	1,9
	Cum %	13.2	34.9	54,7	71,7	87,7	98,1	100,0
S2_1I: Market research: Analysis of competitors	N	18	22	20	24	15	5	2
	N %	17.0	20.8	18,9	22,6	14,2	4,7	1,9
	Cum %	17.0	37.7	56,6	79,2	93,4	98,1	100,0
S2_1J: Market research: Analysis of potential foreign customers	N	16	16	22	25	16	10	1
	N %	15.1	15.1	20,8	23,6	15,1	9,4	,9
	Cum %	15.1	30.2	50,9	74,5	89,6	99,1	100,0
S2_1K: Market research: Analysis of potential foreign partners	N	18	19	20	23	12	13	1
	N %	17.0	17.9	18,9	21,7	11,3	12,3	,9
	Cum %	17.0	34.9	53,8	75,5	86,8	99,1	100,0

## Firms' Technological Resources

### Technological Resources

Variable / Meaning ▶		S2_2: R&D intensity: % of R&D expenditures to TO (N=106)		
▼ Scale Item		N	N %	Cum %
Response Category	0 – 9%	59	55.7	55.7
	10 – 19%	15	14.1	69.9
	20 – 29%	15	14.1	84.0
	30 – 39%	7	6.6	90.6
	40 – 49%	3	2.8	93.4
	> 50.0%	7	6.6	100.0

### Technological Resources

Variable / Meaning ▶		S2_3_I_S: R&D intensity: % of R&D full-time employees to total employees (N=106)		
▼ Scale Item		N	N %	Cum %
Response Category	0 – 9%	52	49.1	49.1
	10 – 19%	18	17.0	66.1
	20 – 29%	11	10.4	76.5
	30 – 39%	8	7.5	84.0
	40 – 49%	4	3.8	87.8
	> 50.0%	13	12.2	100.0

### Technological Resources

Scale Item ▶		Response Category						
		1	2	3	4	5	6	7
▼ Variable – Meaning	N	13	15	21	15	20	18	4
	N %	12.3	14.2	19.8	14.2	18.9	17.0	3.8
	Cum %	12.3	26.4	46.2	60.4	79.2	96.2	100.0
S2_2H: Innovativeness of Technology	N	5	11	5	13	16	25	31
	N %	4.7	10.4	4.7	12.3	15.1	23.6	29.2
	Cum %	4.7	15.1	19.8	32.1	47.2	70.8	100.0
S2_4IR: Product / service development within the firm	N	5	11	5	13	16	25	31
	N %	4.7	10.4	4.7	12.3	15.1	23.6	29.2
	Cum %	4.7	15.1	19.8	32.1	47.2	70.8	100.0

## Firms' International Orientation

### International Orientation

Scale Item ▶		Response Category						
		1	2	3	4	5	6	7
▼ Variable – Meaning								
S5_3F: Firm international experience	N	8	11	9	14	29	17	18
	N %	7.5	10.4	8.5	13.2	27.4	16.0	17.0
	Cum %	7.5	17.9	26.4	39.6	67.0	83.0	100.0
S5_3G: Firm commitment to foreign markets	N	8	11	9	14	29	17	18
	N %	7.5	10.4	8.5	13.2	27.4	16.0	17.0
	Cum %	7.5	17.9	26.4	39.6	67.0	83.0	100.0
S5_3H: Firm knowledge about foreign markets	N	5	4	9	10	30	33	15
	N %	4.7	3.8	8.5	9.4	28.3	31.1	14.2
	Cum %	4.7	8.5	17.0	26.4	54.7	85.8	100.0

## Firms' Financial Resources

### Financial Resources

Scale Item ▶		Response Category						
		1	2	3	4	5	6	7
▼ Variable – Meaning								
S2_4J: Availability of capital for firm's development	N	15	14	19	13	20	18	7
	N %	14.2	13.2	17.9	12.3	18.9	17.0	6.6
	Cum %	14.2	27.4	45.3	57.5	76.4	93.4	100.0
S5_2E: Endowment of firm's financial resources	N	7	7	17	32	28	14	1
	N %	6.6	6.6	16.0	30.2	26.4	13.2	0.9
	Cum %	6.6	13.2	29.2	59.4	85.8	99.1	100.0

