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"A study of the internationalisation of indigenous Irish software technology firms"

2007

Deirdre Garvey, BA (Mgmt), MBS

This thesis is provided in fulfilment of the requirements of the degree of Doctor of Philosophy of the University of Dublin, Trinity College .

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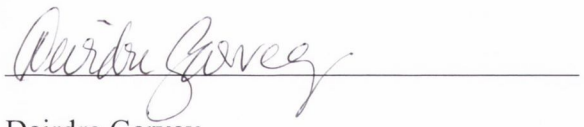

Deirdre Garvey

Summary

This research is a study of the factors influencing the internationalisation of indigenous Irish software technology firms. It is a three phased study – phase one: an initial exploratory study, phase two: an in-depth case study and phase three: an inductive study. The primary research question is "*what factors influence internationalisation of the firm?*" with subsidiary research questions developed at each phase of the research. The following is a summary of the research:

Phase one was an exploratory study of the indigenous Irish software technology sector. The objective of this initial study was to gain insight into the key factors influencing the internationalisation of the firms in the indigenous software technology industry and gain some sector specific data. It also provided firm data as an input to case selection in phase two. The phase one study found evidence of "Born Global" firms within the Irish indigenous sector. The key findings of the study were presented in relation to the pattern and level of internationalisation, the importance of the psychic distance factor and the role of knowledge in internationalisation. The role of knowledge – in particular knowledge intensity and international knowledge accumulation formed the basis of the research conceptual model and design for phase two.

Phase two was the core phase of the research and it was an in-depth case study of a single critical case (Iona Technologies) in the indigenous Irish technology sector. The analytical approach taken is one based on a theoretical proposition, the "Born Global" phenomenon. The case examined the rapid and high level of internationalisation in an Irish software firm. A programme logic model was been used in this research to analyse the internationalisation of the firm over ten years. This analysis focuses on three main areas –

internationalisation pattern analysis, internationalisation level analysis and the role of knowledge in the internationalisation. The key findings were outlined in relation to – the early adopter characteristic of the market, the role of psychic distance, industry specific factors, participation in specialised industry networks and wider contextual factors. The output of the case in the form of firm, country and industry factors influencing the internationalisation of the firm formed the basis for the research objectives of phase three.

Phase three was an inductive study of internationalised Irish software technology firms. This study was developed from the theoretical ideas and information that emerged from phase two. The overall objective was to examine the firm and contextual factors identified in phase two and their typicality in the internationalisation of a wider group of indigenous Irish software technology firms. The key findings were analysed in relation to firm characteristics, patterns and levels of internationalisation, the role of psychic distance, industry factors and accumulated international experience through individuals and networks. Phase three concludes on the evidence of the "Born Global" nature of these firms, the context in which this phenomenon has developed and the firm specific characteristics which have emerged from this study.

The above contributions of the research are discussed under the following three key areas; (1) The importance of context; (2) The role of knowledge; (3) A reconceptualisation of psychic distance. A framework of factors influencing the "Born Global" phenomenon has been developed and this is discussed in relation to further research and potential policy implications.

Acknowledgements

I wish to thank the following people who have helped and supported me in this research:

Dr Louis Brennan, my supervisor for taking me on in the first place and for his faith in me that I would get back to it after each interrupted phase in the past five years. His direction and style of supervision have been invaluable.

Dr Martin Fellenz, for his insightful comments. His time and effort provided much needed clarity.

Dr Chris Horn, who has been so generous with his time and opened the doors of Iona Technologies. He truly values and supports research in the technology sector.

All my colleagues at the IMI, in particular Dr John Mangan and Siobhan McAleer for their collegiality and support. Also, I appreciate Kevin Plunkett's initial encouragement, he planted the idea of a PhD over seven years ago.

Fintan Swanton, my husband for his support and belief that I could and would complete this PhD. I could not have done it without him. My children; Seoirse who delayed the research by one year, Íde who delayed it by six months and Art who accelerated it by three months. All long-term projects! I hope some day it will inspire them to study.

I also wish to thank Tom Leech and all the IMI library staff, Valerie McCarthy and the administration staff of TCD business school for their help and support.

Dedication

I wish to dedicate this PhD to my father Tom Garvey (RIP) who sadly did not see me conclude it. He would have been proud, as he was of every achievement of each his children.

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Chapter 1: Introduction

1. Introduction

1.1. Background to the study

The following outlines the background for this research. Three key contextual factors – Ireland's changing FDI profile, the importance of the software technology sector and the emergence of the "Born Global" phenomenon are highlighted below. Within this context, the potential contributions of the research are discussed.

1.1.1. Ireland's changing levels of FDI

Ireland has been very successful in attracting foreign direct investment (FDI). In 1998 Ireland's level of inward investment as a percentage of Gross Domestic Product (GDP) was 32.7 per cent in comparison of a European Union (EU) average of 17.3 per cent (Forfás Statement on Outward Direct Investment, 2001). However, this situation is changing and in 2001, Ireland's inflow of FDI fell by 60 per cent (Forfás International Trade and Development Report, 2003). While Ireland's outward FDI level as a percentage of GDP is well below the EU average, 22.5 per cent (EU average was 39.6 per cent in 2003), it has increased significantly in the past fifteen years (UNCTAD, World Investment Report, 2004). According to national data sources, outward FDI increased 30 per cent in 2001 as Irish businesses increased the pace of internationalisation (Forfás, 2002). However, published data on direct investment flows between Ireland and the rest of the world does not provide a comprehensive breakdown by sector of origin or country of destination (Forfás, Statement on Outward Direct Investment, 2001).

Dunning (1996) in his "Investment Development Path" (IDP) examines the relationship between the development of an economy in stages, and inward and outward FDI. At stage 3 of the IDP, the original advantage of low cost is being eroded

and is beingreplaced with technological advantages, managerial and marketing know-how. There s a slowdown of inward FDI at this stage and outward FDI starts to develop. Görg 2000) classifies Ireland as approaching stage three of Dunning's IDP. Similarly to Görg's analysis, Porter *et al.* (2002) describe Ireland in the Global Competitiveness Report (2002), as being on the cusp of innovation driven growth. The strategic outlook for firms in the economy at this stage is increasingly global.

The increasinginternationalisation of Irish firms and the importance of this international growth to the development of the economy highlight the importance of internationalisation research.

1.1.2. The importance of the indigenous software technology sector

In 1992, it was identified in the Culliton report that while attracting FDI has been a successful policy in the past, in future Ireland must focus on developing its indigenous sector. Ireland's indigenous technology sector was identified at that stage as having significant potential to contribute to the growth of Ireland's economy. Ireland's dependence oninward FDI has been associated with the use of imported rather than locally generated technologies – this has left a large deficit in Ireland's technology "balance of payment" (Green, 2000, p.3). This gap is now been addressed by the growth of Ireland's indigenous software industry.

"Building Ireland's knowledge economy" (Report to the Inter-Departmental Committee on Science, Technology and Innovation, 2004) describes how the world is undergoing a new industrial revolution, "the Knowledge Revolution" fuelled by the pace of technological change. This report identifies Research and Development (R & D) as being at the heart of scientific and technological progress, creating knowledge-driven competitive advantage. Ireland's Enterprise Strategy Report (2004) concurs

noting that although the pace differs from country to country, most countries' economies are becoming more knowledge intensive.

Using the measure of Gross Expenditure on R & D as a per cent of GNP, Ireland is below the EU average of 1.9 per cent at 1.4 per cent (OECD, 2001). It lags behind the leading knowledge-driven economies of Sweden (4.27 per cent) and Finland (3.49 per cent). While Ireland's public R & D expenditure lags behind the EU average, its business R & D expenditure is in a better position and has more than doubled over the past decade as indigenous technology companies allocate over 20 per cent of value of sales to R & D. Over the past ten years, seven indigenous Irish software companies have listed on major international stock exchanges. Indigenous Irish software companies had a combined turnover of over €1.4 billion (HotOrigin, 2002) and are described by National Software Directorate (NSD) as export-oriented, with 70 per cent of their products going to international markets. Enterprise Ireland's Overseas Incubator Facilities state that over 220 Irish high technology companies are currently active in the U.S. and have set up U.S. headquarters and local offices (NSD, 2004). However, in a study completed by PricewaterhouseCoopers (1999) of Ireland's high-technology internationally traded services sector, it was highlighted that the ability to establish a global position for Irish products and services is the single biggest challenge facing companies across high growth sectors. Research by HotOrigin (2002) on the indigenous Irish software sector also found that entering international markets is one of the biggest challenges faced by these companies and describes the need for companies to "internationalise fast and smart" (2002, p.39). Therefore, while the growth of the software technology sector is a key factor in Ireland's transition to a knowledge based economy, this growth is fuelled by the international development of these firms.

1.1.3. The emergence of the "Born Global" Phenomenon

A recent phenomenon in international business has emerged, the "Born Global" phenomenon; Knight & Cavusgil (1996, p.11) define "Born Globals" as "small technology oriented companies that operate in international markets from the earliest days of establishment". They characterise a "Born Global" firm as small (less than 500 employees) and with an annual turnover typically under $100 million, possessing leading edge technology and developing products for niche international markets. Research has focused specifically on this change from a gradual internationalisation process to a more rapid one; Rennie (1993), McDougall *et al.* (1994) , Knight & Cavusgil S.T. (1996), Madsen & Servais (1997), Erkko *et al.* (2000), Möen & Servais (2002), Chetty & Campbell-Hunt (2004), Knight & Cavusgil (2004). Kuemmerle (2002), highlights the importance of doing research into this issue is emphasised by the increasing number of start-up companies, particularly in the high-tech sector who attempt early and rapid internationalization strategies. This accelerated pace of internationalisation is associated most with "high technology, knowledge-based and service intensive firms" (Coviello & Munroe, 1997, p.362).

As noted by Möen (2002), this phenomenon is not explained by traditional theories of internationalisation. Oviatt & McDougall (1994) similarly highlight that up to the 1980s MNEs have historically emerged from large mature domestically established firms. However, a defining characteristic of the "Born Global" firm to date has been the small size or complete absence of a domestic market for firm. This defining characteristic is of relevance to the Irish market and the success of international indigenous Irish firms noted above.

In the context of (1) The changing nature of Ireland's FDI levels and the lack of sector specific data in relation to this; (2) The strategic importance of the software

echnology sector to Ireland's economic development and its high international growth levels in recent years; (3) The emergence of the "Born Global" phenomenon and its relevance to the Irish context; a study of the internationalisation of indigenous Irish software technology firms was completed in three phases. The structure of this three phase research is described below.

1.2. Structure of the research

The overall objective of the research is to understand the factors influencing the level and pattern of internationalisation of indigenous Irish software technology firms. The research was completed in three phases with the primary research question "*What factors influence the internationalisation of the firm?*" Subsidiary research questions were developed as the research progressed from each phase as shown in Figure 1-1 below.

	Type of research	Research question
Phase one	Exploratory study	What factors influence the internationalisation of the firm?
Phase two	In-depth Case study	How knowledge intensity and internationalisation knowledge accumulation impact internationalisation?
Phase three	Inductive study	How the factors identified in *phase two* transfer to a wider population of internationalised indigenous Irish technology firms?

Figure 1-1: Three phases of the research

The design of the three phases of the research is outlined in more detail below. The output of each phase of the research forms the basis of the research question in the next phase. Phase one was an exploratory study to gain some initial insight into the factors influencing internationalisation and obtain sector specific data. Phase two, the study of an in-depth critical case was the core phase. The output of phase two is a

framework of firm characteristics and contextual factors influencing the internationalisation of the firm. This framework is further examined in phase three – an inductive study, in relation to its transferability to a wider set of internationalised indigenous Irish software technology firms.

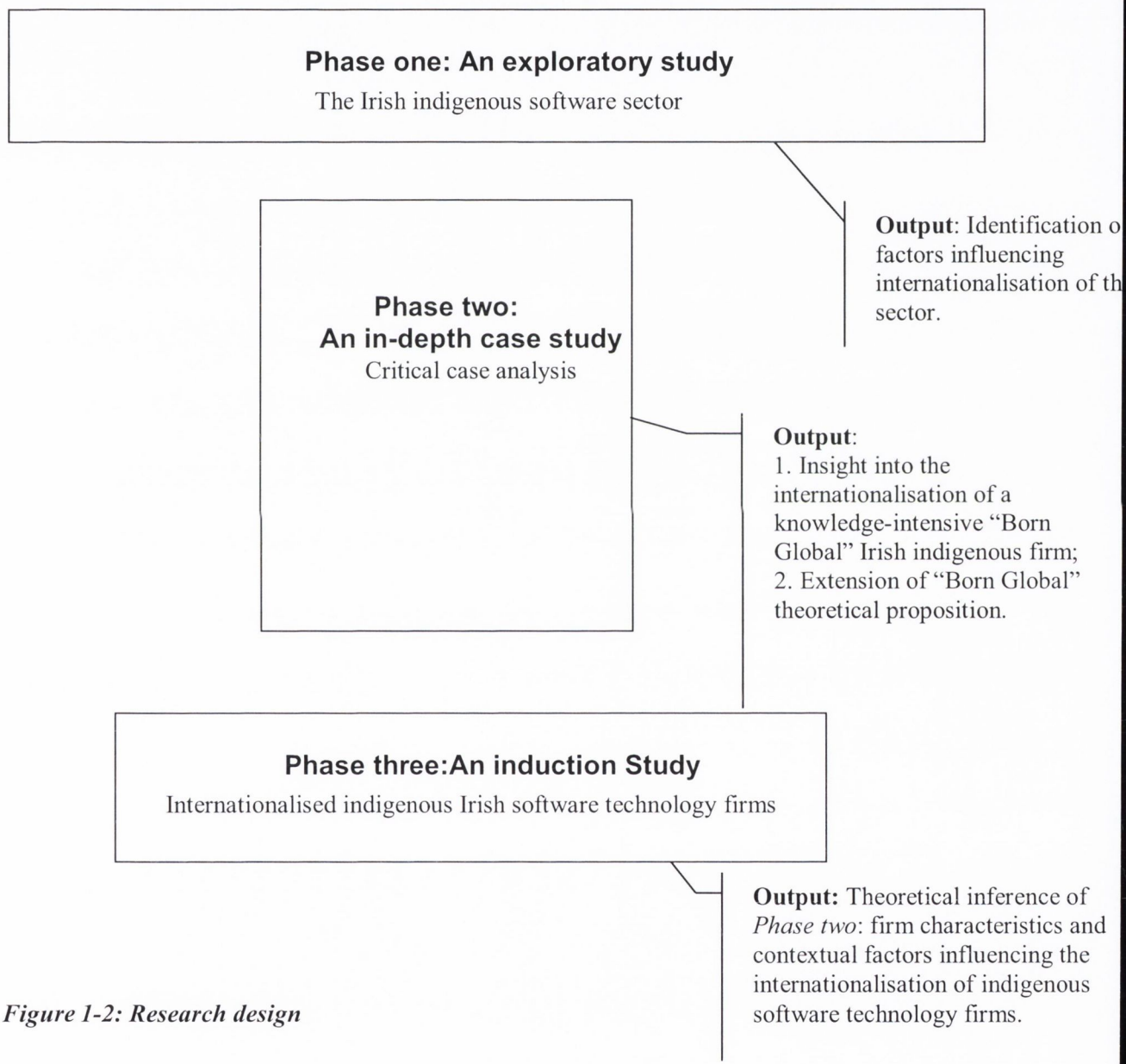

Figure 1-2: Research design

The theoretical base from which the research emerges is described in Chapter 2. Cognisant of the embeddedness of a firm in its industrial and locational context, Dunning's Eclectic Paradigm (1981, 1988, 1998) is employed throughout the research as an organising framework. This forms the basis of the research model which is developed throughout Chapter 2: Literature Review and presented in Figure 2-4.

Given the narrow delineation of the study and the importance of context, an industry sectoral analysis is completed in a separate chapter, Chapter 3. The research philosophy guiding the methodological approach is described in detail in Chapter 4. Following this, Chapter 6 describes the approach to measuring the key constructs of knowledge and internationalisation used in phase two. The findings and analysis are presented in separate chapters for each of the three phases - Chapter 5: phase one, Chapter 7: phase two and Chapter 8: phase three. The key conclusions of the research are presented in Chapter 9, together with the "Born Global" framework developed from the study. This chapter outlines in detail the key contributions of the research and recommendations for further study.

1.3. Contribution of the research

This study makes a contribution in a number of ways:

- Firstly, by establishing sector specific data on the extent and form pattern of internationalisation of these firms;
- Secondly, by developing new insights into the factors influencing early and rapid internationalisation and extending the theories of internationalisation and particularly the "Born Global" phenomenon;
- Thirdly, given the stage of economic development and the importance of the knowledge intensive technology sector, this research has implications for

public sector policy. In particular, it provides detail on the defining characteristics of "Born Global" firms in this sector and identifies how these are currently excluded from policy by definition alone.

As highlighted by Madsen & Servais (1997) the research in this area so far, as with many new research areas, is that it has been mainly empirical. Bell *et al.* (2004) note that there is more recent recognition that internationalisation is affected by multiple influences and that the various internationalisation decisions of the firm are made in a holistic way. The contribution in this research is also in its approach – in examining the firm in-depth within its context (industry and location) and the development of a framework of factors influencing internationalisation in a more holistic way.

Chapter 2: Literature review

2. Literature Review

2.1. Introduction

The main strands of literature pertinent to the research are the theories of international production and internationalisation. The review then focuses specifically on the early and rapid internationalisation of knowledge-based firms – the "Born Global" Phenomenon. A research model as presented in Figure 2-2 has been developed from the literature review. As the literature review has progressed, the model has been modified and extended to reflect this. The following section introduces the research model and the structure of the literature review is derived from this. The chapter begins with a brief review of the earlier theories of international production and in particular the contribution of Dunning's Eclectic Paradigm of International Production. The key developments in International Business since the 1970s are reflected upon in relation to the assumptions of Dunning's paradigm. A detailed review of the extensions and restatements of the Paradigm is completed, providing a contextual framework for the research. The need to examine the firm specific behavioural aspect of the MNE emerges from this and a detailed review of the Internationalisation process models is completed. This leads to a narrower focus of the role of knowledge in internationalisation and how this manifests itself in the "Born Global" phenomenon. The chapter concludes with a comparative review of the studies of knowledge-intensive software technology firms within the "Born Global" context.

2.2. Background

Cantwell (1991, p.16) in his *Survey of theories of international production* describes how in the 1970s and early 1980s it had become "fashionable" to develop general theories of international production which incorporated the contributions of earlier

significant researchers. He notes that by the 1980s, the limitations of trying to find a "catch-all" explanation of international production became more apparent. He highlights that theoretical diversity should be expected in such a field and cites six separate branches of economic theory – theories of international capital movement, theories of trade, locational theories, industrial organisational theory, theories of innovation and the firm, from which international business is drawn. Markusen (1998) also notes how prior to the 1980s there were two distinct and even disjointed literature strands – (a) pure trade theory and (b) industrial organisational theory of trade and locational theory. Buckley (1991) highlighted how the theory of international business is not without its problems. He notes at that stage however, that an established theory of the multinational enterprise now exists – a synthesis based on internalisation theory, the theory of location and competitive dynamics. The internalisation theory is generally attributed to the work of Buckley and Casson (1976) and theory of market power to Hymer (1976).

From this background of theoretical diversity, a general framework drawing on a number of theoretical approaches but not fixed on any one theory, the Eclectic Paradigm of International Production emerged. Since its initial presentation in 1976 by Dunning, he has since revisited and extended it in 1981, 1988 and in 1998 focusing on locational factors, in 2001 in light of changing activities of MNEs and in 2001 (with Cliff Wymbs) in relation to the impact of the Internet. Dunning (1988) himself describes it as a holistic framework and that describing the framework as *Eclectic* was ambitious in itself but deliberate (1988, p. 366). He highlights his objective was to:

"...identify and evaluate the significance and the factors influencing both the initial act of foreign production by enterprises and the growth of such production. It was meant to convey the idea that a full explanation of the transnational activities of

enterprises needs to draw on several strands of economy theory" (Dunning, 1988, p. 366)

The term "international production" may well relate to the nature of MNE activity in 1980s, whereas in later discussions on the paradigm, Dunning (2001, p.174) describes the role of the Eclectic paradigm "in explaining the scope and geography of value-added activities by multinational enterprises (MNEs)". Dunning (1988, p. 369) describes how the eclectic paradigm provides a framework for analysing "structural or contextual" variables facing MNEs – namely country, industry and firm specific variables.

The Eclectic Paradigm is much cited in the international business literature since the 1980s as an integrative framework. Cantwell (1991) describes it as a framework that combines the key theoretical approaches; market power approach (Hymer, 1976), internalisation approach (Buckley & Casson, 1976), competitive dynamics approach (Vernon, 1974), technology accumulation approach (Cantwell, 1999) and macroeconomic developmental approaches (Koijima, 1978, Aliber 1970, Rugman, 1979). He notes that it combines them in a way that is "compatible with the various theoretical approaches" (p.19) and can be applied at a macroeconomic or mesoeconomic level. Markusen (1998) describes the Eclectic paradigm as a "useful organising tool" for the inquiry into MNE and their international development. Rugman (1986) in his assessment of internalisation theory, describes The Eclectic Paradigm as "a comprehensive melding of earlier literature" that has the potential to provide rich insights into the MNE (1986, p. 103).

Dunning's Eclectic Paradigm forms the basis of the research model – as an organising *framework* to connect the literature and ideas in a coherent way. It provides a framework of contextual analysis and the framework is described in detail in the next

section. Another body of literature pertinent to the research is that of Internationalisation Process models (Johanson & Vahlne, 1977; Bilkey, 1977; Johanson & Wiedersheim-Paul, 1976; Cavusgil, 1980; Welch & Luostarinen, 1988). Johanson & Vahlne (1990) provide a comparison between both the Eclectic Paradigm and above mentioned Internationalisation Process Models. They describe how the Internationalisation Process Models are based on behavioural theories while the "theoretical underpinnings of the eclectic paradigm assume that the decision maker has access to perfect information" (p.17). They distinguish between the explanatory powers of both models in relation to the experience of the firm - the Internationalisation Process Models having more explanatory power at the early stages of internationalisation and Dunning's paradigm having better explanatory power for firms more experienced internationally. They note however, that the objective of the eclectic paradigm is to have a wider explanatory purpose and therefore relies on all explanatory factors. Andersen (1993) concurs on this that the Eclectic Paradigm provides "a more complete explanation of the firms' foreign operations" than those of Johanson & Wiedersheim (1975) but that are probably more relevant at the later stages of internationalisation (p. 218).

The unit of analysis of this research is on a firm basis and therefore the behavioural theories of the firm contribute to the understanding of firm internationalisation. The Internationalisation Process Models are described in detail in the following section. This research is focused specifically on the software technology industry and a relatively new phenomenon has emerged in the 1990s, the "Born Global" phenomenon. Knight & Cavusgil (1996, p.11) define these as "Small, technology oriented companies that operate in international markets from the earliest days of establishment. These firms manufacture products for a particular niche in international

markets". Different aspects of the "Born Global" phenomenon highlighted by Oviatt & McDougall (1994), Chetty & Campbell-Hunt (2004) Rennie (1993) among others, are discussed later in this chapter. Dunning (2001) highlights that recent technological and economic events and "the emergence of new explanations of MNE activity" have added to the robustness of the Eclectic Paradigm (2001, p.187). The "Born Global" phenomenon as a "new explanation of MNE activity" in knowledge-intensive industries is examined in relation to the contextual factors influencing its development in an integrative way with the preceding behavioural models. The research model is illustrated in the following diagram and developed throughout the literature review. Dunning's Eclectic Paradigm is generally presented in the order of Ownership, Locational and Firm advantages (OLI configuration), in this research model, it is presented with the firm at the centre of the model. This is consistent with the philosophy guiding the research, examining the phenomenon within its context with the firm as a central unit of analysis.

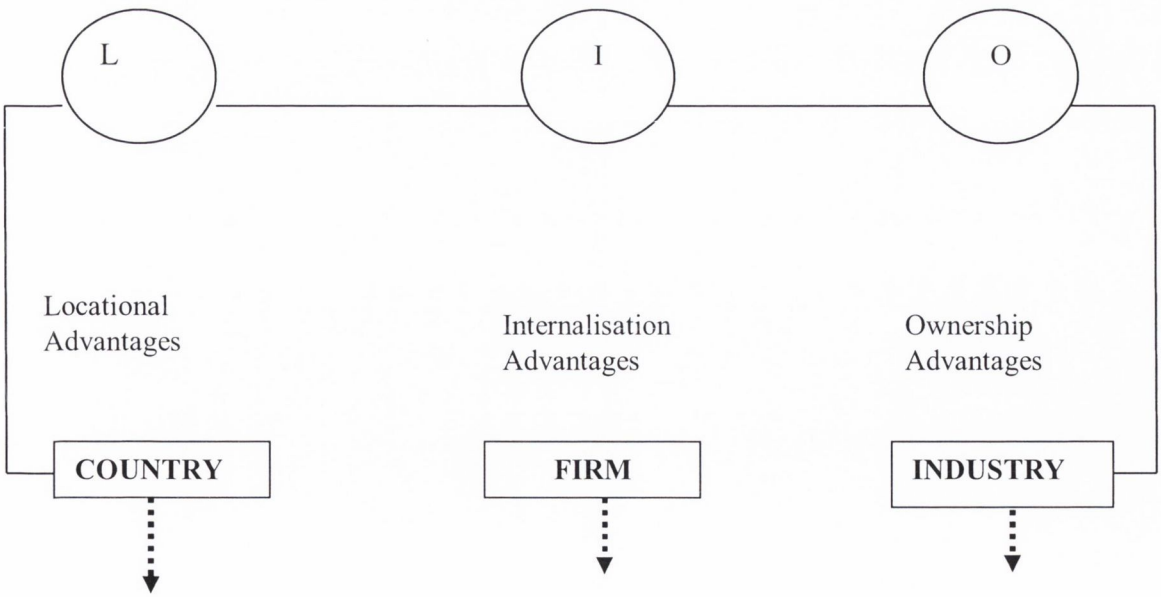

Figure 2-1: Research model stage 1 based on The Eclectic Paradigm of International Production, Dunning (1988a)

2.3. Dunning's Eclectic Paradigm (1981)

The origins of the Eclectic Paradigm dates back to Dunning's 1950s research into U.S. direct investment in the British manufacturing industry and in particular the productivity differences between the U.S. and the U.K. From this research, he developed different hypotheses, which he termed as the **Ownership-specific effect**; productivity differences were explained by spatially transferable intangible assets of parent companies and the **Location-specific effect**: that productivity differences were explained by non-transferable characteristics of the U.S. economy. The concept of the O and L advantages was further extended by Dunning in the 1970s to add another dimension to the model – which referred to as Internalisation (I) advantages. With this third dimension, he sought to explain why firms used resources and capabilities the way they did in their international activities as opposed to selling using the open market.

In its original form, the assumption of the Eclectic Paradigm is that the extent, form and pattern of international production was determined by three sets of advantages as perceived by enterprises (1988, p.367).

Location advantage: this relates to where the firm decides to engage in international activity. The firm will engage in foreign production whenever they perceive there is some advantage to be gained to combine spatially transferable intermediate products produced in the home country with some immobile factor endowments or intermediate products in another country. The choice of location may be influenced by spatial market failure and structural market distortions which encourage or discourage inward investment. Dunning (1988) highlights that location choices although treated separately in the paradigm, are not made independently of ownership or internalisation advantages.

Ownership advantage: The assumption is that the firm possesses a competitive advantage specific to the nature and/or nationality of ownership. These advantages also called competitive or monopolistic advantages must be sufficient to sustain the costs of setting up and operating in a value-adding operation in addition to those faced by indigenous firms. The firms must possess some market power advantage in foreign markets. Two main types of ownership-specific advantages are noted by Dunning (1988) – (1) Asset advantage (Oa) – those that stem from the exclusive privileged possession of or access to particular income generating assets; (2) Transaction advantage (Ot) – the potential of MNEs to capture transaction benefits (or reduce transaction costs) arising from the common governance of a network of assets in different countries, i.e. the MNE structure itself providing a transaction cost minimising advantage. He highlights that the ownership advantages of MNEs will vary according to the characteristics of the firm, the products they produce, the markets in which they operate or whether the competitive process is seen as dynamic or competitive (1988).

Internalisation advantage: It must be in the best interest of the firm as a whole to participate internationally within an organisation, rather than independently license its or sell its product to foreign based enterprises. This is based on the internalisation of markets, Dunning (1988) notes three types of market failure: (1) Those arising from risk and uncertainty; (2) The ability of firms to exploit economies of large scale production but only in imperfect market situations; (3) The transaction of a good or service yields cost and benefits external to the transaction itself. Dunning (1988) notes that the greater the perceived costs of transactional market failure, the more MNEs are likely to exploit their competitive advantage through international production rather than through the external market.

Since its initial conception, economic and technological developments have prompted restatements and extensions of the paradigm by Dunning. In addition, he has responded to criticisms of the paradigm and taken further insights from international business research in these reviews. The following section details some of the economic and technological developments. Each of three components of the Paradigm is examined in more detail in relation to further insights and/or criticisms.

2.4. Developments in International Business

Buckley (1991) presents a number of challenges to international business theory in the form of what he describes as "changes which are likely to lead to considerable restructuring of the world economy and of its constituent parts at national, regional, local, firm and intra-firm levels" (1991, p.16). He outlines four key emerging trends as follows:

1. An increase in competition and collaboration between firms. He notes two areas; firstly, a focus on improvement in competitiveness at national, industrial and firm level and secondly, the increasing use of joint ventures, alliances and other collaborative devices;

Political changes including deregulation, political, economic and financial integration;

Technological imperatives in the form of increasing resources on R & D and the management of radical innovation;

Social changes in the form of demands for improvements in social conditions, growth of "green" issues and the importance of "lifestyle" factors.

He describes how these changes challenge earlier International Business theory in a number of ways - challenges to internalisation theory, questioning of location cost theories and the role of founding entrepreneurs. He highlights the economics of

technological change as being of increasing importance; the high cost of R & D driving international collaboration and technological developments causing agglomeration and splitting effects.

2.4.1. Dynamic nature of international activities

Young (1987) highlighted that while the economic theory of MNE is helpful in distinguishing between certain types of MNE activities, it fails to tackle "the more dynamic and strategic dimensions of internationalisation" (1987, p. 32), particularly in relation to the competitive dynamics of the individual firm. Young (1987) highlights new trends, particularly technology related in the high cost of R & D and the wider availability of market information which are of relevance. Buckley & Casson (1998) also highlight the issue of static analysis and describe a new environment in the 1990s characterised by uncertainty and volatility. They also note new types of international co-operation on a firm basis (Joint ventures, alliances), the increasing importance of the role of entrepreneurship, managerial competence and corporate culture. They present a different environment than in the 1970s. In relation to the different types of international co-operation, Rugman (1986) also highlights that international trade models work well in explaining FDI or exporting but do not explain well other non-equity forms of international involvement. He believes the difficulty arises from the problem in dealing with intangible market imperfections.

2.4.2. Changing profile of MNEs

Markusen (1998) using the OLI framework, presents what he describes as the types of firms and industries dominated by multinationals (1998, p.735). He highlights there is evidence to suggest that MNEs are found in industries in which knowledge capital and knowledge intensive production are important. Among the characteristics that he

notes are that MNEs are associated with high ratios of R & D relative to sales and tend to have a high level of intangible assets. Kotha *et al.* (2001) also highlight that there are numerous studies to support the view that R & D intensity tends to be positively associated with the propensity to engage in foreign production. Markusen notes in relation to Dunning's Ownership advantages, that knowledge capital is more mobile than physical capital in relation to MNE activity and that while there are high initial costs of R & D, subsequent products can be supplied at low cost to foreign production facilities. In relation to location advantages, Markusen (1998) distinguishes between horizontal firms (producing the same product in multiple locations) and vertical firms (fragmenting the production process by stages). He suggests that location advantages arise for horizontal firms when the host-country market is large and trade costs are moderate to high. Location advantages arise for vertical firms when trade costs are low and activities differ in factor intensities/countries differ in factor endowments. He describes internalisation advantages as the most abstract of the three sets of advantages, and highlights that the same properties of knowledge that make it mobile also make it easily dissipated and therefore firms are preserving the value of assets. Markusen's modelling of the MNE in 1998 illustrates a different role of knowledge than is assumed in the earlier 1970s view of the MNE.

2.4.3. Technological impacts

Cantwell (1991) cites Graham's work (1985) suggesting a connection between technological competition and the rise of intra-industry competition. He concludes that expansion of MNEs can be linked to the process of technological accumulation with the firm and therefore innovation and the growth of international production are seen as mutually supportive. In relation to the "technology accumulation" approach,

Cantwell (1991) notes that the growth of international production has been associated with sustained technological competitiveness between MNEs in manufacturing. Similar to Young (1987) and Buckley (1991)'s issues noted above in relation to the high cost of R & D and the return required, Cantwell (1991) concurs in highlighting that if a firm is to take full advantage of its technological advantage, it must co-ordinate the successful introduction of technology elsewhere and maintain control over the network as a whole. He makes an interesting connection with internalisation theory – in suggesting that that this (internalisation) is not so much a feature of the market as assumed in internalisation theory but "a feature of the very nature of technology itself'(1991, p.33). Rugman (1986) also notes that a firm experiences transaction costs related to technology, the best way to counter-act this is for a firm to control the supply and distribution of its knowledge advantage, by internalisation. The increasing number of connections between technologies, which were formerly separate are also highlighted by Cantwell (1991). This has led to international co-operation on research and has had agglomeration effects in attracting MNEs to certain locations.

In addition to the above technological developments on the nature of MNE's competitive advantage and its impact on international activities, the impact of the Internet itself has been the subject of much discussion. Petersen & Welch (2003) examine the range of effects the Internet has had on international business at that point in time. Some of their conclusions are particularly relevant to the discussion above on internalisation and use of the Internet. They highlight that although the advent of the Internet favours externalisation over internalisation because of the contractual enforceable options available to firms – it has not necessarily happened in this way. They note how while internationalisation may be initially facilitated by the

Internet, "purely Internet-based firms find it difficult to operate internationally without establishing a local, physical presence" (2003, p.19). They also note that the nature of intangible assets and in particular knowledge-based assets make them more difficult to protect and that Intellectual Property Rights (IPR) and associated legal issues have been a constraining influence on the benefits of ICT developments. This is similar to Rugman's view of internalisation and its benefits. Petersen & Welch (2003) describe the role of the Internet in the "Born Global" phenomenon as "having ensured that... it [the "Born Global" phenomenon] is a more common-place reality in the process of firm's internationalisation" (p.17). Kotha *et al.* (2001) contend that despite the assertion that all Internet firms are "Born Global", their findings show that it is related to their intangible assets and strategic activity (p.769). This is dealt with in more detail later in this chapter in the review of the "Born Global" literature.

2.4.4. Transaction costs

The Eclectic Paradigm encompasses two key elements of market failure – structural and transactional market failures. Coase's (1937) original work on transaction cost economics, demonstrates how firms are an efficient alternative to markets. Later work by Williamson (1975) outlines an organisational failures framework. Williamson's model encompasses human factors such as bounded rationality and opportunism. While these are not transaction costs as such, they may constitute reasons why effecting transactions is costly (Rugman, 1986, p.110). Williamson (1975) outlines three key transaction costs – information costs, enforcement costs and bargaining costs. Rugman (1986) in applying these to the MNE describes how these transaction costs can be circumvented by the structure of the organisation of a MNE. Johanson & Vahlne (1990) also cite Williamson's (1981) work on transaction costs affected by uncertainty, bounded rationality and opportunism. They note that when transaction

costs are high it pays to internalise or when products are technologically complex. They highlight the issue of experience or knowledge of foreign markets and its impact of perceived costs or risks – "an experienced decision-maker will perceive future transaction costs differently than the inexperienced decision maker" (1990, p.17).

Dunning's Paradigm in its initial form, does not take into account the human factors highlighted by Williamson(1981, 1975), Rugman (1986) and Johanson & Vahlne (1990) above. Dunning (1995) describes how a series of technological, organisational and financial events have occurred since the 1970s that have helped reduce transaction costs (and coordination costs) of multi-activity hierarchies such as the multinational enterprise.

2.5. Expansion of the OLI Paradigm

The OLI paradigm has been a dominant analytical framework for incorporating the different theories of the activities of MNEs. Dunning (1975) highlights that a series of systemic technological and political changes the global marketplace have implications for the understanding of MNE activities. He notes that cross-border activities are increasingly affected by collaborative activities between firms. In 2000, Dunning outlines "four significant happenings of the 1980s and 1990s" (2000, p.167) which prompt him to re-examine the Eclectic Paradigm:

> *"... (1) The maturation of the knowledge-based economy;*
>
> *(2) The deepening integration of international economic and financial activity, including that fostered by electronic networks;*
>
> *(3) Liberation of cross-border markets and the flotation of the world's major currencies;*

(4) The emergence of several new countries as important players on the global stage." (Dunning, 2000, p.167).

Dunning (2001) notes how recent technological advances, more intensive inter-firm competition, the opening up of new markets and the increasing mobility of some firm-specific assets and the increase in cross-border mergers & acquisitions have all led to new motives for FDI. The impact of the Internet on international production and specifically the Eclectic Paradigm is examined in detail by Dunning & Wymbs (2001). They examine each tenet of the Eclectic Paradigm in relation to hierarchical, alliance and e-commerce advantages. The resulting extended eclectic paradigm of international production has a particular contextual relevance to this research.

The following section reviews each of the elements of the original Eclectic Paradigm in relation to the subsequent technological and economic developments, the criticisms and extension of the paradigm as related to the specific context of this research.

2.5.1. Location advantages

Benito *et al.* (2002) highlight that the relationship between firm specific and country specific issues in firm internationalisation is not well understood and that it is becoming increasingly complex. The locational advantage of the country has been assumed in The Eclectic Paradigm, to be a key determinant of foreign production of MNEs. There are two perspectives on locational specific advantages;

- From the target country perspective - as a determinant of where to locate international activities and the locational advantages of the target country in attracting MNEs to that country
- From the perspective of country of origin, as an influence on the international development of the firm and its propensity to engage in international activities.

Dunning (2000) notes that the explanatory variables differ according to the motives for FDI, its sectoral composition, the home and host countries of the investing firms and a variety of firms specific considerations (2000, p.175). The initial Eclectic Paradigm had focused more on structural market failures but with the emergence of a knowledge-based global economy and further work in this area, the focus of the Paradigm has widened accordingly. In 1998, Dunning describes three features of a new world economy impacting locational factors; the emergence of intellectual capital as key wealth creating asset in most industrialised economies, the rising significance of knowledge or information-intensive industries and advances in transport and communications technology. Dunning (2000) highlights the importance of distance related transaction costs, knowledge accumulation and interactive learning, and of spatially related innovation and technological standards (p.175). He also predicts (2001) in relation to agglomerative economics that as the dynamic gains from spatial clustering and network linkages have become important, so will the location choice for firms become a more critical variable. Benito *et al.* (2002) note that a firm's ownership advantages in internationalisation tends to reflect the particular location advantages of its country of origin.

Dunning (1998) describes how the location needs of firms have changed from those associated with market access or natural resources to needs related to knowledge-intensive assets and learning experiences that augment the competitive advantage of the firm. Dunning & Wymbs (2001) describe the ability of some locations to help investing firms upgrade their knowledge and learning experiences as asset-augmenting theories of FDI. They highlight that these global knowledge centres, although physical in location are composed almost completely of intangible resources. As noted earlier, the mobility of intangible assets provides a different dimension to

the earlier assumptions of physical locations and tangible assets that are fixed. However, as noted by Dunning (1998 and 2001), the increased mobility of assets by multinationals is being constrained by the use of these assets influenced by the presence of immobile clusters of complementary value-added activities. So while there are factors facilitating increased geographical dispersion, there are also factors driving geographical concentration.

A further extension and reconfiguration of the Eclectic Paradigm by Dunning (1981, 1988) was The Investment Development Path (IDP). This concept links the two perspectives of location advantage mentioned above, in linking the interaction between foreign and domestic firms with the overall country investment path. Improvement in location advantages such as technological infrastructure and attracting FDI may also help indigenous firms in their strategic development.

In the IDP, he examined the relationship between the development of the economy and inward and outward FDI. At stage one, which is the early development of the economy there is no inward or outward FDI. The economy becomes attractive to inward investment in stage two; investment primarily of a market seeking or trade related type. At stage three, the original ownership advantage of low cost is being eroded and is being replaced with technological advantages, managerial and marketing know-how. There is a slowdown of inward FDI at this stage and outward FDI starts to develop. The technological capabilities of the economy have developed at stage four and its competitive advantage is in capital intensive production as the cost of capital is now lower than that of labour. The strategic outlook for companies in the economy at this stage is increasingly global. The country becomes a net outward FDI investor as companies seek to maintain their competitive advantage by optimising productivity and costs by investing in countries with lower stages of development.

Stage five represents the stage of the industrialised nations where inward and outward FDI fluctuate around zero as technological leadership in individual sectors changes over time between countries. Dunning (2001) notes by the mid 1990s, this stage has been reached by the more advanced industrial economies whose economic growth is dependent on their ability to harness and effectively utilise all forms of knowledge or intellectual capital. Görg (2000) classifies Ireland between stages two and three of Dunning's IDP. Porter and Sachs (2002) describe four stages of economic development from factor driven to investment driven to innovation driven to wealth driven, as the focus moves respectively from input cost to efficiency to creating unique value. Similarly to Görg's analysis, Porter & Sachs describe Ireland in *The Global Competitiveness Report 2001-1002*, as "on the cusp of innovation driven growth".

Dunning & Wymbs (2001) outline a number of issues in relation to locational advantages and the major technological developments. The assumption around immobility of assets is challenged by high digital content products with the replacement of physical goods with "virtual goods". In addition, the cost of serving foreign markets through the use of e-commerce is dramatically lower than those associated with traditional physical product expansions. They note that the Internet reduces both internal co-ordination (favouring FDI) and market transaction costs (favouring trade) and so the relative rate of cost reduction is likely to be firm and industry specific. The home and host country telecommunications infrastructure also facilitates the online delivery of product as opposed to traditional physical infrastructure of the past.