### Appendix 7. 10: Descriptives: Entrepreneurs/CEOs' Resources (Response Categories)

#### Firm/Entrepreneur entrepreneurial orientation

Scale Item ▶		Response Category						
		1	2	3	4	5	6	7
▼ Variable – Meaning								
S2_4A: Firm Innovativeness I	N	9	5	8	15	26	27	16
	N %	8.5	4.7	7.5	14.2	24.5	25.5	15.1
	Cum %	8.5	13.2	20.8	34.9	59.4	84.9	100.0
S2_4BR: Firm Innovativeness II	N	6	14	17	26	21	14	8
	N %	5.7	13.2	16.0	24.5	19.8	13.2	7.5
	Cum %	5.7	18.9	34.9	59.4	79.2	92.5	100.0
S2_4C_R: Firm Innovativeness III	N	5	16	12	24	13	24	12
	N %	4.7	15.1	11.3	22.6	12.3	22.6	11.3
	Cum %	4.7	19.8	31.1	53.8	66.0	88.7	100.0
S2_4D: Entrepreneur risk-taking I	N		8	17	28	25	23	5
	N %		7.5	16.0	26.4	23.6	21.7	4.7
	Cum %		7.5	23.6	50.0	73.6	95.3	100.0
S2_4E_R: Entrepreneur risk-taking II	N	6	23	29	21	17	6	4
	N %	5.7	21.7	27.4	19.8	16.0	5.7	3.8
	Cum %	5.7	27.4	54.7	74.5	90.6	96.2	100.0
S2_4F: Firm proactivity	N	2	10	5	14	26	32	17
	N %	1.9	9.4	4.7	13.2	24.5	30.2	16.0
	Cum %	1.9	11.3	16.0	29.2	53.8	84.0	100.0
S2_4G_R: Entrepreneur risk-taking III	N	5	22	22	24	18	13	2
	N %	4.7	20.8	20.8	22.6	17.0	12.3	1.9
	Cum %	4.7	25.5	46.2	68.9	85.8	98.1	100.0

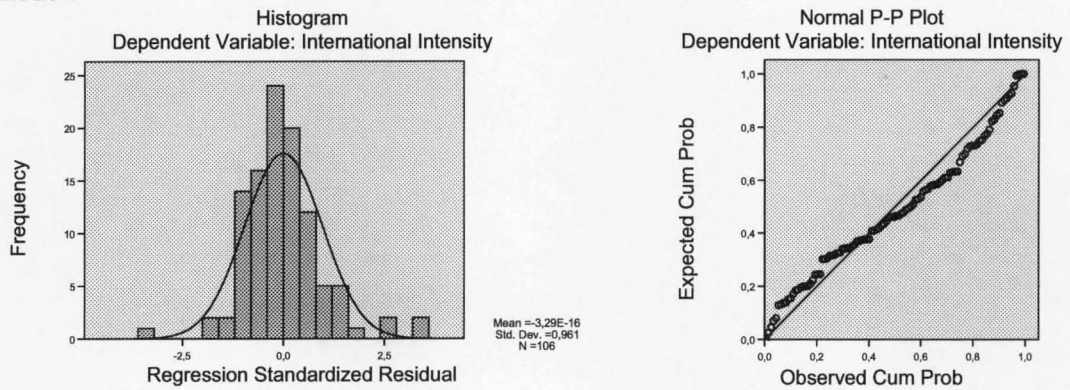
#### Entrepreneur/Chief Executive International Experience