In summary, there are a number of issues emerging from the literature in relation to "location"(L) element of the Eclectic Paradigm pertinent to this specific research as follows;

- The increased knowledge intensity of firms and industries are driving different needs from internationalising firms and together with agglomeration effects which are more common in knowledge-intensive industries, this is also influencing country selection. An asset-augmenting approach to FDI is emerging as firms accumulate knowledge and learning. The increased level of intangible assets indicates an increased mobility of assets across borders in comparison to fixed tangible assets;
- The developments in telecommunications and information technology has resulted in lower costs associated with internationalisation – lower internal co-ordination costs and transaction costs. There is more of an impact with information-intensive products than with other types of products;
- The IDP path of the country of origin of the internationalising firm creates a particular context for the firm. The context is more complex to explain but encompasses the institutional framework as described by Benito *et al.* (2002) "not only formed them [the internationalising firm] but which they have helped to create" (2002, p.62). The innovation and education policies within this institutional framework affect location advantages of countries (and thereby the firms that are created within the country) and this also overlaps with the firm specific advantages. Dunning (2000, p.178) highlights that the competitiveness of firms is "becoming increasingly fashioned by the institutional context within which they operate;"

- Another factor for consideration, although not explicitly dealt with in the original Eclectic Paradigm or its extensions – is the concept of psychic distance. Dunning does include "psychic distance" as an element of structural market failure in his 1988 *"The Endowment/Market Failure Paradigm of International Production"* (Figure 1, p.376). He notes (2000) that managerial-related paradigms are of interest in explaining the behaviour of managers and to tend to focus on the process of internationalisation and not the overall level or pattern of FDI. From a locational advantage perspective, incorporating managerial paradigms to explain the distance creating factors between countries and the role of psychic distance might be beneficial here. The concept of "psychic distance" is reviewed further in this chapter, in the context of the internationalisation process of the firm;
- These factors emerging from the locational advantage component are incorporated into the research model at the end of this section.

2.5.2. Ownership advantages

As noted above, the original ownership advantages component of the Eclectic Paradigm specifies two key types of ownership advantages - asset and transaction advantages.

Dunning (2000) outlines three types of ownership competitive advantages from the extant literature since the 1960s (2000, p.169);

- Advantages relating to the possession and exploitation of monopoly power that creates a barrier to entry to firms not possessing these advantages. He traces this to the industrial organisation theory of the firm;
- Advantages relating to the possession of unique and scarce resources and capabilities of the firm relative to its competitors. He links this to the resource-based and evolutionary theories of the firm;

- Advantages relating to the competencies of the managers within the firm to identify evaluate and optimise resources and capabilities throughout the world.

Due to the developments over recent years in the integration of world markets and the increasingly knowledge-intensity of MN activities, the relative significance of these advantages has changed. Dunning & Wymbs (2001) add further to this in highlighting another important ownership advantage is the ability of firms to work effectively with other enterprises (competitors, customers, suppliers) and therefore leverage market opportunities. Criticisms of the Eclectic Paradigm in its original form were in relation to the static nature of the paradigm while firm specific advantages are dynamic by nature. Dunning argues (2000) that each of these advantages tends to be context specific – to industry or country or related to the types of competitive advantage of the firms. The knowledge-intensive, information –intensive and high increasing returns nature of the technology industry further drives this asset-augmenting approach to internationalisation.

As noted earlier, the asset-augmenting approach to FDI is characterised by firms not just exploiting existing advantages but accessing new knowledge-based assets in international locations, particularly in relation to technology related assets. This extension of the Eclectic Paradigm incorporating the more recent concept of asset-augmenting FDI is presented in Dunning's (1995) "*Reappraising the Eclectic Paradigm in an Age of Capital Alliance*". This deals with the changing firm specific motives for FDI and the choice of location, but related to this is also the new mechanism by which firms achieve this in the form of international alliances and cross-border coalitions. Dunning (1995) includes vertical alliances – providing backward access to R & D or forward to customers, horizontal alliances-providing access to complementary technologies, networks – providing opportunities and

collective advantages and business districts providing access and linkages to knowledge-based institutions as additional ownership advantages. This aspect is dealt with in the next section, examining the Internalisation advantages and how this thinking has evolved over time.

With the increasing levels of outsourcing of non-core activities, Coase & Petzinger (1999) predicts that this will result in larger specialist-type firms. As firms seek more leverage from intangible assets, Evans & Wurster (1997) predict that physical assets will become commodities and the source of monopolistic advantages will be from intellectual and relational assets.

In summary, there is a number developments in recent years which have broadened the Eclectic Paradigm and have contextual relevance to this particular study of knowledge intensive, information intensive, increasing returns industry. The asset-augmenting approach to FDI may be more relevant to the software technology industry than other industries with the inter-relatedness of technology driving institutional and firm based international alliances and with the presence of industry specific global knowledge centres.

2.5.3. Internalisation advantages

As outlined earlier in this chapter, the premise of internalisation is that it must be in the best interest of the firm to participate internationally within an organisation, rather than independently license or sell its product to foreign based enterprises. This is based on the assumption of the presence of market failures (risk, uncertainty, transaction costs, scale/scope economies). Rugman (1986) highlights that licensing to foreign producers is usually not feasible when the firm has internalised a knowledge advantage. He notes that it is only when the product incorporating the knowledge

becomes a standard or when technology itself is not a source of advantage, that the risks are low enough to use licensing. One could argue that by the nature of the software technology industry, technology is always a source of advantage. As noted earlier in this chapter in discussing transaction costs, other transactions costs - information costs, enforcement costs and bargaining costs not initially considered can also by avoided the structure of the organisation of a MNE. Other factors noted above were human factors of international experience, opportunism and individual decision-makers which are very much firms specific. Dunning (1995) acknowledges that endemic or natural market failure also encompasses bounded rationality, information asymmetries and opportunities as realistic principles governing market conduct. Information asymmetry is based on the premise that one of the parties in any transaction has less information relative to the other, the advent of the Internet has increased the availability of information to all parties for informed market decisions (Dunning & Wymbs, 2001). They also note that the information intensity, context and preferred delivery mode of the product determines how much the Internet impacts the transaction costs of the firm. Dunning (2000) suggests that all costs and benefits (not just transaction related costs) associated with corporate activities should be considered in internalisation advantages.

One of the criticisms of the eclectic paradigm has been that it ignores the increased significance of international inter-firm co-operation in the form of joint ventures, collaboration agreements, international network organisations, marketing or research alliances, etc. Dunning (1995) compares traditional single firm MNE activity (hierarchical advantages) with inter-firm MNE activity (alliance or network-related advantages) characterised by international alliances and co-operative agreements. While the former is based on maintaining control in an environment of risk and

uncertainty, the later is based on leveraging, flexibility and inter-relatedness in an more integrated global environment. Again he notes that the impact of "alliance capitalism" is highly industry and country specific. However, Dunning (2001) acknowledges that new inter-firm organisational modalities are only partly explained by internalisation theory. This is similar to Cantwell's (1991) view of the MNE and technology accumulation approach, noted earlier in this chapter. He describes how the technology accumulation approach addresses the question as to why technology is developed in an international network as opposed to a series of separately owned plants. He believes this is partly explained by internalisation theory, which explains why MNEs have come into existence – with the firm seeking to gain full control over its source of technological advantage and exploit this advantage elsewhere. Cantwell's (1991) technology accumulation approach suggests that the growth of international production has been associated with sustained technological competitiveness between MNEs in manufacturing. He highlights two points in relation to this: firstly, internationalisation has supported technological diversification as the form of technology development vary between locations, therefore expanding internationally to gain access to new but complementary areas of technological development; secondly, there is a growing number of connections between technologies that were formerly unrelated, thereby attracting companies to certain centres of innovation.

Cantwell (1991) suggests that internalisation theory sees international inter-firm networks as a feature of the market whereas technology accumulation approach sees it as a feature of the technology itself. Internalisation theory and the knowledge accumulation approach above are not conflicting but complementary and give a fuller explanation than either on its own.

In summary, the use of internalisation advantage in explaining current MNE activity is in the recognition that it is increasingly firm specific but that it also incorporates a wider definition of market failure. A wider view of market failure incorporating the human and non-transaction costs factors point to unique firm characteristics. Where the firm has internalised a knowledge-based advantage or where the advantage is technology based then internalisation provides control on maximum appropriation of value. However, with increased inter-relatedness between economies and technologies, other forms of organisational forms are emerging based on maximum leverage within a network. The technology accumulation approach overlaps in both of these partly explaining hierarchical-capitalism advantages and partly explaining network-alliance advantages.

Figure 2-2: Research model stage two - A contextual framework based on extensions of The Eclectic Paradigm of International Production (1988a, 1995, 2000, 2001a, 2001b) illustrates the progression of the research model. This follows a more detailed review of each of the components of the eclectic paradigm and in view of the major developments in international business since its inception. Key issues are identified each of the interdependent components as follows:

Location (country): The IDP provides an institutional framework from which the firm starts to internationalise. A number of key developments in ICT is identified earlier as having an influence on differing needs of internationalising firms. Increased knowledge intensity of firms is also having agglomeration influences in market selection choices. The institutional context from which firms emerge and contribute to, also influence their motives and methods of internationalisation.

Firm specific (internalisation): A number of firm specific variables or unique firm factors emerge in this area – the nature of the advantage of the firm (if it is knowledge

or technology based), the interrelated and accumulated features of technology markets themselves and the additional influence of non transactional-cost factors, also termed as human factors.

Industry specific (ownership): As the knowledge intensity of industries has increased, the relative ownership advantages have changed in relative significance. The more recent asset-augmenting approach to FDI is related to location factors (agglomeration) internalisation factors (knowledge based assets) and the increasing importance of network-related advantages.

This provides a contextual framework as the research model is progressed further to integrate the "behavioural theories" of internationalisation as noted at the beginning of this chapter.

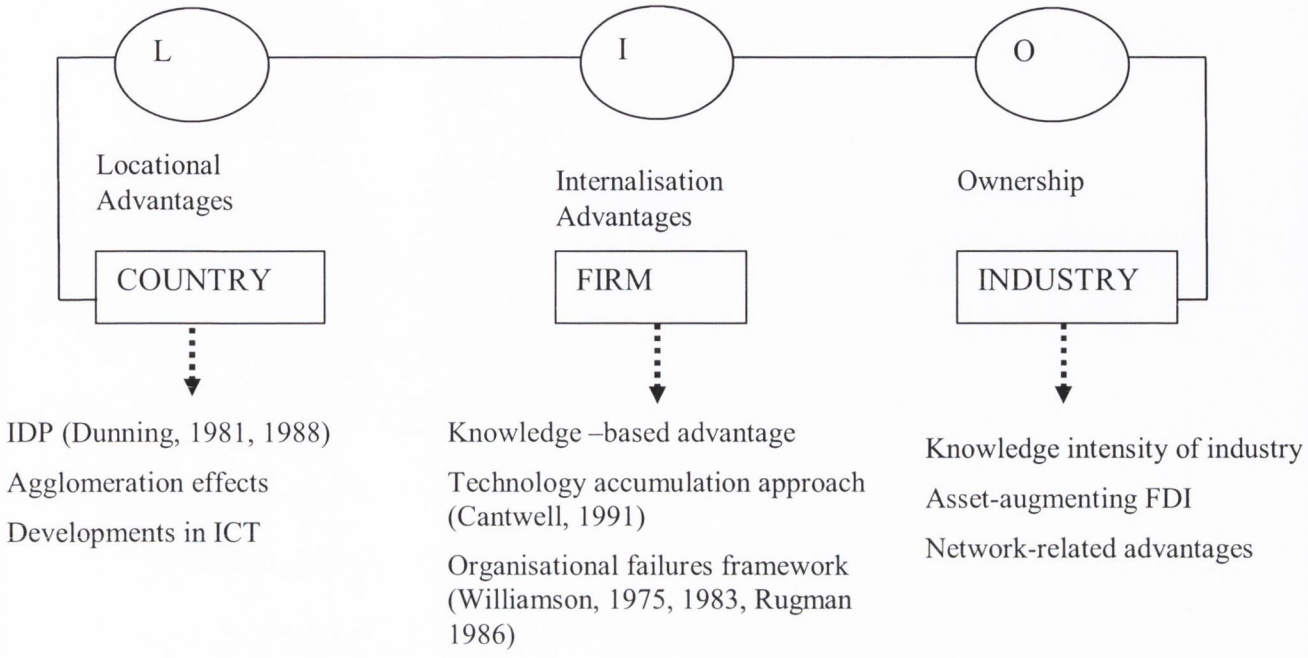

Figure 2-2: Research model stage two - A contextual framework based on extensions of The Eclectic Paradigm of International Production (1988a, 1995, 2000, 2001a, 2001b)

2.6. Internationalisation Process Models

As noted earlier in this chapter, Johanson & Vahlne (1990) describe how the Internationalisation Process Models are based on behavioural theories and highlight the consistencies between Dunning's Eclectic Paradigm and the International Process Models. Andersen (1993) also describes the Internationalisation Process Models as behaviourally- oriented, as do Loane *et al.* (2003) in describing the international process literature as "rooted in Cyert & March (1963) behavioural theory and Penrose's (1959) growth theory of the firm" (2003, p.167). They contrast the fuller explanatory value of Dunning's model with the "extremely partial" explanatory value of the internationalisation process models (1990, p.18). However, the static nature of the eclectic paradigm is also highlighted in comparison to the dynamic nature of the Internationalisation Process Models. As emerged from the detailed review of the

Eclectic Paradigm and its extensions, Dunning acknowledges the weakness in the ability of the paradigm to explain firm-specific behavioural differences.

At the firm level, two somewhat similar international process models have emerged in Europe and the U.S. Andersen (1993) has termed these as the Uppsala Internationalization Model (U-Models) (Johanson & Wiedersheim-Paul, 1975; Johanson & Vahlne, 1977) and the Innovation-Related Models (I-Model, Bilkey & Tesar, 1977; Cavusgil, 1980). Both models view internationalisation as a gradual incremental process. The first of these, the U-Models are the more dominant of the two, and are featured more prominently in international business literature.

2.6.1. U – Models

Based on a case study of four Swedish firms, Johanson & Wiedersheim-Paul (1975) found that firms internationalise according to a chain of establishment. They distinguish four stages as follows:

Step 1: No regular export activity

Step 2: Independent representative/selling via agent

Step 3: Establishment of sales subsidiary

Step 4: Establishment of production facility

They identified a pattern, i.e. "a correct description of the order of the development operations of the firms in individual countries" (1977, p.25) from their research. This pattern is presented in the following causal chain:

Figure 2-3: Establishment chain of Johanson & Vahlne (1977)

Based on their study they conclude that these firms enter new markets with successively greater psychic distance in a series of stages. The concept of "psychic distance" has been defined as factors preventing the flow of information between firm and market including such factors as language, culture, political systems, level of education and level of industrial development (Johanson & Vahlne, 1977, p. 23). The basic assumptions of the Johanson & Vahlne model (1977) are that lack of knowledge about foreign markets is an important obstacle to the development of international operations and that the necessary knowledge can be acquired mainly through operations abroad – through experiential market knowledge. This market experience is seen as country-specific and not easily generalisable to other countries. It is based on a study of large Swedish manufacturing firms in 1977. They present internationalisation as a result of a series of incremental decisions. These incremental decisions are affected by market commitment and market knowledge. The model is a dynamic model in which there are state and change aspects of internationalisation variables. The state aspects are market commitment - resources committed to foreign markets. The change aspects being the decisions to commit resources and the performance of the activities. They highlight experiential knowledge as being "the critical kind of knowledge" (Johanson & Vahlne, 1977, p.29) in the international context and therefore a driving force behind the process.

The Johanson & Vahlne (1977) model assumes experiential knowledge is not only a method of reducing risk but also a vehicle for acquiring information and for

generating opportunities abroad. The model implies that market commitment will be made in small incremental steps as firms gain experiential knowledge over time. They also note that firm size, technology, product line and home country affect the characterisation of internationalisation in different ways. Andersen (1997) highlights this concept of firm unique knowledge (experiential knowledge) relates to Eclectic framework (firm ownership advantage), but that the internationalisation process models differ in assuming a time-dependent process according to a sequence of events.

Johanson & Vahlne (1990) describe how this model has grown out of microeconomic and marketing theory about Swedish firms competing internationally. While the expectation is that the model is limited to countries similar in size and development to Sweden, further studies in other countries have supported this model. They cite a number of empirical studies showing supporting results - among them: a U.S. study: (Denis & Depelteau, 1985), an Hawaiian study (Hook & Czinkota, 1988), a study of Japanese export firms (Johansson & Nonaka, 1983), a study of Turkish exports (Karafakioglu, 1986) and a study of Australian firms (Bartlett, 1986). Welch & Luostarinen (1988) also note that research in other countries although different in sample size, period of study and subject of analysis indicated a degree of consistency with the Scandinavian research. Overall, the model has received strong support in particular for its emphasis on market experience and commitment. It has also highlighted the relevance of psychic or cultural distance in international business decisions. Johanson & Vahlne (1977) suggest that their model of the internationalisation process contributes to the internationalisation process by "stressing the importance of some factors affecting the decision-making process" (1977, p.32). Welch & Luostarinen (1988) highlight that patterns of

internationalisation will vary from country to country over time because of environmental differences as well as developments within a country. Similarly, although more explicitly stated, Dunning & Wymb (2001) describe how the eclectic paradigm identifies three sets of *contextual variables* likely to affect the extent, pattern and form of MNE activity – the types of activities engaged in by the firms, the countries of origins of investing firms and certain characteristics of the firms other than nationality of ownership.

2.6.2. I – Models

The innovation-related models of Bilkey & Tesar (1977), Cavusgil (1980), Czinkota (1982) and Reid (1981) are similar in assuming internationalisation as an incremental process although varying in the number of stages. Internationalisation is presented in these models as an innovation of the firm, a learning approach. The Innovation related models highlight that there are differences between the internationalisation process in large and small firms. Cavusgil (1980) puts forward a five-stage process of internationalisation as follows:

Stage one: Domestic marketing – The firm sells only to the home country

Stage two: Pre-export stage – The firm searches for information and evaluates the feasibility of exporting.

Stage three: Experimental involvement: The firm starts exporting on a limited basis to psychologically close countries.

Stage four: Active involvement: The firm continues to export to more new countries with increasing sales volume.

Stage five: Committed involvement: The firm constantly makes choices in allocating limited resources between domestic and international markets *(adapted from Anderson, 1992, p.213).*

Bilkey & Tesar's (1977) six-stage process, Czinkota's (1982) six-stage process and Reid's (1981) five-stage process are all similar in the stages they present from a purely domestically oriented firm, to gaining export-information, through the varying degrees of export to being an experienced exporter. They differ in the number of stages and how the stages are described but they essentially represent a gradual pattern of internationalisation based on the adaptation of the firm. The role of psychic distance is also consistent in each of the four I-Models above in that firms first export to psychologically close countries before more psychologically distant countries. Reid (1981) notes that the export behaviour in small firms is likely to be influenced by the individual decision-maker whereas in the large firm it is likely to be more structurally determined. Andersen (1993) highlights that whereas the U-Model is assumed to be valid for firms of any size, the I-Models may be applicable to small firms only. Both U and I-Models reflect the early stages of internationalisation from the period of no international sales to initiation of internationalisation. Anderson (1993) describes both U and I-Models as behaviourally oriented and that the gradual pattern of internationalisation is attributed to the lack of experiential knowledge and the uncertainty relating to the decision to internationalise.

As noted earlier in relation to the U-Models, there have been numerous studies in countries outside Scandinavia to support the gradual internationalisation pattern and its assumptions. In general, an incremental process of internationalisation as presented by both the U and I-Models as been supported by further studies; Luostarinen (1980) & Larimo (1985) have produced similar evidence for Finland and Buckley (1982) in

the U.K. Coviello & McAuley (1999) identified eight different studies supporting an incremental internationalisation process for small firms.

However, research on Swedish firms in Japan by Hedlund & Kverneland (1984) suggested a speeding up of the internationalisation process from a gradual and slow process to more direct and rapid entry modes. In 1987, in a review of the internationalisation approaches of firms, Stephen Young raises a number of issues particularly in relation to high technology firms and the changing pace of internationalisation. Despite the support for the above models, since the 1980s the stage theory of internationalisation has been challenged. These challenges have been specifically in relation to the process and pace of internationalisation, and the factors influencing a changing pace and pattern. The challenges to the U and I-Models are discussed below in relation to the changing role of knowledge and industry or firm specific characteristics.

2.7. Challenges to the Internationalisation Process Models

2.7.1. The role of knowledge

Petersen *et al.* (2003) provides a summary of the key characteristic of knowledge in the U-Models, which may also be applied to the I-Models:

- The knowledge of critical importance to firms is market-specific;
- Knowledge is experience-based and is acquired in a learning-by-doing process;
- Knowledge is embedded in individuals and is not easily disseminated throughout the organisation;
- Market commitment increases proportionally with acquisition of market knowledge.

It is questionable whether these assumptions about the characteristics of knowledge are still valid given the technological, economic and political developments since the 1980s. The assumptions underlying the nature of knowledge, the acquisition of knowledge and the different types of internationalisation knowledge are examined more in more detail as follows.

2.7.2. The acquisition of knowledge

Anderson (1993) challenges the assumption of experiential knowledge of the U-Models, highlighting that when market conditions are stable and homogenous, relevant market knowledge can be gained in other ways than experience. Similarly, Young (1987) notes that specifically in relation to high technology firms, that as firms learn from the experience of others that "presumably" some of the barriers to internationalisation should be reduced. Other studies also indicate that experiential knowledge of other firms may be gained without going through the experience of other firms (Eriksson *et al.*, (1997), Kraatz (1998), Lane & Lubatkin, (1998)). Petersen *et al.* (2003) highlight Penrose's (1959) distinction between experiential and objective knowledge – they note how objective knowledge can be acquired through standardised methods in that market research can be easily transferred to other countries and replicated by firms. Blomstermo & Soon-Gwn Choi (2003) also differentiate between objective knowledge that can be acquired through textbooks and marketing courses and experiential knowledge that is unique and firm specific.

Petersen *et al.* (2003) also highlight that companies can acquire crucial international knowledge by recruiting individuals with valuable international knowledge that they have gained in other companies. They believe the "Born Global phenomenon" is partly explained by spin-offs of personnel from international companies and thence have a faster internationalisation process.

2.7.3. Accumulated internationalisation knowledge

Bloodgood *et al.* (1996) highlight a simple explanatory value of the stage theories of internationalisation in that the more experience a firm has the better it will be able to internationalise. This allows for experience to be located within individuals and acquired by the firm in different ways and not just on a market basis experientially.

Research by Eriksson (1997) indicates that accumulated internationalisation experience is not related to specific country markets (as assumed in U-Models) but is ***firm specific*** knowledge related to all markets. Their study used perceptual measures of knowledge development in the internationalization process of the firm. It is based on information from seventy face-to-face interviews with CEOs of Swedish firms. Christensen & Jacobsen (1996) in their study of newly established international firms in Denmark, conclude that firms have different routes to internationalisation based on "knowledge acquired prior to the initiated new business". This is closely related to the role of the founding entrepreneur(s). They also note that market knowledge and the international skills and experience of the founder may also have been obtained before the birth of the firm. Similarly, the idea that knowledge can be acquired by hiring individuals with valuable international experience is supported by Barkema & Vermulen (1998), Reuber & Fischer (1997) and Erkko *et al.* (2002).

Almeida (2000) note that knowledge about international markets and operations and the efficiency by which the knowledge is learned, is an important determinant of international growth for entrepreneurial firms. This was based on their study of the Finnish electronics industry, with a sample of 134 firms using a postal survey. Eriksson *et al.* have extensively researched different aspects of internationalisation knowledge accumulation – the effect of variation on knowledge accumulation in the internationalisation process (2000), experiential knowledge and cost in the

internationalisation process (1997), the perceived usefulness of network experiential knowledge in the internationalising firm (2004), and path dependence and knowledge development in the internationalisation process (2000). Their research is based on Swedish firms engaged in international operations. On the basis of information from personal interview with Swedish CEOs, a questionnaire based survey was distributed to 774 firms. Eriksson and colleagues have defined three types of international knowledge as follows:

Internationalisation knowledge – a firm's capability and resources to engage in international operations;

Business knowledge – competitive situations in specific markets and clients in these markets;

Institutional knowledge – information about governance structures in specific countries and their rules, regulations, norms and values.

In a later study, Eriksson *et al.* (2000) examine the effect of variation in the geographical scope of international business operations on experiential knowledge development in the firm. They define *variation* as the diversity of foreign environments to which the internationalising firm is exposed. This variation may come in the form of diversity across products, clients, technologies and markets. They found that variation had a positive effect on internationalisation, in that firms develop knowledge on internationalisation by being exposed to environmental diversity.

Hadley & Wilson (2003) adapt Eriksson's *et al.* (1997) above mentioned components of experiential knowledge to test the association between experiential knowledge, firm degree of internationalisation and market degree of internationalisation. They used Johanson & Mattson's (1988) typology of the network model of

internationalisation – namely The Early Starter, The Late Starter, The Lonely International and The International among others. Their study was across five industries within the Australian and New Zealand secondary industry sectors; agriculture, electronics, printing and publishing, furniture and non-metallics. It was based on a postal and fax survey. Similarly to Eriksson's *et al.* (2000), Hadley & Wilson (2003) found that internationalisation knowledge is significantly relation to the firm's market diversity. They also highlight that foreign business knowledge is strongly related to firm internationalisation.

2.7.4. Contextual influence

The firm's business context is an influencing factor in internationalisation is highlighted in the preceding review of literature particularly in relation to the Eclectic Paradigm. While the U and I-Models focus on the behaviour of the firm and individuals within the firm in the internationalisation process, it is important also to highlight the business context of the firm as an explanatory factor. The network theory of the firm and the impact on internationalisation process is highlighted by Johanson & Mattson (1988) and Johanson & Vahlne (1990). The network approach suggests an influence of the inter-firm relationships and knowledge embedded in network organisations and its impact on how firms internationalise. Coviello & Munro (1997) describe how the network perspective goes beyond models of incremental internationalisation and that the firm's internationalisation is influenced by a variety of network relationships. Coviello & Munro's research into network relationships specifically in relation to the internationalisation of small software companies is reviewed further in this chapter.

In summary, the following key developments in our understanding of knowledge have changed the view of the role of knowledge in the internationalisation process;

- Nature of knowledge - Objective/experiential and tacit/explicit knowledge (Penrose, 1959, Nonaka 1991);
- Types of internationalisation knowledge (Eriksson, 1997, 2000, 2004,);
- Ways of acquiring knowledge (Anderson, 1993, Eriksson *et al.* 2000);

In addition, as noted earlier in this chapter, technological developments in the form of ICT and the increasing knowledge intensity of MNE activities have changed the role of knowledge from one of a barrier that is overcome through knowledge acquisition on a market basis experientially in a gradual internationalisation process. Petersen *et al.* (2003, p.52) highlight that knowledge now plays a far more complex role that assumed in internationalisation models of the 1980s - "the role of knowledge may change from being a factor that curbs the international expansion of firms – as was assigned to the Uppsala theorists – to becoming a driver and catalyst of firm's internationalisation". Hedlund & Kverneland (1985, p.56) highlight that the "establishment and growth strategies on foreign markets are changing towards more direct and rapid entry modes than those implied by theories of gradual and slow internationalisation process". The role of knowledge is explored further in relation to firm and industry characteristics associated with internationalisation behaviour, different to that exhibited by the earlier U and I-Models.

2.7.5. Firm and industry characteristics

Young (1987) outlined key factors, particularly in relation to high-technology firms, which contribute to a faster internationalisation process;

Cost of R & D: High technology products require substantial investment in R & D and therefore this may drive a need for rapid market penetration to recover these costs. Barkema & Vermulen (1998) also note that knowledge based firms are driven into global expansion earlier than more traditional firms due to the need to recover R

& D costs. These are firms where knowledge creation or knowledge intensity is a source of competitive advantage.

Shortening product life cycles: Young (1987) notes that many high technology products are characterised by short product life cycles. Shorter product life cycles may indicate a need for more rapid internationalisation than in the past. Bernardino & Jones (2003) also highlight that because products have shorter lifecycles, continuous investment in R & D is required to maintain competitive advantage. They also note that high technology small firms are driven to internationalise to recover R & D expenditure which is too large to recover on the home market. This may also relate to the characteristic of the home market itself.

Focus on the U.S. market: For European companies there is a market concentration in U.S.A (and also Japan) for high technology products. This may also question the role of "psychic distance" in the incremental process models in guiding market selection. Anderson (1992) cites a number of studies that question the hypothesised relationship between psychic distance and choice of new market. Concentrated focus on the U.S. market may also be attributed to the asset-augmenting FDI strategies and the accumulative nature of technology markets highlighted earlier in this chapter.

Availability of market knowledge: Young (1987) describes how improvements in market knowledge as companies learn from the experience of others, reduces some of the barrier to internationalisation (as also noted above). There are number of other issues arising from the literature in relation to knowledge and high technology firms. For high technology firms, knowledge is mobile (Liebeskind 1996, McDougall, 1994), this lowers the cost of international expansion. Kotha *et al.* (2001) describe how Internet firms experience less the "liability of foreignness". Kotha's research also found that the intangible assets of Internet firms in the U.S. were important predictors

of the propensity to internationalise. He notes that the greater the value of the intangible asset in the domestic market, the more likely the firm was to deploy these in foreign markets. The availability of knowledge is clearly related to the above developments in our understanding of the types of knowledge and how knowledge is acquired. It would also indicate that the cost of acquiring knowledge is lower for knowledge-intensive firms.

Research by Autio *et al.* (2000), found that early internationalisation and greater knowledge intensity were associated with faster international growth. They distinguish between the period of time since the firm formation and international growth *and* the speed of a firm's subsequent international growth.
Closely related to this – is the nature of knowledge-based assets in high technology firms themselves (intangibility and mobility of assets) that make international expansion more economical and faster than in traditional firms with tangible assets. Investment in technology-related assets is seen as a key driver of internationalisation (Pugel 1985, Kogut & Chang 1991, Kogut & Zander 1993). According to Bartlett & Ghoshal, (1987a) development of new technical knowledge is important for success in international markets.

Education level of high-technology entrepreneurs: The education level of high-technology entrepreneurs may also be a factor in reducing the psychological barriers to internationalisation decisions. According to Reuber & Fischer (1997), firms with an internationally experienced management team can skip the first two stages of Cavusgil's internationalisation model. Jones (1999) highlights that there is a body of work to suggest that the orientation and experience of the entrepreneurs influence the speed and nature of internationalisation – in addition to the nature of the product and the industry itself. Reuber & Fischer (1997) completed a study of Canadian SME

software companies to understand the influence of the management team's international experience on internationalisation behaviours. They found that internationally experienced management teams have a greater propensity to develop foreign partnership and delay less in obtaining foreign sales and that these behaviours are associated with a higher degree of internationalisation. Erkko *et al.* (2002) in their Finnish study also found that the contacts and experiences of the management team had a positive effect on the "development of the distance of internationalisation". Therefore, this is perhaps not only due to their education level but also their accumulated international experience evident in their critical role in the internationalisation decisions of the firm.

2.7.6. Summary

The focus on the firm-specific element of internationalisation of the firm through the review of the International Process Models, has led to a rethinking of the role of knowledge in the internationalisation process. Petersen *et al.* (2003) note how this partly explains an emergence of a new phenomenon in internationalisation - the "Born Global" phenomenon". Other firm specific characteristics may also contribute to the emergence of this phenomenon. Knight & Cavusgil (2004) highlight that while in the external international business environment, the globalisation of markets and technological developments in ICT have facilitated this phenomenon of early internationalisation; there has been little research into the firm specific factors driving this phenomenon.

The research model is further developed to incorporate these issues, leading to a more detailed review of the research to date into "Born Global" firms and also specifically "Born Global" high technology firms. This is illustrated as follows in *Figure 2-4:*

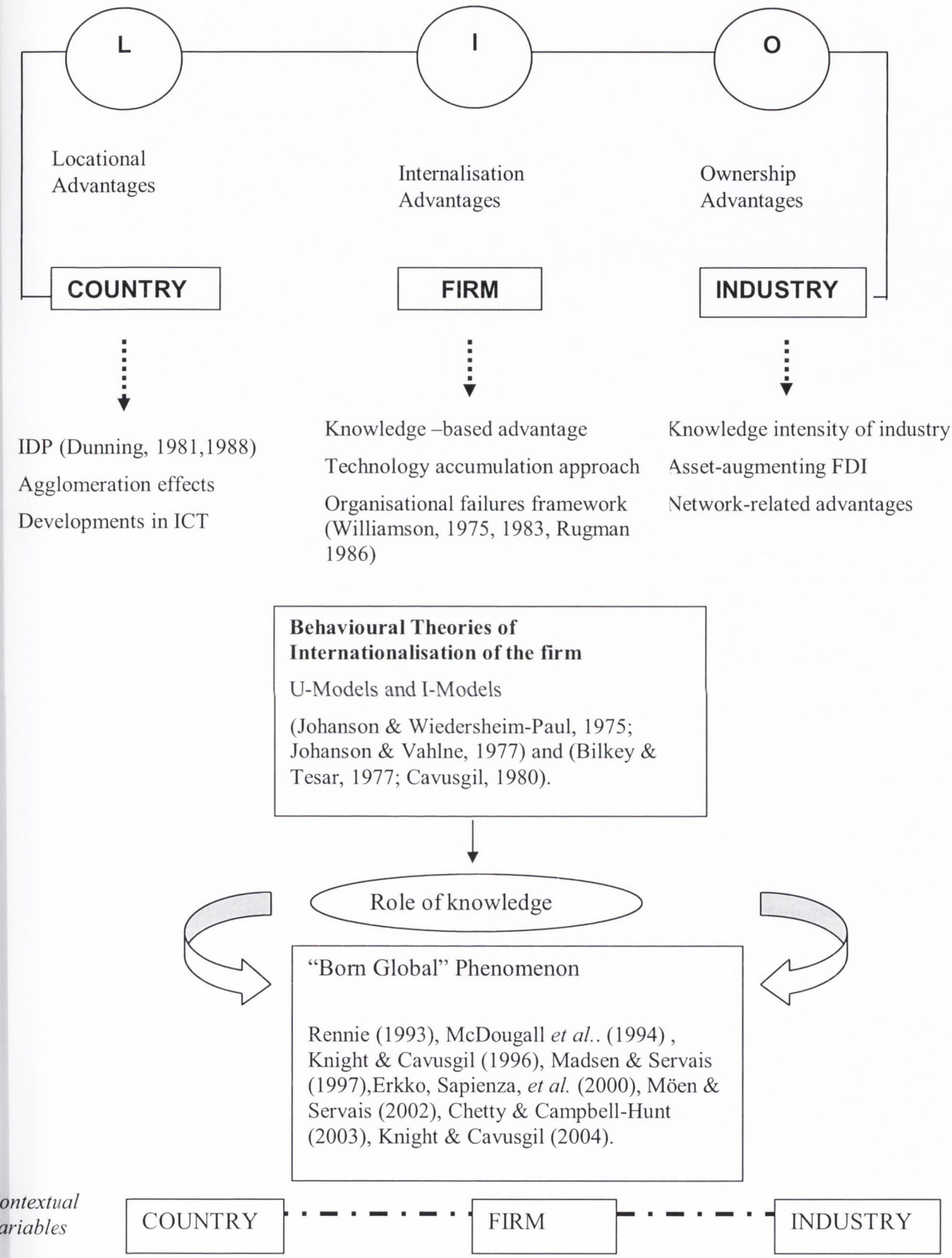

Figure 2-4: Research model stage three - examination of the "Born Global" phenomenon integrating firm specific attributes with contextual variables

2.8. The "Born Global" phenomenon

2.8.1. Introduction

According to Kuemmerle (2002), the importance of doing research into this issue is emphasised by the increasing number of start-up companies, particularly in the high-tech sector who attempt early and rapid internationalization strategies. Oviatt & McDougall (1994) highlight that organisations which are international from inception, which they have termed International New Ventures (INV) are an increasingly important phenomenon. Research has focused specifically on this change from a gradual internationalisation process to a more rapid one, The "Born Global" Phenomenon; Rennie (1993), McDougall *et al.* (1994) , Knight & Cavusgil S.T. (1996), Madsen & Servais (1997), Erkko *et al.* (2000), Möen & Servais (2002), Chetty & Campbell-Hunt (2004), Knight & Cavusgil (2004). This accelerated pace of internationalisation is associated most with "high technology, knowledge-based and service intensive firms" (Coviello & Munroe, 1997, p.362). As noted earlier, Knight & Cavusgil (1996, p.11) define "Born Globals" as "small technology oriented companies that operate in international markets from the earliest days of establishment". They characterise a "Born Global" firm as small (less than 500 employees) and with an annual turnover typically under $100 million, possessing leading edge technology and developing products for niche international markets. McDougall *et al.* (1994) use the term "International New Ventures" (INV) to describe "firms that are international from the time of their formation" (p.470). They further define these as firms that from their inception derive their competitive advantage from the sale of their outputs in multiple countries. They cite it as a relatively new phenomenon and primarily in high-tech business (but also are beginning to emerge in a variety of industries). Möen (2002) highlights four reasons why it is importance to

study the "Born Global" phenomenon; firstly that an increasing number of firms can be classed as "Born Global" and that it can be expected to become more widespread in the future; secondly this phenomenon is not explained by traditional internationalisation theory (U and I-Models); thirdly newly established knowledge-intensive firms are important in developing competitive economies and finally that managers of newly established exporting firms face difficulty challenges. Rennie (1993) concurs on the importance of "Born Global" firms in describing them as "the most extreme example of the potential significance of small and medium-sized enterprises for a nation's export growth" (1993, p.47).

2.8.2. Research to date on the "Born Global" Phenomenon

The following table provides a summary of the key research into the "Born Global" phenomenon to-date. This is presented chronologically highlighting key focus of the research:

Table 2-1: An overview of key research to date into "Born Global" phenomenon

Research focus	Country focus	Industry focus	Author
"Born Global" firm profile	Australia	High value-add manufacturing	Rennie (1993)
Towards a new theory of INV	Theoretical focus on necessary conditions for INV and types of INV		Oviatt & McDougall (1994)
Explaining the formation of INV – background of founders, firm motives for internationalisation and the nature of their international activities	New Zealand, U.S, Switzerland, UK, Czechoslovakia, Germany, France, Brazil, Israel, Singapore	Cross industry	McDougall *et al.* (1994)
The challenge of "Born Global" to traditional internationalisation theories	Theoretical focus on the challenges to existing internationalisation theory, the factors influencing a "Born Global" firm.		Knight & Cavusgil (1996)
Strategic and structural characteristics important to internationalisation of "high potential" ventures	U.S.	Cross industry	Bloodgood *et al.* (1997)

Internationalisation process of "Born Globals" (a synthesis of earlier works)	U.S., Australia, Denmark, Switzerland, Sweden, Italy, France	Cross industry	Madsen & Servais (1997)
"Born Global" internationalisation process	New Zealand	Software technology industry	Coviello & Munroe (1997)
Factors influencing "Born Global" phenomena	Synthesis of country studies to date	Cross industry	Knight & Cavusgil (1996)
Impact of international diversity, mode of entry, technological learning and performance on INVs	U.S.	High technology industries	Zahra *et al.* (2000)
Pattern and pace of internationalisation of "Born Globals"	Norway, France and Denmark	Cross industry	Möen & Servais (2002)
Impact of firm decision-maker and market conditions on "Born Global" firms	Norway and France	Cross industry	Möen (2002)
Managerial oriented framework assessing influences and impact of "Born Global" strategies	Finland	Technology-based firms	Erkko *et al.* (2002)
"Born Global" internationalisation attributes			Chetty & Campbell-Hunt (2003)
Network perspective on the internationalisation of "Born Globals"	Sweden	High technology firm	Sharma & Blomstermo (2003)
Inquiry into "Born Global" firms in European and U.S.A	Denmark and U.S.A	Cross industry	Knight *et al.* (2004)
A comparison of internationalisation process of traditional internationalisation and "Born Global"	New Zealand	Cross industry	Chetty & Campbell-Hunt (2004)
Innovation, organisational capabilities and the "Born Global" firm	U.S.	Cross industry	Knight & Cavusgil (2004)
Gradual approach of "Born Globals"	Israel	Knowledge-intensive firms	Hashai & Almor (2004)

2.8.3. A definition of the "Born Global" Firm

Various definitions of "Born Global" firms have been provided in the literature in an effort to identify the characteristics of the phenomenon. Rasmussen & Madsen (2002) describe how there is no clear theoretical definition nor an accepted empirical operationalization that helps to distinguish "Born Global" firms. The various definitions in the literature to date are analysed chronologically below according to key characteristics identified – age of firm, size of firm, international revenue profile and the period of time from formation to international sales:

Table 2-2: Summary of various definitions of the "Born Global" firm

Source	Firm age	Firm size	% of sales from International markets	No of years from firm formation to International sales
Rennie (1993)	14 years	Not specified	Average 76% of sales from export	2 years
Knight & Cavusgil (1996)	Not specified	<$100million	>25% of sales from export	Not specified
Möen (2002)	Established post 1990	Small, niche focus	>25% of sales from export	Not specified
Knight *et al.* (2003)	<20 years old	SMEs	>25% of sales from outside domestic market	0-3 years
Hashai & Almor (2004)	Established from 1990	SMEs >500 employees	>25% of sales from outside domestic market	0-3 years OR < 9 years and foreign sales are >75% of turnover
Chetty & Campbell-Hunt (2004)	Pre 1984 Post 1984	Not specified	>75% of sales from outside domestic market	0-2 years

In contrast to the traditional view of internationalisation, Oviatt & McDougall (1994) highlight that one of the defining factors in a "Born Global" firm is the age of the firm when it internationalises and not the size of the firm. Knight *et al.* (2004) in their later studies of "Born Global" firms in U.S.A. and Europe also highlight this also in noting

"we emphasise not the size but rather the age by which the firm enters into foreign markets" (2004, p.645). From their case studies and survey data, they classify "Born Global" firms as those that internationalised within the first three years of formation and describe them as having a global outlook from inception.

Therefore, in establishing a clearer definition of the "Born Global" firm and building on the research to date in this area, the following would appear to be the defining features:

Table 2-3: Definition of the "Born Global" firm

Firm characteristic	"Born Global" Firm
Firm size	Small <$100 million revenue
Business description	Knowledge intensive
Market focus	Niche
No. of years from formation to international sales	0-2 years from formation*
Percentage sales from international markets	> 25 per cent

* Chetty & Campbell-Hunt (2004) use a higher international ratio of >75 per cent due to the small size of the domestic market. Hashai & Almor (2004) use the higher international ratio also in combination with a slower internationalisation from period of firm formation of 0-9 years.

The following are some of the key issues emerging from review of the literature on the "Born Global" Phenomenon:

2.8.3.1. Changing pace and process of internationalisation

Consistent with Moen (2002) above, much of the research to date has focused on the changing pace of internationalisation and how (and whether) the pattern of internationalisation has changed from the dominant internationalisation models from

the 1980s reviewed earlier – the U and I-Models. Madsen & Servais (1997) describe how there is general agreement in the literature to date about the fast and immediate pattern of internationalisation of "Born Global" firms.