Scale Item ▶		Response Category						
		1	2	3	4	5	6	7
▼ Variable – Meaning								
S1_7A: International experience as a result of working abroad	N	50	11	11	10	4	7	13
	N %	47.2	10.4	10.4	9.4	3.8	6.6	12.3
	Cum %	47.2	57.5	67.9	77.4	81.1	87.7	100.0
S1_7B: International experience as a result of living abroad	N	54	11	8	14	2	8	9
	N %	50.9	10.4	7.5	13.2	1.9	7.5	8.5
	Cum %	50.9	61.3	68.9	82.1	84.0	91.5	100.0
S1_7C: Marketing and sales experience of products/services in foreign markets	N	20	9	12	25	17	14	9
	N %	18.9	8.5	11.3	23.6	16.0	13.2	8.5
	Cum %	18.9	27.4	38.7	62.3	78.3	91.5	100.0
S1_7D: Individual links with international social networks	N	9	12	13	24	20	16	12
	N %	8.5	11.3	12.3	22.6	18.9	15.1	11.3
	Cum %	8.5	19.8	32.1	54.7	73.6	88.7	100.0

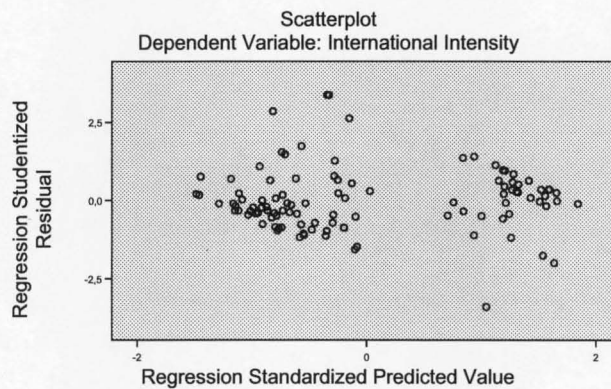
## Appendix 7. 11 : Assumptions in Multiple Regression Analysis (Research Aim 4)

### 1. Normal Distribution of the Error Terms:

Histogram of the standardised residuals and normal probability plot of the residuals of the model:

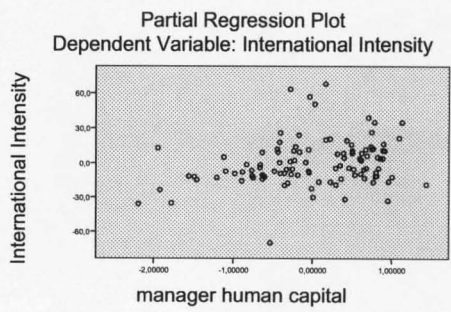
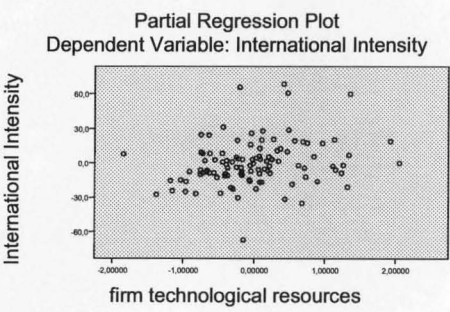
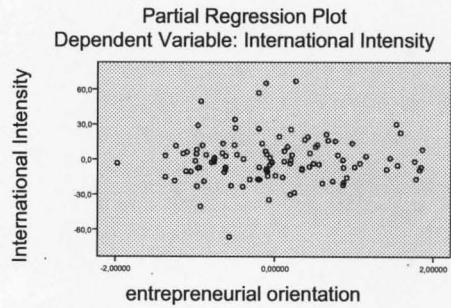
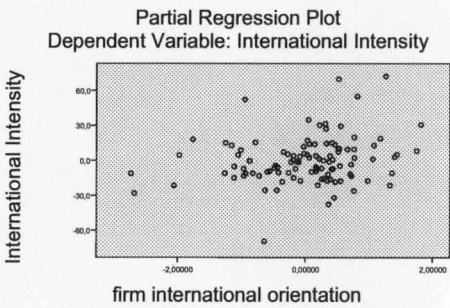
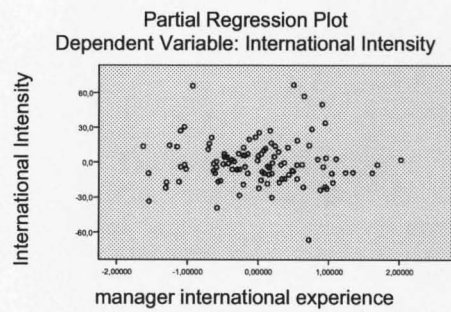
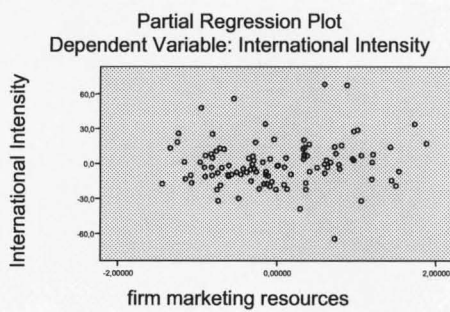
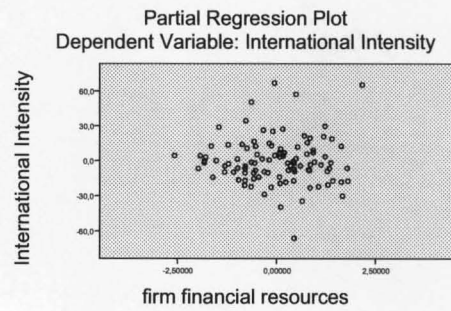
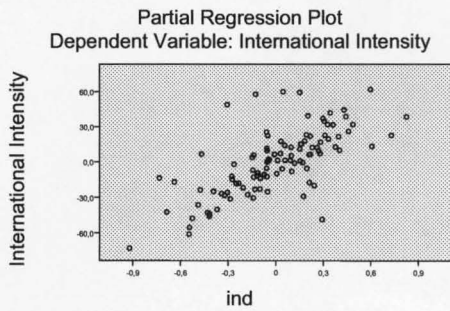