Oviatt & McDougall (1994) highlight that the emergence of International New Ventures (INV) presents a "unique challenge" to the stage theory of internationalisation. They describe how historically MNEs emerged from large, mature domestic firms but since the late 1980s, case studies of INVs/"Born Globals" from multiple countries have indicated otherwise. They highlight how changes in ICT and transportation together with increasing market homogenisation and changes in how knowledge is acquired challenge the assumptions of the stage theories (incremental, risk-averse, lack of knowledge about markets). Since INVs have no experience with any market, Oviatt & McDougall (1994) note that this fundamental assumption of the stage theories is clearly challenged. They conclude that with changes in industry environments, technology and firm capabilities – firms may skip stages or internationalisation may not occur in stages at all. A further study by McDougall *et al.* (1994) of 24 cases of INVs across multiple countries found that none of the firms followed an incremental process of internationalisation. One of the oldest cases in their study Oxford Instruments, founded in 1959 had 50 per cent of its revenue from international operations within its first year of existence. This is somewhat different to studies noted above where "Born Global" firms were thought only to be in existence from the 1990s onwards. Their case studies also indicate that competing in a niche high technology market is a key factor in driving early internationalisation and the importance of markets outside of the domestic market from inception. This was particularly relevant for software case studies and the

importance of the U.S. market for first product sales as opposed to the domestic market.

Möen & Servais (2003) in their empirical study across three countries (France, Norway and Denmark) specifically examine the existence of a gradual development of internationalisation in relation to "Born Global" firms. Similar to Oviatt & McDougall (1994) above, they highlight the importance of a firm's year of establishment on export intensity. They found that firms that internationalised earlier in their existence had a higher export intensity than those that delayed exporting until later in their existence. Specifically, the found that firms that internationalise within two years of establishment had a significantly higher export share. They also found no evidence of a gradual development from psychically close to psychically distant markets over time. The firms that internationalised within two years of existence had a greater degree of export activity in more geographically and psychically distant markets and exported a greater number of markets. This study of "Born Global" firms, further challenges the incremental nature of internationalisation evident in the stage theories and the role of psychic distance in market selection. It also highlights the significance of firms internationalising early in the existence on the level of internationalisation. Hashai & Almor (2004) from their study of Israel-based "Born Global" knowledge-intensive firms, argue that "Born Global" firms do internationalise in stages, albeit not at the same pace or to the same predictions of the stage theories. They suggest that the main differences in the internationalisation process of "Born Global" firms and traditional MNE is in the size of the firm ("Born Global" firms being much smaller), the importance of their home market and the relative pace of internationalisation. Chetty & Campbell-Hunt (2004) in their study of New Zealand "Born Global" firms, also highlight the significance of the home

market. They highlight that the limited importance of a domestic market is recognised from inception by the founders of "Born Global" firms and they therefore target international markets with a perception of opportunity rather than uncertainty.

Knight *et al.* (2004) highlight a number of ways in which "Born Global" firms challenge the traditional U and I-Models – in addition to those highlighted above they also note how initial foreign selling may be to many markets simultaneously and that due to the nature of developments in ICT technologies (the Internet), they are in effect "Born exporters". The importance of the Internet is clearly contextually related to the point in time of company formation.

2.8.3.2. Market selection

In Möen's (2002) study of Norwegian newly established firms, he found that the most important markets for "Born Global" firms were U.S.A, Italy, The Netherlands, Brazil, Germany, Sweden and not other Nordic countries (countries most geographically and culturally similar). Madsen & Servais (1997, p.564) also highlight that for "Born Global" firms, the firm domestic market is no longer as important "a learning place" as earlier studies indicate.

They found that newly established firms with less export involvement (than "Born Global" firms) considered the Nordic countries to be their most important network market. They found that "Born Global" firms tended to be in highly internationalised industries and that specifically in relation to computer software firms, some firms did not have any domestic market in Norway. This challenges the stages of internationalisation as depicted in the U and I-Models and also the chain of establishment process of internationalisation.

In Madsen & Servais (1997) analysis of various case studies of the internationalisation of "Born Globals", they note that "Born Global" firms do not choose geographical markets according to physical or psychic distance in contrast to traditional models of internationalisation. They highlight other factors evident across case studies – followership of lead customers (Cochlear case study, founded in 1988?) and network contacts of the founder (MK Electronics case study, company founded in 1984). They differentiate "high tech "Born Globals" who they describe as attracted to "lead markets to access lead customers as well as leading edge technology" (1997, p. 577). Hashai & Almor (2004) while also noting the distinguishing feature of "Born Global" firms as targeting markets for newly developed technology, argue that they first target psychically close markets which are perceived less risky. They describe a sequence of how firms target psychically close markets before psychically distant markets in a gradual pattern. Sharma & Blomstermo (2003) in their work on the network view of the internationalisation process of "Born Globals" suggest that the choice of markets as well as the foreign market entry mode of "Born Globals" is influenced by the stock of knowledge held by the firm. This stock of international knowledge on markets and customers is developed from network linkages and therefore reduces the risk involved in internationalisation. Chetty & Campbell-Hunt (2004) also note that "Born Globals" benefit from market and experiential knowledge of networks instead of having to accumulate this knowledge experientially themselves.

It could be argued that markets are perceived to be close psychically and less risky due to experience, knowledge and linkages with the market. This view is also supported by Chetty & Campbell-Hunt (2003, p.62) as they note how "prior knowledge and work experience reduce psychic distance to specific market". They

also highlight as "Born Globals" begin with a level of internationalisation knowledge, they are better able to accumulate new knowledge about internationalisation. The concept of psychic distance is defined and discussed further later in this chapter.

McDougall *et al.* (1994) dismiss the ability of Internalisation theory to explain market entry choices, as they are not driven by cost reduction. Instead, they note also the importance of technology trends and "access to superior international networks" in driving international location decisions (1994, p.480). Knight *et al.* (2004) also emphasise that managers in "Born Global" firms experience fewer infrastructural and mental barriers in the internationalisation process and are highly entrepreneurial with a global strategic outlook. They note that they compete in specialised market niches and differentiate by "leveraging new technologies" (2004, p.654).

2.8.4. The "Born Global" Phenomenon and the Resourced Based View

Recent research in the area of small firm internationalisation, INV and the "Born Global" phenomenon has drawn linkages with the resourced-based view (RBV) of the firm (Bell et *al.*, 2003, Bell & Kuivalainen, 2006, Coviello & Cox, 2006). Bell et *al.* (2003) highlight that the basic premise of the resource-based perspective is the firm's ability to generate and leverage resources and competencies that is the key to their competitive advantage, drawing on Barney (1991) work on the RBV of the firm. In a similar way, Coviello & Cox (2006) describe how Barney's RBV helps us to consider the firm as a unique bundle of resources. According to Barney (1991), these resources provide the basis for competitive advantage to the extent that they are valuable, rare, inimitable and not easily substituted.

Bell et *al.* (2003) distinguish between between "knowledge-intensive" and "knowledge-based" firms, in that "knowledge-based" firms exist because of the

emergence of new technology whereas "knowledge-intensive" firms may use knowledge to develop new offerings. They note that knowledge-based firms are likely to internationalise faster, but that in both cases knowledge can be regarded as a core competence. Bell & Kuivalainen (2006) present an integrative model of a "Knowledge-based View of small firm internationalisation which includes the type of knowledge and capabilities, the nature of knowledge characteristics and the level of knowledge capabilities influencing internationalisation patterns and levels. According to Bell & Kuivalainen (2006), their Knowledge Based View (KBV) of internationalisation is particularly applicable to small knowledge/technology intensive firms who typically have fewer resources and an ability to leverage electronic channels.

Barney's (1991) original model does not include technology as a resource providing the basis for competitive advantage, noting that technology can be easily copied (failing to meet the inimitable criteria). As possession of a niche leading-edge technology is one of the defining characteristics of the "Born Global" firm, this poses a challenge to the use of Barney's (1991) framework for distinguishing resources. Coviello & Cox (2006) also acknowledge this and overcome it in their research into the resource dynamics of INVs by broadly classifying resources as valuable asset to the firm. However, as noted by Knight & Cavusgil (2004) the RBV of the firm helps explain how unique organisational capabilities are developed and leveraged by "Born Global" firms. The RBV has informed the later Knowledge Based View of firm internationalisation (Bell & Kuivalainen, 2006). The KBV of the firm reflects a different role of knowledge in internationalisation relevant to small high technology firms. Bell et *al.* (2003) conclude that the knowledge intensity of the firm (as well as firm motivation and objectives) impacts the pace and pattern of internationalisation

and influence the strategic approaches adoped by these small firms. This changing view of the role of knowledge in internationalisation is discussed in more detail later in this chapter.

2.8.5. Key issues in relation to the "Born Global" phenomenon

Madsen & Servais (1997) highlight that due to the newness and lack of definition around the "Born Global" phenomenon as a research area, there are disparate opinions about the characteristics of the phenomenon. They describe three important interrelated factors which they believe are key drivers of the "Born Global" phenomenon:

New market conditions – increasing industry specialisation and therefore the rise in the number of niche markets. As a result, domestic markets are too small for niche technology markets, even in the largest countries.

Technological developments in the areas of production, transportation and communication. In addition, the way in which information about international markets can be gained and disseminated is different that assumed in the U and I - Models of internationalisation as highlighted earlier in the discussion on "ways of acquiring knowledge".

Increased international experience: They describe the human resource aspect as one of the key driving forces behind the "Born Global" phenomenon. This is evident in the increasing number of people that have gained international experience. This is brought to bear in the formation of new ventures and in the ability of firms to acquire market knowledge through the hiring of individuals with international experience.

These may be seen as industry (specialisation), country/location (developments in ICT) and firm specific (international experience) factors as represented in the research

model. Factors one and two above relate to the external factors as described by Knight & Cavusgil (2004), factor three above relates more to the firm characteristics and international capabilities. However, each of these factors is interrelated. Knight & Cavusgil (1996) also identified wider contextual factors which provide the means of internationalisation – knowledge, facilitating institutions, globalisation of technology and the emergence of international R & D platforms.

The role of knowledge at firm level emerges as one of the key differences in the "Born Global" internationalisation process as opposed to the traditional internationalisation process reviewed earlier. This encompasses the role of psychic distance, the influence of international networks and the accumulated international knowledge of the founders and managers in internationalisation process and market selection.

Dunning (2000, p.181) warns of the difficulty in providing any comprehensive explanation of the "contemporary MNE" unless the context in which the explanation is being made is "very narrowly delineated". This is similar to Madsen & Servais (1997) point above on the newness of this research area. Much of the research review above spans a wider context – cross industry, spanning different periods of time and therefore technological advances, firms with different levels of knowledge intensity and firms with different marketing approaches (niche or broader targets). There is evidence in the literature to date that each of these contextual factors above influence the internationalisation approach of the firm.

A narrower focus of the "Born Global" literature pertinent to the area of study – knowledge intensive software technology firms; is reviewed in relation to the contextual factors identified above. The role of psychic distance, the influence of

international networks and the impact accumulated internationalisation knowledge on the internationalisation of "Born Global" firms are discussed in the following section.

2.8.5.1. The role of psychic distance

Pyschic distance is defined as the sum of factors preventing flow of information from and to the market (Johanson & Vahlne, 1977, p.23). They cite differences in language, education, business practises, culture and industrial development. Johanson & Wiedersheim-Paul (1975, p.308) defined psychic distance in terms of "factors preventing or disturbing the flows of information between firm and markets". Stöttinger & Schlegelmilch (2000) note that the concept of psychic distance is based on assumptions that managers are less likely to pursue business with countries perceived to be dissimilar.

Chetty & Campbell-Hunt (2003, p.63) describe two opposite views of the role of psychic distance in the traditional internationalisation and "Born Global" approaches. The traditional approach assumes that firm enters new markets as a function of psychic distance to the firm. The "Born Global" approach assumes psychic distance has become irrelevant in the internationalisation process, and that the internationalisation does not follow these steps but entering multiple global markets simultaneously. Research to date on the "Born Global" phenomenon in the software technology sector has not indicated a complete irrelevance of psychic distance, but nor does it suggest that market selection is a function of psychic distance.

Bell (1995, p.67) in his study of Finnish, Norwegian and Irish software technology companies found that psychic proximity did not "provide an adequate explanation for the firm's initial market selection decisions". He notes that although the quantitative data supports the notion of psychic distance, the qualitative data indicated that market

selection decisions were not influenced by psychic factors. There was evidence of other factors - client followership, sectoral targeting and industry trends, influencing market selection decisions. Bell (1995) also notes that neither the age or size of the firm has any significant influence on the decision to internationalise. Coviello & Munro (1997) study of New Zealand software technology companies found that firms entered psychically close markets first (within 1-3 years of existence) supporting Johanson & Vahlne (1977) internationalisation pattern. They highlight that psychically close markets were also physically close. The next phase of internationalisation which they characterise as from 3 years of their existence, when the firms moved to psychically distant markets, similar to Bell's (1995) study mentioned above. Coviello & Munro (1997) also found the New Zealand firms using multiple market entry modes simultaneously and their internationalisation decisions strongly influenced by the firm's international network and relationships. They conclude from their study that "network relationships can drive market expansion and development activities including choice of market and entry mode" (1997, p.379). Jones (1999) from her study of small high technology firms in the U.K. notes that patterns of internationalisation are more diverse than the literature might suggest. Crick & Jones (2000) from their in-depth qualitative study of UK software technology firms found that the psychic distance of a market was not a key factor in internationalisation decisions – they found that global technology trends and network relationships were more important factors.

Joly *et al.* (1992) give a different perspective on this, highlighting that high technology start-ups must choose business areas with homogenous customers and minimal adaptation because they do not have sufficient scale in operations worldwide. They believe that the high fixed cost of these companies and the need to have broad

market access reduces the importance of psychic distance as a market selection criterion. However, a further qualitative study by Bell *et al.* (2004) on the internationalisation of knowledge intensive and traditional firms in three UK regions, also indicated knowledge-intensive firms were more likely to be influenced by client relationships and global industry trends. They found that what they classed as traditional firms were more influenced by psychological or geographic proximity. The focus on niche product markets by knowledge intensive firms and the small size of the UK market for such niche products as also evident as a key factor in the international approach of knowledge-intensive firms. They found that typically the U.S.A was the lead market for knowledge intensive firms, in that it offered the best international opportunity. This appeared to be industry-specific, i.e. while the U.S market was the lead market for "electronic and info-tech firms" firms in the drinks or food industry tended to target other lead markets such as Scandinavian countries or Benelux countries (beer industry) depending on the industry segment. Bell *et al.* (2004) did find however, the regardless of industry, international network connections were a strong influence on the initial internationalisation decision, entry mode and subsequent internationalisation of the firm (2004, p.40).

While the above indicates that psychic distance may not be a guide to market selection decisions in the "Born Global" firm, it does raise some challenges about the assumed irrelevance of psychic distance in "Born Global" firms also.

2.8.5.2. The role of knowledge

Erkko *et al.* (2000) highlighted that knowledge plays an important role in both the process theory of internationalisation and the "Born Global" theory of internationalisation. Petersen *et al.* (2003) note that due to ongoing globalisation,

firms are internationalising faster but that "empirical evidence is lacking" to support this. Petersen & Pedersen (1999) in their empirical study of Danish firms suggest that faster internationalisation may be the result of globalisation of industries. Global markets tend to require little local adaptation and therefore one could argue that they then require limited internationalisation knowledge. Despite the lack of empirical evidence in relation to the "Born Global" phenomenon, it is possible to draw some insights from the research to date in this area:

- There is evidence of an increased pace of internationalisation in knowledge intensive industries;
- Internationalisation knowledge is potentially less of a barrier in global industries and therefore contributes to a faster internationalisation process;
- Knowledge intensive products and services tend to have high costs up-front and low (or zero) marginal costs. The high level of intangible assets may drive the need for market access quicker and changes the incremental nature of internationalisation;
- Developments in information technology and the advent of the Internet may contribute to lower costs in internationalisation particularly where knowledge is the subject of the exchange. Knight *et al.* (2004) describe advances in ICT and particularly the use of Internet sales as "an important facilitating factor" in the emergence of the "Born Global" phenomenon. (2004, p.659).

This leads us to see a different role of knowledge, not as a barrier to the internationalisation process of the firm as in the U and I-Models above, but as a driver of an accelerated internationalisation process in the more recent "Born Global" approach above.

The following diagram summarises some of the knowledge related issues underpinning the U and I-Models and what emerges from some of the research in this area as the inter-related factors fuelling the current internationalisation process. While the earlier models (U-Models and I-Models) have viewed knowledge as barrier to internationalisation in that acquiring market knowledge or the firm developing knowledge as an innovative process, influences the internationalisation process in an incremental way. On the other hand the "Born Global" phenomenon is being driven by knowledge in that it is largely present in knowledge-based industries and competitive R & D levels are driving a faster and earlier internationalisation process. The three drivers identified by Madsen & Servais above; market conditions, technological developments and capabilities – are enabled by information and knowledge at institutional, individual and firm level.

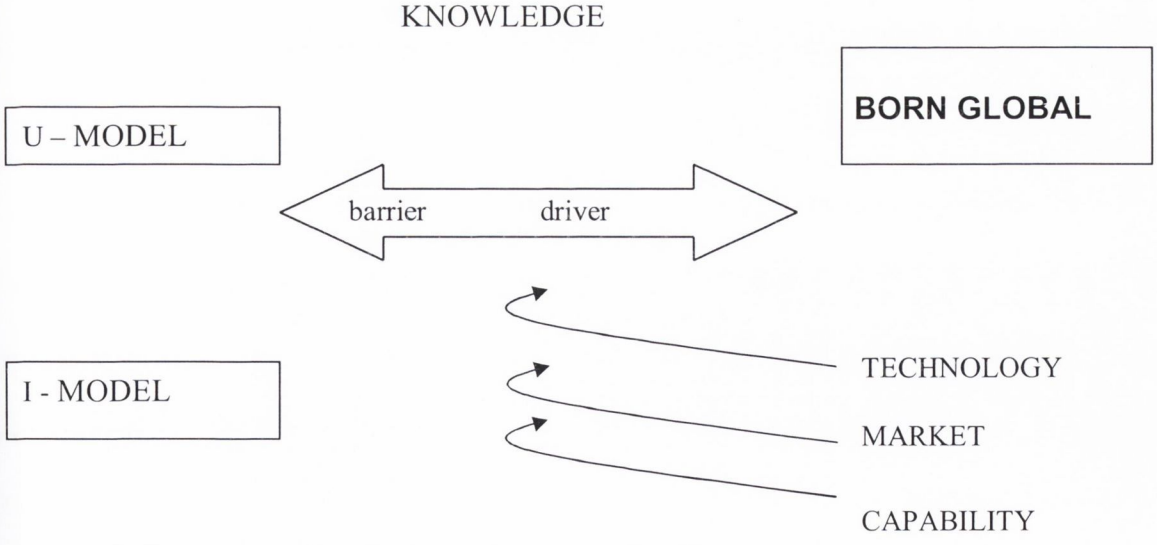

Figure 2-5: The impact of knowledge on internationalisation

Zahra (2000) highlights how new firms (defined as companies six years or younger) are moving into international markets early in their lifecycles. He notes how these

firms achieve growth and positive returns by capitalising on the creation and exploitation of knowledge. Eriksson *et al.* (2000) argue that the closer the relation between foreign environment and a firm's stock of knowledge, the more applicable the knowledge will be abroad and therefore the more rapid the internationalisation of firms. They concur with Sharma & Johnson (1987) that there is a reason to take the initial knowledge base of the firm into consideration when studying firms that internationalise from the outset.

The R & D intensity of high technology sectors is much cited in the literature (Young, 1987, Barkema *et al.* (1998)) as one of the key factors accelerating internationalisation. Karagazoglu & Lindell (1998) in their study of small technology companies (small defined as having less than 99 employees) in the U.S., found that the opportunities in foreign markets and following inquiries from foreign buyers were the key motives for small U.S. technology firms to internationalise. They also found in their study that the third most important reason for the U.S. companies was the size of the domestic market to sustain competitive levels of R & D, which they define as 35 per cent of expenditure. Erkko *et al.* (2000) in their study of Finnish electronics industry found that high knowledge intensity is positively associated with faster international growth. They suggest that greater knowledge intensity requires greater intensity of effort by the firm and therefore more fully embeds foreign organising knowledge in a firm or helps it to assimilate new knowledge. Prashantham & Berry (2004) describe how knowledge intensive firms have a propensity to be "Born Global" (they note that "knowledge-intensive" firm as a term as superseded the terms "high-technology firm" and "technology-based firm" in studies about software firms (2004, p.151). Knowledge intensity is seen as one of four key influences on the internationalisation of these firms – their small size, the environment and the

entrepreneur being the other three. However, Prashantham & Berry (2004) also note that these four influences are "moderated by network relationships" (p.154). They cite evidence from the literature in this area that network relationships have been found to accelerate the internationalisation of small (they define small as firms with fewer than 100 employees) knowledge-intensive firms.

2.8.5.3. Knowledge as barrier or driver in internationalisation

Anderson (1993) challenges the assumption of experiential knowledge of the U-Models, highlighting that when market conditions are stable and homogenous, relevant market knowledge can be gained in other ways than experience. Similarly, Young (1987) notes that specifically in relation to high technology firms, that as firms learn from the experience of others that "*presumably*" some of the barriers to internationalisation should be reduced. Erkko *et al.* (2000) note that knowledge about international markets and operations and the efficiency by which the knowledge is learned, is an important determinant of international growth for entrepreneurial firms.

Eriksson *et al.* have extensively researched different aspects of internationalisation knowledge accumulation – the effect of variation on knowledge accumulation in the internationalisation process (2000), experiential knowledge and cost in the internationalisation process (1997), the perceived usefulness of network experiential knowledge in the internationalising firm (2004), and path dependence and knowledge development in the internationalisation process (2000). However, their findings indicate that accumulated internationalisation experience is not related to specific country markets (as assumed in U-Models) but is ***firm specific*** knowledge related to all markets. In their study on the accumulation of knowledge, they developed three constructs of knowledge in the internationalisation process:

Internationalisation knowledge – a firm's capability and resources to engage in international operations

Business knowledge – competitive situations in specific markets and clients in these markets

Institutional knowledge – information about governance structures in specific countries and their rules, regulations, norms and values.

Figure 2-6 below illustrates the key issues in relation to knowledge emerging from the literature review into the internationalisation of "Born Global" knowledge intensive firms:

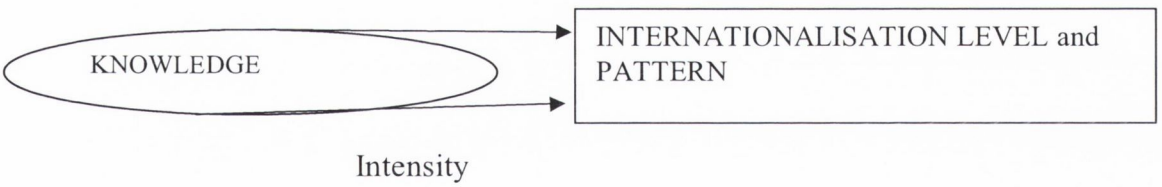

Figure 2-6: The roles of knowledge in internationalisation

As noted earlier much of the research into "Born Global" knowledge-intensive or high-technology firms focuses on a comparison with more traditional incremental internationalisation process. The two extreme views on the underlying assumptions of the earlier internationalisation models (U and I - Models) and the internationalisation of "Born Global" firms - particularly in relation to the role of psychic distance is not evident consistently throughout the literature. As noted by Bell (1995) while the quantitative data supports the notion of psychic distance, the qualitative data indicated that this did not guide internationalisation decision making in these firms. Referring to

the discussion earlier in this chapter on how our understanding of the types of knowledge, the nature of knowledge and knowledge acquisition has developed; the perception of psychic distance may be more implicit than explicit in decision-making. The accumulated internationalisation experience of the individual and therefore the firm, together with the knowledge integration of international network relationships clearly influence the pattern and pace of internationalisation. From the literature reviewed in this chapter, the knowledge intensity of firm is seen as one of the key drivers of internationalisation; related to this is the nature of demand in the domestic market for high technology niche products and global industry trends.

2.9. Summary

Coviello & McAuley (1999) as well as Bell *et al.* (2004) conclude that no single internationalisation model provides sufficient explanatory power on their own for knowledge-intensive firms. While some researchers (including above mentioned) have highlighted the need to examine internal and external influences, the Research Model as outlined earlier in this chapter provides an integrative framework to examine country and industry contextual variables influencing the internationalisation of the firm.

Dunning's Eclectic Paradigm (1977) is used as a framework for contextual analysis and a organising tool to connect the international business literature. The robustness of the model is examined in related to some key developments in international business since the 1970s – the dynamic nature of international activities, the changing profile of MNEs and the major technological changes. From the more detailed review of the extensions of the Paradigm between 1977 and 2002, a number of country, firm and industry factors emerge. The country and industry contextual factors are inter-

related with a gap identified by Dunning himself, in the need for better understanding of firm specific factors influencing internationalisation.

A review of the Internationalisation Process models is treated in an integrative way in the literature review, rather than one or other theory (Eclectic Paradigm or Internationalisation Process models) providing better explanatory power. A number of challenges to the assumptions of these Internationalisation Process Models are identified in relation to their assumptions about knowledge – the different types of knowledge, the nature of knowledge and the acquisition of knowledge in an internationalisation context. It is suggested from the rethinking of the role of knowledge in internationalisation, that this partly explains the emergence of the "Born Global" Phenomenon.

The "Born Global" Phenomenon is a relatively new phenomenon in International Business and a synthesis of the research to date in this area provides some clarity in defining the "Born Global" firm and understanding the key characteristics of the firm. The changing pace and pattern of internationalisation, the factors influencing market selection decisions and the role of psychic distance are discussed in relation to this new phenomenon. Industry, country and firm specific factors of specialisation, ICT developments, international experience respectively are identified as important interrelated factors driving this phenomenon. The importance of context is again highlighted in the ability to provide an comprehensive explanation of the contemporary MNE (Dunning, 2000), particularly given the diversity in the research to date in the "Born Global" field. The context is narrowed further in the review of research to date of "Born Global" firms in the knowledge-intensive software technology industry sector. The impact of knowledge intensity, accumulated internationalisation knowledge on a firm basis and the influence of international

networks is discussed in relation to the research in this specific sector. The role of psychic distance is considered as one implicitly impacting each of the above. Differing views emerge on the key influencing factors on the internationalisation of this particular sector.

Overall, the objective of this research is to examine the "Born Global" phenomenon within its context and contribute to the explanatory power of existing theories. The issues identified above form the basis of the research questions in each phase of the research as outlined in the following chapters.

Chapter 3: The indigenous Irish software industry

The indigenous Irish software industry

3.1. Introduction

The Irish software industry is comprised of foreign owned firms (multinational firms) and indigenous Irish firms. O'Riain (1997, p.185) define these two sectors more specifically:

Software logistics and localization: comprising of firms which are mainly U.S. multinational corporations and perform low end software development and language translation

Software Development: dominated by small and medium-sized indigenous Irish firms who are gaining growing recognition in international technical markets and who are typically focused on the U.S. market.

At the end of 2004, according to the National Software Directorate (NSD), the Irish software industry consisted of more than 900 companies employing 24,000 people and exporting over €16billion of products and services (http://www.nsd.ie/htm/ssii/stat.htm). Table 3-1 below provides a summary breakdown of the industry as a whole from 1991 to 2004. Ireland is much cited as the largest exporter of software in the world (ICT Ireland, 2005), however this figure is heavily skewed by the exports of Multinational (MN) firms who account for 94 per cent of that €16billion of exports in 2004, with exports of indigenous Irish firms worth just under €1billion in 2004.

Table 3-1: Profile of Irish software industry

Profile of Irish software industry				
Year	**Irish firms**		**MN firms**	
	Revenue €m	**Exports €m**	**Revenue €m**	**Exports €m**
1991	191	78	2,007.00	1,966.00
1993	300	147	2,230.00	2,192.00
1995	490	287	3,316.00	3,282.00
1997	650	455	5,032.00	4,981.00
1998	913	566	5,704.00	5,293.00
1999	1278	792	6,347.00	5,728.00
2000	1400	875	8,750.00	7,625.00
2001	1508	1228	11,571.00	10,968.00
2002	1537	1313	12,331.00	11,689.00
2003	1058	681	14,620.00	14,171.00
2004	1369	946	15,597.00	15,109.00

Source: Created from data downloaded from NSD website, January 2006.

The focus of this research is on indigenous Irish software firms and specifically their internationalisation. Therefore, the remainder of this chapter focuses primarily on the development of the indigenous software sector, its internationalisation and the factors influencing the development of the industry. The foreign owned MN sector is considered as a factor in the overall industry development and internationalisation. O'Gorman *et al.* (1997) also highlight that a unique and notable attribute of the Irish software industry is that although foreign investment (FDI) has been an important influence, the indigenous Irish owned software sector is now a "substantial industry in its own right" (1997, p.1).

3.2. The development of the indigenous Irish software industry

> *"...development of the Irish software industry has not meant the creation of a local industry protected from the perils of global integration but rather an industry that has pursued ever deeper but gradually more rewarding global connections, going beyond subsidiaries and sub suppliers to technology and business-development alliances"* (O'Riain, 2004, p.111).

Stern (2004) provides a detailed history of what he describes as the five generations of the Irish software industry. The following is a brief chronological history of the development of the industry and the origins of these differing generations of firms drawing from the research of O'Gorman *et al.* (1997), O'Malley *et al.* (2001), O'Riain (1997 and 2004) and Crone (2002 and 2003) into the indigenous Irish software sector.

3.2.1. The foundation of the industry 1960-1970

In Ireland in the 1960s, the first generation of programmers that emerged in Ireland focused on three main hardware manufacturers at that time, ICL, Honeywell and IBM. Up to this most software had been supplied by the system makers themselves. The earliest indigenous Irish firms – Cara, System Dynamics, Applied Management Systems (AMS), Chaco Computer Consultants, Software Development Services, IMPC were primarily service providers. Most of these firms were "partners" or direct offshoots of hardware manufacturers. As hardware was proprietary and incompatible at that time, this resulted in emerging Irish firms being tied to one particular hardware manufacturer – typically IBM, ICL or Digital at that time. The issue of technical compatibility was a key contextual factor in the development of this first generation of Irish software firms.

3.2.2. The early development stage 1970 – 1980

By 1977, the industry consisted of 30 companies employing 300 people (Stern, 2004). Industrial policy in the 1970s was based on attracting foreign investment to Ireland, the state agency responsible for this was the Industrial Development Authority (IDA). This policy, through investment incentives in relation to corporation tax and employment grants attracted international but predominantly American companies to establish operations in Ireland. O'Riain (1997, p.187) describes this policy as "investment by invitation" and notes how since the 1960s the IDA had developed significant skills in servicing the needs of multinationals. He highlights that the IDA and government policy had developed the labour force specifically for international investment, investing in education in the form of technical colleges in the 1970s.

The indigenous software companies were faced at this point with the transition from bureau services to products. Stern (2004) cites the example of Cara, owned by Aer Lingus, who acquired the rights to a Phillips minicomputer administration package. It achieved a few product sales in Europe but earned their core revenue stream from data processing and hardware reselling. It subsequently failed to develop the software sector of its business. System Dynamics similarly stayed in the services end of the business focused on the domestic market.

O'Riain (2004) cites the example of another group of firms founded in the 1970s – Kindle Banking Systems, McKeown and Insight. This group of firms did move into export markets within particular product areas. They did this through the development of software programmes for leading MN firms that had established themselves in Ireland at that time. Their market selection also tended therefore to reflect the market presence of

their MN customer. For example, Kindle Banking Systems completed a number of software development contracts on the ICL platform and therefore the U.K. and former colonies of the British Empire were their market focus and presence. GC McKeown, through Digital Equipment Corporation (DEC) had developed business with local authorities in the U.K., Insight software had achieved sales in the U.K., Iceland and Germany through their development of software for IBM.

In addition to the industry factors of compatibility and hardware dependency, a further contextual factor emerges above - the industrial policy of the 1970s in attracting leading multinational firms and investing specifically for international development.

3.2.3. The growth phase 1980 – 1990

The emergence of the minicomputer in the early 1980s and the pace of computerisation saw the formation of a new wave of software companies. Gradual standardisation and the reducing cost of hardware reduced the entry barriers to the software industry. The first initiatives in institutional building also occurred during the 1980s. In 1980, the Innovation Centre in Plassey Technology Park, University of Limerick (then known as National Institute of Higher Education, NIHE) was established, providing laboratory space, education facilities and services. Software companies such as Percom and Software Architects International emerged from this environment. In 1984, the National Software Centre (NSC) was formed with the objective of providing marketing support, product support, technical assistance and acting as a liaison between industry and industry development associations. At this point in time, there were 250 software companies in Ireland. The indigenous industry was characterised by small companies

who were severely under financed. A number of new ambitious software companies were formed in the early 1980s – Glockenspiel, Vision and Intelligence Ireland.

The focus was on software products not services at this stage and while the software firms themselves saw the international potential of their products, financial institutions failed to see this potential. This difficulty manifested itself between 1986 and 1989, with many closures and acquisitions. Companies such as Cops, Software Laboratories, Dashco, Microman, Omnicorp among many others closed. Intelligence Ireland, CBT Systems, Insight Software, RTS were among those to be acquired. The National Software Centre was also part of this fallout and closed in 1988. It was owned by IDA, whose primary interest was in attracting inward investment to Ireland. In the late 1980s, the number of large U.S. software firms locating to Ireland also increased with Microsoft, Lotus, Oracle, Ashton-Tate forming a large part of the "Software logistics and localization" sector of the software industry described at the beginning of this chapter. The IDA also focused on attracting telecommunications companies to Ireland at this stage such as Alcatel and Eriksson, and as a result the early 1980s saw an upgrading of the telecommunications infrastructure to meet this investment requirement.

In the late 1980s, another institutional development took place with the formation of Programmes in Advanced Technologies (PAT) under Eolas, the government agency responsible for Science and Technology and funded by the European Union (EU) Structural Funds. The European Commission's Esprit research programme provided not just funding for research at this stage, but an opportunity for Irish software companies like Captec, Generics, Baltimore Technologies, to develop an international profile and linkages in the software industry.

Stern (2004, p.23) highlights how "a technically elite subset of the software industry surfaced in the 1980s" who developed not end-user software but systems software, development tools and communications functions for existing applications. O'Riain (2004, p.93) concurs with this in noting that "The industry was relatively open in the early years and something of a technical community, linked to international trends developed". Stern (2004, p.23) cites Glockenspiel founder John Carolan as "the most elite of the elite". In 1986, it was the first company in the world to ship a C++ compiler for applications developers. It had developed a reputation in North America for its technical expertise. In 1988, 70 per cent of Glockenspiel product was shipped to the U.S. and the company revenues peaked at $3 million in 1991. However, after experiencing difficulties with their sole distributor in the U.S., the company lacked the financial support to sustain itself and was acquired by Computer Associates in 1992. O'Riain (2004) notes how acquisition has been a destination for many indigenous Irish companies, particularly in the late 1980s. The results as noted by Stern (1992) in his analysis of eighteen take-overs between 1986-1989, had been a weakening of the country's technology base rather than having a positive effect.

A Software Industry Working Group was established in 1989, this was a working group appointed by the government to develop a support strategy for software development in Ireland. The group recommended the introduction of new support structures for Irish owned firms with international potential and recommended that the state should address the issues of financing and management development within the indigenous sector

This period of development in the Irish software industry saw the results of the earlier institutional investment in technical education but at a time when the international

software industry was at a critical stage of development. The maturing of the international software industry with lowering entry barriers and reducing costs, made it difficult for small under-financed Irish firms to compete with large global players.

3.2.4. The maturing of the industry 1990-2000

The National Software Directorate was founded in 1991, as a result of the recommendations of the Software Industry Working Group. In 1991, there were 250 Irish-owned software development firms, with 3,225 employees and combined exports of $90million (NSD data). Crone (2002) notes that both revenue and total exports of the Irish software industry grew at an average annual rate of 15 per cent during the 1990s with companies expanding at a faster rate during the late 1990s. Contrary to the experience of the 1980s, O'Gorman *et al.* (1997) notes that the indigenous software industry in Ireland was characterised by a particularly high start-up rate and a low closure rate during the 1990s. O'Riain (2004, p105) describes how in the 1990s, the indigenous technology sector "came into its own". Computer science and engineering disciplines were established, supported by programs to upgrade research capabilities in Universities.

Stern (2004) highlights that the start-ups in the 1980s had been generalists, but the differentiating characteristic of firms in the 1990s was that they targeted narrow market niches. He also notes there was a "general rule" (p.26) that if a software company was successful in the U.S., then it could sell everywhere else afterwards. By 1998, the U.S. had become the biggest market for Irish software firms with 40 Irish firms having set-up subsidiary offices in the U.S. The firms emerging in the 1990s were in three sub-sectors – computer-based training, telecommunications software and middleware and by the nature

of their products targeted global market niches in these areas. The following highlights the major Irish software firms that emerged in this era;

CBT systems in the computer-based training sector was already the biggest Irish-owned software exporter by the end of 1991, with most of its revenue generated from the U.S. They subsequently successfully went public in 1995. Euristix and Aldiscon had developed niches in the international telecommunications industry. Aldiscon had secured the world market for short messaging service systems[1] and had implemented a standard at a critical time in this industry sector. Iona Technologies was formed in 1991 from a campus company in Trinity College Dublin. It had participated in European Research projects on distributed object technology. The international Object Management Group (OMG) designated CORBA[2] as the standard messaging between software objects and similarly Iona Technologies developed the first implementation of CORBA. Their competition for the implementation of this standard brought it into competition with some of the largest industry players. Their technical expertise and understanding of CORBA had gained them an international reputation. O'Riain (2004, p.107) describes how Iona emerged "from a technical community rooted in a university, supported by state agencies but also drawing on EU and international technology consortia as resources".

Baltimore Technology also emerged from the educational system having drawn on EU programs to support its research. O'Riain (2004, p.107) describes how Baltimore was transformed from a "research house" on cryptography to an Internet security firm which was acquired by an Irish investment house in 1997.

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[1] Short messaging service systems are the management systems behind text messaging on mobile phones
[2] CORBA is Common Object Request Broker Architecture.

Trintech was founded in 1987 by two brothers; the company developed payment software for offline credit-card transactions. Supported by IDA employment and capital grants, the company grew rapidly in the 1990s to become an industry leader in its niche of payment software. Trintech went public in 1999 in the U.S. and Germany.

The financing difficulties experienced by indigenous Irish software companies in the 1980s were being addressed by state funding in the early 1990s. The characteristic of the software industry in its R & D intensity with significant development lead-times before earning income from a product, posed particular difficulties for the indigenous sector. Rain (2004) highlights that in contrast to this, most of the funding of R & D for multinational firms came out of their own earnings. He presents Forfás 1995 data to illustrate this:

Table 3-2: R & D funding in Indigenous Software Firms, 1993-1995 (O'Riain, 2004, p. 98)

Total R & D spending (millions IR£)	**Source of funding**					
1993	**Own company**	**Other Irish companies**	**State grants**	**Other Irish sources**	**European Union**	**Other Foreign Sources**
14.77	58.1%	3.3%	13.4%	3.6%	14.4%	10.5%
1995						
17.00	84.7%	4.7%	6.0%	1.9%	2.8%	0

State and EU funding provided almost 30 per cent of funding directly for indigenous software companies in 1993. As these funds were provided on a matching funds basis, O'Riain (2004) estimates that this source accounted for almost 50 per cent per cent of the R & D funding in 1993. He describes these government policies supporting R & D as "critical" to the industry's development together with the funding received from the EU programmes (2004, p.98). It also stimulated R & D investment within the industry.

Analysis by Crone (2002) of NSD data shows that by 1999 the indigenous industry was composed of a small number of large companies (1.9 per cent of companies with more than 100 employees) and a large number of small companies (82 per cent of companies had less than 25 employees). He concludes that this "confirms the presence of relatively small number of leading firms within the indigenous software industry" (2002, p.56). In the late 1990s, increasing numbers of Irish software companies looked to float on the U.S. stock exchange, on the NASDAQ. U.S. investors like to see significant company presence in the U.S., which saw those companies who were planning an IPO increase its

commitment to the U.S. market. Some companies like CBT/Smartforce[3] relocated its headquarters to the U.S.; others such as Iona retained their headquarters in Ireland while increasing a presence in the U.S. market.

Towards the end of the 1990s, Ireland was experiencing a skills shortage in the software developer area. The NSD survey data of 1998 provided more detailed breakdown of the indigenous sector into ten sub sectors as follows – the main sub sectors at this point being Computer-Based Training, Banking and Finance Applications, Telecommunications software and "other niche products" comprising of 17 per cent of the international revenue of the indigenous industry (Stern, 2004, p.33). Internet related software was responsible for just 1 per cent of export sales in 1998 although the Internet boom was happening in the late 1990s. Stern (2004) notes that the impact of the Internet was two fold for Software companies – first in a providing a new software distribution channel in which software trials, sales and marketing were on-line and secondly in the fundamental issue of the end of packaged software products and the transition to software as a service on the Internet. A number of short-lived Internet consultancy firms emerged in the Irish industry towards the end of the 1990s – Ebeon, Oniva, and Digital Channel Partners. This period also saw a number of start-ups from the successful internationally successful indigenous firms, among them: Alatto Technologies, Am-Beo, Anam, Cape Technologies, ChangingWorlds, Network365 and Xiam. According to a HotOrigin Report on *Ireland's Software Cluster* (2004), the number of start-ups peaked in 2000 and "founders are most likely to come from the indigenous technology sector" (p.3).

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[3] CBT Systems was sold to Hoskyns from the U.K in 1987 and bought back in 1991 before going public in 1995 and changing its name to Smartforce.

This period was the most critical in the development of the indigenous Irish software firms and their ability to compete in an international industry. There were institutional and industry developments which a created a context in which Irish software firms successfully competed on a world stage. On an institutional level, the recognition of the importance of the indigenous software industry and the subsequent investment in institutional support was a key development. The high level of state and EU funding for R & D overcame a critical financial difficulty experienced by firms in the 1980s. The emergence of the Internet during this period provided (particularly to firms like Iona) a cheaper and more direct distribution channel than had been experienced by Glockenspiel in the previous decade. The maturing of the software industry at this stage enabled these firms to focus on narrow international niches rather compete in a wide international market. There was also an increasing focus by firms in this period on the U.S. market.

3.2.5. International success 2001- 2004

By 2001, seven indigenous Irish software companies had gone public on the NASDAQ. These were as follows:

Table 3-3: Indigenous Irish firms floated on NASDAQ by 2001

Company name	Date of company formation	Date of NASDAQ listing
SmartForce (CBT Systems)	1983	1995
Parthus Technologies	1993	2000
Iona Technologies	1991	1997
Trintech	1986	1999
Baltimore Technologies	1997	1999
Riverdeep	1996	2000
Datalex Communications	1985	2000

Source: Compiled from Crone (2002, Leading publicly-listed Indigenous Software Firms, p.75 and Summary of stock market activity involving Irish Software Firms 1999-2001, p.79)

A number of other companies floated on other stock market exchanges – Alyphra, AIM London in 1999, Conduit Neuer Markt in 2000, Horizon Technology Group floated in 1999 on the London and Dublin stock exchanges (Crone, 2002). However, in 2001 the U.S. economy received a major shock in the form of September 11th terrorist attacks and this spurred a major slowdown in the technology market worldwide. The indigenous Irish industry's exports to the U.S. rose 27 per cent in 2001 and then fell by 10 per cent in 2002 (NSD, 2005). However, although the Irish industry had slowed down, the export figures kept rising and start-ups were on the rise again from 2002 (HotOrigin, 2004). O'Riain (2004) notes that those firms which had floated in the U.S. stock market and which been most embedded in the U.S. system of corporate governance experienced the

most difficulties in the industry downturn. Also, Stern (2004) noted that the sector markets that experienced the most difficulties were telecommunications, financial services and software developer applications which were in competition from open source groups. The market remained buoyant for mobile network related software and new sectors in life sciences and graphical information systems emerged.