### 2. Constant Variance of the Error Terms (Homoscedasticity)



Scatterplot of the studentised residuals of the model against the standardised predicted dependent values.

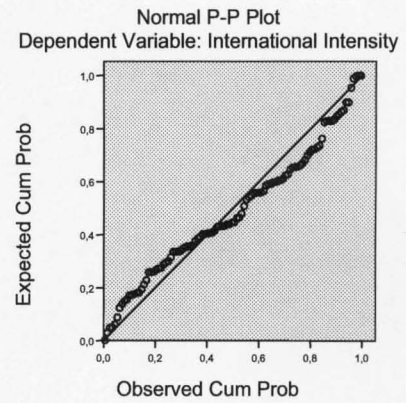
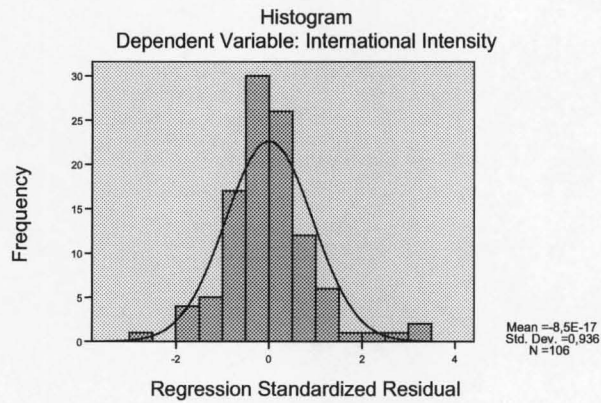
### 3. Linearity between the Independent Variables and the Dependent Variable



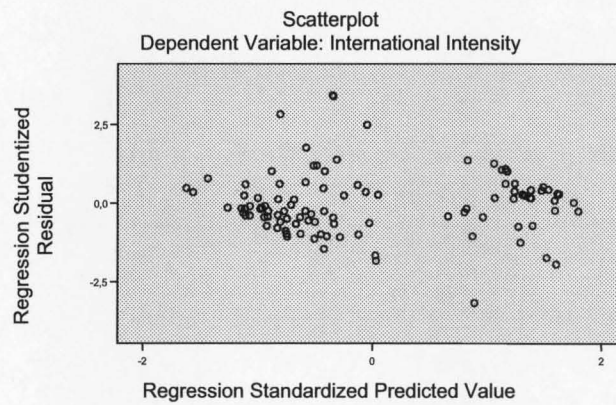


## Appendix 7. 12: Assumptions in Multiple Regression Analysis (Research Aim 6 – Performance measured by international intensity in the main foreign market)

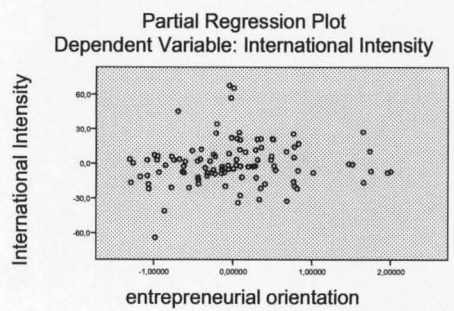
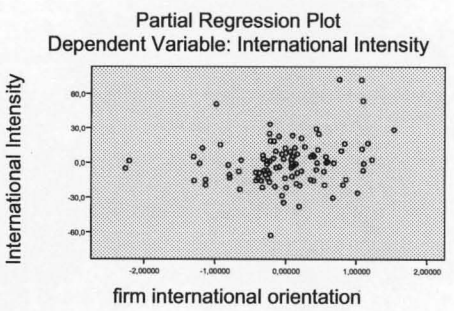
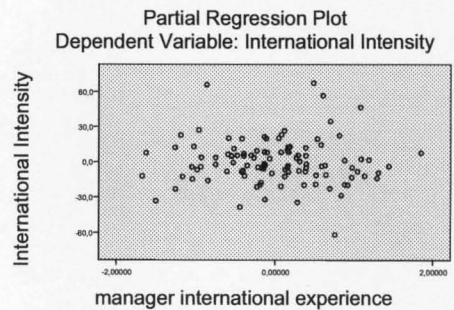
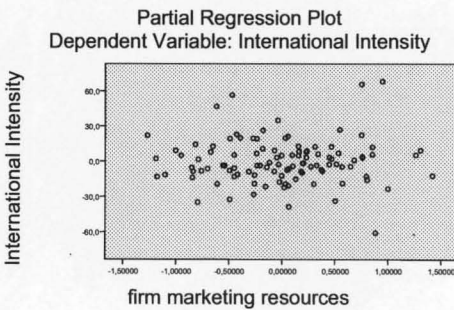
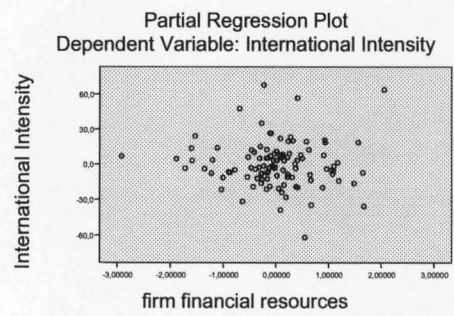
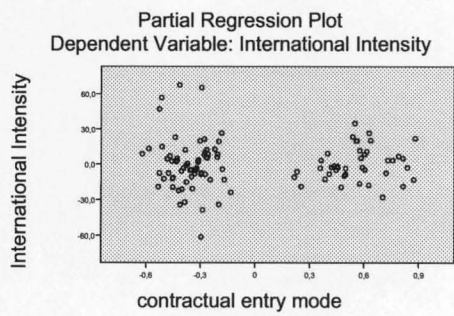
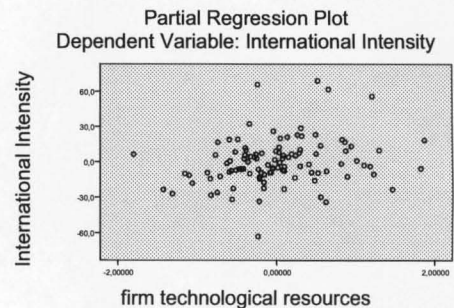
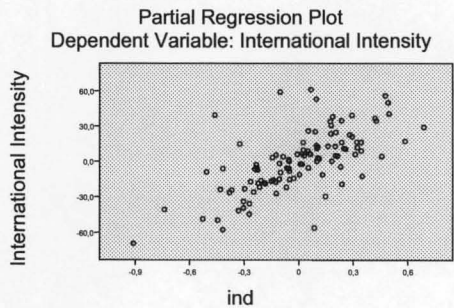
### 1. Normal Distribution of the Error Terms