Companies that performed well during this phase were established firms who had targeted niche specialisms and companies whose founders had significant experience in the industry. Curam software who developed software for social welfare services had significant success the U.K. and North America. Qumas who specialised in regulatory software for the pharmaceutical industry had considerable success in the U.S. and Fineos; a financial applications developer all remained strong. A HotOrigin Report (2004) entitled *"Ireland's software cluster: Preparing for consolidation"* describes how in the indigenous software sector, the public company landscape had changed significantly. Alyphra and Riverdeep went private through management buyouts, Baltimore had sold off its technology assets on a move out of the ICT sector. This left Datalex listed on the ISE, Iona Technologies on NASDAQ and Trintech on NASDAQ. They note how these three companies generated a combined turnover of €120million in 2003 compared with almost €160million in 2002 (HotOrigin, 2004, p.8).

Those firms which had most international success in the U.S. market, were also those most affected by the major external shock to the U.S. market in 2001. The industry experienced a considerable shakeout as a result. Another industry challenge emerged at this stage, the increasing presence of Open Source development groups. The following section looks at the indigenous industry in this new context, at the end of 2004.

3.3. The indigenous Irish software industry in 2004

According to NSD data 2004, 11,250 people were employed in Indigenous Irish companies generating €1,369m revenue with exports worth just under €1billion. The following table compiled from NSD data (2005) summarises how the indigenous sector of the Irish software industry has developed form 1991 to 2004.

Table 3-4: Profile of the Indigenous Irish software industry

Profile of indigenous Irish software industry			
Year	**No. employed**	**Revenue €m**	**Exports €m**
1991	3,801	191	78
1993	4,495	300	147
1995	5,773	490	287
1997	9,200	650	455
1998	9,250	913	566
1999	11,100	1278	792
2000	14,000	1400	875
2001	15,000	1508	1228
2002	12,600	1537	1313
2003	10,710	1058	681
2004	11,250	1369	946

Source: Created from data downloaded from NSD website, January 2006.

Irish firms are described by the NSD in 2005 as having a small number of common characteristics: they are product-oriented, targeting niche or vertical markets with export markets a priority.

3.3.1. Export Intensity of the industry

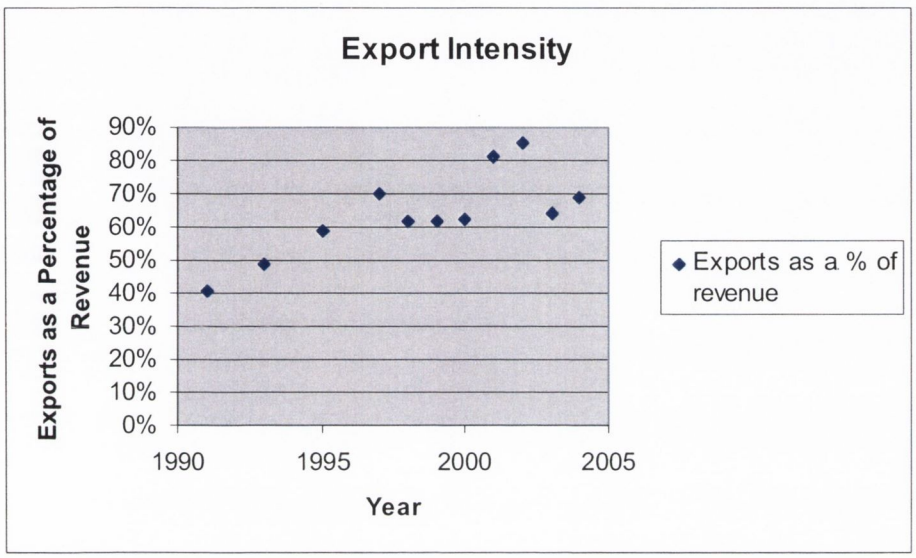


Figure 3-1: Export intensity of the indigenous Irish software industry 1991-2004

Source: Created from data downloaded from NSD website, January 2006.

The above analysis of NSD data on export intensity of the sector over time indicates a gradual but steady increase in the export intensity of the industry which has been sustained following the world-wide slowdown of the ICT industry after 2001. According to Crone (2002) there is a positive correlation between firm size and export orientation. His analysis of NSD 1998 data shows that among larger firms (firms with 100 employees and over) exported 81 per cent of their output and smaller firms (firms with 11-24 employees) had less than 40 per cent of their revenue from export (2002, p.63). The Irish Software Industry (ISA) Software Outlook Survey in 2004 described the U.S. market as "back in play" with "two out of five companies" expecting to see significant growth in the U.S. market (International Ventures, 2004).

The industry is still comprised of a large number of small companies and a small number of medium sized companies. The following breakdown from HotOrigin survey data in 2004 illustrates this composition, showing a slight change from 2003:

Table 3-5: Composition of Irish indigenous software industry, 2004.

	Percentage of companies	
No. of employees	**2004**	**2003**
0-25	73%	75%
26-75	18%	18%
>75	9%	7%

Source: Created from selected HotOrigin survey data in Report Ireland's software cluster: Preparing for consolidation (2004, p.10).

3.3.2. Origins of the firms

There has been much discussion in both government and academic environments about the existence or not of a spin-off or clustering effect from inward FDI. The origins of the indigenous Irish firms, according to HotOrigin survey data (2004) indicates that over 30 per cent of company founders came from the indigenous Irish technology sector with over 20 per cent from multinational technology companies. Crone (2002, p.87) describes this spin-off from established indigenous firms as a phenomenon. In his research into cluster development in the Irish software industry (2003, p.50) he notes that 12 out of 19 VC-backed companies had their origins in the indigenous Irish software industry. Three of these firms alone were spin-offs from Iona Technologies. Academia currently represents approx. 10 per cent; this is expected to increase in the future with the formation of a number of new university innovation centres with financial support from Enterprise Ireland. Crone (2002) highlights that while this is not the most numerically

significant, the most successful indigenous firms have originated from academic environments (Iona Technologies and Baltimore).

3.3.3. Sectors of focus

The international industry subsectors in which Irish indigenous companies have achieved success have changed along with industry technological and regulatory developments. From the earliest focus in the 1960s on data processing, to hardware specific applications in the 1970s, to software systems and tools of the 1980s, to narrower niches of telecoms, CBT and financial software of the 1990s, the industry focus is on some key market niches in 2000s. HotOrigin (2004) research into the key market niches targeted by indigenous technology firms is shown below:

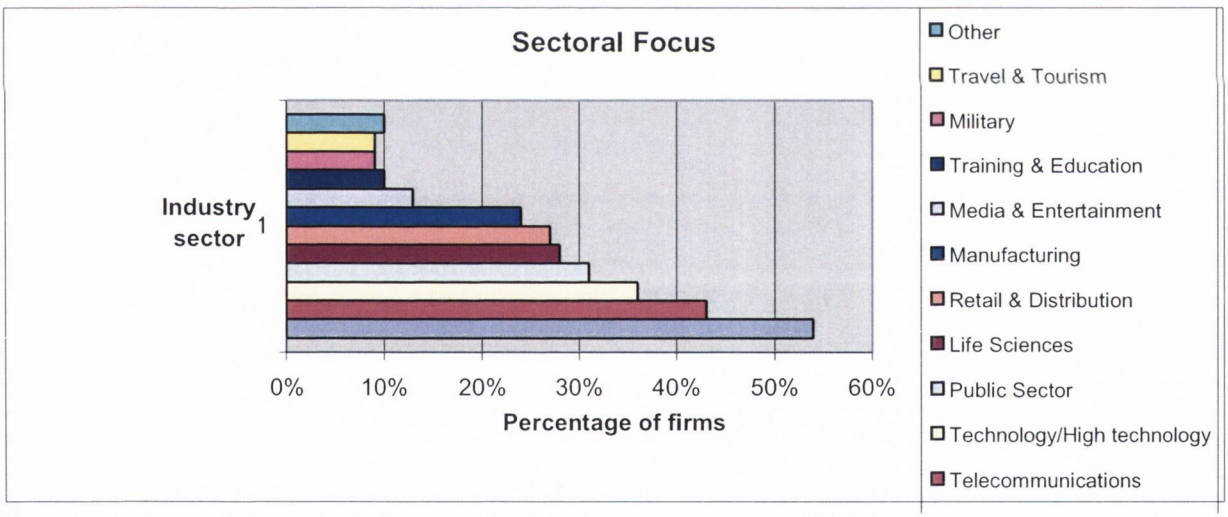


Figure 3-2: Sectoral focus by indigenous Irish software companies, 2004

Source: Created from selected HotOrigin survey data in a report: Ireland's software cluster: Preparing for consolidation, (2004, p.11).

Similarly in the late 1990s and early 2000s, the financial services sector was the leading market. HotOrigin (2001) explains the focus on this sub sector in terms of the market opportunity available, the significant IT expenditure in this sector and by the early

adoption of new technologies. The telecommunications sector has also remained a strong sector despite a period of extreme cost cutting in this sector in 2002. Industry sources note a recovery in this sector in 2004.Although the European market is still experiencing difficulties, Asia appears to present the most growth opportunity. (HotOrigin, 2004, p.13).

3.4. The internationalisation of the indigenous software sector

The academic work of O'Gorman *et al.* (1997), O'Riain (1997, 2000), Crone (2002) and the published work of technology journalist; Stern (2004) provide a detailed account and analysis of the development of the Indigenous Irish software industry to-date. The following section provides analysis of the development of the indigenous Irish software sector in the context of its internationalisation. This is described in four phases from 1970 to 2004, with a review of the industry and institutional factors influencing its development.

3.4.1. "Client followership" era (1970-1980)

The internationalisation of indigenous Irish firms was closely linked to multinational clients. Their initial software development work for multinational clients led to further software development opportunities within the client network. Their international market tended to follow closely that of their multinational client. Kindle Banking and its contract with ICL is an example of this era of internationalisation. There are some inter-related institutional and industry factors which led to this approach. The strong presence of MNs in Ireland at this point was a direct result of the 1970s (and 1980s) industrial policy of attracting inward FDI to Ireland. Also at this stage in the industry, hardware platforms were not compatible and therefore software development by its nature was platform

dependent. Software companies therefore aligned themselves to a specific platform resulting in a number of software-hardware alliances of the time.

Bell's (1995) study of Irish, Finish and Norwegian small software firms found that "there is strong evidence that the process (of internationalisation) is influenced by domestic and client followership" (1995, p.71). Although he notes that neither age nor size of the firm had a significant impact on the decision to internationalise, at the time of the study (in 1995) the firms were approx. 10 years old. The internationalisation process emerging from Bell's 1995 study is characteristic of firms of that era, primarily following multinational clients. Coviello & Munro's (1997) study of small software firms in New Zealand found three distinct phases of internationalisation. The first of these is "product development agreement with a major hardware vendor" and the second "piggy-backing on hardware vendor". Again the date of formation of these firms was between 1978 and 1983. This is also similar to the internationalisation stages of Irish software firms of that era, in that their international development is influenced by their relationship with a hardware vendor at that time.

3.4.2. "Technology leader" era (1980-1990)

The internationalisation of this phase of software development companies is characterised by Irish firms starting to compete with established international software firms and participating in European research programmes. This was the era of the emergence of the "technical elite" as described earlier in this chapter. Their technological competence saw them compete with the large U.S. players and in the area of systems applications and tools. For example, CBT with their financial dealing software product (Intuition) had sales in New York and in locations which had a major presence in financial markets.

Gockenspiel who had developed software for the Unix operating system expanded into the U.S. market targeting software developers. Intelligence Ireland developed its own desktop suite of software competing with Lotus and Microsoft. As opposed to following the markets of its clients, this phase of companies confident in their technological developments, followed the markets for those products and competed in the international software industry. Other companies like Captec, Baltimore Technologies and Generics gained an international network through their participation in European funded research. However, the industry was severely under-funded at this stage and the ambitious international targets of many of these companies resulted in an international profile technologically but also subsequent acquisition for those technological assets.

As the software industry developed, there was increased standardisation and reducing hardware costs. This resulted in lowering the barriers to entry in the software development market. It also saw the demand for shrink-wrapped products for the PC increase considerably throughout the 1980s. The software industry was now a large international industry. Irish companies, small and under-financed by international standards competed in wide international markets.

The foundations of the institutional frameworks started in the 1980s and although industrial policy was still focused on attracting inward investment, an active network of technical experts emerged. Many these were involved in and contributed to the Software Industry Working Group report to the government, which saw a turning point in industrial policy.

The lack of institutional support and the difficulty in competing in wide international markets contributed to the internationalisation (and therefore market growth) difficulties

encountered by firms at this stage. Many of these firms had the technological competence, had gained international attention for their technology and had international vision for the organisation. However, they did not achieve the sustained international growth of the next generation.

3.4.3. "Born Global" era (1990-2000)

The internationalisation of firms in the 1990s could be described as "Born Global" or even "Born U.S.A" since the key focus of these firms was the U.S. market. The various definitions of a "Born Global" firm are discussed in Chapter 4. The following are the defining characteristics of the "Born Global" firm as developed in the above mentioned chapter;

Table 3-6: Definition of "Born Global" firm

Firm characteristic	**"Born Global" Firm**
Firm size	Small <$100 million revenue
Business description	Knowledge intensive
Market focus	Niche
No. of years from formation to international sales	0-2 years from formation*
Percentage sales from international markets	> 25%

Many indigenous Irish software firms exhibited some if not all of these characteristics - small technology oriented firms, targeting niche global markets with little or no domestic market. The U.S. market was the primary focus for these firms, believing that U.S. market success was critical to their technological success in European and other markets.

Earlier industrial policy with the purpose of attracting inward FDI had invested in technical education and upgrading of telecommunications infrastructure. Software

companies in the 1990s were benefiting from the technical competency in the workforce, the telecommunications infrastructure and the institutional support which came in the 1990s. The institutional support was in the form of an indigenous-focused software network organisation and state funding. The state-funding and EU funding for R & D was critical in early product development stages of the company and the later matching of funds in the international growth of the companies. The now mature software industry was impacted by the advent of the Internet. For many established Irish firms, the Internet had a positive effect in providing a low cost international distribution channel. For another sector of firms it resulted in the start-up of a number of Internet-based services firms which either had a short existence or remained with domestic focus.

Many of the "Born Global" firm founders had been as individuals, part of the technical community emerging in the 1980s with involvement in ESPRIT and had significant industry experience. This international experience came from involvement in industry network but also from previous employment in MN companies in Ireland. The success of these firms was influenced by a number of factors - the institutional support (financial and network), the "fall-out" from earlier industrial policy, the targeting of niche markets as opposed to wide international markets and the industry and international experience of the founders.

3.4.4. The era of the "Irish International" (2000 – 2004)

The events of 2001 and the U.S. stock market collapse of technology firms and subsequent slowdown in ICT spending from 2002 sent a shock to the indigenous software industry. Those that were affected most were the "Born U.S." firms of the 1990s. A few key points emerge from the research in this area to date:

1. The high number of spin-offs that are emerging from indigenous Irish technology companies founded in the 1990s.
2. The role of the U.S. market – while it remains Irelands number one software export market, the ability to succeed in the U.S. market is critical to the growth of indigenous firms, while also remaining embedded in the indigenous software industry. This does not mean domestic market sales focus but competing in an international industry while remaining part of the indigenous industry network.

The industry outlook remains challenging for Irish software firms with global predictions that software will be distributed free by 2020 and the continued growth of Open Source software (Cooper, 2004).

The following diagram provides a summary analysis of the internationalisation of the indigenous Irish software industry and the institutional and industry factors discussed above, affecting its international development. A plus sign (+) indicates a positive influence on internationalisation, a negative sign (-) indicates a negative influence on internationalisation and a question mark (?) indicates the outcome yet unknown.

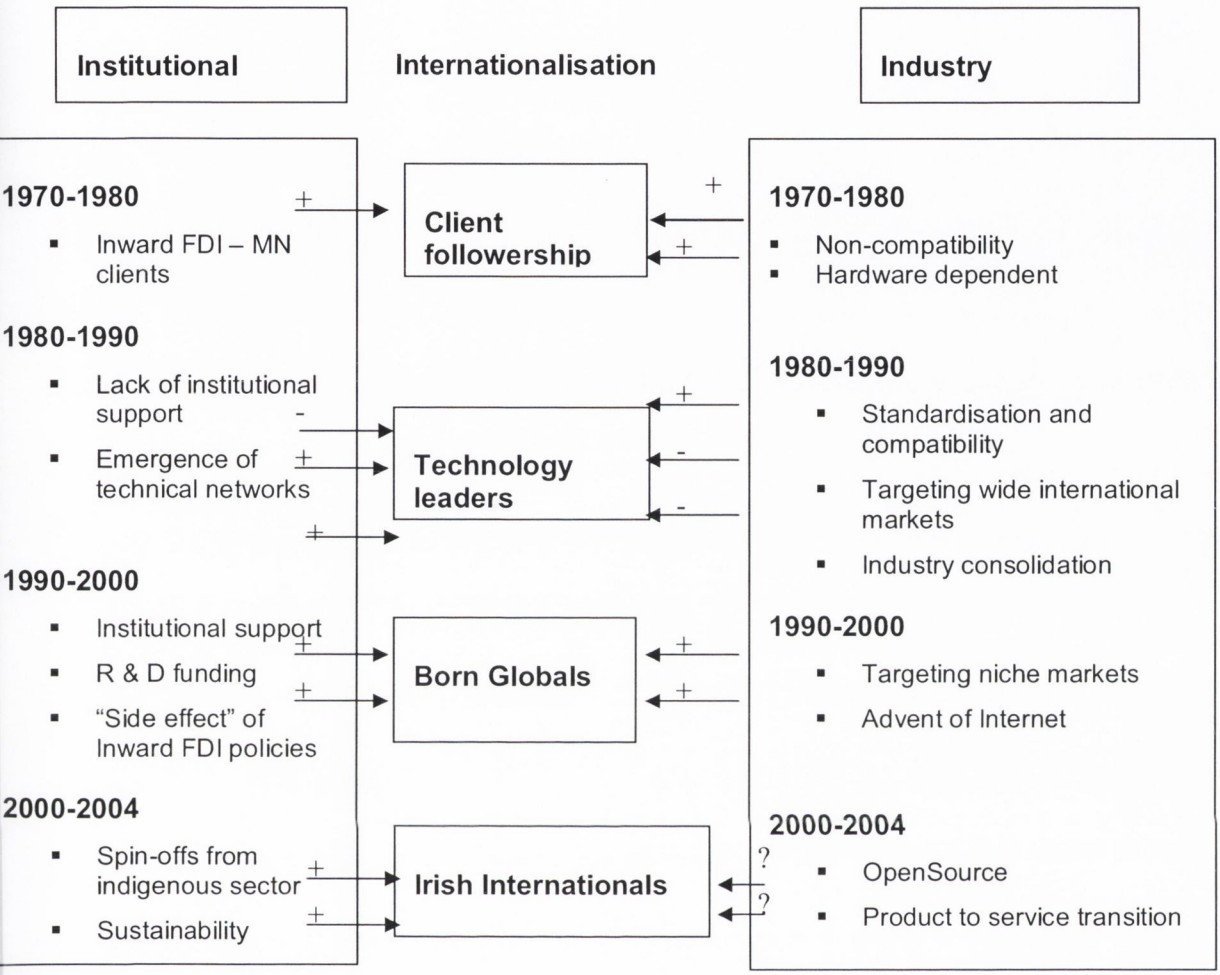


Figure 3-3: Analysis of the internationalisation of the indigenous Irish software industry from 1970 – 2000

3.5. Summary

As outlined in Chapter 4, the ontological approach for this research is that which emphasises the importance of understanding context in a holistic fashion. The research model presented in Chapter 2 illustrates the wider background and the context for the study. Overall, this study examines the institutional, industry and locational factors influencing the pace, pattern and level of internationalisation. There is evidence in the

literature reviewed in Chapter 2 that each of these contextual factors influences the internationalisation approach of the firm and specifically the "Born Global" firms.

This chapter reviews the institutional and industrial context in which indigenous Irish software industry have developed. Figure 3-3 graphically presents the institutional and industrial factors influencing the different approaches to internationalisation. The different approaches to internationalisation have been described above as "Client Followership, "Technology leaders", "Born Global" and "Irish Internationals". The approaches vary in their market selection, market entry mode, levels of internationalisation and the process of internationalisation. The influences identified at the different phases are consistent with results of the different studies to date into the software technology sector by Bell (1995), Coviello & Munro's (1997), Crick & Jones (1999) and Bell *et al.* (2004). However, the research noted above tends to focus on the relevance or not of the role of psychic or geographic distance in internationalisation decisions (particularly market selection decisions). This chapter presents the view that internationalisation decisions and particularly market selection and process decisions, are strongly influenced by the institutional and industry context in which the firms develops. This does not exclude the role of psychic distance but that it is also perhaps implicit in the institutional and industry context.

Bell *et al.* (2004, p.27) go some way towards this in highlighting that "the nature and pace of internationalization is conditioned by product, industry and other external environmental variables, as well as firm-specific factors". This chapter goes further in this view in identifying the institutional and industry influences on the approaches to internationalisation. Bell *et al.* (2004) also note that particularly "critical incidents" may

impact a firm's overall business strategy and market focus. This is examined further in phase two of this research in the in-depth case study. However, this is done so in the institutional and industry context of the "Born Global" approach to internationalisation as outlined in this chapter.

Chapter 4: Research Methodology

Research Methodology

4.1. Introduction

In this chapter the methodology used in this research is described. The research paradigm from which the methodologies have been chosen are discussed and why it is appropriate to this study. A conceptual framework for the study is presented which is linked to the research model provided in the literature review. The research design and analysis mechanisms for the three phase methodologically triangulated study is described in this chapter. The main focus of this chapter is the core phase of the research – phase two: an in-depth case analysis. The first phase: an initial exploratory study and phase three: the final inductive phase are also described.

The chapter begins with the broader discussion on research philosophy, outlining the differences between the major paradigms of social science, highlighting the support for use of mixed research methods and presenting a view of a continuum of approaches to social science. The approach of this inquiry on the continuum is identified and the subsequent decisions on research design, data collection and analysis are presented.

4.2. Overview of the research

The following diagram provides an overview of the research and its progression over three phases. Phase one was an exploratory study of the indigenous Irish technology sector. Phase two was an in-depth case study of a critical "Born Global" case firm. Phase three was an inductive study of the internationalised indigenous Irish technology sector.

The objectives and design approach for each of the phases in described in detail in the following chapter.

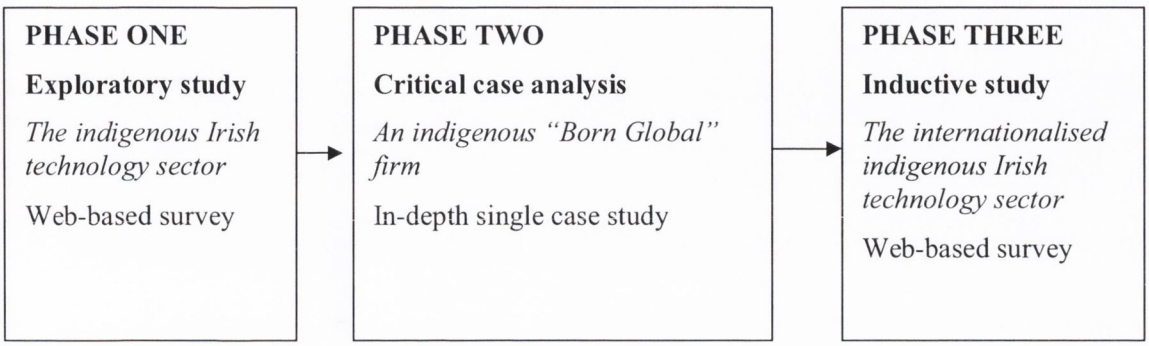


Figure 4-1: Overview of research phases

4.3. Research philosophy

The term paradigm refers to the progress of scientific practise based on people's philosophies and assumptions about the world and the nature of knowledge, and in this context how research should be conducted (Hussey & Hussey, 1997).

Guba & Lincoln, (1994, p.99) simply define a paradigm as "a basic set of beliefs that guide actions" and that questions of method are secondary to questions of paradigm. The fundamental questions of paradigm are those of:

Ontology: what is the form and nature of reality and what can be known about it;

Epistemology: what is the nature of the relationship between the knower or the would-be knower and what can be known.

The methodology question then deals with the overall approach to the research process given the research paradigm adopted. On a practical level, Easterby-Smith *et al.*, (1991) highlight that an understanding of philosophical issues is particularly important in clarifying research designs .

Burrell & Morgan, (1979) in their seminal text *Sociological Paradigms and Organisational Analysis* applied the idea of paradigms to social science and the following views four different approaches to social science from a subjective/objective dimension.

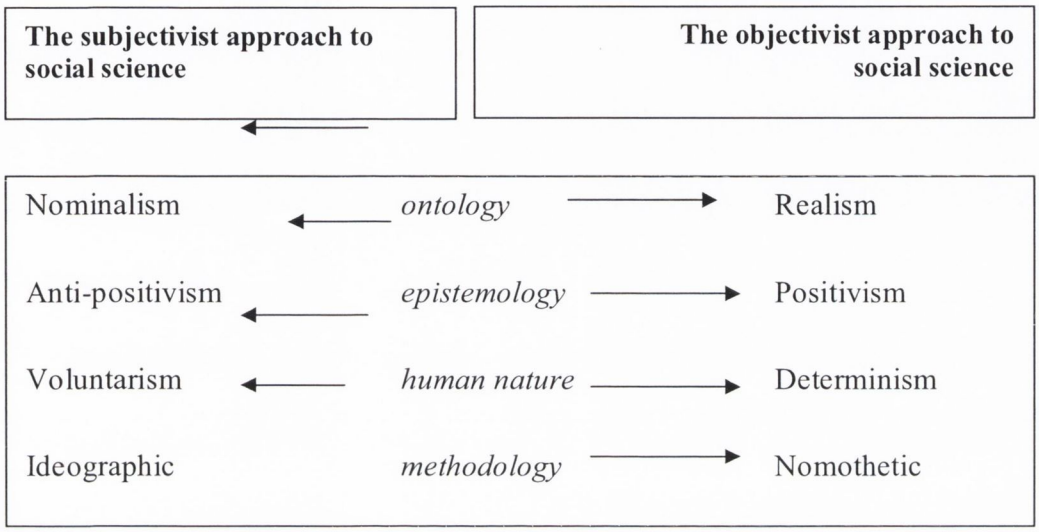


Figure 4-2: Different approaches to social science

Source: Burrell and Morgan (1979, p.22)

They describe the extreme perspectives which characterise the approaches to social sciences. From an ontological perspective, the nominalist does not view the world as having any *real* structure while the realist views the world "as made up of hard, tangible and relatively immutable structures". The positivist on one epistemological extreme, seeks to explain and predict what happens looking for causal relationships. The anti-positivist on another epistemological extreme "rejects the notion that science can generate objective knowledge of any kind". The voluntarism-determinism debate revolves around the issue as to whether man is shaped by his environment or whether he is completely autonomous and independent of his environment. The ideographic methodological approach emphasis in-depth analysis, generation of insights by interaction with subject under study and the use of diaries/journalistic records for insight. The nomothetic

approach emphasises scientific rigour and the importance of basing research on systematic protocol.

They regard each of these four paradigms as mutually exclusive and researchers do not tend to move between paradigms. However, Guba & Lincoln (1994) have a differing view and advocate that both qualitative and quantitative methods may be used with any research paradigm. They put forward four alternative paradigms of inquiry – positivism, postpositivism, critical theory and constructivism. The following table represents some of the practical research issues from each of the paradigms:

Table 4-1: Paradigm issues adapted from Guba and Lincoln, (1994, p.112)

Issue	Positivism	Postpositivism	Critical theory	Constructivism
Aim of inquiry	Explanation, prediction & control	Explanation, prediction & control	Critique & transformation	Understanding /reconstruction
Ontological position	Knowledge as verifiable hypotheses	Knowledge as nonfalsified hypotheses	Knowledge as insights developed overtime	Knowledge is continually revised, Knowledge as based on interpretation
Epistemological position	Findings are true	Findings are probably true	Value-mediated findings	Value-mediated findings

In management research, the various paradigms are often discussed in terms of an antithesis between two schools of philosophy (Hussey & Hussey, 1997) generally referred to as positivism and phenomenology, which relate to Positivism/Constructivism (Guba & Lincoln, 1994), Objectivist/Subjectivist approach (Burrell & Morgan, 1979), Positivism/Social Constructionism (Easterby-Smith *et al.* 1991), Quantatitive/Qualatitive

(Creswell, 1994). The following table shows the key features of each of these two broader paradigms:

Table 4-2: Key features of positivist and phenomenological paradigms (Adapted from Easterby-Smith et al. 1991).

	Positivist Paradigm	**Phenomenological Paradigm**
Basic beliefs:	The world is external and objective Observer is independent Science is value free	The world is socially constructed and subjective
Researcher should:	Focus on facts Look for causality and fundamental laws	Focus on meanings Try to understand what is happening Look at the totality of the situation Develop ideas through induction from data
Preferred methods	Operationalising concepts so they can be measured Taking large samples	Using multiple methods to establish different views of phenomena Small samples investigated in-depth or over time

4.4. The phenomenological paradigm

The phenomenological paradigm developed as a result of the criticisms of the positivist paradigm (Hussey & Hussey,1997). Some of the main criticisms they cite are the difficulty in treating people as separate from their social contexts, the structured approach of research design focusing on results but possibly ignoring the underlying causes and the challenge in capturing complex phenomena in single measures. The subjective nature of the human being would imply therefore that management research has to be somewhat subjective in nature.

The various research paradigms have been briefly discussed here to gain an understanding of the basic ontological, epistemological and methodological assumptions of each. This leads to the explanation of the paradigm within which this research is carried out and why this approach was taken. The issues of research design, data collection & analysis and dealing with issues of validity, reliability and generalisation are subsequently addressed

According to Guba & Lincoln (1994), differences in paradigm assumptions should not just be treated as philosophical differences, as the adoption of particular paradigm has important consequences for the conduct of the research. The particular paradigm that one chooses is partly determined by the research problem itself (Hussey & Hussey, 1997). Bonoma (1985) highlights that there is a broad set of sociology of science variables affecting the choice and that two particular characteristics of the research problem are pertinent to the decision – the purpose of the research and the nature of the phenomenon under study. The overall purpose of the research is to understand the factors influencing the level and pattern of internationalisation of indigenous Irish software technology firms. The nature of this phenomenon is that it is embedded in an industry and institutional context and the research needs to incorporate the potential influencing contextual factors.

The guiding paradigm for this research is primarily a phenomenological one guided by the purpose of the research and the nature of the phenomenon. This combines three phases of research, the core phase of the research – An in-depth case study (Phase two). The issue of mixed methods is discussed further in this chapter. The purpose of combining survey methods with case research is discussed under phase one (exploratory) and phase three (Inductive) research design.

Yin (1994) describes case study research as a research strategy in itself and cites Stoecker (1991) in saying it is not a data collection tactic nor merely a design feature alone but a comprehensive research strategy in itself. Case study research has been adopted as a research strategy in itself for the core of this research. He specifies three criteria by which one should decide which research strategy to follow.

- The type of research question posed;
- The extent of control an investigator has over actual behavioural events;
- The degree of focus on contemporary as opposed to historical events.

He stipulates that "how and "why" research questions are explanatory and suitable for the use of case study as a research strategy. Yin (1994, p.13) defines a case study as: "...an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly evident".

Eisenhardt, (1989, p.534) defines a case study as "a research strategy which focuses on understanding the dynamics present within a single setting".

In relation to the core research (phase two):

Phenomenon: The phenomenon under study is the early and rapid internationalisation of indigenous Irish technology companies.

Context: The study is at firm level within an industrial and institutional and context.

Firm context is defined and discussed in detail in the preceding Chapter 2. Dunning's (1988) Eclectic Paradigm of International Production (OLI) is used as a framework of contextual analysis; Firm (I), Industry (O) and Country (L) variables.

The boundary between the industrial and institutional context and the influence of contextual factors on the internationalisation of these firms is not clearly evident. The purpose of the in-depth case study is to generate a better understanding of the influence of both firm and contextual factors in its real-life context.

Easterby-Smith *et al.* (2002) provide a matrix of research philosophies on two dimensions – the ontological position and the role of the researcher. They map Yin's case study design onto the social constructionist ontological position and from a detached researcher perspective. They do note however, that while there is a clear dichotomy between the positivist and social constructionist philosophy, the practise of research often compromises these pure positions. This issue is discussed further below under the use of mixed methods.

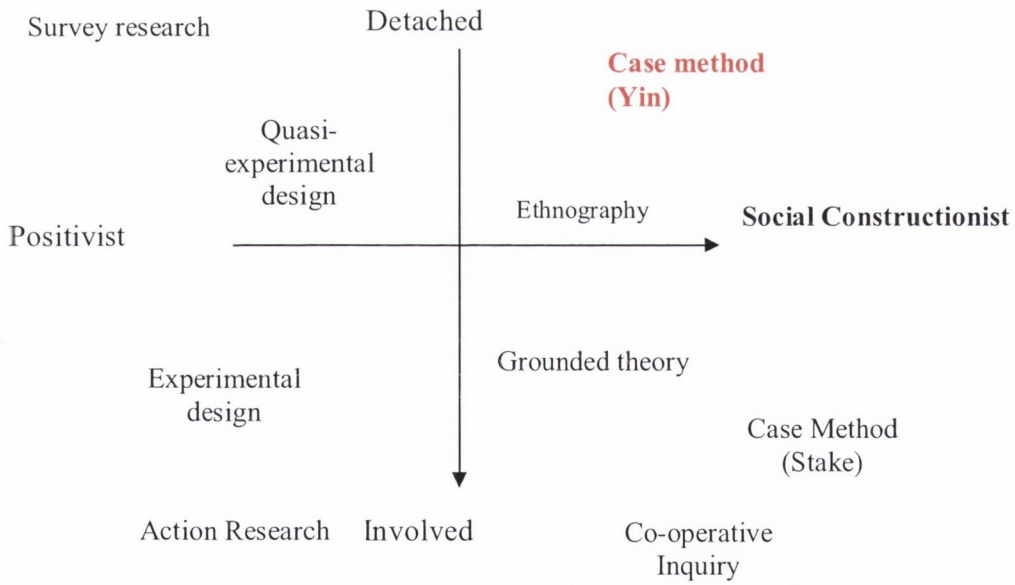


Table 4-3: Matrix of research designs (Easterby-Smith et al., 2002, p.57)

In relation to some of the key features of the phenomenological paradigm, (Easterby-Smith *et al.*, 2002) outlines some implications of the social constructionist paradigm:

- The aim of the research is to increase general understanding of the situation;
- The research progresses through gathering rich data from which ideas are induced rather than hypotheses;
- The unit of analysis may include the complexity of "whole" situations;
- Generalisation is sought through theoretical abstraction;
- The sampling requires a small number of cases chosen for specific reasons rather than large numbers randomly selected;

These implications are considered as follows in relation to this research:

- The research seeks to increase the understanding of the factors influencing the internationalisation of the indigenous knowledge intensive technology sector as opposed to demonstrating causality;
- The research progresses through gathering rich data from in-depth study from which ideas are induced;
- The unit of analysis is on a firm basis but the research includes the "complexity of the whole situation" examining the firm within its industry, institutional and locational context and the potential influence of contextual factors;
- Generalisation is sought through theoretical abstraction by contributing to and extending the theories of internationalisation rather than generalisation in statistical sense;

A single *critical* case is chosen for in-depth analysis. The rationale for a single case is discussed further in this chapter under *"Case selection"*.

As described in detail in Chapter 6, the key constructs of knowledge intensity and knowledge accumulation have been operationalised, following Yin's (2004) recommendation on improving construct validity. There is support for the use of mixed methods within the research paradigm as outlined below.

4.5. Use of mixed methods

Easterby-Smith *et al.* (2002) note that management researchers have increasingly put forward an argument for mixed methods as it has the potential to provide more perspectives on the phenomena being investigated. Eisenhardt, (1989, p.538) has highlighted in relation to case methodology that "the qualitative data are useful for understanding the rationale or theory underlying relationships revealed in the quantitative data or may suggest directly theory that can then be strengthened by quantitative support". She cites Mintzberg (1979) on this synergy "we uncover all kinds of relationships in our hard data but it is only through the use of this soft data that we are able to explain them" (p.538). Morgan & Smircich, (1980, p.491) argue that "the dichotomy between quantitative and qualitative is a rough and over simplified one". Bonoma (1985) also notes that case method is distinguished from other qualitative methods in that it involves numerous data sources, some of which are quantitative. According to Yin (1994) regardless of whether one favours qualitative or quantitative research, there is essential and strong common ground between the two.

Easterby-Smith *et al.* (2002) describe four different types of triangulation – data triangulation, investigator triangulation, methodological triangulation and triangulation of theories. Methodological triangulation refers to when both qualitative and quantitative techniques are employed. This research is described as a three-phased methodologically

triangulated project. Yin (1994) concurs that in a case study inquiry data needs to converge in a triangulating fashion.

Morgan & Smircich (1980) in relation to the two extreme perspectives described above, present a continuum of core ontological assumptions. This has been further adapted by Hussey & Hussey (1997) as follows and is useful in explaining the approach to this research:

Approaches to social science

Positivist Phenomenologist

Reality as a concrete structure	Reality as a concrete process	**Reality as a contextual field of information**	Reality as a realm of symbolic discourse	Reality as a social construction	Reality as a projection of human imagination

Table 4-4: Continuum of core assumptions (Hussey & Hussey, p.51, 1997)

The ontological approach for this research is that of "reality as a contextual field of information". According to Morgan & Smircich (1980), this ontological position calls for epistemology which emphasises the importance of understanding context in a holistic fashion. The researcher is encouraged to draw boundaries around the subject of research "elevating it in importance around a wider background" (Morgan & Smircich, 1980, p.496). In Chapter 2, the wider background or context for the study in illustrated by the research model developed. The context is the locational and industry context which influence the pace, pattern and level of internationalisation. The boundary for the study is

the indigenous Irish software technology industry. The issue of concern in this study is how the individual firm and its context (industry and country location) have evolved in internationalisation and not necessarily causality, which would be the focus of a pure positivist approach. Bell *et al.* (2004) highlight that there is more recent recognition that internationalisation is affected by multiple influences and that the various firm internationalisation decisions are made in a holistic way. The objective in the research approach outlined above is to understand the contextual factors influencing firm internationalisation decisions in a holistic way.

4.6. Phase one: Research design

The three phases of the research described in Chapter 1, illustrate how primary and subsidiary research questions have been developed through each of the phases. Phase one of the research was an exploratory study of the internationalisation of the indigenous Irish software technology sector. This is described in detail in Chapter 5. The objective of this exploratory research was to understand the factors influencing the internationalisation of this sector. The lack of sector specific data on indigenous Irish firms expanding internationally had been identified. (Forfás, Statement on Outward Direct Investment, 2001, Görg, 2000). The objective therefore was to develop some insight into the internationalisation of the sector for more rigorous investigation in phase two.

Due to the lack of sector specific data on internationalisation as noted above, the primary research question *"What factors influence internationalisation of the firm?"* was the focus of phase one.

Gomm *et al.* (2004) describe the usefulness of combining surveys and case study work. They highlight the two ways of doing this: firstly, in using the survey to provide a basis for case selection and secondly of using a survey to investigate the typicality of the case that has been investigated in-depth. Given the lack of sector specific data highlighted above, this approach was adopted in phase one of the research, the exploratory study. Phase one of the research was also used as a basis for case selection for a more in-depth study in phase two.

4.7. Phase two: research design

This section describes the research design approach to the core phase of the research, the case study. As noted above, Yin's case methodology is used in this phase of the research while also integrating this with Eisenhardt's (1989) work on building grounded theory from case studies.

4.7.1. Research question

In Chapter 5, the findings of phase one of the research are described in detail. The pace and pattern of internationalisation exhibited by firms in the exploratory study is similar to a recent phenomenon in internationalisation – The "Born Global" phenomenon. Research to date into this phenomenon is reviewed in detail in Chapter 2. Subsidiary research questions were developed to examine this in more depth:

- Why does an indigenous software technology firm internationalise early in its existence?
- How does the firm internationalise?

The logical unit of analysis from the case study proposition is at firm or organisational level.

4.7.2. The role of theory development

The role of theory development prior to data collection is a point of difference between the major research paradigms. Glaser & Strauss (1967) in their classic book on this topic, developed an approach known as grounded theory. They see the work of the researcher as being to generate theory through "comparative analysis". Glaser (1978) warns that "the danger is to force the data in the wrong direction if one is too imbued with the concepts from the literature". In an interview (with Lowe, A., *www.groundedtheory.com*), Glaser highlights the usefulness of grounded theory in management research. He describes how particularly in healthcare and business, it is "faithful on how one acts on the dependent variables", often strategic dependent variables such as profit or productivity. The original authors have differed on their initial approach since 1967, Glaser (1992) believing that researchers should start with no pre-suppositions allowing ideas to emerge from the data and that the researcher can go into data collection without having reviewed the existing literature. Strauss & Corbin (1990) on the other hand recommend familiarising oneself with prior research and using a structured approach to make sense of the data. The Straussian view of grounded theory assumes that pre-conceptions are inevitable. He advocates that the researcher should make themselves aware of previous work in a general field before starting to generate their own theory. Locke (2001) draws attention to a practical issue in that grounded theory has developed in settings such as health and education where access is relatively easy but research with managed organisations means access is more difficult. Therefore, a Straussian perspective of grounded theory would

appear to make more effective use of limited access to organisations, as in this in-depth case study. Glaser (1978) highlights that strict adherence is required to the core procedures and stages of analysis of grounded theory. Strauss & Corbin (1994) describe the essential features of grounded theory method as – data/theory interplay, making constant comparisons, and asking theoretically oriented questions. They do not advocate the same strict adherence to methodology as required by Glaser above and see the methodology as an "evolving contingency" (Strauss & Cobrin, 1990).The Straussian view of grounded theory is adopted for this research, consistent with Yin's (1994) case methodology and in view of Locke's (2001) practical issue of organisational access.

Eisenhardt (1989) in her paper "building theories from Case Study Research", is cognisant of the work by the above authors on methods for building grounded theory, of Yin (1981,1984) on case design and of Miles & Huberman's (1984) work on analysing qualitative data. She puts forward a framework for building theory from case study research. While the later Straussian view of grounded theory above is moving a little on the continuum towards a positivist approach, the process that Eisenhardt (1989) outlines includes specification of constructs, cross case analysis and use of the literature and therefore moves much further in the direction of positivism. Yin (1994) believes that theory development prior to data collection is an essential step in case study research. He describes it as a "blueprint" for the research in guiding what data to collect and strategies for analysing data. He also sees the role of theory as "analytic generalisation" as opposed to statistical generalisation, which is discussed further in relation to case selection and analysis. Eisenhardt (1989) also concurs on this in that the goal is generalisation across settings.

According to both Yin (1994) and Eisenhardt (1989) the first step in theory development in case study design is the development of theoretical propositions and then what Eisenhardt (1989) describes as "the essential feature" – the comparison with extant literature and emerging concepts. This involves asking "what is this similar to? What does it contradict and why?" This process of comparison of existing and emerging concepts follows the extensive literature review.

Underpinning many of the inter-related influences in the context of the internationalisation of the indigenous software technology sector is the role of knowledge. This role may be seen as an influence from two different but related perspectives – knowledge intensity and knowledge accumulation.

4.7.3. Theoretical propositions

- Firms with high knowledge intensity internationalise early in their existence
- Firms with accumulated internationalisation knowledge have a rapid and more direct internationalisation process

4.7.4. What is similar to existing theories of internationalisation?

The study propositions are similar to recent theoretical propositions: "Born Global" firms Rennie, (1993), Knight & Cavusgil (1996), Madsen & Servais, (1997), Erkko, *et al.* (2000), Möen & Servais (2002), Chetty & Campbell-Hunt (2003), international new ventures; McDougall *et al.* (1994) and internationally focused knowledge intensive firms Bell (1995), Coviello & Munro, (1997), Jones, (1999). The following are some of the key findings in the above studies:

- An accelerated pace of internationalisation is present in high knowledge intensive, high technology companies;
- The high up-front cost of knowledge intensive products and services is a driver for more rapid market access;
- The higher the level of intangible assets, the more likely a firm is to internationalise;
- Knowledge is inherently mobile and firms with knowledge intensive assets can exploit international opportunities more flexibly than those with fixed assets alone;
- Developments in Information and Communications Technology (ICT) may lower the cost of internationalisation, particularly where knowledge is the subject of exchange.

4.7.5. What is different than existing theories?

The theoretical proposition is different than the earlier internationalisation models: The Uppsala-Models : Johanson & Vahlne, (1977), Johanson & Wiedersheim-Paul, (1975), and Innovation-Models: Bilkey & Tesar, (1977), Cavusgil, (1980). The following summarises some of the key assumptions underlying these models which the theoretical propositions of this research contradicts:

- Internationalisation is an incremental process, market commitment increasing proportionally with market specific knowledge acquisition;
- The knowledge that is of critical importance is market specific as opposed to firm specific;

- Knowledge is primarily experience-based;
- Firms internationalise to psychically close markets initially and move to more distance markets later in their internationalisation process.

4.7.6. Selection of cases

Yin (1994) outlines four basis types of designs for case studies as follows:

	Single-case designs	**Multiple-case designs**
Holistic (single unit of analysis)	TYPE 1	TYPE 2
Embedded (multiple) units of analysis	TYPE 3	TYPE 4

Figure 4-3: Basic types of design for case studies (Yin, 1994, p.3)

Four different types of design are represented on the matrix above, with single and multiple cases reflecting different design situations. Within either a single or multiple cases, there can be unitary or multiple units of analysis. The first understanding to reach in case selection is the distinction between statistical generalisation in which an inference is made about a population on the basis of empirical data collected about a sample and analytical generalisation in which a previously developed theory is used to compare the results of the case study (Yin, 1994). Yin (1994, p.31) describes:

> *"...a fatal flaw in doing case studies is to conceive of statistical generalisation as a method of generalising the results of the case. This is because cases are not sampling units".*

Stake (1995, p.4) concurs with this in highlighting "...a case study is not sampling research". This therefore, poses the issue of the criteria for deciding the number of cases and the basis for selecting a case. Stake (1995) describes the first criterion as maximising what we can learn from the case. He also highlights the practical issue of access for fieldwork and that this should also be a criterion. Schofield (2004) is critical of the idea of choosing cases for convenience purposes and sees the selection of a case on the basis of its fit with a typical situation as preferable. The difficulty then arises in defining the dimensions of typicality.

What is of critical importance in considering multiple cases is that the rationale is *replication logic* and not sampling logic in selecting cases. Replication logic may be a *literal replication* – predicting similar results or *theoretical logic* producing contrasting results but for predictable reasons (Yin, 1994).

4.7.7. Single or multiple cases?

According to Yin (1994), a single case is appropriate under three circumstances:

- The case represents a critical case
- It is an extreme or unique case
- It's a revelatory case – the situation when a researcher has an opportunity to investigate a phenomenon previously inaccessible to scientific investigation

A single in-depth case (Iona Technologies) was chosen on the basis of a critical case and the justification for doing this are outlined below. Yin (1994) highlights that the requirement for a single critical case is that the research has a clear set of theoretical propositions as well as circumstances within which the propositions are believed to be true. If the case objective is to confirm, challenge or extend the theory, there may exist a single case meeting all of the conditions for testing the theory. The case objective in this research is to *extend the theory*. Stake (1995) highlights that an entirely new understanding is seldom reached in single or small numbers of cases, but a refinement of understanding is often reached. To revisit the theoretical proposition:

1. Firms with high knowledge intensity internationalise early in their existence
2. Firms with accumulated internationalisation knowledge have a rapid and more direct internationalisation process

The case objective is therefore to extend the theory of "Born Global" – the early internationalisation of knowledge intensive firms. Therefore to consider what are the conditions for extending the theory: Firstly, the following table provides a number of

definitions of "Born Global" for the purpose of clarity, these are derived from the literature review:

Table 4-5: Definition of "Born Global" firm

	"Born Global" definitions:
Knight & Cavusgil (1996, p.11)	*"Small, technology oriented companies that operate in international markets from the earliest days of establishment. These firms manufacture products for a particular niche in international markets"*
Oviatt & McDougall (1994, p.49)	*"A business organisation that from inception seeks to derive significant competitive advantage from the use of resources and sale of outputs in multiple countries"*
Chetty & Campbell-Hunt (2003, p.60)	*"Firms do not internationalise incrementally but enter international markets soon after the firms inception. Such firms may not even sales in their domestic market."*
Rennie (1993, p.46)	*"Born Globals" began exporting within 2 years of their foundation and achieved 76 per cent of their sales from exports"*

Secondly, the following criteria were then developed for selecting the critical case:

- An indigenous firm with high level of internationalisation;
- A knowledge intensive firm;
- A firm which has internationalised early in its existence;
- A firm which has had a fast pace internationalisation as opposed to a gradual market based approach;
- A firm which has a small or no domestic market;

- A firm that focuses on a high-technology niche in international markets;
- Longevity – the firm has been established for at least five years to enable analysis over a significant period of time.

The findings from phase one, the exploratory study indicated that the age of the firm and the size of the firm produced variations due to these factors so therefore it was decided to control for age and size. Chetty & Campbell-Hunt (2003) also recommend controlling for age and size in their research recommendations in this area, as do Madsen & Servais (1997). All firms in the indigenous software technology sector listing of the National Software Directorate (NSD) involved in international activities were then classified by size and age. The recommendation provided by the Commission of the European Communities (1996) was used, which provides a common definition across markets using criteria of number of employees and revenue or balance sheet total. The age of firms was classified within a five year age bracket from 0-5 years up to 16-20. Four listings of potential cases (of similar size and age) were developed from this with online databases (see Appendix 5 for phase two case listings) used for further desk research on each of these firms.

From this, Iona Technologies emerged as a single critical case in the Irish context meeting the criteria identified above. A number of industry writers have also identified Iona Technologies as a critical Irish company in the International software industry. O'Riain (2004) in his book *The Logic of High Tech Growth* identified "Leading indigenous software companies 1992-2001" and in this he ranks Iona Technologies top of this list. He highlights the difference between Iona and other successful Irish software firms is that Iona has remained "heavily embedded in the Irish software industry". Stern

(2004) described how Iona Technologies "raised the horizons of Irish software onto a higher plane" and that the followers of Iona in generation 4 (of the industry) were "its heirs and offspring" (p.152). He cites Robert Baker (a leading technology entrepreneur) in saying "Iona provided the template that showed how an Irish company could be a player on a world stage" (p.152).

In addition, the practical issue of access is considered in the critical case selection, the author has a business linkage with the Chairman and former CEO of Iona Technologies, Dr. Chris Horn and therefore was granted permission for access and research in this area.

4.7.8. Potential issues with a single case

The potential risk of a single case is that it may not turn out to be the case it was thought to be at the outset. Yin (1994) identified two ways to deal with this:

- Careful pre-investigation analysis - As a public company the availability of company reports and analysis of same enabled in-depth pre-investigation.
- Maximising access: This was agreed at the outset, with interview schedule and locations flexibly worked over a six month period according to the schedule of the senior management of the company.

Another potential risk is the ability to generalise - Eisenhardt (1989, p.545) recommends 4-6 cases, highlighting that "with fewer than four cases, it is difficult to generate theory with much complexity and its empirical grounding is likely to be unconvincing". However, if the study was from a purely positivist approach, investigating causal relationships with empirical evidence, then multiple cases could be appropriate. From the phenomenological perspective, and specifically a critical theory one (generating

knowledge insights), then one case may be more appropriate. The issue of generalisability is discussed further under "External Validity".

Donmoyer (1995) in Gomm *et al.* (2004) highlights the role that single cases might serve in what he describes as social sciences newly defined purpose – of forming questions rather than the finding of answers. Madsen & Servais (1997) highlight that the issue with the research in this area so far, as with many new research areas, is that it has been mainly empirical. They highlight the need to understand and explain the phenomenon; the objective of the in-depth case analysis is to go some way towards bridging that gap. The contribution of a critical case in this emerging research area may be to develop more questions to help explain the "Born Global" phenomenon.

4.8. Phase three research design

There are generally two ways for drawing conclusions from a case or small set of cases to a wider set – empirical or statistical generalization as used in survey research and theoretical or logical inference as typically used in experimental research. Gomm *et al.* (2004, p.103) highlight that "the aim in research directed towards drawing conclusions on the basis of theoretical inference is to identify a set of relationships among variables that are universal, in the sense of occurring, that is everywhere there are not countervailing or over-determining factors". The theoretical propositions of phase two as outlined earlier are:

- Firms with high knowledge intensity internationalise early in their existence
- Firms with accumulated internationalisation knowledge have a rapid and more direct internationalisation process

The in-depth case study analyses through a series of pattern-matching and time series analysis, confirms the two propositions above. The analysis also considers the importance of contextual factors and the importance of external events on the internationalisation pattern. A set of relationships between firm, industry and locational factors influencing the internationalisation of the firm has been developed from the in-depth case study of phase two.

Phase three is described as "inductive research" perhaps not in the traditional sense, but in a sense of moving from the specific to the general. The overall objective of phase three is to examine the firm and contextual factors identified in phase two and their **typicality** in the internationalisation of a wider group of knowledge intensive indigenous Irish software companies. As highlighted in phase one research design, Gomm *et al.* (2004) also note the appropriate use of combined case and survey work in providing an assessment of the typicality in relevant aspects of the case that has been investigated in-depth.

The two key decisions in this phase of the research are identifying the "relevant aspects" of the case and to what population typicality or transferability is sought. The first issue, "relevant aspects" is identified in the case analysis as a number of firm, industry and country or locational characteristics. These are graphically presented in Chapter 7 and examined in more detail in phase three, which is discussed in Chapter 8.

4.8.1. Population transferrability

The second decision to be made is the population to which typicality or *transferability* applies (Donmoyer, 2004, Lincoln & Guba , 2004). Schofield (2004, p.76) also notes this as one of the key questions in generalisability of qualitative research as "To what do we

want to generalize?" (Schofield does not refer to generalisability in a classical sense but as comparability and transferability in "the applicability to other situations", 2004, p.75). The issue of transferability to the population of internationalised indigenous software technology companies as a whole is discussed further below.

Gomm *et al.* (2004) notes that the greater the heterogeneity of a population, the more problematic are empirical generalisations, particularly from a single case. Although empirical generalisation is not the objective in this instance, it is necessary to take account of the heterogeneity of the population. Gomm *et al.* (2004) provides a useful way of taking account of probable heterogeneity within the population, by using theoretical ideas and information about the case and population in analysis and selecting cases on the basis of such information and ideas. The use of theoretical propositions has been the basis of selection of a critical single case in Phase two. The use of such information and ideas derived in phase two analysis are used to define the population for phase three and deal with the probable heterogeneity within the population.

As noted in phase two case selection and above, research to date has shown that variants in firm age and size can account for differences in internationalisation patterns and levels. However, the industry analysis suggests that contextual variances in relation to institutional and industry factors may also account for differences in internationalisation patterns and levels. These are consistent with contextual factors identified in phase two of the research, for example, the age of the firm in relation to the use of the Internet for product distribution, the stage of industry development in relation the firms international market focus. These are analysed in detail in Chapter 7. It was important therefore to identify firm variables and contextual factors in the response profile. The identification of

a population of internationalised indigenous software technology firms is described in Chapter 8.

4.9. Quality of Research Design

The terms reliability and validity have traditionally been used to assess the quality of quantitative research. The term *reliability* is used to describe the extent to which the same findings can be repeated using the same data collection procedures. *Validity* refers to the extent to which findings accurately represent what is happening in the situation. Hussey & Hussey (1997) highlight that there is a tendency for validity to be high and reliability to be low under a phenomenological approach to research, whereas under a positivist approach, reliability tends to be high and validity low. They describe how under a phenomenological paradigm, reliability may be interpreted differently. Easterby-Smith *et al.* (2002) provide a useful perspective on the interpretation of validity, reliability and generalisability based on the philosophical viewpoint adopted.

Table 4-6: Perspectives on validity, reliability and generalisability (Easterby-Smith et al., 2002, p.53)

	Positivist	**Relativist**	**Constructionist**
Validity	Do the measures correspond closely to reality?	Have a sufficient number of perspectives been included?	Does the study clearly gain access to the experiences of those in the research setting?
Reliability	Will the measures yield the same results on other occasions?	Will similar observations be reached by other observers?	Is there transparency in how sense was made from the raw data?
Generalisability	To what extent does the study confirm or contradict existing findings in the same field?	What is the probability that patterns observed in the sample will be repeated in the general population?	Do the concepts and the constructs derived from this study have any relevance to other settings?

The philosophical viewpoint adopted in this research is that of phenomenological approach, a critical thinking perspective (Guba & Lincoln, 1994) and from a contructionist perspective in the above classification (Easterby-Smith *et al*, 2002). These are the pertinent questions of the validity and reliability of the research, the issue of generalisability is discussed later in this chapter. The following section discusses the issues of validity and reliability for each of the phases of the research. Phases two and three are discussed briefly together given the nature and objective of these phases of the research. The main focus of the discussion is on the core phase of the research (phase two).

4.9.1. Phases one and three

Ticehurst & Veal (2000) describe the best the best forms of protection against validity errors in questionnaire based surveys are careful attention to the research design and the use of a pilot survey. A pilot survey was completed in both phases before finalising the questionnaire. The pilot was used to check questionnaire wording, sequencing and layout. Due to the nature of the objective of each of the surveys (exploratory in phase one and inductive in phase three) and the narrow sectoral focus, neither survey involved substantial numbers of subjects. Therefore, while response reliability in large survey based research may be estimated by methods such as "test/re-test", "Split-halves", "internal consistency", the scale and objectives of phases one and three did not require this type of reliability in a positivist sense. As highlighted also in Chapter 5, Hussey & Hussey (1997, p.187) describe how phenomenologists may choose to use quantitative data in their research but may not necessarily analyse it using statistics.

4.9.2. Phase two

Yin's (1994) interpretation of reliability (and validity) are used specifically in Phase two of the research and described in detail in this section. Yin (1994) describes four ways (which are commonly used in social science research) in which the quality of the research may be assessed. He recommends using these in case studies, these are as follows:

- Construct validity: establishing appropriate operational measures for concepts being studied;
- Internal validity: establishing casual relationships (as distinguished from spurious relationships);
- External validity: establishing a domain to which the study's findings can be generalised;
- Reliability: demonstrating that the operations of the study can be repeated with the same results.

Easterby-Smith *et al*, (2002) note how Yin (1994) operates from a realist perspective on construct validity but from a constructionist perspective on external validity. However, they do not attach much significance to this, but rather that what ever the research strategy adopted – the results should be believable and reached through methods which are transparent (Easterby-Smith *et al.* 2002, p.54).

4.9.3. Construct validity

According to Yin (1994), this is especially problematic in case study research and so a considerable amount of time has been dedicated to this specific area of validity in the research design. The objective of measuring is to move from the abstract to the concrete

(Singleton *et al.*, 1993). The objective is to take the concept of knowledge from two different but related perspectives in internationalisation (knowledge intensity and knowledge accumulation) to provide concrete firm level measures of both concepts. Singleton *et al.* (1993) describe three steps in the measurement process – conceptualisation, specification of indicators and operationalisation. Due to the considerable work completed in this area for phase two of the research, a separate chapter has been dedicated to this. Chapter 6 describes in detail the approach to measuring the concepts of knowledge being studied. It provides an overview of the key approaches to date by researchers in measuring knowledge intensity and internationalisation knowledge. The strengths of using multiple composite measures in the single case are highlighted, while acknowledging the need for further rigour in content validity if used in multiple cases or in a large empirical study.

4.9.4. Internal Validity

Yin (1994) notes that internal validity is a concern only for causal case studies, where the researcher is trying to determine whether event X led to event Y. If a third factor Z which was not considered may have caused Y, then the research has failed to deal with some threat to internal validity. The key issue of concern in internal validity of the case study research is how to eliminate or deal with possible rival explanations.

This is not a causal case study but independent and dependent variables have been identified in the research model. Ticehurst and Veal (2000, p.204) provide a useful example on the relationship between independent and dependent variables. They use the example of "the amount of money spent on text books" (dependent variable) and "level

of income" (independent variable). They note that although the level of income doesn't *cause* people to spend money on textbooks, it may *constrain* it and therefore can be considered an *influence* on the money spent on textbooks. There may be other independent variables like age, occupation as well as income which influence the money spent on textbooks.

Similarly, this research does not set out to establish if knowledge intensity or internationalisation knowledge cause early and fast internationalisation but how they influence the level and pattern of internationalisation. There may be other contextual influences – industry, locational and market factors. The internal validity issue for case studies is the broader problem of making inferences (Yin, 1994). The key questions are: is the inference correct? Have all rival explanations been considered? Yin (1994) outlines a number of ways of dealing with internal validity – pattern matching, explanation building and time series analysis and program logic models.

A programme logic model is a combination of pattern matching and time series analysis. It is particularly useful in analysing a complex chain of events (pattern) over time (time series) covering dependent and independent variables. Programme logic model has been used in this research to analyse the internationalisation pattern over ten years, including in the analysis of knowledge intensity and internationalisation knowledge. With a single case, pattern matching with rival explanations increases the internal validity. Further details of the program logical analysis model are outlined under section 4.9 of this chapter.

4.9.5. External validity

External validity deals with the issue of generalisability – whether a study's findings are generalisable beyond the immediate case. Yin (1994) describes how a common complaint about case studies is the difficulty in generalising from one case to another. He highlights however, that no set of cases no matter how large can satisfactorily deal with this. "...the problem lies in the very notion of generalising to other case studies" (Yin 1994, p.37). As highlighted earlier in this chapter, case studies are concerned with analytical generalisation and not statistical generalisation as is the concern of survey research. Lincoln & Guba (2004, p.29) describe generalisations as "assertions of enduring value that are context-free". They highlight a number of issues with the *positivist* view of generalisation, among them is the issue (pertinent to this study) of what they describe as the dependence on the assumption of freedom from time and context. They explore an argument as follows: if the issue with generalisation is that it does not take account of time factors and contextual conditions, then why not enlarge the context to include every generalisation possible? They highlight that this defeats the purpose in the first place to facilitate prediction and control! They conclude that the only true generalisation is no generalisation. They put forward a concept of *transferability* which is a function of the similarity between two contexts. This is consistent with Donmoyer (2004)'s view on the need to reconceptualise the notion of generalisability in relation to the single case study. He highlights that it is more useful to think of generalisability in more psychological terms (of finding questions) than in terms of mathematical probability (finding answers). Gomm *et al.* (2004, p.103) make a similar distinction between theoretical inference and empirical generalisation. They define "theoretical inference" as "reaching conclusions

about what happens with a given degree of probability, in a certain type of theoretically defined situation". Yin (1994) describes two levels of inference – level one (statistical generalisation) and level two (analytical generalisation). Level two inference is concerned with analysing the case(s) to either support the theoretical proposition (literal replication) or fails to support a theoretical proposition due to predictably different circumstances (theoretical replication). Yin (1994) highlights that analytical generalisation can be used in single or multiple case design, with the purpose of level two inference.

In summary, the objective of phase two of the research with the use of a single case is analytical generalisation, drawing theoretical inference and the view of generalisability is one of psychological terms as opposed to mathematical probability. It is important to understand both the context (industry, locational and institutional) and timing in the study of the "Born Global" phenomenon. The objective is to generalise the case findings to the theoretical proposition established and to therefore extend the emergent theory of "Born Global".

4.9.6. Reliability

The objective in testing the reliability of the research is to ensure if another researcher conducted the same case study that they would arrive at the same findings and conclusions. In ensuring reliability of the study, one needs to minimise errors and biases in the research. Hussey & Hussey (1997) note that the criterion of reliability may be interpreted in a different way under a phenomenological paradigm. They describe how it is not that measures need to be reliable in a positivist sense but whether similar observations and interpretations can be made on different occasions and/or by different observers. Yin (1994) describes two ways of improving the reliability of the case study –

by development of a case study protocol and the use of a case study database. Both of these were employed in the case study. The case study protocol developed in advance of data collection is included in Appendix 4.

Miles & Huberman (1994) provide a useful comparative analysis of the different computer programs and identify a number of key criteria which help in choosing the most appropriate software for the research. The key criteria pertinent to this research are:

- Single versus multiple cases: The focus on a single case reduced the need for a software programs that would allow cross case comparison or selection of portions of the database.
- Uniform of diverse entries: The diversity of the data sources was a key factor in choosing a software programme that can facilitate search and retrieval of for example, PDF files (company reports) as well as interview transcripts, questionnaires etc.
- Qualitative or quantitative data: The use of qualitative and quantitative data in the case study was also a key factor in choosing a program that can facilitate both. While the key decision was an optimal solution for Phase two of the research, a program that would also incorporate Phases one and three was ideal.
- Interest in context of the data: The context of the data is of significance particularly in Phase two of the research and the ability to access contextual information in "wider chunks" of data was also of importance.

A number of programs were evaluated and *askSam* was chosen for its database functionality, multiple file format capability, search and retrieval facility and its ability to

manage both qualitative and quantitative data together. While phase two was initially setup in askSam, phases one and three data were also incorporated. The structure of the database is outlined in Appendix 11.

The important distinction here is that a case study database (phase two) is separate to the case study report. This allows that the database can be the subject of separate secondary analysis independent of reports by the original investigator. The following is a summary of the key issues in testing the quality of the research and how these are dealt with in the case study design. This is adapted from Yin (1994, p.33):

Table 4-7: Quality of research design

Tests	Case Design
Construct validity	Use of multiple sources of evidence Key informants review of case report
Internal validity	Program Logic model: "Rival explanation" pattern matching and time series analysis
External validity	Analytical generalisation Theoretical inference
Reliability	Case study protocol Case study database

4.10. Data collection and analysis

4.10.1.Data collection and analysis – phases one and three

Data collection and analysis for phases one and three are described in each of the relative chapters on the findings and discussion of the research phase. Data collection and analysis for the core phase of the research is described in the following section.

4.10.2.Data collection and analysis – phase two

This section describes the approach to data collection in the case study, illustrating what data was identified and how the data was collected. There are six possible sources of evidence outlined by Yin (2004) are documentation, archival records, interviews, direct observations, participant-observation and physical artefacts. No single source has an advantage over the other and the issue in relation to case study research is using multiple sources of evidence and the convergence of these multiple sources. The following illustrates the convergence of multiple sources of evidence in relation to this study:

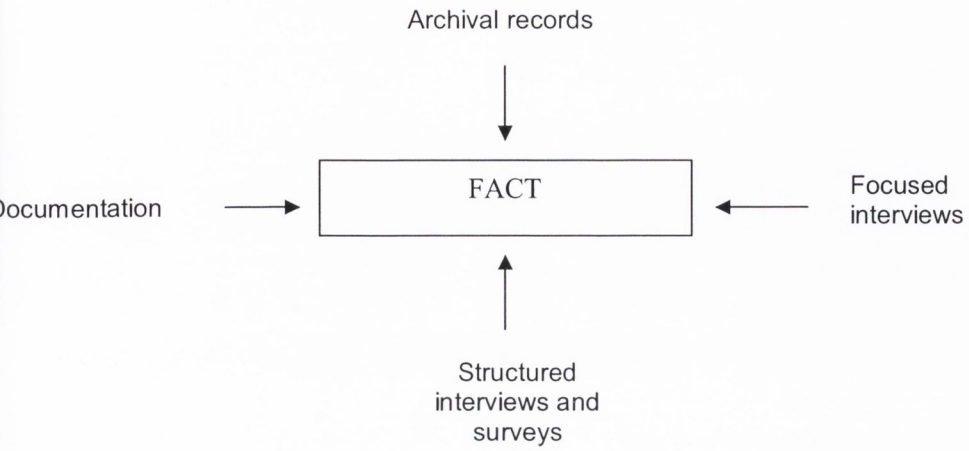


Figure 4-4: Convergence of multiple sources of evidence. Adapted from Yin (1994, p.93)

4.10.2.1. Documentation

The key sources of documentation were company reports, as a publicly listed company. These were available in electronic (PDF format) through the company website and have some key advantages as sources of data:

- Broad coverage – Company reports were available dating from 1996 to 2003 and further quarterly reports available on archive;
- Unobstrusive – The use of company reports enabled data collection and analysis in advance without having to gain access in company. It also facilitated careful pre-investigation analysis, required with the selection of one critical case;
- Stability – As a source of information, company reports are stable and can be accessed and viewed repeatedly;
- Exact – Due to the regulations requirements around company reporting, the reports contain records of company information and events.

However, it must be also noted that company reports may reflect a reporting bias in their function in reporting to the stock market. Other documentation was used in the form of newspapers reports using a number of Internet databases (e.g. Datamonitor, Proquest and Factiva).

Two other key sources used in pre-analysis investigation were previously published in-depth interview with the CEO of the company (Kenny, 2001) and a case study written on the company from the perspective of managing growth (O'Gorman, 1997).

4.10.2.2. Archival records

Archival records in the form of organisational human resource records and legal records of internationalisation decisions were collected from the organisation. The objective in gaining access to this data was to corroborate evidence already collected in interview and from documentary evidence. They have the same advantages of coverage, stability and exactness of the above documentary sources but require access to confidential company records. This access was granted following interviews with the Chief Executive Officer and Human Resources Director and electronic files were sent through e-mail. Other archival records – organisation charts, geographic locations, client service records, product information were all available through the company website.

4.10.2.3. Interviews and surveys

Two types of interviews were used in the case research, focused and structured interviews as follows. Focused interviews were completed with each of the original founders of the company. Web-based questionnaires were completed with the senior management team. Further detail on these data collection methods are included in Chapter 7.

4.10.2.3.1. Data collection

Yin (1994) highlights three principles of data collection which help in dealing with construct validity and reliability of a case study:

- Using multiple sources of evidence – data triangulation;
- Creating a case study database – separate from the case study analysis which can be examined independently;
- Maintaining a chain of evidence – case study analysis should cite data collection sources and display consistency with the case study protocol.

Each of these principles has been employed in the data collection phase of the study. This is important in developing the reliability of the case study. The following diagram is adapted from Yin (1994, p.72) and in included is the case protocol in Appendix 4: It illustrates the link between case design and data collection sources.

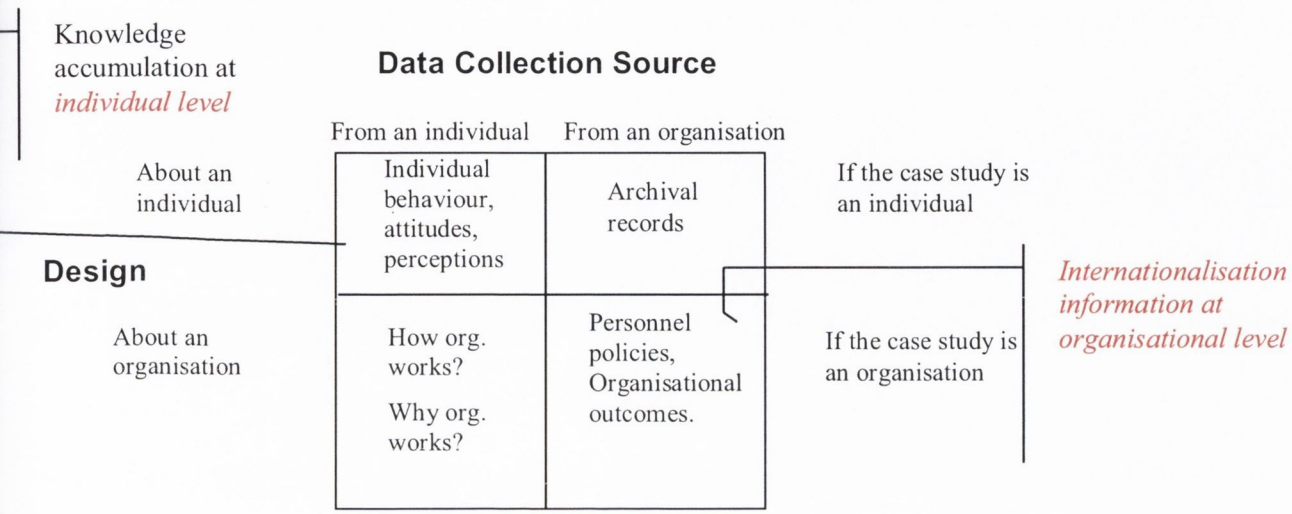


Figure 4-5: Design and data collection adapted from Yin (1994, p.72).

Yin (1994) describes different levels of questions, the first two levels as follows applicable to a single case. The data collection is at level one (questions asked of specific interviewees) and level two (questions asked of the individual case). At level one, questions are asked of the individual's internationalisation knowledge and experience in the internationalisation context (*from an individual about an individual* and *from an individual about an organisation*). At level two, questions are asked of the individual case about the organisation's internationalisation patterns and level (*from an organisation about an organisation*). At both level one and two, conclusions are based on multiple sources of evidence.

4.10.3.Data analysis

Yin (1994) describes two main approaches to case study analysis:

Analysis based on theoretical propositions – which led to the case study inquiry;

Analysis based on a case description – when the objective of the case is a descriptive one and when theoretical propositions are absent.

The analytical approach is one based on theoretical proposition. The original objectives and design of the case study are based on theoretical propositions as outlined in section 3.5.2, which in turn reflect issues identified in Chapter 2 and insights generated from phase one research: exploratory study.

The mode of analysis used as part of this strategy is a programme logic model. There are four dominant modes of analysis according to Yin (1994), (1) pattern-matching, (2) explanation-building, (3) time-series analysis and (4) programme logic models.

Programme logic model is a combination of pattern matching and time series analysis. It is particularly useful in analysing a complex chain of events (pattern) over time (time series) covering dependent and independent variables. Programme logic model has been used in this research to analyse the internationalisation pattern over ten years, including in the analysis, knowledge intensity and internationalisation knowledge. The type of pattern matches used is "rival explanations as patterns". The theoretical propositions as outlined in section 3.3.2.2 of this chapter are:

Firms with high knowledge intensity internationalise early in their existence (why?)

Firms with accumulated internationalisation knowledge have a rapid and more direct internationalisation process (how?)

The outcome that the case examines is a rapid and high level of internationalisation in a knowledge-intensive firm. Its specifically examines how and why the outcome occurred (how the firm internationalised and why it internationalised). The objective also in using

case study methodology is to examine within a specific context. This context may provide alternative or rival explanations. To perform analysis on "rival explanations as patterns", Yin (1994) describes how the analysis requires the development of rival theoretical propositions in operational terms. The important characteristic of rival explanations is that each involves a pattern of independent variables that is mutually exclusive. This method of analysis was examined in relation to this study, but the requirement for mutual exclusivity of the both independent variables would threaten the validity of the study. However, "time-series analysis" analyses the theoretically significant trend specified in the theoretical proposition (early and rapid internationalisation) and also the rival trends:

- Firms internationalise in an incremental way, marketing commitment increasing with market specific knowledge (how?);
- Firms internationalise to psychically close markets initially and move to more distance markets later in their internationalisation process (how?);

These rival trends have been developed as outlined in case design stage section 3.5.2.2 "What is similar to existing theories of internationalisation? and 3.5.2.2 "What is different to existing theories?" The objective in the case study is not just to observe the pattern of internationalisation but also to examine the how and why of the internationalisation pattern. The complexity of the events linked together by the different concepts of knowledge (knowledge intensity and internationalisation knowledge) makes the case an appropriate one for the use of a Programme Logic Model. The analytical approach outlined above determines the structure for the case study report as presented in Chapter 7.

4.11. Conclusion

This chapter has described the overall approach to the research. The philosophical viewpoint of the research is identified as that of a phenomenological perspective. This guides the research design decisions of a three phased study – an exploratory study, an in-depth case study and an inductive study. Primary and subsidiary research questions are developed through the three phases of the research.

The core phase of the research is phase two, a single in-depth case study and this is the main focus of research design decisions. Yin's (1994) case methodology is used, while adopting a Straussian view of the use of theoretical propositions as the basis of the research design.

The overall validity and reliability of the three phases of the research are discussed, in the context of the philosophical viewpoint adopted. Validity and reliability are briefly discussed in relation to phases two and three relative to the nature and objectives of these phases. The reliability and validity of phase two is discussed in detail. Considerable focus is given to the issue of generalisability, as a problematic area in case research and as an important differentiating factor in the overall research. Generalisation is viewed in terms of transferability, analytical generalisation and developing theoretical inference. Data collection methods and the use of a programme logic model for analysis, based on theoretical propositions are outlined.

Chapter 5: Phase one – an exploratory study

Phase one: an exploratory Study

5.1. Introduction

This chapter describes phase one: an exploratory study. It outlines the objectives of the study, the design and research methods used and presents the key findings of the study. The findings are discussed in relation to similar studies and in the context of the overall research.

5.2. Research objectives

As highlighted in Chapter 1, published data on internationalisation does not provide any sectoral breakdown (Forfás, Statement on Outward Direct Investment, 2001). While the National Software Directorate (NSD) captures export data, there are no detailed data available on the internationalisation of the indigenous Irish software technology sector. Therefore, the primary objective of the exploratory study was obtain sector specific data on the internationalisation of these firms.

Using Dunning's Eclectic Paradigm (1981, 1988, 1998) as an organising framework for the overall research, the exploratory study sought information on three inter-related factors – institutional, firm and industry factors influencing the internationalisation of firms. The specific objectives of the exploratory study were:

- To understand the current level of internationalisation of indigenous Irish technology firms;

- To identify the process and timeframe by which the firms have expanded internationally;
- To identify where (geographic location) Irish FDI from the software technology sector has been focused and if there is a level of concentration in any specific market;
- To identify if there has been founder influence in the internationalisation process;
- To identify institutional factors influencing the nature, level and pace of internationalisation.

In addition, as highlighted in Chapter 4, the data from phase one was used as basis for case selection in phase two.

5.3. Study design and methods

The exploratory study sought information on three inter-related factors – institutional, organisational and industry factors influencing the internationalisation of firms.

A web-based survey was composed in three sections: company profile (section one), the internationalisation of the firm (section two) and the potential internationalisation of the firms for firms not yet internationalising (section three) to gain an understanding of the barriers to internationalisation as well as the influencing factors. The focus of questions was developed from the literature review particularly in relation to the internationalisation process. The question types were a combination of closed and open questions with multiple choice questions and ranking scales used. The survey is attached in Appendix 2. A pilot survey was conducted to check questionnaire wording, sequencing and layout.

The population was defined by listings by Enterprise Ireland and NSD (2003) as 350 indigenous Irish software technology firms. A web-based surveying system

(www.surveymonkey.com) was used to create distribution lists, distribute and manage the survey response. The survey was distributed to the main contacts of the initial 350 companies.71 mail surveys were returned due to either incorrect contacts or due to the fact that the company had ceased trading. This left a population of 279 firms. Surveys not returned in the initial timeframe were followed up again with a second e-mailing reminder. The overall response rate was 11 per cent (32 firms), and although this is a low response rate, it is a typical response rate of electronic surveys. However, given the exploratory nature of the study it enabled the development of some insight into the internationalisation of the sector.

The firms were from the industry sectors as shown in below:

Table 5-1: Phase one sectoral profile

Industry sector	Percentage of firms
Banking & finance	16%
Telecommunications	9%
Internet and online applications	16%
Software tools	22%
Infrastructure software	9%
E:learning and internet based training	0%
Other	28%

Classifications of companies as small or medium sized varies from country to country. The framework provided by the European Commission (1996) provides a common definition across markets using criteria of no. of employees and revenue or balance sheet total. Using the combined headcount and revenue criteria above, 48 per cent of

companies were micro enterprises and 41 per cent of companies were small enterprises with the remaining 11 per cent being medium sized enterprises.

5.4. Key findings and discussion

The following section describes the key findings of the study in relation to the level of and process of internationalisation and the types of international activities evident in the study. The key findings of this exploratory study of the indigenous Irish software sector are discussed below in relation to similar although not directly comparable studies of the software technology sectors in Finland, New Zealand, U.K. and Canada. While the studies may not be directly comparable, it is possible to develop some additional insight into the drivers of the internationalisation process of firms (Madsen & Servais, 1997).

5.4.1. The level of internationalisation

A simple measure of international ratio (international revenue relative to the overall revenue) was used to assess the current level of internationalisation. 41 per cent of respondents had international revenues of over 50 per cent. 22 per cent of respondents had no revenue at all from international markets. Of those companies not currently engaged in international activities, 80 per cent of these companies plan to get involved in international activities in the future. This gives a strong indication of the growing importance of internationalisation to the indigenous industry sector at this point in time.

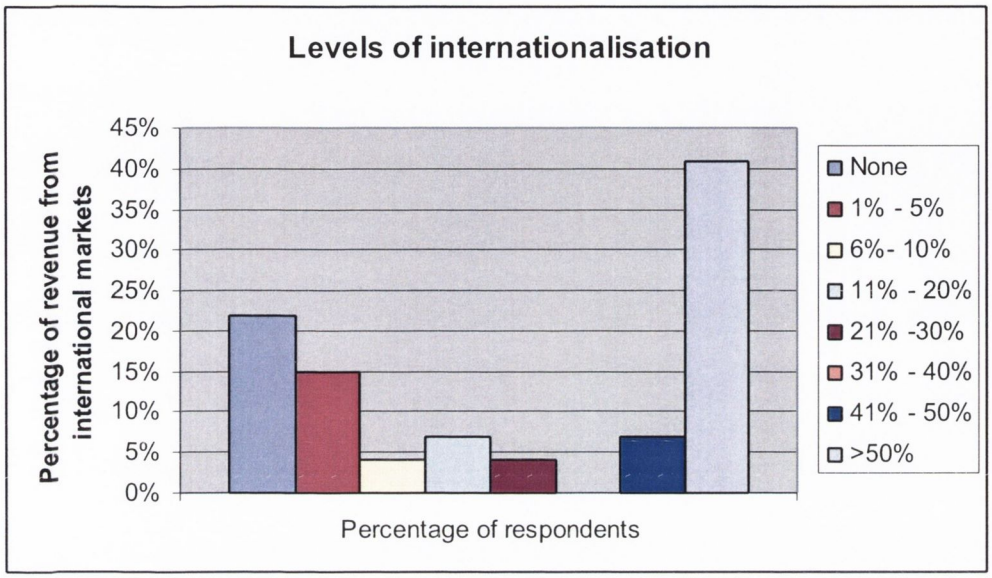


Figure 5-1*: *Levels of internationalisation

When this is compared this with Reuber & Fischer's (1997) survey of 132 Canadian software SMEs, 10 per cent of firms had no foreign sales, 20 per cent of companies had 90 per cent of their revenue from international. The profile of both sectors is somewhat similar in relation to the level of internationalisation.

There is much debate about the appropriate way to measure internationalisation. Sullivan (1994) argues that multiple item measures should be used rather than just foreign sales as a percentage of the total. More in-depth case research enables the use of multi-dimensional measurement and gain a more comprehensive understanding of the level of internationalisation. The development of a multi-dimensional measure is presented in Chapter 6.

5.4.2. The internationalisation process

Reuber & Fischer (1997) note in their study of Canadian software companies that what is of interest in the study of "Born Global" firms is not how long a firm has been selling into international markets but rather for how long the firm delayed before selling in foreign markets. The survey of Irish firms poses the questions as to what year the company was formed and what year it first engaged in international activities. The average time it took for companies to engage in international activities after their business formation was 3.66 years. However, there were two companies in the study 24 and 17 years in existence; these took 15 and 10 years respectively to engage in international activities. If these are excluded the average time is 2.56 years that it took companies to engage in international activities. 14 per cent of the respondents could be classified as extreme "Born Globals" having engaged in international activities from inception. 29 per cent of respondents engaged in international activities with two years or less after formation. The average age of these "Born Global" companies were 3.5 years. There is an indication from this that younger firms are internationalising early on in their existence. This is consistent with finding of Jones' (1999) study of small high-technology firms in the U.K. who found that in general, younger firms progress more rapidly from one stage to the next. It is also consistent with Reuber & Fischer's (1997) study of Canadian software companies, in that 14 per cent of companies had international sales from their first year of operation. They noted that older firms delayed longer in obtaining foreign sales and highlight that this might reflect the increased globalisation of the software industry in recent years. This is consistent with the findings above of the Irish firms.

5.4.3. Types of international activity

The type of international activity that firms engaged in was primarily product export (58 per cent), but also involved in provision of software related service (21 per cent) and setting up of sales office (10 per cent). There was an indication that this was a serial rather than parallel process as 79 per cent of respondents said that they did not engage in international activities in more than one market at a time. Coviello & Munro's (1997) study of New Zealand software companies found that these small firms make simultaneous use of multiple and different modes of market entry mechanisms which they describe as part of the firm's larger international network. It is not possible to conclude from the exploratory nature of this study that there was evidence of this in the Irish sector. However, Irish firms may well have used their international network in the provision of software related services noted above.