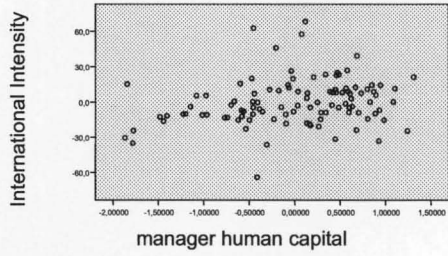
### 2. Constant Variance of the Error Terms (Homoscedasticity)



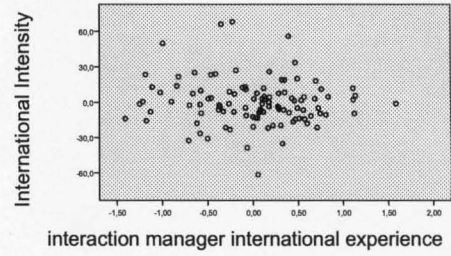
### 3. Linearity between the Independent Variables and the Dependent Variable



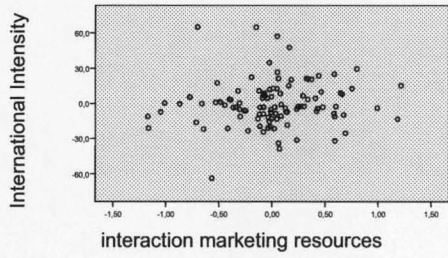
Partial Regression Plot  
Dependent Variable: International Intensity



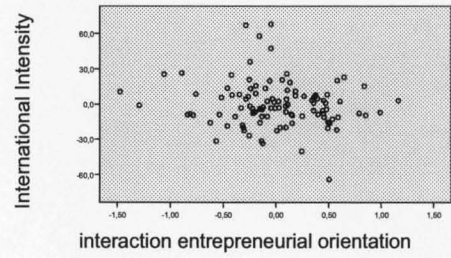
Partial Regression Plot  
Dependent Variable: International Intensity



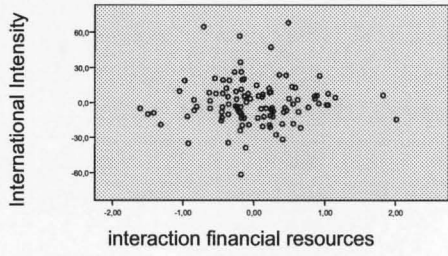
Partial Regression Plot  
Dependent Variable: International Intensity



Partial Regression Plot  
Dependent Variable: International Intensity

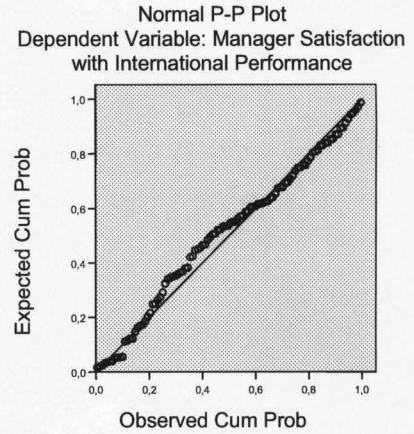
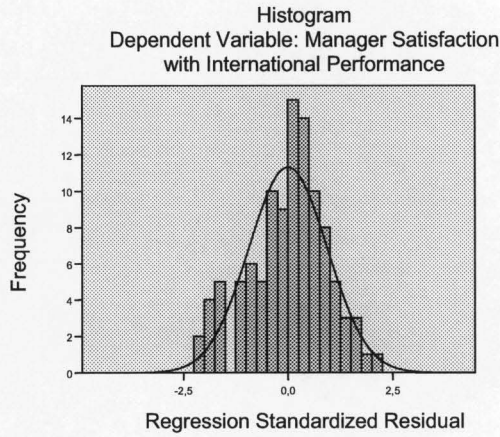