5.4.4. Market selection

The following graph illustrates the country in which firms had their first international activity:

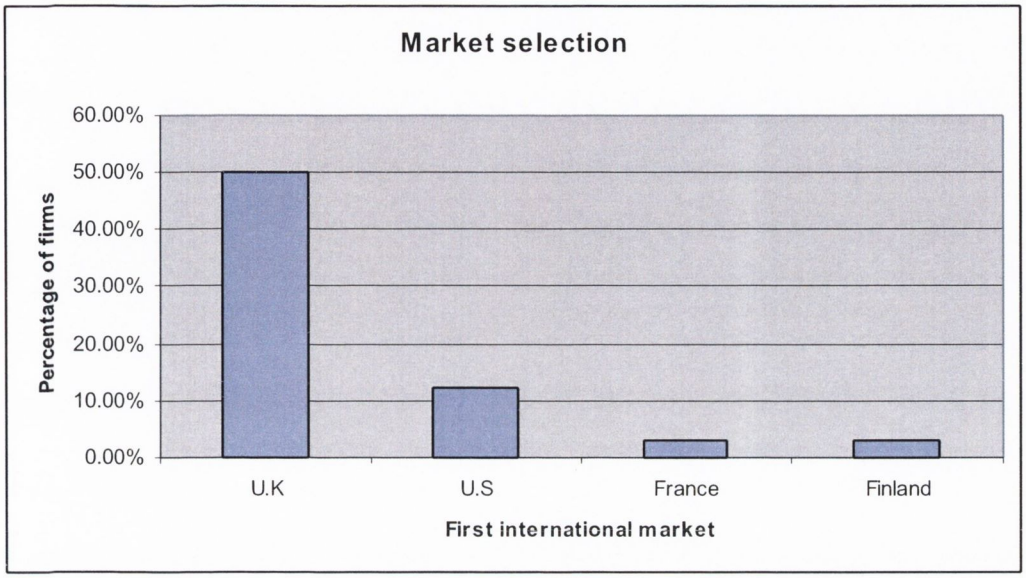


Figure 5-2: Market selection

The first market in which 50 per cent of firms engaged in international activities was the U.K market. The U.S. was the first market for 12.5 per cent of firms. Given the similarities of language, culture, political systems, level of education, level of industrial development, this would suggest that these companies focused internationally on markets within a close psychic distance. This is consistent with the findings of Bell's (1995) research of computer software firms in Finland, Ireland and Norway. He found that 50-70 per cent of firms entered "close" markets in the initial stages of export development and that Irish firms specifically tended to target the U.K. first. Research by Coviello & Munro (1997) into the international growth patterns of Canadian small firms in the software industry found three stages of international activity over a specific timeframe. In the initial stage, (years 0-1) firms had largely a domestic focus but clear intentions to internationalise. The second stage (years 1-3), the firms became actively involved in psychically close markets. The third stage (year 3 onwards) indicated committed involvement across multiple markets including psychically distant markets. In this study,

when asked to rank the countries viewed as the most strategically important market for the future, the respondents ranked the countries as follows:

Table 5-2: Strategically importance markets for the future

Country	No. 1	No. 2	No. 3
United Kingdom	58%	21%	
United States	21%	14%	2%
China			18%

This may indicate a similar pattern as outlined by Coviello & Munro above, in that Irish firms may be moving towards psychically distant markets from stage three (year 3 onwards). It is related to the findings on the process of internationalisation in that there is an indication that the process, while still a gradual one, it is happening in a "compressed timeframe" (Coviello & Munro, 1997). A study of the internationalisation strategies of "technology based new-firms" by Erkko *et al.* (2002) in Finland, concluded that there is much diversity of "Born Global" strategies. Their study included software and hardware technology companies of less than three years in existence. They found that the pattern of internationalisation reflected a gradual one (internationalisation starting in year two) but early in the existence of the firm. They also noted that the first markets were "new countries but same geographic region" and entry to more distant country cultures started to happen between years 3 and 4.

Due to the exploratory nature of this study, it was not possible to examine international growth patterns as did Coviello & Munroe's (1997). However, it highlights the

importance of pattern analysis which is examined further in phase two in the in-depth case study.

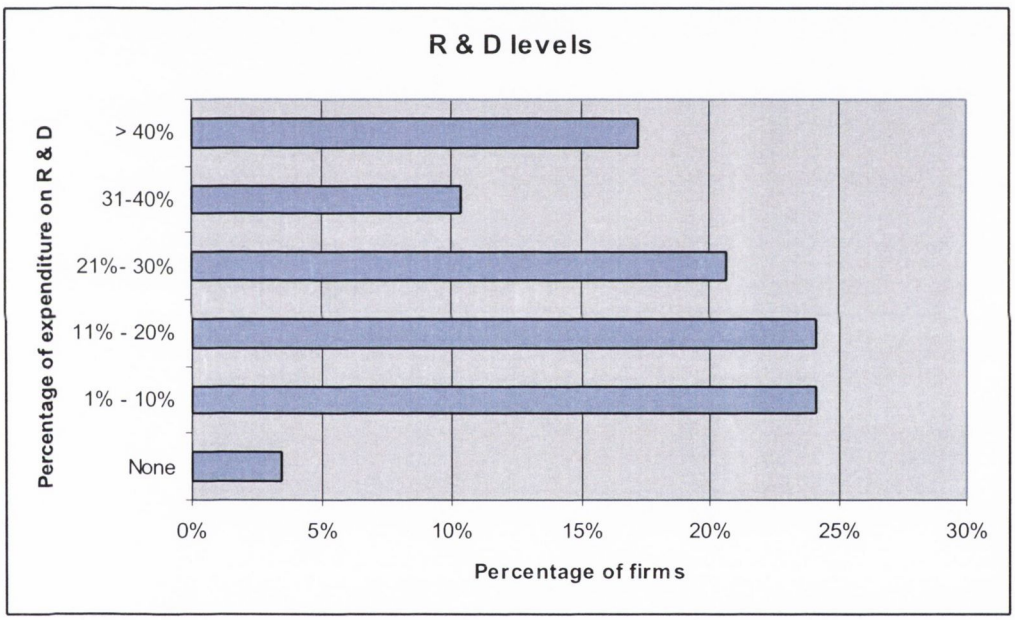
5.4.5. Firm internationalisation knowledge

In understanding the factors influencing the internationalisation of the firm, this exploratory research sought to understand the founder and employee internationalisation experience. 37 per cent of companies indicated that 0-10 per cent of their employees had international experience prior to joining the company. 26 per cent of companies indicated that over 50 per cent of their employees had international experience prior to joining. Looking further at this in relation to their level of internationalisation - of this 26 per cent, 71 per cent of these companies had also greater than 50 per cent of their revenue from international markets. This would indicate that a high level of international experience within the company is positively related to a high level of internationalisation, this concurs with the findings of some other studies in this way. Reuber & Fischer (1997) completed a study of Canadian SME software companies to understand the influence of the management team's international experience on internationalisation behaviours. They found that internationally experienced management teams have a greater propensity to develop foreign partnership and delay less in obtaining foreign sales and that these behaviours are associated with a higher degree of internationalisation. Erkko *et al.* (2002) in their Finnish study also found that the contacts and experiences of the management team had a positive effect on the "development of the distance of internationalisation".

5.4.6. Firm knowledge intensity

This survey of the Irish sector also sought to understand the level of R & D spending among these companies, shown in Table 5-5 below. As indicated, 16 per cent of companies had R & D expenditure of greater than 40 per cent, 23 per cent had R & D expenditure of between 21-30 per cent and 54 per cent had R & D expenditure from ranging 1 to 20 per cent.

Figure 5-3: R & D levels



The R & D intensity of high technology sectors is much cited in the literature as one of the key factors accelerating internationalisation. Karagazoglu & Lindell (1998) in their study of small technology companies in the U.S. found that the third most important reason for the U.S. companies to internationalise was the size of the domestic market to sustain competitive levels of R & D. It is possible to conclude that to sustain *competitive* levels of R & D, Irish companies need also to sustain levels of international growth.

5.4.7. Firm motives for internationalisation

The most important reasons for companies to expand internationally were ranked as follows:

Market growth/access to new country markets (75 per cent ranked this no. 1)

International customer requirements (50 per cent ranked this no. 2)

International competition (44 per cent ranked this no. 3)

Given the small size of the Irish domestic market and the R & D intensity of this sector, it is not surprising that market growth should rank as the most important motive for internationalisation. In the above mentioned U.S. study, Karagazoglu & Lindell (1998) found that the opportunities in foreign markets and following inquiries from foreign buyers were the key motives for small U.S. technology firms to internationalise. The high ranking of "international customer requirements" is consistent with the findings of Bell's (1995) study of Irish, Finnish and Norwegian software companies. He found for 62.5 per cent of firms, that client international requirements had influenced both the initial decision to export and on the choice of foreign market. He concludes that there is strong evidence that the internationalisation process for small computer software firms is influenced by domestic and client followership as opposed to the psychological or geographical proximity of export markets.

Two reasons for expanding internationally which were ranked the lowest were "access to technology" - 45 per cent ranked this as 10 out of 11 in order of importance and "Access to skill or knowledge base" – 30 per cent ranked this as 10. Given the strategic importance of the U.S. market in the software industry and the No. 2 ranking of this

market in the study, one might have expected that software technology companies are moving to critical strategic arenas of their industry. For example, Bell (1995) found that "industry-specific factors were much in evidence" – in that markets where software development was concentrated, that this was a factor in the decision. While one can't conclude that small firms are primarily following larger international clients or competition, as opposed to developing a presence in strategic locations of the industry, it is a possible that this is related to the small size of the companies.

5.4.8. Barriers to internationalisation

Those firms who have not yet engaged in international activities were asked to rank in importance one to six the key reasons why they have not done so to date.

Ranking highest was "sufficient growth in domestic market"- 50 per cent ranked this as number one and "lack of financial support" – 50 per cent also ranked this as number one. This may indicate support for a gradual but quickened pace of internationalisation process as noted in the above studies, in that years one to two of existence are focused on domestic growth. In contrast, in a study of the U.S. software technology SMEs, only 9 per cent indicated that funding was a barrier to internationalisation. The lack of financial support in the Irish companies may be related to a number of institutional and organisational factors, which are also self-perpetuating in relation to the growth of the company.

The issue that "the nature of the product or service is tailored to the local rather than international market" was ranked by 40 per cent as the number one reason. And although lack of international experience was not ranked as a key barrier, with 60 per cent of companies ranking this as number four, product internationalisation or localisation

knowledge could be classed as implicit knowledge gained by experience. Therefore, one could argue that although firms when not engaging in internationalisation don't see their lack of experience as a barrier, it may be become more evident as a factor when they start internationalising. This is also related to the role of psychic distance as noted earlier.

5.5. Phase one conclusion

This initial phase has been exploratory in nature and in common with other web-based surveys has had a low response rate. Nonetheless, it does fulfil the objectives of the exploratory study and provide the insight required into the internationalisation of the indigenous Irish software sector. It also highlights some interesting areas for research in Phase two. It is possible to conclude from this initial study some key findings in relation to the pace of internationalisation, the factors influencing the process and the profile of internationalisation as follows:

5.5.1. Pace and pattern of internationalisation

Internationalisation of the indigenous Irish software sector may be described as following a gradual process but an accelerated pace. There is evidence of "Born Global" firms within the sector - i.e. internationalising early (within the first two years) of their existence. The pattern of internationalisation – the use of multiple modes of market entry and the timing of the stages of entry, appears to be diverse across micro, small and medium sized enterprises in the study.

5.5.2. The role of psychic distance

There was evidence of psychic distance influencing the early internationalisation decisions. There was also evidence of international clients and competition influencing

the decision to internationalise. The study findings did not suggest that firms internationalise to access technology or knowledge in specific markets, although the findings did show that firms viewed the U.S. market as one of strategic importance. By following international clients and competitors, companies are moving to strategic locations of the industry like the U.S., albeit not explicitly stated in the study.

The study findings are compared and contrasted with Bell's (1995) study of Irish, Finnish and Norwegian software companies. He refers to Czinkota & Ursic (1987), in that they do not believe those firms undergo a complex systematic analysis of geographical, cultural and political factors. From this initial phase of research, there is evidence of psychic distance being a factor in the first internationalisation decisions ***and*** the influence of client international requirements. The two are not necessarily mutually exclusive and while firms might not undergo complex systematic analysis, perhaps it is an implicit bias in decision making on international markets. It is possible also that previous experience, knowledge and connections relating to prior international experience can also explain it.

5.5.3. Firm internationalisation knowledge

While experiential knowledge is still of key importance, the role played by other types of knowledge emerges from this exploratory study. The influence of psychic distance may be related to the tacit knowledge (Nonaka, 1991) that the firm possesses, not necessarily gained by experience about a specific market but as a result of the collective individuals' knowledge. This also relates to the tendency in the study for firms to follow international clients or competitors. The level of employee international experience in the companies that had a greater degree of internationalisation, together with the similar findings of studies in Canada and Finland would indicate that there is a positive relationship between

the two. Therefore, it would suggest that the stock of knowledge already accumulated in the firm plays an important role in internationalisation.

The role of knowledge and in particular experiential knowledge has been one of the key assumptions underlying the internationalisation models to date. What has emerged from the literature review and this exploratory study is - the role of knowledge in perhaps a different way. This role is may be seen as influence from two different but related perspectives – knowledge intensity and knowledge accumulation.

This phase of research has been contrasted with the study findings with a U.S. study in relation to the motives to internationalise being driven by the need to sustain competitive levels of R & D. This is of significant importance in this industry sector study. Given the R & D levels indicated from the study and the wider software industry R & D levels reported by ICT (2000) – this competitive level of R & D is likely to be a key driver of internationalisation going forward.

5.5.4. Summary

The findings of this exploratory phase were used to develop the subsidiary research questions for phase two of the research. Having established initial data on the internationalisation of the sector, the next phase of the research seeks to examine in more depth the factors influencing this level and pattern of internationalisation. The role of knowledge has emerged as a central theme and how this influences the internationalisation of these firms. The inter-relatedness of these factors is also highlighted from this study and consistent with more recent research into the "Born Global" phenomenon, it poses some challenges to the assumptions of the earlier internationalisation models (U and I Models discussed in Chapter 2).

Figure 5-4 below graphically presents insight generated from phase one and the review of the literature to date to form the conceptual model for the core phase of the research. The in-depth inquiry in phase two examines further the "Born Global" phenomenon and how internationalisation knowledge accumulation influences internationalisation decisions, knowledge intensity and its impact on internationalisation levels and patterns.

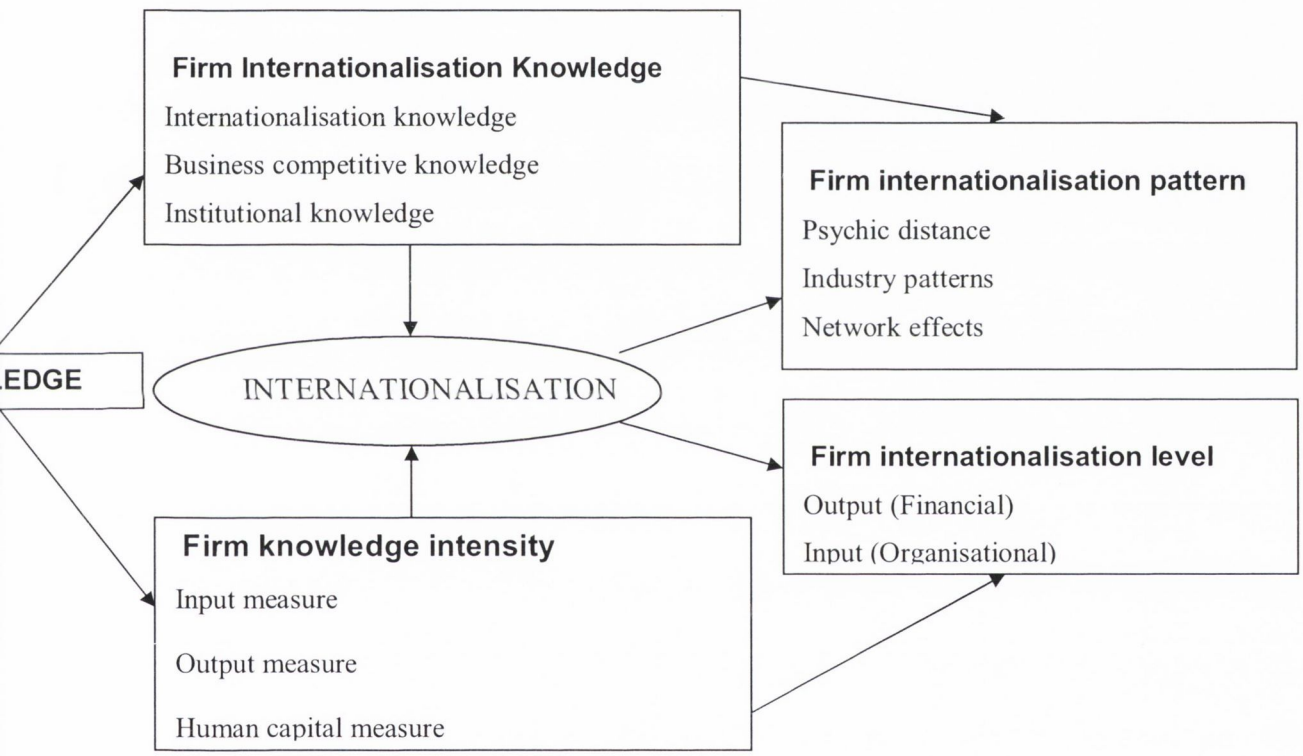


Figure 5-4: Conceptual model

Chapter 6: Operationalising the constructs of knowledge

Operationalising the constructs of knowledge

6.1. Introduction

This chapter focuses on the measurement of knowledge intensity and internationalisation knowledge accumulation for use in phase two of the research, an in-depth case study.

As noted earlier in Chapter 4, the objective is to take the concept of knowledge from two different but related perspectives in internationalisation (knowledge intensity and knowledge accumulation) to provide concrete firm level measures of both concepts. This chapter follows Singleton *et al.*'s (1993) three steps in the measurement process – conceptualisation, specification of indicators and operationalisation.

6.2. Conceptualisation

A conceptual framework was developed as the first step in this task of conceptualisation. This was developed from the insight gained from the exploratory study in phase one together with the review of the literature. It is developed from the central theme of the role of knowledge in internationalisation. This conceptual model is presented at the end of Chapter 5 and it forms the basis of the inquiry in phase two. The key constructs of knowledge and internationalisation are defined further in Table 6-1 as follows;

Table 6-1: Definitions of constructs

Construct	Definition	Source
Internationalisation	"The increasing involvement in international operations"	Welch & Luostarinen (1988, p.35)
Firm knowledge	"A firm is a repository of knowledge that consists of how information is coded and action coordinated"	Kogut & Zander (2005, p.517)
Internationalisation knowledge	"Firm experiential internationalisation knowledge, firm competitive business knowledge and market specific knowledge"	Developed from Eriksson *et al.* (1997); Eriksson *et al.* (2000); Hadley & Wilson, (2003)
Knowledge intensity	"the expression of the role of knowledge in a firm using input and output measures"	Developed from Stewart (2001)

Following the definition of the constructs, the next step in the measurement process is the specification of indicators.

6.3. Specification of Indicators

The following outlines how the firm level indicators have been developed for knowledge intensity, internationalisation knowledge and internationalisation level;

6.3.1. Knowledge Intensity

Pancucci (2002) describes how there is a growing number of knowledge measurement models, with varying degrees of management science and pragmatism. He notes that two

schools of thought have emerged – those seeing knowledge as quantifiable and those that see knowledge being solely for qualitative purposes, which can only ultimately measured by outcomes.

Coviello & Munro (1997, p.362) define knowledge intensive firms as "having a high added value of scientific knowledge embedded both in product and process. Often this knowledge is also required in sales and marketing function". Erkko *et al.* (2000) highlight that no generally accepted approach to the measurement of knowledge intensity has yet been developed. Stewart (2001) in *The Wealth of Knowledge* describes three "revelatory ratios" – Tobin's *q*, Pulic's VAIC and Stewart's Market-to-Book ratios. Tobin's *q* ratio developed by economist James Tobin in the 1950s is the ratio of a company's market value to the replacement value of its assets. Changes in *q* provide a proxy for measuring effective performance or not of a firm's intellectual capital. As *q* moves above 1, the market seems to be placing increasing value on a firm's intangibles. In Stewart's (1997) Market-to-Book ratio, the value of intellectual capital is considered to be the difference between the firm's stock market value and the firm's book value. Due to the nature of stock market valuations, Stewart contends that it is difficult to ascertain a real value for intangibles. However, he believes both Tobin's *q* and Market-to-Book ratio give a general picture of R & D intensity of a firm or industry.

Pulic (1997) in Stewart (2001) developed a measure of knowledge-capital efficiency called Value Added Intellectual Coefficient (VAIC). Pulic's premise is that the role of labour has changed in modern times and that a knowledge worker's output cannot be inferred from hours worked but from value-added. Taking company revenue and

subtracting all non-employee inputs, he establishes a measure of value added. This is then divided by payroll/benefit costs which he uses as a proxy for human capital.

Stewart (2001) highlights that while this is imperfect as a measure of human capital or investment in it, it is an acceptable way to characterise the knowledge intensity of a business. He also notes the other more commonly used measures: R & D spending as a percentage of revenue, innovation related measures: percentage of sales from new products, patents registered and people related measure: percentage of knowledge workers in the firm. Knowledge workers are defined as "professionals, senior management, technical, engineering and scientific staff" (Stewart, 2001, p.294). Sveiby (1997) distinguishes between professional and support staff in his work on measuring knowledge assets. He also highlights the grey areas of independent contractors who are an important element in the external network of a knowledge-based company and of variability of employee tasks. Classification of employees is obviously an important first stage in measuring the knowledge workers in the firm but that in itself presents some measurement difficulties, due to the grey areas highlighted above.

Adler (2001) in his examination of the role of knowledge-intensity on inter-firm relations highlights that increasingly knowledge-intensity takes two forms: the rising education of the workforce and the growing scientific and technical knowledge materialised in new products. Bontis (1996) in Sveiby (1997)has also developed an innovation-based measure "Citation-Weighted Patents" – a technology factor is calculated based on the patents developed by a firm. Erkko *et al.* (2000) in their study of a number of factors, including the impact of knowledge intensity on international growth used "managers assessment" as a way of assessing knowledge intensity. Using seven-point scales,

executives rated three statements about the extent to which knowledge intensity characterised their firm. They also obtained assessments of knowledge intensity from industry experts for validity.

The following is a summary of some of the different indicators of knowledge-intensity:

Table 6-2 : Comparison of key knowledge-intensity indicators

Knowledge-intensity Indicator	Focus	Strengths	Weaknesses
R & D as a % of revenue	**Input**	- Easily calculated from published reports - Comparable cross company	- Accuracy as a measure due to the time lag of the development cycle
Tobin's *q*	**Value**	- Indication of value of intangible assets	- Variant nature of stock market valuations
VAIC	**Value**	- Indication of value relative to investment in employees	- Labour costs vary from country to country - Some element is just labour cost and not knowledge intensive labour
% sales from new products	**Output**	- Innovation measure	- Also related to other measures of innovation - patents registered etc.
% of knowledge workers employed	**Human resources**	- Indication of the level of knowledge workers	- May be subjective on a firm by firm basis depending on definition
Firm self rating scale	**Perception**	- Designed for use specifically in small firms	- Potentially subjective in nature

According to Singleton *et al.* (1993), no two indicators measure a given concept or variable in the same way and no single indicator is likely to respond perfectly to its underlying concept. Therefore, it is advisable in research to rely on more than one indicator when measuring the concept of knowledge intensity. Drawing on multiple sources of evidence increases the construct validity of the measurement.

A composite measure of the concept of knowledge-intensity using input, output and human capital indicators was developed. These three indicators were selected on the basis of a having balanced measure and minimising subjectivity (such as that potentially in stock market evaluations and using solely self-perception based measures). Each of the three indicators is weighted equally to derive a single measure of knowledge intensity on a scale of 0 to 100 which is comparable over time and on a firm basis.

In a sophisticated positivist study, confirmatory factor analysis would be required on this measure. However, as noted by Hussey & Hussey (1997, p.187) "...phenomenologists may also use quantitative data but may not necessarily analyse it using statistics"

Rowntree (1991) describes how statistics are useful in recognising and evaluating errors in quantifying our experience particularly when generalising from a sample to a wider population. As highlighted earlier, the objective in case study research is not statistical generalisation but analytical generalisation. The objective here is to gain a deeper insight into the knowledge intensity of the firm using three balanced indicators.

Table 6-3 : Composite measure of knowledge intensity details the three measures;

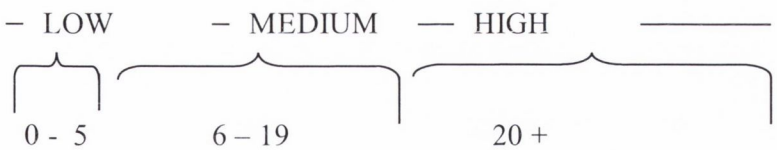
Table 6-3 : Composite measure of knowledge intensity

Type of measure	**Knowledge Intensity Indicator**	**Weighting**
Input measure	R & D spend as a percentage of sales revenue annually	33.33 per cent
Output measure	Percentage sales from new products annually	33.33 per cent
Human capital measure	Percentage of knowledge workers in the organisation relative to total headcount	33.33 per cent
	Composite measure	100 per cent

Hashai & Almor (2004) highlight that various measures exist to classify knowledge intensive industries and firms. Similar to above composite measure developed, Almor & Hirsch (1995) used three measures of knowledge intensity; (1) ratio of R & D investment to sales; (2) percentage of skilled employees; (3) total employment cost on a per firm basis. The question arises as to the appropriate cut-off points for classification of knowledge intensive firms. In an Irish industry consulting report on *Innovation – the fuel for international success*, (HotOrigin, 2002), it was highlighted that most computer-related companies spend 10-15 per cent of revenue on R & D. Hashai & Almor (2004), on the basis of industry data used a threshold for classifying "Born Global" firms of a ratio of at least 5 per cent R & D investment to sales. In Karagozoglu & Lindell's (1998) exploratory study of U.S based small and medium sized technology firms, they found that these firms had a average R & D-to-sales ratio of 10 per cent. They also define "competitive levels of R & D" as 35 per cent R & D-to-sales ratio, in the context of the ability of the domestic market to sustain competitive levels of R & D. A Forfás report (1997) noted that R & D expenditure has been increasing for Irish firms, their data

showing 7.1 per cent of sales on R & D in 1993 and 9.6 per cent in 1995. Phase one of this research, indicated that 54 per cent of Irish companies had R & D levels ranging 0-20 per cent of expenses. This is similar to Crick & Jones (2000) findings in their study of U.K small high-technology firms - all firms in their study had R & D expenses of 20-25 per cent of total expenses.

O'Riain (2004) highlighted that given the R & D intensity of the international software industry, an international comparison of R & D levels would be insightful but that currently this data is not available. Given the variance across different measures and methods (as a percentage of revenue or as a percentage of total expenses) and the lower tendency of the scale, and the lack of international benchmark data - three classifications were developed to represent low, medium and high knowledge intensity. R & D as a percentage of revenue was used rather than R & D as a percentage of expenses as this is the most commonly used in the literature and most common way of reporting for firms.



High knowledge intensity = 20 +

Medium knowledge intensity = 6 - 19

Low knowledge intensity = 0-5

Figure 6-1: Knowledge intensity scale

The concept of knowledge intensity was operationalised using public company reports, in-depth interviews and company internal data.

6.3.2. Internationalisation knowledge accumulation

Eriksson *et al.* have extensively researched different aspects of internationalisation knowledge accumulation – the effect of variation on knowledge accumulation in the internationalisation process (Eriksson *et al.* 2000), experiential knowledge and cost in the internationalisation process (Eriksson *et al.* 1997), the perceived usefulness of network experiential knowledge in the internationalising firm (Blomstermo *et al.* 2004), and path dependence and knowledge development in the internationalisation process (Eriksson *et al.* 2000). Eriksson and colleagues have developed three constructs to measure international experiential knowledge as follows:

Internationalisation knowledge – a firm's capability and resources to engage in international operations;

Business knowledge – competitive situations in specific markets and clients in these markets;

Institutional knowledge – information about governance structures in specific countries and their rules, regulations, norms and values.

Eriksson *et al.* (1997) used a five-point Likert scale to measure each of the types of knowledge and particularly "lack of knowledge" as this study was focused on experiential knowledge and cost in the internationalisation process. In Eriksson *et al.*'s (2004) study of the perceived usefulness of knowledge in the internationalising firm, they captured the firm's experience in terms of development/adaptation of products, doing

business in new markets and co-operation with other firms. They used a seven-point scale from low to high in each of the three areas of product, customers and co-operation.

Hadley & Wilson's (2003) methodology expanded on Eriksson's *et al.* (1997) original two items of lack of foreign experience and lack of unique knowledge and competence. They included additional questions and the items were measured on a seven-point scale. The original Eriksson's *et al.* (1997) and Hadley & Wilson's (2003) constructs have been further developed with the objective of measuring knowledge accumulation over time and therefore to establish the "stock of knowledge" in a firm. The measurement objective in each of these three types of knowledge is outlined as follows relative to some of the issues emerging from the research to date in this area:

Table 6-4: Measuring international knowledge accumulation

Internationalisation knowledge (IK)	**Objective:** to develop a measure of the firm's international capability
Questions focus on prior knowledge and experience of the founders and senior management team, the development of a market niche internationally and overall international marketing capability.	Knowledge & experience of founders and executive management – *Christensen & Jacobsen (1996), Jones (1999), Reuber & Fischer, (1997), Barkema & Vermulen (1998)* Unique firm capability, international niche markets - *Jolly et al. (1992), Petersen et al. (2003), Madsen & Servais, (1997)* International marketing capability – *Johanson & Vahlne, (1977), Yip, (1994), Gabrielsson (2002)*
Business knowledge (FBK)	**Objective:** to develop a measure of the firm's international business knowledge in the context of their firm
Questions focus on the firm's knowledge of its international competitive marketplace	Network effects on internationalisation - *Coviello & Munro, (1997), Bell et al. (2004)*
Institutional knowledge (IK)	**Objective:** to develop a measure of the firm's knowledge of foreign market norms, regulations and standards

Questions focus on the firms market specific knowledge and its acquisition of the knowledge	Nature of knowledge and its acquisition *Andersen, (1993), Young, (1987), Blomstermo et al. (2004), Kotha et al. (2001)*

To conceptualise this further, a detailed set of questions was developed in each of the three areas to establish a measure of internationalisation knowledge at a point in time:

Internationalisation knowledge (IK) questions focus on senior management/founders international experience, the international vision & growth of the firm, and international marketing experience. Business knowledge (FBK) questions focus on the firm's knowledge about international competitors, international complementary products/services, foreign distribution channels and foreign business contacts. Institutional knowledge (FIK) questions focus on knowledge about laws, norms, international standards and foreign language capability.

A summated scale of knowledge accumulation (KA) was developed as follows:

Total KA = FIK (0-15) + IK (0-15) + FBK (0-15) = 45

Singleton *et al.* (1993) recommends using existing well validated scales to measure subjective experiences where possible, cognisant of this, the existing validated scales of Hadley & Wilson (2003) were used.

Neither Eriksson's *et al.* (1997) earlier work or Hadley & Wilson's (2003) research used a summated scale, but rather treated each of the three constructs separately. Eriksson *et al.* (2000, p.26) describe these as "three interrelated components of international experiential knowledge". Based on the previous work on measuring these components, and on the inter-relatedness among them study, each of the components is weighted

equally. This was developed from the fifteen questions in an ordinal scale, coded under each of the three areas of internationalisation knowledge, business knowledge and institutional knowledge. The approach to operationalisation was based on in-depth interviews and survey questionnaires with each of the founders and with current senior managers in the firm. Again, to improve construct validity multiple sources of evidence have been used and key firm informants have reviewed the final case study report.

6.3.3. Internationalisation level

The most commonly used measure of internationalisation level of a firm is foreign sales revenue as a percentage of total sales revenue. Sullivan (1994) highlights that despite the theoretical and practical importance of such a measure, estimating the degree of internationalisation of a firm remains quite arbitrary. The following compares some of the key composite methods used for measuring the internationalisation of a firm from the internationalisation literature:

Table 6-5: Review of the methods of measuring firm internationalisation

Internationalisation indicator	**Dimension**	**Measurement indicator**	**Source**
Dimensions of Internationalisation	Operations	Modes of entry, target markets	(Welch & Luostarinen, 1988)
	Organisational	Organisational structure and capacity	
	Financial		
	Marketing		
Degree of internationalisation	Performance	Foreign sales as percentage of total (FSTS)	(Sullivan, 1994)
		R & D Intensity (RDI)	
		Advertising Intensity (AI)	
		Foreign profits as percentage of total profits (FPTP	
	Structural	Foreign Assets as percentage of total (FATA)	
		Overseas subsidiaries as percentage of total (OSTS)	
	Attitudinal	Top Management International experience (TMIE)	
		Psychic dispersion of international operations (PDIO)	
Level of internationalisation	Performance	Ratio of firms foreign turnover to total turnover (FTPTT)	(Hadley & Wilson, 2003)
		The number of foreign markets served (MKTS)	
	Structure	Ratio of full-time employees devoted to international versus domestic activities (FEPTE)	
		Ratio of foreign assets to total assets (FAPTA)	
		Presence of separate export marketing department (EXPDIV)	
		Extent of operation diversity (OPDIV)	
	Attitude	International planning (EXPLAN)	

		Foreign market diversification of earnings (EXPPTM)	
		Diversity of markets (MKTDIV)	
Dimensions of internationalisation	Depth	Value chain functions establishing in target markets	(Erkko *et al.* 2000a)
		Foreign sales as percentage of total sales	
		Percentage of employees in foreign operations	
	Distance	No. of countries where company has established a presence No. of cultural clusters where company has established a presence No. of geographic clusters where company has established a presence	
	Diversity	Type and no. of entry modes	

The following are some issues which arise from the review of the key methods of measuring internationalisation and the measurement objectives of this research:

Although the foreign sales relative to total sales is widely accepted and used as a measure on its own, its strength in its simplicity is also a weakness in the ability to gain any insight by this single measure. While this is widely used as an indicator of internationalisation, it is not the sole measure. In much of the literature, levels and patterns of internationalisation have been treated together, in this research for reasons of clarity, they are treated separately.

While Sullivan, (1994) provides comprehensive composite models, which has been further adapted by Hadley & Wilson (2003), two particular measures (top management international experience and R & D intensity) have been treated as dependent variables . Considering the dependent variable is the variable whose values are predicted by the

independent (Hussey & Hussey, 1997) then consistent with the theoretical proposition of this research (knowledge as a driver of internationalisation) R & D intensity and internationalisation knowledge are treated as independent variables and the level (and pattern) of internationalisation as the dependent variables.

Reverting back to the research questions: why an indigenous knowledge intensive firm internationalise early in their existence and how they internationalise, therefore the objective in measuring internationalisation level is to also understand the factors that influence the pattern of internationalisation. This research examines the role of a number of inter-related firm and contextual factors (illustrated in Chapter 2, Figure 2-2).

A framework has been developed to measure internationalisation and encompassing internationalisation level and internationalisation pattern but treating them separately to understand the factors impacting both elements.

6.3.3.1. Financial measure

Methods of measuring the level or degree of internationalisation in the literature to date have generally been relative to domestic revenue or total revenue (Welch & Luostarinen, 1988; Sullivan, 1994; Erkko *et al.*, 2000; Hadley & Wilson, 2003). Research specifically on "Born Global" firms to date have used a measure of export intensity or an export ratio; (Rennie, 1993; Bell, 1995; Knight & Cavusgil 1996, Coviello & Munro,1997; Möen & Servais, 2002 ; Chetty & Campbell-Hunt, 2003). Crick & Jones (2002, p.80) highlight that due to the different types of market entry used by international high-technology firms that "academic studies might ask the firm to specify their international ratio rather than

purely an export ratio". International ratio would appear to be a more inclusive term and therefore also used in this case study

International ratio: Foreign sales or revenue as percentage of total sales or revenue (FS):

Low FS: <25 per cent International ratio

Medium FS: 26-50 per cent International ratio

High FS: >50 per cent International ratio

These thresholds are developed from those used to date in research into the "Born Global" phenomenon, as presented in Chapter 2, Table 6-6.

6.3.3.2. Organisational measure

The ratio of full-time employees in international activities (FEIA): As noted by Welch & Luostarinen (1988, p.39), international personnel is a prime indication of the internal extent to which a company has become internationalised but "it is perhaps more difficult to measure than the preceding three dimensions" (method, target market and organisational resources). While Sullivan (1994) and Hadley & Wilson (2003) operationalise a "structural" attribute of internationalisation, there is no accepted norm for percentage of employees in international activities. On the logic that resource allocation in firms tends to map to revenue generation, FEIA is mapped similarly to FS as follows:

Low FEIA: <25 per cent

Medium FEIA: 26-50 per cent

High: >50 per cent FEIA

Depth of internationalisation: The percentage of value chain activities performed outside home country (D). Erkko *et al.* (2002) developed a dimension of internationalisation – internationalisation *depth* in which they assess degree of internationalisation of the value chain by the number of value chain functions performed outside the home country. Similarly, this has been used by Oviatt & McDougall (1994) in distinguishing the different types of International New Ventures (INV). Bloodgood *et al.* (1996) conceptualised the extent of internationalisation as the number of primary activities the firm engaged with outside of the home country. Following the existing work on the internationalisation of the value chain noted above, Porter's (1985) generic value chain is used to analyse the international value chain of the company activities as follows:

High: >50% of primary activities performed in international locations

Medium: >25% primary activities performed in international locations

Low: < 25% of primary and support performed in international locations

The thresholds were developed from Erkko *et al.* (2002) and Bloodgood *et al.* (1996) work to date on assessing the depth of internationalisation.

The following summarises the criteria for three levels of internationalisation:

Table 6-7: Levels of internationalisation

Level of internationalisation	**Low**	**Medium**	**High**
Financial	FS: <25 per cent export ratio	FS: 26-50 per cent export ratio	>50 per cent export ratio
Organisational	FEIA: <25 per cent D: <25 per cent	FEIA: 26-50 per cent D: >25 per cent	FEIA: >50 per cent D: > 50 per cent

6.3.4. Pyschic Distance

The definition of psychic distance has varied across the literature and therefore how it has been conceptualised and measured. The term "psychic distance" was first introduced by Beckermann (1956) to highlight the need for a broader definition of distance in international business. The following sections review the different approaches to operationalisation of this concept to date.

As noted earlier in Chapter 2, psychic distance is defined as the sum of factors preventing flow of information from and to the market (Johanson & Vahlne, 1977, p.23). Vahlne & Nordström (1992) viewed psychic distance as the sum of distance-creating factors (cultural, structural and languages differences) minus the sum of distance bridging factors (knowledge dissemination and trial-and error processes). They operationalised psychic distance using the following indicators:

- Level of economic development in the importing countries;
- Difference in the level of economic development between Sweden and the host countries;
- Level of education in importing countries;

- Difference in level of education between Sweden and host countries;
- Difference in business language;
- Difference in culture and local language;
- Existence of previous trading channels between Sweden and the host countries.

O'Grady & Lane (1996) highlight that although many researchers use cultural distance and psychic distance interchangeable, they concur with Vahlne & Nordström (1992) in treating them separately. Vahlne & Nordström (1992) have developed a psychic distance index which captures

Cultural differences – those dimensions defined by Hofstede (1980);

Structural differences – legal and administrative systems differences;

Language differences – differences in native language;

O'Grady & Lane (1996) adopted Nordström & Vahlnes' (1992) index of psychic distance in their research into performance issues between psychically close countries - U.S.A and Canada. They concluded in their research that although the countries are psychically close, significant business differences occurred. They highlight there are possible variations in regional and industry cultures. Dow (2000) has further developed Nordstrom's approach using an expert panel-based instrument to measure psychic distance.

Stöttinger & Schlegelmilch (2000) have operationalised the concept in using what they describe as both factual indicators (economic development, education, language) and a perceptual component (perceived distance). They used the term "foreignness" to incorporate language, culture and industrial development of business practises in their

research. They used Sethi (1971) work on clustering countries. Ronen & Shenkar (1985) completed a review of eight cluster studies (including the Hofstede's (1980) study) and compares them on a number of dimensions. These include organisational level and size studied, whether they were industry specific or not and whether demographic variables were included. They present a synthesis of the results of the eight cluster studies reviewed in the form of a map. The most highly developed countries are placed at the centre of the cluster map, indicating the level of development on values and attitudes of the countries.

In the context of this study, the focus is on the concept of psychic distance and its impact on internationalisation decisions. As Stöttinger & Schlegelmilch (2000, p.170) highlight "...psychic distance is said to lend itself well to guiding country selection decisions during the internationalisation process".

There have different approaches to the operationalisation of the concept to date, with no one approach gaining widespread acceptance. Child *et al.* (2002) highlight that objective measures of psychic distance have generally related to potential distance creating factors and that they largely ignore the distance reducing factors. They note that "it is a major challenge to translate these latter factors into objective measures because most of them cannot be neatly operationalised and readily quantified – psychic distance needs to be viewed in terms of its changing context, including politico-institutional environment. This is important in the approach to measuring the concept of psychic distance in this study. While operationalising the concept of psychic distance to analyse the pattern of internationalisation, the objective of this study is also to understand why and therefore the context for the decisions –industry and institutional

Given Singleton *et al.* 's (1993) view that no two indicators measure a given concept in the same way and no single indicator is likely to respond perfectly to its underlying concept, it was initially decided to use more that one measurement of psychic distance. Dow (2000) describes Nordstrom & Vahlne (1992) work as one of the few empirical efforts that has achieved a reasonable balance between content and construct validity. It also comprehensive in capturing cultural, language and structural differences separately. This would ideally have been the index to use in the study, however Nordström & Vahlne's research is based on Swedish firms exporting to Japan and therefore Ireland was not included in this work. The author made direct contact with Kjell Nordström who confirmed that they did not have any data on Ireland in their Psychic distance index. Therefore, although using multiple indicators is ideal, given the inavailability of the above indicator, Ronen & Shenkar's (1985) clustering map was used to analyse internationalisation decisions. Ronen & Shenkar's (1985) cluster mapping provides a useful synthesis of earlier work in this area.

The following framework outlines the overall approach to developing a measure of the level of internationalisation and also understanding the factors influencing internationalisation patterns in phase two.