Partial Regression Plot  
Dependent Variable: International Intensity

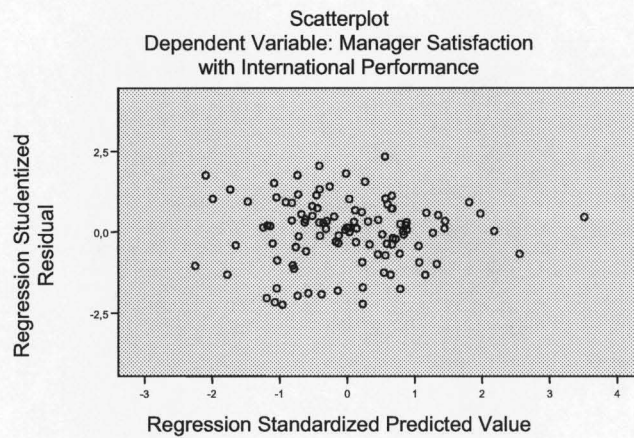


## Appendix 7. 13: Assumptions in Multiple Regression Analysis (Research Aim 6 – Performance measured by manager satisfaction with performance in the main foreign market)

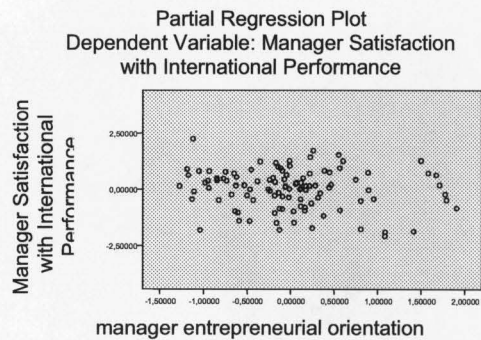
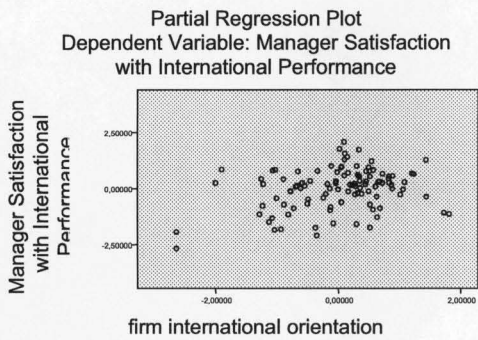
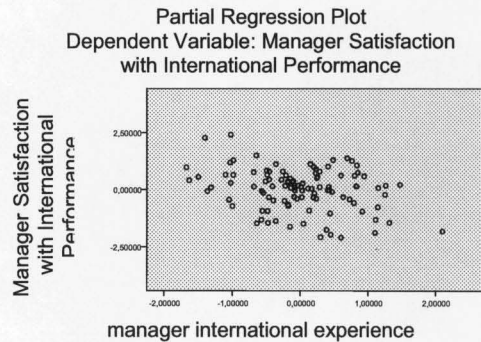
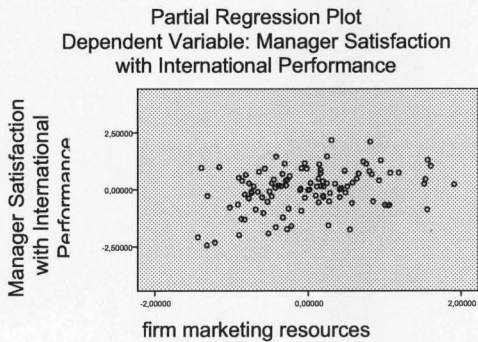
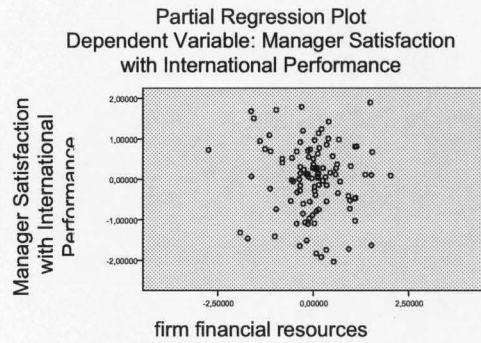
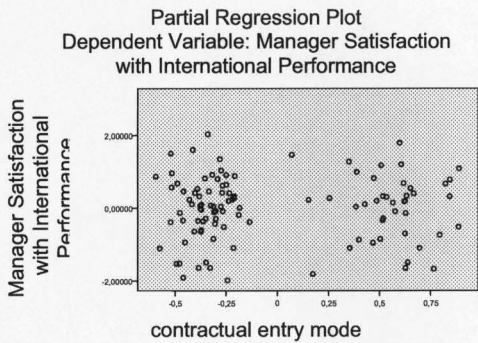
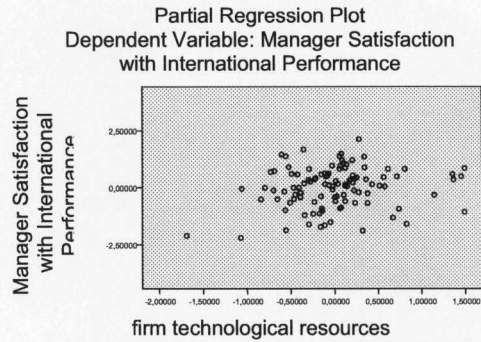
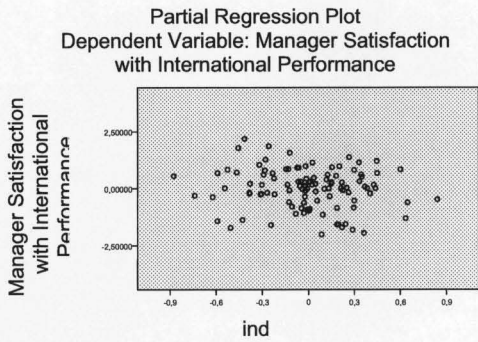
### 1. Normal Distribution of the Error Terms