Table 6-8: Framework for measuring firm internationalisation

Level of internationalisation	Pattern
Financial measure • International ratio: Foreign sales/revenue as percentage of total (FS) **Organisational measure** • Ratio of full-time employees in international activities (FEIA) • Depth of internationalisation: Percentage of value chain activities performed outside home country (D)	• Time mapping of internationalisation decisions together • Psychic distance mapping of the location of the decisions • Geographic distance mapping • Pattern of factors influencing each of major internationalisation decisions

6.4. Summary

This chapter has described the approach to establishing operational measures for the key constructs of knowledge used in Phase two of the research. As noted earlier in Chapter 4, Yin (1994) highlights this as an especially problematic area of case methodology. The approach follows Singleton's three step process of developing measurements and is characterised by;

- The use existing validated measurements where appropriate;
- The use of more than one indicator to measure a concept where possible.

Composite measures of knowledge intensity and internationalisation knowledge have been developed. The use of the measures in the in-depth case study is described in Chapter 7.

Chapter 7: Phase two:

an in-depth Case Study

Phase two: an in-depth Case Study

7.1. Introduction

The exploratory study in phase one of this research, provided some initial sector specific data on the internationalisation of internationalisation of indigenous software technology firms. As noted in Chapter 4, the use of an initial survey in phase one also provided the basis for selection of a single critical case. An in-depth case study was performed on Iona Technologies, an indigenous Irish software technology company.

7.1.1. Research objective

The development of the primary and subsidiary research questions through the phases of the research are described in detail in Chapter 4. The initial exploratory study provided insight into the pace and pattern of internationalisation. The internationalisation pattern exhibited by firms in phase one is similar to that of recent phenomenon in internationalisation – the "Born Global" phenomenon. The research to date into this phenomenon is discussed in detail in Chapter 2. The key insights from phase one in relation to the pace and pattern of internationalisation, market selection decisions and the role of knowledge in internationalisation form the basis of the research questions and analysis in phase two. From these initial insights in phase one, subsidiary research questions were developed as follows to examine this in more depth:

- Why does an indigenous software technology firm internationalise early in its existence?
- How does the firm internationalise?

The overall approach to this core phase of the research – the selection of a critical case, the role of theoretical propositions and the method of analysis is described in

Chapter 4. The following chapter describes the Iona Technologies case study in detail under the following structure:

- Firm Overview
- Firm History
- Case analysis
- Internationalisation pattern analysis
- Internationalisation level analysis
- The role of knowledge in internationalisation
- Case conclusion

7.2. Firm Overview

Iona Technologies are an Irish resident public limited company. Their corporate headquarters are in Dublin, Ireland with its U.S. headquarters in Massachusetts and Asia-Pacific headquarters in Tokyo. Iona Technologies is in the integration software business (Company report, 2004) developing software integration products and providing professional services including product support and high level consultancy. It is a global company with all of its revenue ($68 million, 2004) generated outside of the domestic Irish market. Iona Technologies employs 350 people in 22 offices worldwide (Company Report, 2004).

Its customers are global companies with complex enterprise Information Technology (IT) environments. The customers span a number of industry sectors – Financial services, telecommunications, manufacturing, Independent Software Vendors (ISVs) and System Integrator Partners (SIS). Iona Technologies describe their approach as "focused on making IT organisations' accumulated infrastructure investments interoperable without sacrificing performance, scalability or reliability". Their

approach is based on three fundamental principles of on-going complexity and heterogenity (of enterprise IT), standards-driven technologies (its pioneering approach with CORBA) and service orientation (Company Overview, July 2005). They have three core products as follows:

Orbix™ is Iona Technologies' original high-performance infrastructure of mission-critical applications. Orbix is the world leading CORBA standards-based technology , Iona Technologies being the largest CORBA vendor worldwide (Company Overview, July 2005).

Artix™ is intregration technology that service-enables existing systems in an extensible way. This extensibility is particularly important to large organisations.

Celtix™ Enterprise, is the company's open source Enterprise Service Bus (ESB). The initial release of Celtix was in December 2006.

Underpinning each of Iona Technologies' products is ART ™ – Iona Technologies' patent-pending Adaptive Runtime Technology. ART is the engine behind the world's largest and most complex integration projects and is the key interoperability characteristic of Iona Technologies' products.

7.3. Firm History

Iona Technologies was founded in March 1991 as a campus company by Chris Horn, Annrai O'Toole and Sean Baker. It was born out of seven years of a research programme (ESPRIT programme) in Trinity College Dublin (TCD), in which the three founders worked. The ESPRIT programme is funded by the European Commission and supports research in the European computer industry. In 1989, an international group known as the Object Management Group (OMG) was formed with the aim of establishing a standard for Object Technology Software. The standard developed by this group was CORBA and the goal of Iona Technologies was to

develop the software to implement this standard. The first year of the company was spent developing a business plan and trying to raise capital. They generated income from programming in C++ training courses and smaller roles in European Commission projects. The three academics spent a year writing code for their product and in 1993, the company launched its first product Orbix. The product was displayed at an Object World trade show in San Francisco, U.S.A. and was very well received by industry representatives present. At this point in time, the company had established a network of contacts from their ESPRIT involvement and received considerable industry attention for "the first full implementation of CORBA", the emerging industry standard. In 1993, the company had developed a complex product, with no domestic market and they were undercapitalised to fund international growth. However, by providing the first complete implementation of CORBA, they were well positioned to discuss alliances with other software companies.

In 1993, Iona Technologies' revenues were IR£30,000. Sun Microsystems had taken an interest in their product at that first U.S. trade show. Following due diligence in late 1993, Sun invested $600,000 in Iona Technologies. This was a critical point in the development of the company. IDA matched this funding in job grants, financing the creation of 56 jobs. Following the Sun Microsystems investment, in 1994, Motorola picked Orbix as the middleware to underpin its control systems for a global satellite network. By 1993, the Internet has become a common working environment for the developer market that Iona Technologies wanted to target. This allowed Iona Technologies to communicate with customers over e:mail and distribute the product over the Internet using FTP (File Transfer Protocol).

After the Motorola product endorsement, Boeing also invested $750,00 in Orbix licenses. The company opened a U.S. sales office in 1994 in California to be close to

Sun. They experienced difficulties in working with the eight hour time difference and so they opened a sales and marketing in Massachusetts a year later. When Hewlett Packard took the decision to close its office in Massachusetts which had been working on a competing product, Iona Technologies acquired some of the key engineering resources and thus established a development centre in Massachussetts. Following their establishment in the U.S., they focused on the German market, signing a software reseller agreement with German consultancy firm.

By 1996, Iona Technologies' revenue was $21million. The Orbix product had grown to a suite of software integration products and "Iona Technologies' brand accounted for over half of the world's Corbra licenses" (Sterne, 2004). In 1996, through similar opportunistic decision making that had resulted in a Massachusetts-based development centre, Iona Technologies opened a development centre in Perth, Australia. An Australian London-based employee of a competitor targeted Iona Technologies to setup an office in Perth, Australia. Perth as a location provided a pool of development resources and the ability to serve Tokyo and Hong Kong. It also opened its first European sales subsidiary in Germany in 1997.

Iona Technologies were considering an IPO at this time and decided to strengthen the experience of the board, bringing in multinational financial, HR and legal experience. It also continued to build the software development capability by hiring experienced managers of international engineering teams. Stern (2004) notes that in 1996, Iona was looking more like an American start-up en route to the NASDAQ exchange than like their Irish predecessor Glockenspiel[4]. The company went public in 1997 and was

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[4] Glockenspiel was an Irish technology company founded in 1984 by John Carolan, focused on the then new object-oriented approach to software development . Carolan became a legendary figure in the Irish software industry. Its flagship product CommonView was launched in the U.S in 1989 and this

11 times over subscribed raising $60million in cash. It was the third largest software IPO ever. The company's revenues grew 129% in 1997 reaching $48.6 million.

Iona Technologies remained an active contributor to international industry bodies – Java Community Process, World Wide Web Consortium, Web Services Interoperability Organisation, the SoapBuilders Forum and the Organisation for the Advancement of Structured Information Standards. The company represented itself as the integration software vendor that bridges the gaps between rival camps as well as between alternative technologies. Chris Horn remained very involved in the Irish software industry chairing expert committees and advising on strategies for the industry as a whole.

Although Iona Technologies' close identification with the CORBA standard resulted in its flagship product, it also limited its development of a product portfolio. In the late 1990s Sun's Java environment become the preferred working environment for many application developers. Iona Technologies' allegiance to C++ resulted in its technological development along the CORBA path, looking for acquisitions in firms with CORBA tools. Sun's direction towards Java and away from CORBA meant that Iona Technologies were no longer as strategic to them. Following the IPO, Sun sold their 25 per cent for $6million.

In 2000, the company separated the position of CEO and Chairman. Barry Morris an Iona Technologies employee with many years experience in the industry took over as CEO (Chris Horn remained as Chairman). In mid 2001, Iona Technologies had reached its peak, with 1,000 employees and revenues of $180million. After their first profit warning in 1999, the company suffered heavy losses in 2001 and 2002. After a

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business peaked in 1991. In 1992 the company ran into financial difficulties and was subsequently acquired by U.S. software company Computer Associates.

turbulent few years in Iona Technologies, Chris Horn took over as CEO again in May 2003 with revenue at $74 million in 2003.

7.4. Case analysis

The analysis of the case is done using a combination of pattern matching and time series analysis. Firstly the key phases of internationalisation are presented. The internationalisation pattern is then analysed against the earlier incremental stage process of internationalisation and then against a number of "Born Global" patterns in internationalisation. The level of internationalisation of the company in 2004 is determined using financial and organisational measures. The role of knowledge in internationalisation of the case firm is examined in relation to the knowledge intensity of the firm and the influence of internationalisation knowledge accumulation.

7.5. The internationalisation of the firm

The following sections present the internationalisation of the firm in a time series analysis. The key milestones of decisions relating to the internationalisation of the firm and the different phases of internationalisation are illustrated in the following diagram. Each of the key date milestones are noted together with the type of internationalisation decision (e.g. sales office opened) and the relevant location:

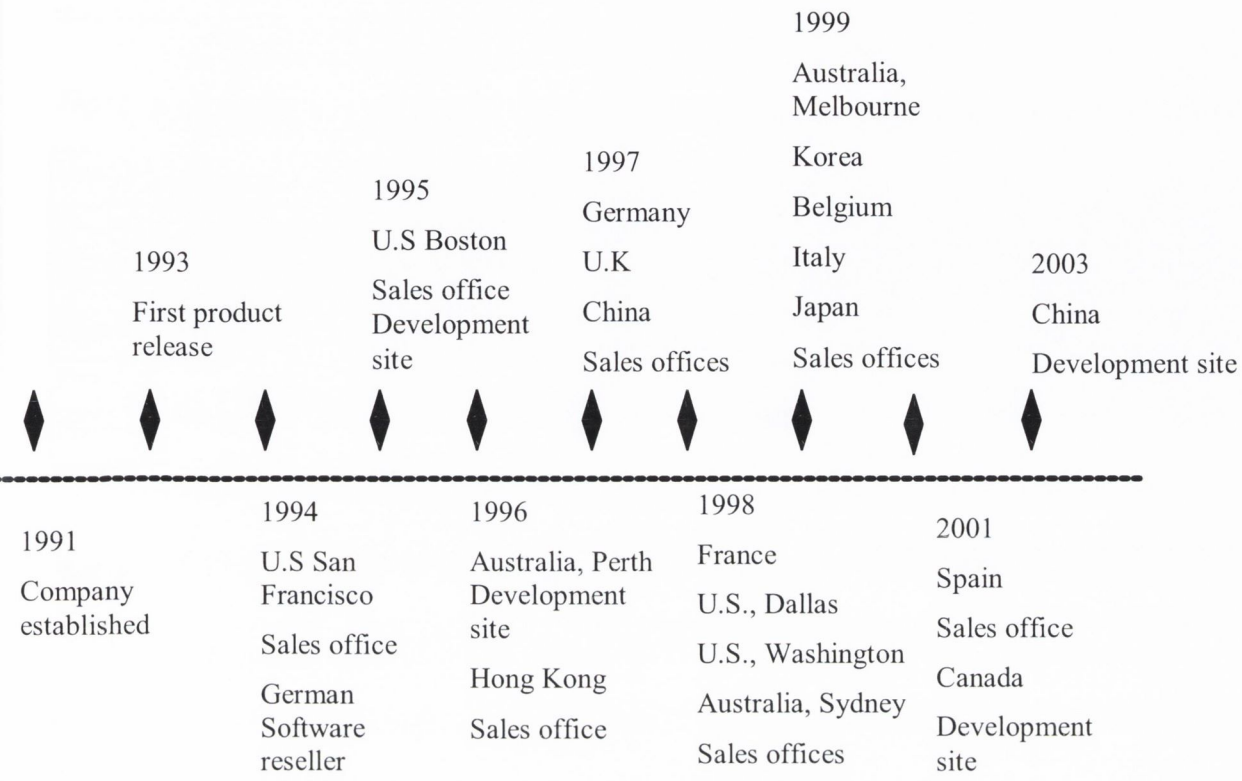


Figure 7-1: Key internationalisation milestones

The date of formation of the firm is 1991, however the first product prototype availability was 1993. The first two years of the firm were spent in product development. It therefore arises as to which date (formation or product availability) is the most appropriate to use in analysis. Oviatt & McDougall (1994, p.48) also highlight this issue in noting that "empirical studies of international new ventures must resolve a definitional ambiguity". They describe how new ventures although in existence, have no sales because their product or service is under development. Oviatt & McDougall (1994) recommend that researchers should rely on observable resource commitments to establish a point of business inception. While Iona Technologies had some income from training fees, there was no income from the core product as this was under development. The most appropriate milestone to resolve this definitional

ambiguity would appear to be product prototype availability. The following classifies internationalisation phases according to this point in time:

Table 7-1: Internationalisation phases

Internationalisation phase	Years since product prototype	Year
Phase 1	0-1 years	1993-1994
Phase 2	1-3 years	1995-1996
Phase 3	3-5 years	1996-1998
Phase 4	5-7 years	1998-2000
Phase 5	7-10 years	2000-2003

7.5.1. Phase one internationalisation

7.5.1.1. Market selection

Iona Technologies' first product (a prototype) was available for market in 1993. The company had generated an income in the first two years of product development from professional services (training programmes in C++) in the domestic market. However, they (the founders) did not believe there was a domestic market for their product Orbix. The first market that was targeted was the U.S. market. In interviews with each of the founders, they were in strong agreement on their decision to target the U.S. market first.

> *"...the defining market, at the time for enterprise software"* – Annrai O'Toole.
>
> *"...we expected and were right in thinking that even as this settled down the US would represent something like 2/3rds or thereabouts of the market"* – Sean Baker.
>
> *"..because it was* [the U.S.] *and still remains the primary market for all new high technology products. It is difficult to find early adopters for technology products in the software industry outside of the U.S."* – Chris Horn.

The decision to sell into the U.S. market was also influenced by the experience of Chorus Systemes, a Paris-based developer of systems software. The founder of Chorus Systemes Michel Chien had advised Iona Technologies that the U.S. market was of critical importance. There is number of different but industry-related reasons for selecting the U.S. market which emerged from the interviews:

7.5.1.2. "Early Adopter" characteristic of the U.S market

All of the company founders held the view that the U.S. market is an early adopter of new technology and still is today. The size of the U.S. market was not a consideration at this stage but rather this characteristic of the market (as an early adopter) was critical in the marketing of new technology.

> *"...American business community was fairly aligned to the Irish way of doing business but the primary factor was market, early adopters"* – Chris Horn.
>
> *".. if you look back and we are talking about "early adopters" then you are talking about nearly 90 per cent of the market"* – Sean Baker [in relation to the U.S. market].

They also see the "early adopter" factor as the key driver in the internationalisation pattern both in the past and in the future. In relation to their new product Artix, Chris Horn highlights;

> *"...our key focus for the new product is the U.S. and then the U.K. in the short-term because once again they tend to be the early adopters of new technology".*

The U.S. was considered as a strategic location for software companies:

> *"...certainly, we saw it like that from day one and from day one we tried to make it in the U.S. market and didn't think of Europe or Ireland at that time"* - Annrai O'Toole.

7.5.1.3. International Industry networks

International industry network organisations – in particular Object Management Group (OMG) was another key influence on the company's internationalisation. OMG, as noted earlier was formed with the aim of establishing a standard for Object Technology Software, which was CORBA. The founding members of Iona Technologies had participated in European research projects on distributed object technology and had closely tracked the development of the standard internationally. The members of OMG were all U.S. based and Iona Technology's understanding of CORBA was hailed by leading authorities in the field (Stern, 2004). Annrai O'Toole describes this forum as:

> "…an essential forum to be involved with "

in that they met with developers of the CORBA standards, customers and competitors through involvement with OMG. Two of the founders Chris Horn and Sean Baker have served on the OMG's board of directors. The company also became an active contributer to other industry bodies – The Java Community Process, The WorldWide Web consortium, the SoapBuilders Forum and the Organisation for the Advancement of Structured Information Standards. Through their OMG involvement and their presence at the Object World trade show, they developed a relationship with Sun Microsystems which resulted in Sun Microsystem's equity stake in December 1993.

7.5.1.4. The nature of the Irish software industry

The nature of the Irish software industry – it emerged from the interviews that the founders of Iona Technologies saw the Irish software industry as being closely linked to the U.S. software industry. In particular, they viewed the Irish software industry as

"strongly influenced" by the U.S. and "culturally close". The view of one of the founders was that:

> *"...we did not have a software industry in Ireland, it was an extension of the U.S. software industry"* - Sean Baker.

He goes on to say;

> *"...we felt that the culture within the Irish software industry had been heavily influenced by the USA market for many years and therefore we hadn't got our own model in Ireland in the software industry and therefore we were influenced by the international market which was highly Americanised".*

Annrai O' Toole describes the Irish software industry;

> *"...we think very similarly, like we are very close to Boston"*

7.5.1.5. Impact of the Internet

Their mode of entry was strongly influenced by the experience of Glockenspiel, who encountered distribution difficulties in the U.S. market in 1990/1991 by signing an exclusivity agreement with an American company. Iona Technologies launched its first product Orbix at the Object World trade show in San Francisco in 1993. OMG members present at that trade show were also familiar with the technical capabilities of the company at this stage. This generated the first sales for their product, which were international sales.

By 1993, the Internet had become a basic working environment for the development professionals, customers of Iona Technologies. The company set-up a FreeFone number and distributed the product through the Internet. The FreeFone number allowed them to sell the product from Ireland giving transparency of location and without any U.S. sales force at this time. This is evidence of the founders

understanding of the U.S. market and how "to do business" in the U.S. and at an individual IT professional level – Sean Baker describes the use of a freefone number;

"...it was the knowledge of the way in which people worked in the U.S.

and in relation to their [the U.S. market] use of the Internet:

"...they liked the whole idea of new technology, it is just something they are driven by. They just liked the idea of doing some business over the Internet"

Language was not a barrier as the language of developer professionals worldwide was English and the Internet provided a fast, flexible and cheap means of distributing the product. Clearly, at this time the company did not have the financial resources for a conventional marketing campaign, but also it is questionable whether this would have been as successful with the targeted development market and technical complexity of the product. Distribution through the Internet facilitated trial versions which although widespread now, was quite novel at the time. The general view within Iona Technologies' founders was that the Internet had an impact on their early international success. Sean Baker described it as having:

"...a high impact on their success"

Chris Horn described it as a:

"...a major impact"

and Annrai O'Toole noted that it enabled:

"...innovative ideas about how to market and distribute the product"

He highlights how they had;

"...the first website in Ireland and their website was rated in the Top 10 commercial websites ever"

Stern (2004) also describes how "once their Orbix product began to ship, Iona Technologies quickly became the biggest user of bandwidth in Ireland" (p. 146).

7.5.1.6. Industry role models

There were varying views on the exact level and nature of impact other software companies had on Iona Technologies but two specific examples were cited in the interviews: Glockenspiel and Chorus Systemes. John Carolan, who established Glockenspiel 1984, was a legendary figure in the Irish software industry. He developed a reputation both in Ireland and the U.S. as a talented, creative software developer. Stern (2004) described how Carolan "did more than anyone else to convince the outside world that Ireland could product cool software". Although Glockenspiel achieved exports worth millions, the company was sent into examinership in 1992 and acquired by Computer Associates. Glockenspiel's difficulties are attributed to their difficulties entering the U.S. market, specifically in choosing a distributor and in signing an exclusivity agreement. John Carolan spoke specifically to Iona Technologies about his U.S. market entry and Chris Horn described Carolan as an influence on their market entry strategy.

> *"...in a sense he was a precedent and showed that it was possible to build a world class product based in Ireland and build a market in the U.S. which was essentially what we were trying to do as well and he had shown the concept was workable"* – Chris Horn.
>
> *"...they were certainly role models for sure, we would look at what they had done, not in hugely analytical detail but more anecdotally"- Annrai O'Toole*

One of the other founders describes it as a weaker link;

> *"...I think you would want to be careful not to overstate that. We certainly talked to John and we certainly knew some of the things that John had been bitten by"- Sean Baker*

He does acknowledge that they:

"...learned from his mistakes" [in relation to their U.S. market entry]

As a result, Iona Technologies did not sign an exclusivity agreement in the U.S. market. The other founders don't describe this influence as explicitly, in that there was not any significant analysis in making this decision. They did see Glockenspiel as "a role model" but this was more technically than commercially at that time. Chorus Systemes, a French software company as noted earlier had also advised Iona Technologies on the critical importance of the U.S. market.

7.5.2. Phase two internationalisation

The second internationalisation phase of the company was characterised by increasing involvement in the U.S. and a move into the number one software market in Europe at that time, Germany.

Following the equity agreement with Sun Microsystems in December 1993, the company established a sales office in San Francisco. The key reason to choose San Francisco was to have close proximity to Sun Microsystems. One of the founders Annrai O'Toole relocated to San Francisco to head up the operation. The eight-hour time difference between Ireland and San Francisco proved too difficult to work with for the company at that time. As a result, Iona Technologies opened an office in Boston, Massachusetts which has a five hour time difference and more workable with the Dublin location. At this point, this office performed marketing and sales activity with product development activity based in Ireland. However, Hewlett Packard were

in close proximity and they were working on producing a competitor product to Iona Technologies'. When Hewlett Packard announced it was closing their development facility, Iona Technologies agreed to hire some of its key engineers. This was how a software development activity was started in the Boston location in 1995.

7.5.2.1. Market selection

In 1994, Iona Technologies were completely focused on the U.S. market when they were approached by a German consulting company, this is described in the interview with Chris Horn :

> *"...when we launched the product we were entirely focused on the U.S. market and out of the blue we were approached by a German consulting company who said we like your product, could we represent you as a reseller. And we said of course and signed an agreement for a three-year term and this was sort of opportune and we subsequently went into Germany on our own round about 1996".*

This was viewed as an important strategic direction for the company. Again it was somewhat opportunistic in responding to an opportunity in the market and little comparative analysis was done in choosing the reseller. This is described somewhat differently by one of the other founders as follows:

> *"...that was a case of the right strategic decision of the market to go after, but poorly executed" - Annrai O'Toole*

The decision to expand into Perth Australia in 1996 was a similar opportunistic decision as occurred in relation to the Boston development site. A London-based developer in a competitor company Tibco, initiated a discussion with Iona Technologies about setting up a development site in Perth. Nomura, a large Japanese

Bank in London, was a customer of both Tibco and Iona Technologies. Perth being in the same timezone as Tokyo and Hong Kong, it was believed that this new development centre in Perth could also provide support for these markets.

There are differing views within the founders of the reasons to expand into Australia. One is a rationalised view of accessing a pool of graduates in a depressed economy while also serving the Asian market;

> *"...at the time the IT sector in Ireland was becoming more competitive in terms of access to human resources as the industry was gaining momentum and there weren't enough qualified people, costs were rising and we need to find a new pool of talent. Secondly, we had sales and customers in Japan, live systems but we really didn't have a way of handling the after sales technical support for our Japanese customers..." – Chris Horn*

The other view is one of purely opportunistic decision making without any market analysis. Annrai O'Toole viewed this decision as a mistake in that the company needed to have sales office in the country market;

> *"...no one in their right mind would try to build an Asian market from Australia"*

They did open a sales office in Hong Kong also in 1996. The Perth development operation was subsequently closed in 2002. The third founders' view on this acknowledges the opportunistic nature of the decision but in a more positive sense;

> *"...it was opportunistic. We still do business in Australia and still use their code and we have incorporated their code into a beta version of our latest product"*

He highlights in relation to the closure;

> *"...it happened solely because of the down turn in the software industry. It was a great site, good people, good value for money"*

It would appear there is agreement on the opportunistic location of a development site, but a difference in opinion on the decision to support the Japanese market from Australia. The reasons underlying this are considered further in internationalisation pattern analysis and the role of psychic distance on location choice.

7.5.3. Phase three internationalisation

The third phase of internationalisation of was characterised by a deepening involvement in Europe, in Germany and in the then second most important software market in Europe, the U.K. Germany was viewed by Iona Technologies as;

> *"...in 1993, the first or second most importance market in Europe, and still is" - Annrai O'Toole.*

Regardless of the differing views concerning the mode of entry and execution of the decision, it was viewed a key milestone of the company in expanding into the critical European software market. The company established their own sales office in the German market in 1997. In 1997 also, a sales office was established in the neighbouring U.K. market and in the more distant Chinese market. At that point in time, Germany was the number one software market for Iona Technologies in Europe. By the time of their second product launch Artix, the U.K. had taken this position of the most important market in Europe with Germany second.

7.5.4. Phase four internationalisation

This fourth phase of internationalisation saw the company add to their presence in Europe and make significant inroads into the Asian market. From 1998 onwards Iona Technologies were trying to reposition the company and this saw a number of

technologically driven acquisitions (as opposed to geographically market driven). They acquired Transarc a wholly owned subsidiary of IBM and also acquired a license to source code from EDS. This further strengthened their U.S. presence.They continued the European strategy and opened a sales office France. In 1999, they also extended their Asian presence opening offices in Singapore and Korea . Further sales offices were opened in Sydney and Melbourne, Australia in 1999.

7.5.5. Phase five internationalisation

This fifth phase saw some more acquisitions and also some consolidation of international activities and locations. The acquisitions were primarily technology-led and not used as a market entry mode geographically. For example, Chris Horn noted that in the case of OOC (team in St Johns Newfoundland); this was a completely complementary technology but at a lower end of the market and helped provide a fuller portfolio of products. Iona Technologies gained a development site in Newfoundland, Canada in 2001 through the acquisition of OOC and it continues to support that product. The acquisition of Netfish was an attempt to break into a new vertical market segment of retail and logistics software. Chris Horn describes the acquisition as being in;

> *"...the geographic markets where we were strong already but it would have been a new vertical market"*

A sales office was established in Spain also in 2001. With the downturn in the technology industry 2001 (as Horn describes "...the markets turned against us in summer 2001"), this phase also saw some consolidation of international activities and locations. Sales offices were closed in Singapore and Korea in 2001 while a new development centre was opened in Beijing, China. Their view on the Chinese market and decision to open a development site there described by one of the founders:

"...the China site is partly to develop our relationship with China and partly because the cost is low and partly because we had an expansion of our product line and we had to support our existing product in China. We do quite well out of China because it is such a big market" – Sean Baker.

The Perth development site was closed in 2002 and the remaining Australian sales offices in Sydney and Melbourne were closed in 2003.

7.6. Internationalisation pattern matching

The analysis of the internationalisation pattern of the company begins with pattern analysis with some of the earlier models of internationalisation – the U and I models, referred to as an incremental process of internationalisation. The case is then analysed against the key "Born Global" models of internationalisation to date.

7.6.1. Incremental internationalisation

The concepts of the U-Models and I Models of internationalisation as a stage-process are reviewed in Chapter 2. The well-known Johanson & Vahlne (1977) model has been selected for analysis of an incremental process of internationalisation. They describe a pattern of incremental internationalisation in four steps as follows:

Step 1: No regular export activity

Step 2: Independent representative/selling via agent

Step 3: Establishment of sales subsidiary

Step 4: Establishment of production facility

The pattern of internationalisation is presented in a causal chain as follows:

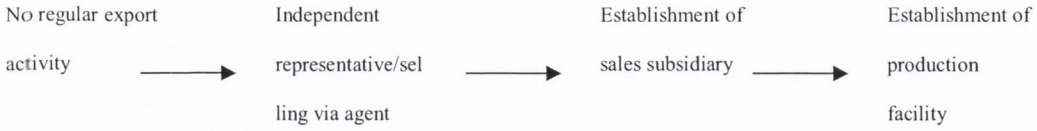
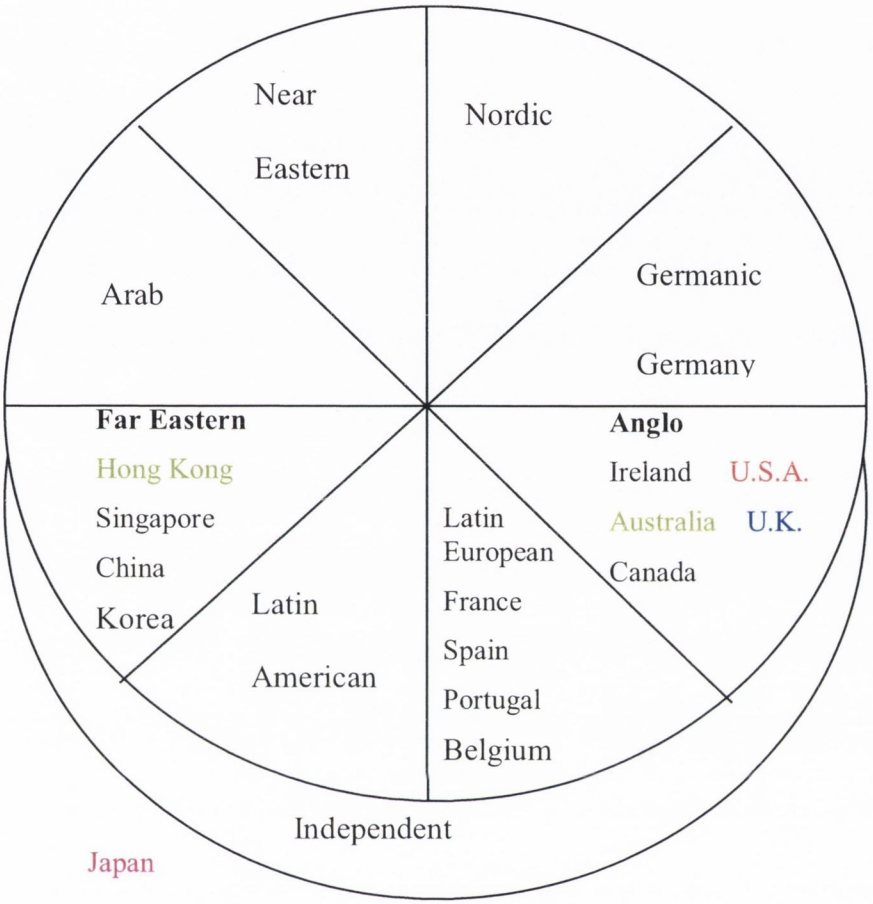


Figure 7-2: Establishment chain of Johanson & Vahlne (1977)

This establishment chain assumes sales in the home market before the first step of "no regular export activity". This is the first point at which the pattern of internationalisation at Iona Technologies differs from the incremental process pattern as the company although formed in 1991, did not have any product sales in the home market and its first product sales were "export activity". The second point at which it differs is the fact that it had product sales (through the Internet) that were not through an agent (step 2) and before establishing a sales office (step 2). It therefore starts from a point of "Having export sales" to move to "establishment of a sales office". Johanson & Vahlne (1977) highlight that "in no case has a firm started production in a country without having sold in a country via an agency or a sales subsidiary before" (p.26). While this was consistent with Iona Technologies first internationalisation decision in the U.S., this was not the case with their establishment of a development facility in Australia at a time when they had no product sales or sales office in Australia.

Johanson & Vahlne (1977) also note that "the time order of such establishments seems to be related to the psychic distance between the home and the import/host countries" (p.24). The following diagram illustrates psychic distance analysis of internationalisation decisions using Ronen & Shenkar's (1985) psychic distance clustering.



Red = Stage 1 internationalisation decisions
Green = Stage 2 internationalisation decisions
Blue = Stage 3 internationalisation decisions
Pink = Stage 4 internationalisation decisions
Black = Stage 5 internationalisation decisions

Figure 7-3: Psychic distance analysis of internationalisation decisions using Ronen & Shenkar's (1985) clusters

While this indicates first internationalisation decision was to a market psychically close to Ireland – the U.S., in the form of product sales first and then establishing a sales office, the next market decision was different. It was then to psychically distant markets – Germany, Hong Kong and Australia. While this indicates an incremental pattern of decision making, this does not appear to be related to the psychic distance. As noted by Vahlne & Nordström (1992) in Chapter 2, psychic distance does not have such explanatory power, but nor does market potential fully explain it either. Interviews with each of the founders gave consistent explanations of the country choices at a particular point in time. In summary, the explanations of the "Anglo-clustering" of countries for Iona Technologies were as follows:

U.S. market – "Early adopter" characteristic of the market

Australia – Opportunistic resource seeking decision

U.K – Market potential in the European software industry

Canada – Technology driven acquisition

In particular, the psychically close market of the U.K. was not targeted until later in the international development of the company (stage three internationalisation) and this was driven both by the I.P.O. and the increased importance of the U.K. in the European software industry, particularly in the telecoms sector.

While the data collected does not indicate psychic distance is driving the country choice, there is evidence that psychic distance does still have some impact. When each of the founders were questioned in relation to the U.S. market and why they chose this market, they were in strong agreement about the characteristic of the market. When questioned further about the ease of doing business with the U.S. due to

language, cultural and legal factors – they highlighted that it was not a reason to choose the U.S. but rather an enabling factor in the ease of doing business.

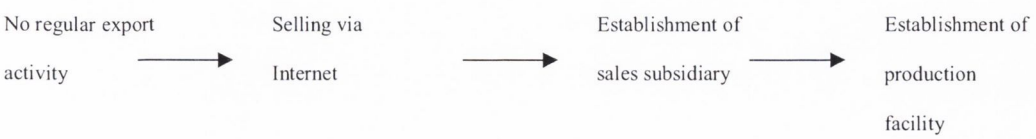
This is evident further in the decision to serve the Japanese market from Australia initially. When questioned if they considered establishing a sales office directly in Japan at that time..;

> *"...we had actually looked at that and then there were the culture and language issues and I was cautious about opening a centre in Japan with Japanese staff. Also there was an expense issue, Tokyo was extraordinarily expense at that time and the cost of office space was exorbitant. So it would have been higher cost and with cultural issues*"- Chris Horn.

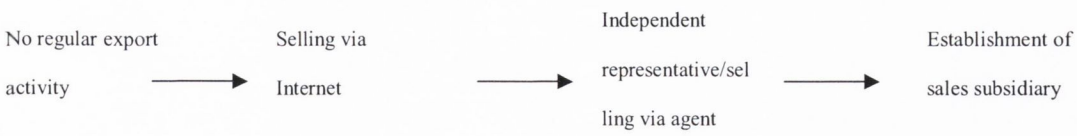
This indicates that the Australian location may have been chosen on the basis of the perceived psychic distance of the Japanese market. As a Japanese sales office was opened in the later internationalisation stage, this is consistent with a pattern of later internationalisation decisions with psychically distant markets.

The pattern of internationalisation, when analysed against Johanson & Vahlne (1977) model illustrates a different pattern for each market of the first internationalisation decisions of the company. The pattern of Iona Technologies is presented below:

U.S. market (1994-1998)



German market (1994-1997)



Australian market (1996-1999)

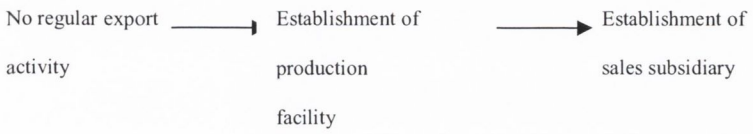


Figure 7-4: Analysis of internationalisation decisions using Johanson & Vahlne (1977) incremental model

While the patterns may be similar to Johanson & Vahlne (1977) in their gradual nature, they differ in a number of ways. These differences are in the internationalisation stages, the chain of establishment and the role of psychic distance.

7.6.1.1. The internationalisation steps or stages

The original model does not anticipate a stage between "no regular export activity" and "selling via an agent", which in this case study is the use of the Internet both to sell and distribute product before the establishment of a sales office or software reseller. It also does not have in its underlying assumptions the possibility of a company with no domestic market.

7.6.1.2. The chain of establishment

None of the markets followed the chain of establishment outlined in the Johanson & Vahlne (1977) model of internationalisation. In fact, none of the markets followed exactly the same process of internationalisation and differ quite considerably between

major markets – the U.S., Germany, and between major commitment decisions such as Australia.

7.6.1.3. The role of psychic distance

The psychic distance does not impact internationalisation decisions in the same "time-ordered" way as in the above mentioned internationalisation model. The U.S. market "happens" to be in the same psychic country cluster but this is not the basis of market selection. The psychic closeness of the two countries helps in the implementation of the decision but is not the reason to entry the market. For example, the U.K. market is also within the same psychic clustering but they did not enter that market until much later in their internationalisation when they had established themselves in the U.S. market. There is evidence of the distant psychic distance of the Japanese market being a perceived barrier in internationalisation, overcome by the initial decision to serve this market from the psychically closer market of Australia. However, the Australian market also served another purpose as a development site and was a lower cost location than Japan. These factors were also considered in the decision making.

The issues of knowledge underpinning the Johanson & Vahlne (1977) model – lack of knowledge as an obstacle in international operation, the acquisition of knowledge and the knowledge of the decision maker are analysed later in the case.

7.6.2. "Born Global" pattern analysis

The research to date on the relatively new "Born Global" phenomenon is reviewed in Chapter 2. The internationalisation pattern of Iona Technologies is analysed against "Born Global" internationalisation pattern developed by some of the key researchers in this area to date. These are outlined in the following table:

Table 7-2: "Born Global" pattern analysis

"Born Global" analysis	**Author**
"Born Global" firm profile	Rennie (1993)
"Born Global" internationalisation attributes	Chetty & Campbell-Hunt (2003)
"Born Global" pattern	Möen & Servais (2003)
"Born Global" internationalisation process	Coviello & Munroe (1997)
Factors influencing "Born Global" phenomena	Knight & Cavusgil (1996)

7.6.2.1. "Born Global" (Rennie, 1993)

Rennie (1993) describes "Born Global" firms as those which began exporting only two years after foundation and achieved 75 per cent of their total sales from export.

He describes a "Born Global" firm's profile as follows:

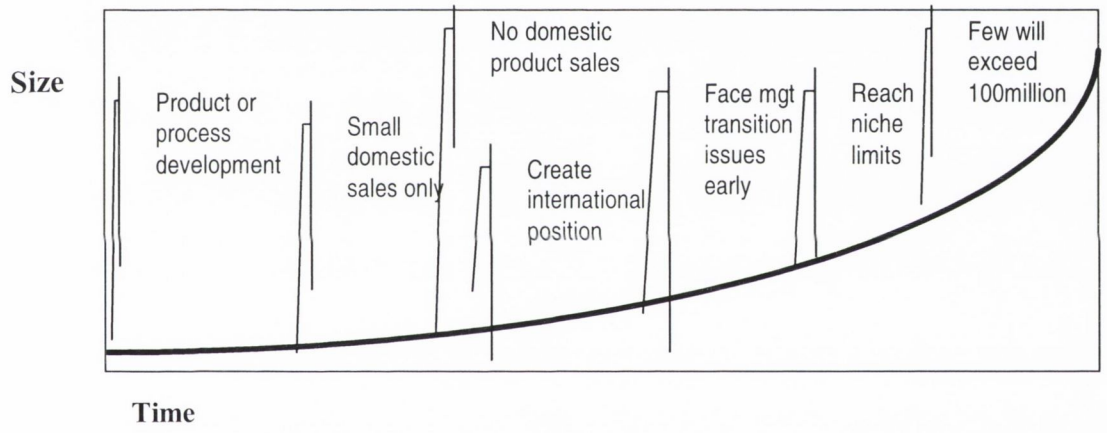


Figure 7-5: The "Born Global" firm's profile (Rennie 1993, p. 46)

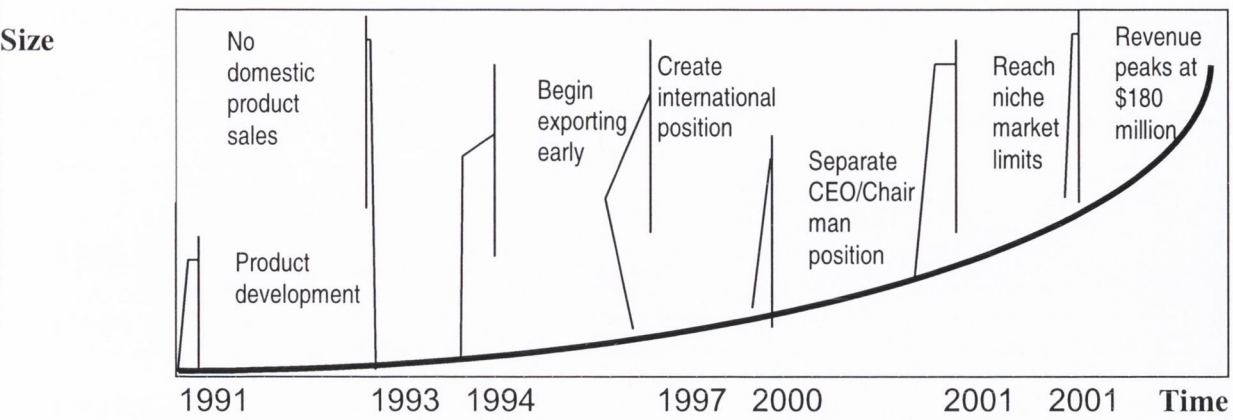


Figure 7-6 Case firm profile using Rennie (1993, p. 46)

Iona Technologies profile is analysed against Rennie's (1993) "Born Global" pattern above. There are a number of similarities in their early internationalisation. While Rennie (1993) uses the criteria of within two years of formation, the case in question is not exactly within that criteria. The company formed in 1991 but did not have product prototype available for the market until 1993 (two years later) and internationalisation within one year of their first product launch. So while not strictly within the criteria, the company can be described as one which "internationalised earlier in its existence" and perhaps the date of product availability is a more appropriate milestone than date of company formation. The "small domestic sales" factor is strong in the Iona Technologies profile in that they had no domestic product sales at all at that stage. The key milestones of "begin exporting early" and "create international position" are consistent with the path of Iona Technologies.

While Rennie (1993) does not specify a timeframe in his profile, he notes that the average age of the companies studied was fourteen years. The period examined within the milestones set out indicates a shorter timeframe for Iona Technologies (a ten year period) and possibly shorter given that they reached a revenue of over $100million in

1999. This would therefore indicate a more accelerated process. The technologically motivated acquisition phase from 1999-2000 indicates that company had reached the limit of a single product, Rennie (1993) terms this "reaching the limits of niche market".

There are a lot of similarities with the "Born Global" firm profile mapped by Rennie (1993) – early internationalisation, niche market, competing against larger established players worldwide. However, there would appear to be a stronger profile of a "Born Global" firm in Iona Technologies. This is evident in having no domestic market, an accelerated internationalisation time-path and reaching higher growth rate than indicated in Rennie's (1993) research.

7.6.2.2. "Born Global" (Chetty & Campbell-Hunt, 2003)

Chetty & Campbell-Hunt's (2003) research describes "Born Global" firms as "having near simultaneous and thus rapid engagement with multiple markets national markets; as occurring early in the life of the firm, when the firms is still small and thus able to operate only in niche global markets or in emerging markets opening up to new technologies; and as requiring greater use of business networks to achieve global reach quickly". They highlight the difference in the definition of "Born Global" and clearly define "Born Global" firms as having internationalisation within two years of inception. They identify a number of key internationalisation attributes for the "Born Global" firm for which a comparative analysis with the case study in question is completed in the following table;

Table 7-3: Comparative analysis of "Born Global" internationalisation attributes (Chetty & Campbell-Hunt, 2003)

Internationalisation Attribute	**"Born Global" View (Chetty & Campbell-Hunt, 2003)**	**Iona Technologies**
Home market	Domestic market largely irrelevant (75 per cent export ratio)	Domestic market largely irrelevant (100 per cent export ratio)
Prior internationalisation experience	Founder has extensive experience in relevant markets	Founders have experience in relevant technological market
Extent of internationalisation	Many international markets developed at the same time	Many international markets developed at the same time
Pace of internationalisation	Rapid	Rapid
Psychic distance	Relevant in first market selection decision. Reduced relevance once internationalised	Irrelevant in market selection decision, relevance in success of execution
Learning to internationalise	Learning occurs not from slowly accumulated market experience but from superior internationalisation knowledge	Learning occurs not from slowly accumulated market experience but from superior internationalisation knowledge
Firm strategy	Competitive requires rapid, full internationalisation; Product/market focus is niche	Competitive requires rapid, full internationalisation; Product/market focus is niche
Use of Information and communications Technology (ICT)	Key role as enabler of global market reach	Key role as enabler of global market reach
Network of business partners	Rapid development of global reach requires rapid, comprehensive network of partners	Network of business partners developed in a fast opportunistic way

These are explained further:

Home market: This compares positively with the internationalisation attributes outlined above, with a stronger export ratio than identified than Chetty & Campbell-Hurt (2003).

Prior internationalisation experience and **Learning to internationalise:** Internationalisation experience and learning in relation to each of the founders is analysed in more detail later in the case study under "accumulated international experience". The evidence from the case study indicates that the founders had prior experience in international technological areas which were important in their international decisions, particularly in relation to the U.S. market. The founders' involvement in the ESPRIT programme prior to founding the company was critical in their understanding of the technological market. They were also involved in the International OMG forum, which they described earlier as a "critical forum" one which was critical for them to become involved in from an international perspective.

> *"...I was intensively travelling in Western Europe for a period of 10 years before forming the company"* – Chris Horn.
>
> *...we knew the market quite well"* – Sean Baker.
>
> *"...OMG was primarily a U.S based organisation. And through this I had met all of the global competitors and companies commercially interested in the technology and a lot of the customers were there"* - Annrai O'Toole.

Extent and pace of internationalisation: This is analysed further in the case analysis under "level of internationalisation". There is not a clear definition of what may be viewed as "simultaneous" within Chetty & Campbell-Hunt (2003) research. Iona Technologies developed international activities in many near and distance market within a short period of time. Between 1994 and 1997, the first three years of internationalisation they had opened development sites in the U.S.A and Australia, and had opened sales offices in Germany, U.K, Hong Kong and China.

Psychic distance: Chetty & Campbell-Hunt (2003) highlight that psychic distance irrelevance predicted by the "Born Global" model did not hold true in their study of New Zealand firms. Their study displayed a similar pattern as to that of traditional firms (Incremental process of Johanson & Vahlne (1977)) in selecting countries of close psychic distance. As outlined above in analysing the pattern of internationalisation against this traditional model, the psychic distance of the initial markets did not have relevance in the decision in this case but rather the nature of the market itself (early adopter of technology). However, it is possible from the case study evidence that in later internationalisation decisions, that psychic distance dictated the entry mode (in the Japanese market initially). And while psychic distance did not play a role in market selection in initial markets, this closeness meant the company found it easier to do business with the U.S. market;

> *"...We also didn't think there were huge barriers for us to do business in the USA, we felt that culturally we were a match"* and
>
> *"...we felt that the culture within the Irish software industry had been heavily influenced by the USA market for many years"* – Sean Baker.

The possible link between the U.S. influence on the Irish software industry and psychic distance is explored further in the case study.

Firm strategy: Chetty & Campbell-Hunt (2003, p74) describe the "Born Globals" in their research as having products which are "technology intensive and highly specialised" and "with a small number of customers in each country". They describe them as "market leaders in a product with a good reputation". Stern (2004, p. 146) describes how in 1993, "Iona Technologies was still a tiny operation with just eight employees. But it could network with the big corporations. Their techies respected the expertise of its techies". The company from its early days had developed a reputation

in technology and were perceived as market leaders in the highly specialised middleware market. When questioned on their firm strategy as to what was critical to the growth of the firm (product development or market development) all founders were in agreement on the need for geographic market development in 1993:

> *"...market development but we couldn't rest on our laurels either. Market development at that stage was more important than product development but we had to still invest in our product"* – Chris Horn.
>
> *"... well in a sense that we were developing a product so without the product we were nothing. But we were trying to grow a market into which our product would fit at the same time. It really was hand in hand"* – Sean Baker.

Use of Information and Communications Technology (ICT): Chetty & Campbell-Hunt (2003) conclude that extensive use of ICT is not a "sufficient condition for the rapid-internationalisation "Born-Global" path. This conclusion is based on their research which showed that firms which followed the traditional incremental internationalisation process also had ICT as "central to the business model". Throughout the interviews with each of the founders, an Irish software company Glockenspiel, a predecessor to Iona Technologies in the middleware market is discussed. The nature of the questioning focuses on the company as a role model and their experiences. In an interview with Kenny (2001, p. 114), Chris Horn notes that:

> *"... the time we had our first product in 1993, the Internet was much more developed – it was possible to sell to though the Internet to a U.S technical audience. Had it been there in the 1980s, Glockenspiel would have been a brand name as much as Iona is today".*

The use of ICT and in particular the impact of the Internet on their U.S. market entry is discussed earlier in this chapter. The founders are all of the view that the use of the

Internet at the point in time was a critical factor in the firms early international success. This is possibly industry specific, cognisant of the fact that Chetty & Campbell-Hunt (2003) cases span a number of industries. This may also be an issue of timing, the "Born Globals" studied by the above had formed between1972-1996. Glockenspiel was formed in 1984, and entered the U.S. market in 1988. Iona Technologies' critical use of the Internet for product awareness, distribution and support started in 1994, indicating a different era of company and possible Internet usage.

Network of business partners: Distributors, subcontractors, buyers and sellers are all included as an international network in Chetty & Campbell-Hunt (2003). The international network that Iona Technologies most benefited from in their internationalisation was that of industry networks. In particularly the U.S. presence on the OMG strongly guided and enabled their entry into the U.S. market. This is discussed earlier under the role of industry networks. Their involvement in the Esprit project also provided them with a useful network in the European software industry:

> *"...we had very good contacts in the European industry. We knew senior people in some of the big companies whom we did talk to"* – Sean Baker.

Their role in the international industry network is also described by Stern (2004). He notes that Iona Technologies, while affiliated with OMG attempted to bridge rival industry factions. He describes how the company has maintained a relationship with Microsoft who were pushing its own object management technologies in opposition to OMG. He describes Iona Technologies as being:

> *"...an upholder of industry standards that also stays friendly with Microsoft – a tricky diplomatic act at the best of times, one it has performed consistently"* (Stern, 2004, p.149).

From inception the company benefited from its industry network in the U.S. and Europe in its internationalisation and developed a different role for itself in that international network. The industry specific nature of the role differs somewhat from that defined in Chetty & Campbell-Hunt (2003).

The comparative analysis between the "Born Global" attributes presented Chetty & Campbell-Hunt (2003) and that of Iona Technologies indicate some similarities and differences. They show similarities in the nature of the home market, the pace and pattern of internationalisation, the role of internationalisation experience and learning and the firm strategy. They differ in the role played by psychic distance and in the industry specific areas of the role of ICT (and particularly the Internet), and the nature of the international networks.

7.6.2.3. "Born Global" (Möen & Servais, 2002)

Möen & Servais' (2002) research on "Born Globals" across Norway, France and Denmark examines the influence of the year of establishment on export intensity, global orientation, geographic and psychic market coverage. Firms are classified using three dimensions, first year of exporting and time period from establishment until first export activity. A pattern of internationalisation is presented as follows:

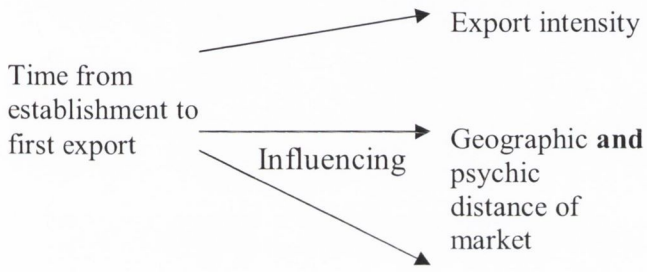


Figure 7-7: "Born Global" internationalisation pattern created from Möen & Servais (2002)

According to Möen & Servais (2002), firms that internationalise within the shortest period from establishment (0-2 years) have a higher export intensity and global orientation. They found that the year of establishment had no significant impact on export intensity, global orientation or the geographic or psychic distance to the first and most important export market. They therefore highlight that it is not the year of establishment of the firm but the period from establishment to exporting that was significantly different in "Born Globals" and a strong indicator of export intensity. They classify firms in three groups by year of establishment: 1800-1975, 1976-1989 and 1990-1998. They note that older firms (established before 1975) began exporting later had a low export intensity.

Analysing Möen & Servais (2002) pattern above against the case study in question:

Year of establishment: 1991

Time before export: 0-2

The following chart indicates the export intensity (100 per cent) and profile of revenue over time for the company.

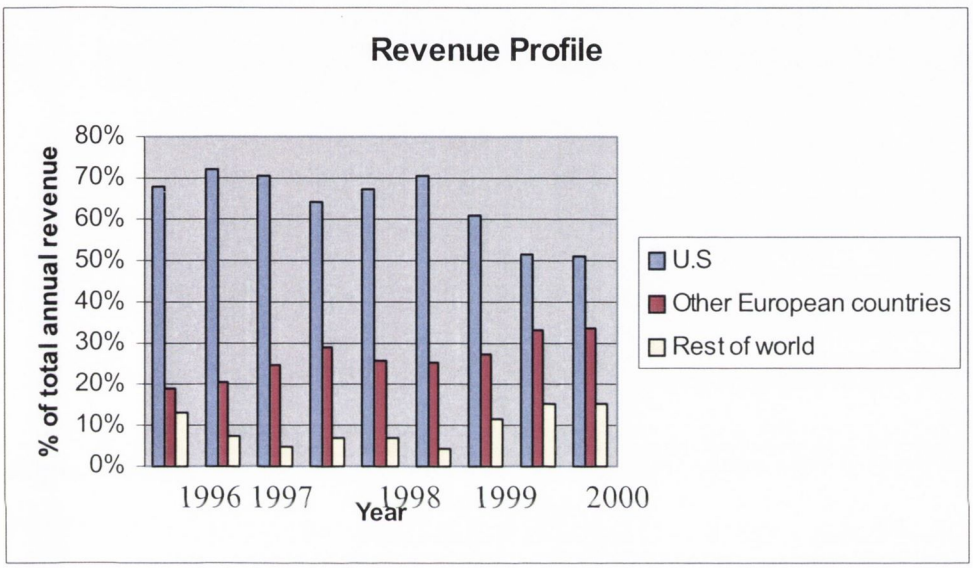


Figure 7-8: Iona Technologies revenue profile 1996-2004

Iona Technologies is therefore consistent with Möen & Servais (2002) grouping of "new firms" or "Born Globals". However, the export intensity of the Norwegian, French and Danish firms were 54%, 49% and 59% respectively. Iona Technologies had an export intensity of 100%, but one can not necessarily conclude that this higher level is also due to the short period of establishment to exporting. Their results in the Norwegian firms (but not French and Danish) showed the firms that began exporting soon after establishment exported to the most distant markets psychically and geographically and exported to a greater number of countries. Iona Technologies exported to both psychically close markets (U.S.) and psychically distant markets

(Germany) in their early internationalisation stage, they did export to a large number of countries in comparison to their Norwegian and French firms.

The following diagram shows the analysis of Iona Technologies internationalisation pattern against the "Born Global" internationalisation pattern from Möen & Servais (2002) described above.

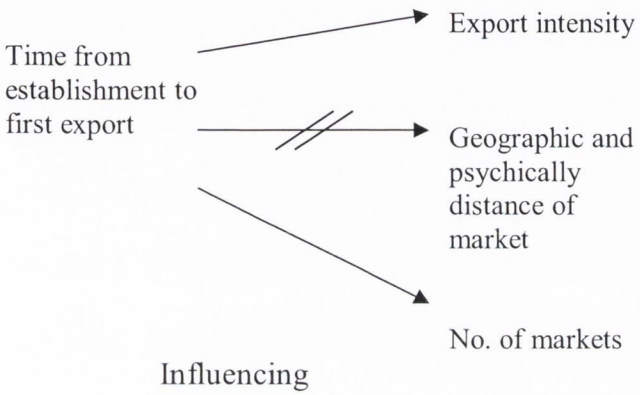


Figure 7-9: Pattern analysis of Iona Technologies and "Born Global" internationalisation pattern (Möen & Servais, 2002)

It indicates a similar pattern in the influence of the period from "firm establishment to export" on export intensity. However, it shows a significant difference in export intensity than categorised by Möen & Servais (2002). While their pattern indicates that these firms export to more psychically and geographically distant markets and to a greater number of markets. Iona Technologies pattern of internationalisation is not completely consistent with this in exporting to psychically close and geographically distant markets in their early stages. This may indicate an irrelevance in psychic distance as a driver of market selection as indicated in some of the previous pattern analysis.

7.6.2.4. Internationalisation of small knowledge-based software firms

Coviello & Munro (1997) developed an internationalisationalisation process of small software firms based on their case study research of four firms established between 1978 and 1983. The firms were varying in size from $2-$15million with an average growth rate of 83 per cent annually. The following is the process outlined by Coviello & Munro (1997) from their study:

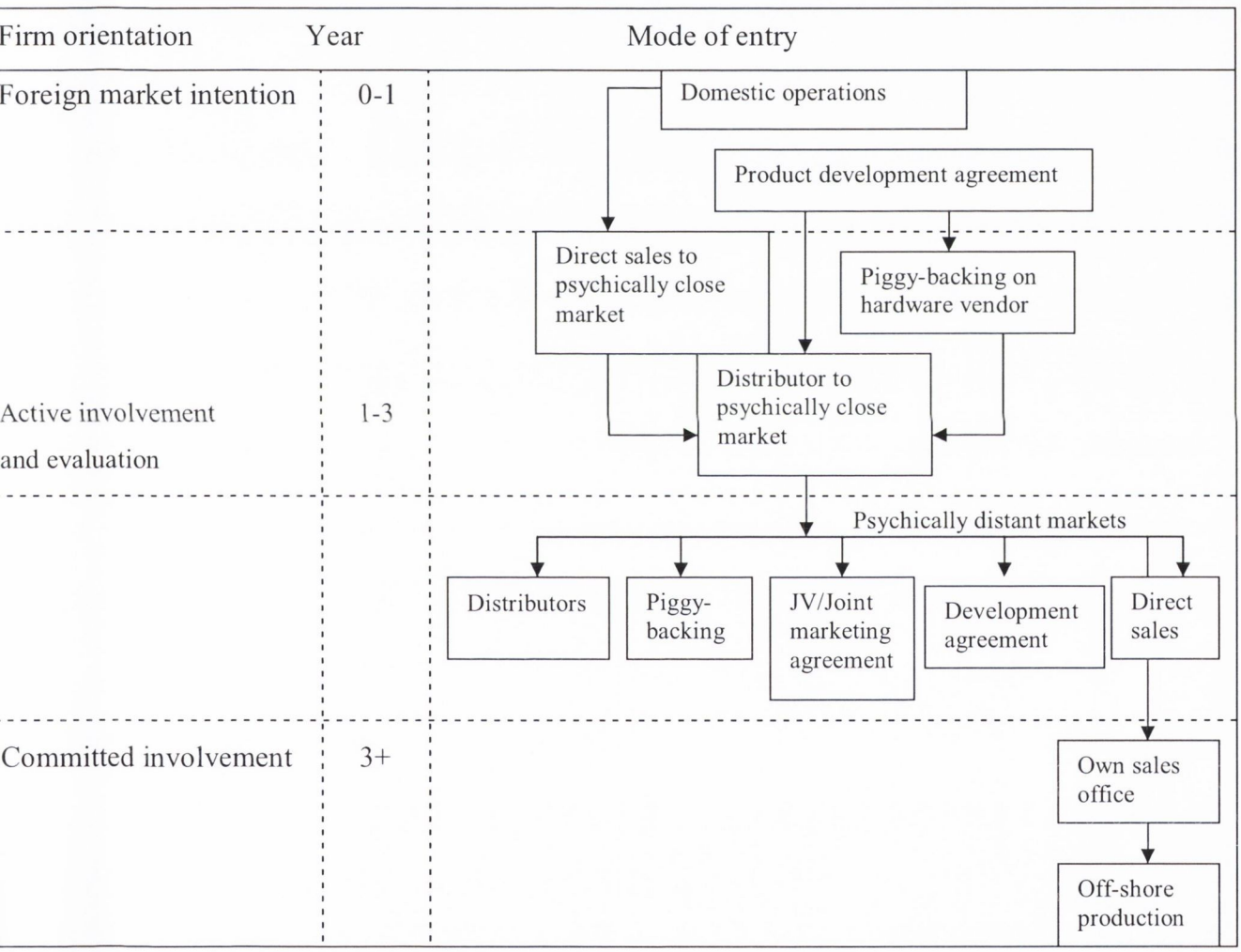


Figure 7-10: Adaptation of "The international process of small software firms" (Coviello & Munroe, 1997, p. 370)

There are a number of key characteristics in each of the phases identified by Coviello & Munroe above:

Overall it indicates and compressed timeframe, becoming "committed internationalists" within three years (p. 379).

In years 0-1 the firms had largely a domestic focus.

- Prior to their first market entry, some firms established a product development agreement with a large overseas partner. These agreements provided them with development funding and these relationships quickly evolved to distribution agreements.
- The psychically close market was also physically close.
- In stage 3, markets were both psychically and physically distant.
- Establishment of sales office occurred in only two of the firms and in the later 5-7 year stage. Although the U.S. was considered a critical market, establishment of product development facility there was completed by one firm in the later 5-7 stage of internationalisation.
- The rapid internationalisation growth of the firm is "a result of their involvement in international networks" (p. 372) influencing foreign market selection and market entry. They describe how the early partners of these small software firms were large international or multinational hardware vendors.

An analysis of this pattern of internationalisation against that pattern displayed by Iona Technologies is completed as follows:

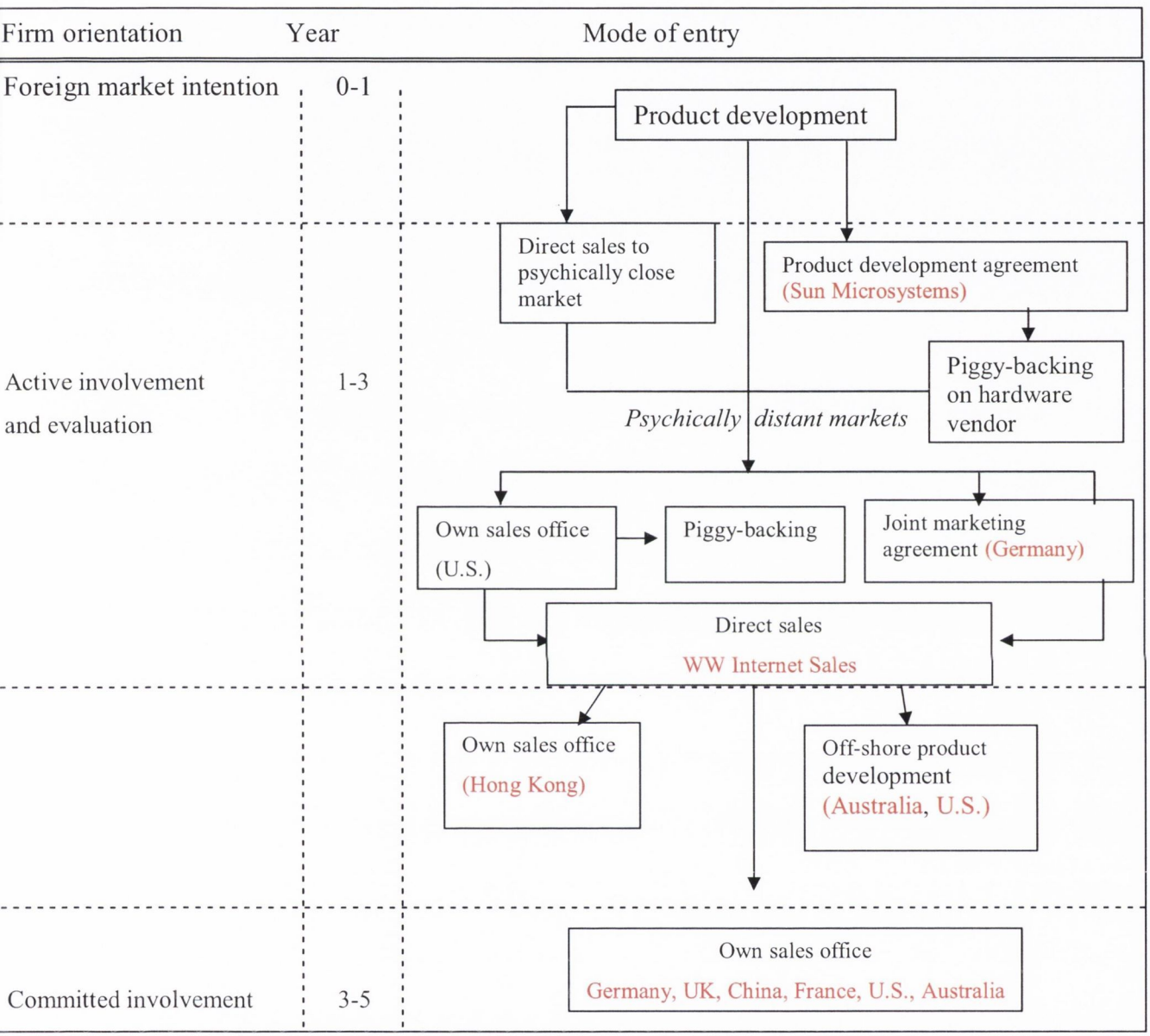


Figure 7-11: Analysis of Iona Technologies with Coviello & Munro's (1997) international process of small software firms

Firstly, there some differences in the profile of the firms in the age and time period within which the firms were formed and internationalised. Previous analysis has shown that the earlier period of foundation 1978-1983 versus the later establishment

date of Iona Technologies of 1991 may explain differences in distribution and market entry modes due to ICT advances and in particular the Internet. The average growth rate of Iona Technologies over a ten year period (1994-2004) was 68 per cent - this includes the industry slow-down period (from 2001-2004). However, the growth rate over the first five years of internationalisation (covering the three phases of internationalisation) was an average 140 per cent. This indicates a higher growth rate, than the average of 83 per cent in Coviello & Munro's (1994) firms.

The pattern of internationalisation of Iona Technologies in comparison to the pattern exhibited by the New Zealand software firms indicates some key similarities in relation to product development agreement and the role of networks in internationalisation. However, there are also characteristics of the process which don't match in relation to the pace and the impact of psychic distance:

7.6.2.5. Pace of internationalisation

This higher growth rate mentioned above is also evident in a more accelerated pattern of internationalisation of Iona Technologies, as all growth of the company was international revenue. The first data point is from the date of establishment of the company (stage 1: 0-1 years). As Iona Technologies was formed in 1991 but spent the first two years in product development but not having a domestic product sales focus, the more relevant data point is perhaps the date of first product prototype availability. Following this data point, in year 2 (stage 2: 1-3 years), an accelerated pace of internationalisation in evident in this phase. Key milestones of product development agreement, U.S. direct sales, U.S. sales office and German product reseller agreement all occurred within this period. Direct Internet sales to the U.S. specifically but by the nature of the Worldwide reach, available to all markets is also a key milestone at this

stage. Offshore product development occurs in years 4 and 5 (since company formation), whereas in the New Zealand cases, this did not occur (if at all) until much later in the firm's existence (years 5 to 7).

7.6.2.6. Impact of psychic distance:

There is no clear differentiation between sales to psychically close and distant markets in the case of Iona Technologies. Initial internationalisation decisions are with psychically close but geographically distant markets and they move into psychically distant markets within the same stage, unlike the New Zealand firms. This happens in stage 3 of the New Zealand firms, indicating that perhaps Iona Technologies and these firms are following a similar pattern but at a different pace (as noted above).

7.6.2.7. Product Development Agreement

In December 1993, Iona Technologies concluded an agreement with Sun Microsystems, a multi-million dollar U.S. corporation. Sun Microsystems were aware of Iona Technologies from the OMG forum involvement and had seen their product prototype at the U.S. trade show. They flew over from California to see the company. This is described by one of the founders:

> *"...what he (Jim Greene, Sun Microsystems) wanted from us was that our COBRA product would work with his on Sun's computing equipment. And he wanted two board seats"* – Chris Horn.

Sun Microsystems invested $600,000 for 25 per cent of Iona Technologies, at that time the company had revenue of £30,000 from consulting services. This agreement was described as:

> *"... very critical for the company"* – Chris Horn

The IDA was evaluating Iona Technologies for investment at that time and when the agreement came with Sun Microsystems, they matched their investment with another $600,000. This was in the form of job grants, enabling them to create 56 jobs and the remaining 50 per cent in a repayable loan. In return the IDA took a 7 per cent equity position. Stern (2004, p. 147) describes how "the company went on a recruitment drive in early 1994", after Sun Microsystems bought a minority stake in the firm and provided it the investment needed.

In addition,

> *"...Motorola at that time were interested in our products but were worried about our size and durability. When they saw that Sun had invested in us, we got a contract from them worth $600,000"* – Chris Horn

The critical impact of the product development agreement with Sun Microsoystems is consistent with Coviello & Munro's (1994) pattern of international internationalisation. It is described as follows:

> *"...an initial relationship with a larger firm is developed in the first year of the small firm's lifecycle, often in an opportunistic or reactive manner and usually for the purposes of product development. This relationship also provides a mode of entry to a psychically close market"* (Coviello & Munro, 1995, p.381).

The also note that the early partners of these small software firms "tended to be large internationally-established hardware vendors", this was also the case with Sun Microsystems. Iona Technologies moved out of their Trinity location to a development centre with Sun Microsystems in Dublin. They also opened their first U.S. sales office in San Francisco and chose this U.S. location because of its close proximity to Sun Microsystems. They did a joint marketing campaign at that stage with Sun Microsytems. Coviello & Munro (1994) describe how in stage 3 of

"committed involvement" that the firms growth patterns are controlled by the initial partner and the initial network and while this gives them increased international visibility, it also leads to conflict/power play with the initial partner. By 1996, the Iona Technologies/Sun Microsystems relationship was experiencing some difficulties, mainly driven from a technology standpoint but also due to Iona Technologies' intention to go public at this stage. Sun Microsystems had subsequently developed their own JAVA technology which created internal rivalry for the ownership of their software strategy. Chris Horn, CEO describes this conflict in his proposition to Sun Microsystems:

> *"... you invested in Iona because of COBRA and OMG, now your whole strategic direction is changing towards JAVA and away from COBRA. Therefore, Iona is not as strategically important to you as it was. If we were to an IPO your 25 per cent would be worth $50million"* – Chris Horn

Iona Technologies gained their independence from Sun Microsystems following their IPO in 1996, as Sun Microsystems sold their 25 per cent for $60 million. They continued their international growth and market development independently, without being acquired by a larger international firm to date. Coviello & Munro (1994) describe how with increased market visibility in the later stages of internationalisation, the firm may become a target, as happened in three of the four New Zealand cases.

Coviello & Munro (1994) refer to networks of social and industrial relationships, among them they give examples of customers, suppliers, competitors, family and friends. They describe how opportunities and threats may be presented to the firm by their network of relations which may drive or facilitate (or inhibit) it international development. They particularly emphasise the role of hardware vendors in partnership

with these firms early in their formation. The role of networks in the development of Iona Technologies differs from the above. Their involvement in ESPRIT prior to the formation of the company gave them a set of European industry relationships and visibility, their involvement in OMG gave them an industry network in the critical U.S. market and another level of recognition. As noted earlier in analysis against Chetty & Campbell-Hunt (2003) "Born Global" pattern, they developed a highly visible role in a specialised industry network.

7.6.3. Factors influencing "Born Global" phenomena

Knight & Cavusgil (1996) describe how research over the past 20 years provides support for the existence of the "Born Global" firm. They focus on contextual factors that have contributed to the rise of the "Born Global" firm. They outlined six factors which they believe help explain this; (1) Role of niche markets; (2) Advances in process technology, (3) Advances in communications technology; (4) Advantages of small companies; (5) Accessibility; (6) Importance of global networks. This in-depth case study supports five of those factors and indicates some additional factors, these are discussed in more detail below:

Role of niche markets: Knight & Cavusgil (1996) highlight that with globalisation of markets and increased competition from large multinationals, small firms only way to compete was in narrow global niches. There is also a possible linkage here with the nature of the home market as highlighted earlier in the analysis. The small size of the home market and the characteristic of the market in relation to leading-edge technology niche, meant there was no domestic base with which to start from.

Advances in communications technology: Knight & Cavusgil (1996) note this specifically in relation to the ability to share information and the reduction in cost of

internationalising. The advances in communications technology, specifically in relation to the advent of the Internet was a critical factor in the internationalisation of Iona Technologies. However, while benefiting from the ability to share information – they specifically benefited from direct sales and product distribution through the Internet. This approach also had cost benefits in their early internationalisation as opposed to a more tradition physical product distribution. However, as noted in the pattern analysis with Chetty & Campbell-Hunt (2003) "Born Global" firms, the use of the Internet in this way may be specific to the industry and at a specific point in time.

Advantages of small companies: Some of the advantages of the small companies are seen as flexibility, adaptability, ability to respond quicker (Knight & Cavusgil, 1996). Iona Technologies displayed such characteristics in their flexibility and ability to respond quicker than larger competitors ;

> *"...Boeing evaluated our technology and that of our competitors ..but more importantly Boeing got a problem solved in a very short time"* – Chris Horn.

but also in relation to innovation:

> *"...we had innovative ideas about how to market and distribute it"* - Annrai O'Toole

Knight & Cavusgil (1996) refer in particular to small American firms and their ability to adapt quicker to international tastes and standards and Rennie (1993) to the customisation ability of Australian firms. Iona Technologies had targeted individual IT professionals in organisations (which they believed to be early adopters of new technology, as an individual nor organisations). They describe how their knowledge of the U.S. market and how the industry work in the U.S. helped them in adapting to the U.S. business practises:

"...so we knew that Americans just want to call a U.S number, and they don't want to hear about + 353. What's this + thing ? They just want to ring a local number. Why don't we set up a number, okay lets make it a 1800 number and it really worked, this understanding of listening to Americans and trying to see what it is that individuals want to do rather than necessarily the companies...because it could be hard to read company culture, a business culture but it is easier to read people" – Sean Baker.

Accessibility: Knight & Cavusgil (1996, p. 22) describe how the "means of internationalisation – knowledge, technology, tools and facilitating institutions" have become more accessible to all firms. The issue of knowledge, how it is acquired and accumulated is dealt with in detail under *Internationalisation Knowledge* later in this chapter. The access to international research platforms is another key factor. Stern (2004) describes how in the 1980s, the computer science department at Trinity College Dublin was earning $1.5 to $3 million annually from ESPRIT projects – funded by the European Union. Stern (2004) notes how the founders of Iona Technologies considered the work on the CORBA product as an extension of their work they had done in the ESPRIT projects.

Importance of global networks: The influence of global networks emerges in the analysis of Coviello & Munro (1994) and Chetty & Campbell-Hunt (2003) "Born Global" patterns, specifically in relation to Iona Technologies role in an international industry network and agreement with a large U.S. multinational at the early stage of their development.

An a additional factor which appears to be a significant influence of the "Born Global" pattern of this case study firm is the characteristic of the initial target market (the U.S. in this case) in terms of its adoption of new technology. For a small firm,

with leading edge technology or a unique product innovation, the key market selection criteria appears to be wherever this technology is likely to be adopted most quickly.

7.6.4. Summary "Born Global" internationalisation pattern

The analysis of Iona Technologies internationalisation pattern above indicates a lot of similarities with "Born Global" firm internationalisation to date. The analysis with Rennie's (1993), Chetty & Campbell-Hunt (2003), Möen & Servais (2002), Coviello & Munroe (1997) findings on "Born Global" firms indicates in most cases a similar or stronger pattern of "Born Global" internationalisation. The analysis in this section suggests contextual differences related to the industry and the point in time of analysis and the stage of ICT development. The analysis provides in-depth insight into the characteristic of the target market from a technology adoption perspective, the role of psychic distance and the impact of international networks.

7.7. Internationalisation Level

The following section focuses developing an understanding of the internationalisation level of the firm using measures as described in Chapter 6 and presented in the following framework:

Table 7-4: Framework for measuring firm internationalisation

Level of internationalisation	Pattern
Financial measure Foreign sales/revenue as % of total (FS) Organisational measure Ratio of full-time employees in international activities (FEIA) Depth of internationalisation: % of value chain activities performed outside home country (D)	Time mapping of internationalisation decisions together Psychic distance mapping of the location of the decisions Geographic distance mapping Pattern of factors influencing each of major internationalisation decisions

Two key indicators – financial and organisational are used as follows:

7.7.1. Financial measure

The company has one industry segment reportable for all revenue – "Enterprise Infrastructure Software", this includes product and services revenue. The company has three headquarters as follows: Corporate headquarters: Ireland, U.S. headquarters: Massachusetts, Asia-Pac Headquarters: Japan. Revenue is reported geographically into three areas – U.S., "European countries" and "Rest of world". The structure and countries/states covered in each of these regions is illustrated as follows:

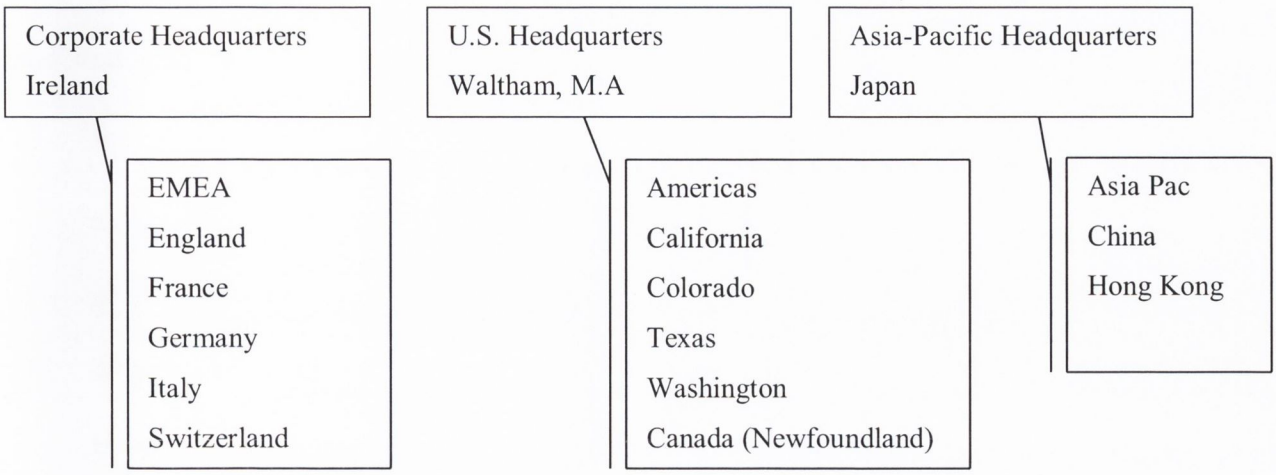


Figure 7-12: Iona Technologies geographic structure

The domestic market – is recorded in company reports in relation to tax liabilities but not as a separate revenue generation within the EMEA (Europe, Middle East and Africa) region. This indicates the insignificance of the home market from a product revenue perspective. When this was questioned further with the CEO, it was clarified as follows:

> *"...the sales revenues directly from Ireland in general are negligible - we have very few customers indeed here. Ireland is thus primarily a cost centre"* – Chris Horn.

Therefore, from an international revenue perspective, practically 100 per cent of revenue is generated from outside the domestic market. However, since the Intellectual Property Right (IPR) is owned and resident in Ireland, there are also transfer tax agreements in place with the overseas subsidiaries whereby they remit appropriate royalties back to Ireland, on which Irish tax is liable. This explains a tax liabilities figure on income to the Irish operation, which is reported in the annual company reports.

The key focus of the company has been the U.S. market and achieving a geographic and strategic balance between revenue from the U.S. and elsewhere:

> *"... if you go back to 1993, the revenue was all from the U.S., by the time we went public, my recollection it was about 80 per cent U.S. and 20 per cent rest of world. And we wanted to get to a point that it is 50/50. Today it is only about 40 per cent U.S and now it's a concern in that we have gone too low"* - Chris Horn

He also highlights that the revenue profile is also related to the product lifecycle

> *"...we have an elderly product coming to the end of life and new opportunities for that are limited and we have a new product and its back to the story of where are the early adopters for new product and in practise it tends to be the U.S. Over the next year or so, I would expect the mix to go back to 50/50, on the basis of this new product"* – Chris Horn.

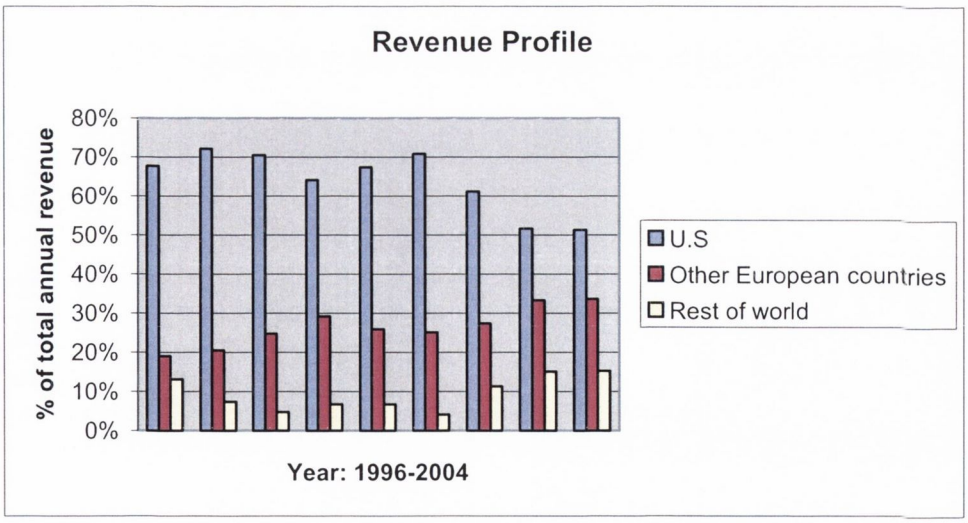


Figure 7-13: Iona Technologies international revenue profile (source: company reports)

The above graph depicts the revenue profile from 1996 to 2004, with the U.S. representing 51 per cent, EMEA 34 per cent and "rest of the world" 15 per cent in the year ending 2004.

As outlined in Chapter 6, international ratio is used in this case study, as a more inclusive term than "export ratio" given the various market entry modes available to firms. Knight & Cavusgil (1996, p. 12) highlight however, that "Born Globals" do not see foreign markets as simple adjuncts to the domestic market. This is similar also in the case in question, as foreign markets are not represented relative to domestic revenue but the market is considered global. The break-down in revenue is therefore of the global market.

7.7.2. Organisational measure

Two organisational measures of the internationalisation of the company are used – headcount allocation to international markets and value chain analysis.

Internal headcount data reports headcount allocated geographically to U.S., AP (Asia Pacific), EMEA (Europe, Middle East and Africa). Internal company data from HR systems were only available for the previous four years (2000-2004) and the following graph illustrates the headcount allocation geographically over this period:

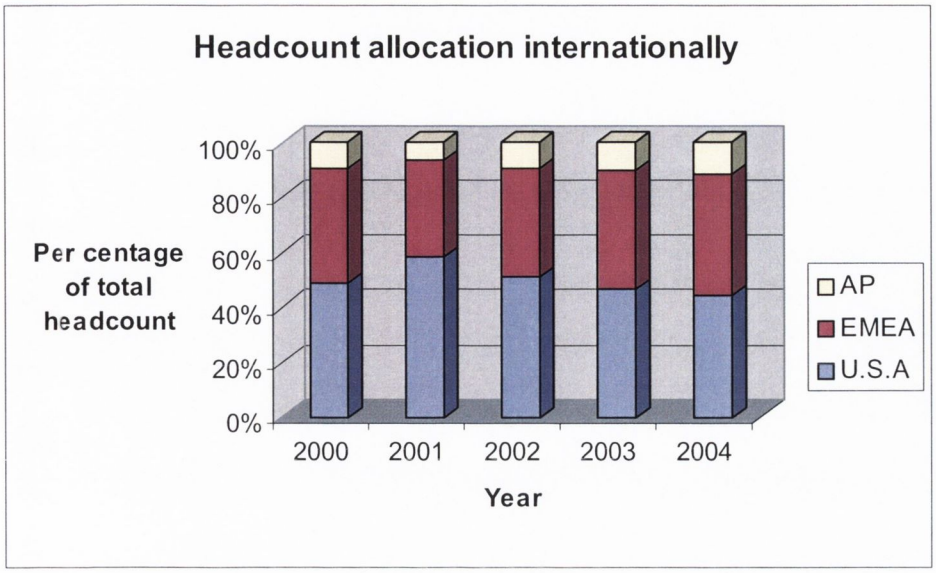


Figure 7-14: Iona Technologies headcount allocation (source: company internal data)

In 2004, the headcount allocation was; U.S. 45 per cent, 44 per cent EMEA, and 11 per cent AP. The headcount of the domestic Irish operation in 2004 was 120, which is 35 per cent of the total headcount.

Autio *et al.* (2002) developed a dimension of internationalisation – internationalisation *depth* in which they use the value chain – degree of internationalisation of the value chain and the number of value chain functions performed outside the home country. They note in their study of Finnish "Born