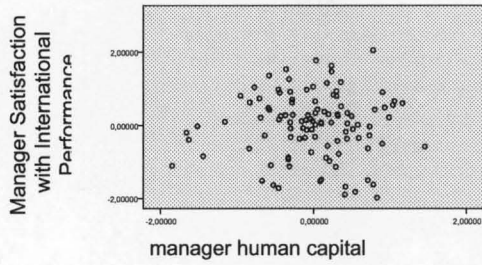
### 2. Constant Variance of the Error Terms (Homoscedasticity)



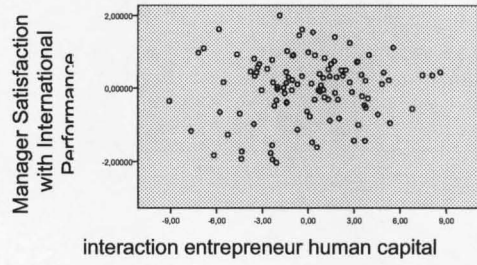
### 3. Linearity between the Independent Variables and the Dependent Variable



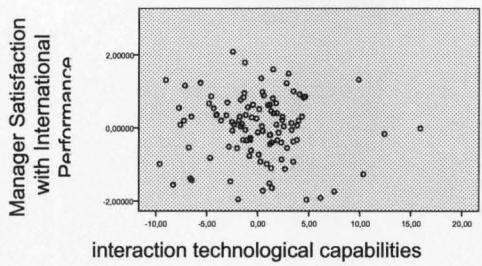
Partial Regression Plot  
Dependent Variable: Manager Satisfaction  
with International Performance



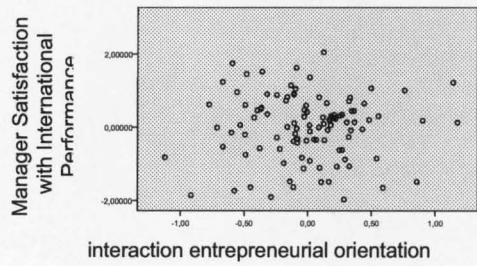
Partial Regression Plot  
Dependent Variable: Manager Satisfaction  
with International Performance



Partial Regression Plot  
Dependent Variable: Manager Satisfaction  
with International Performance



Partial Regression Plot  
Dependent Variable: Manager Satisfaction  
with International Performance



Partial Regression Plot  
Dependent Variable: Manager Satisfaction  
with International Performance

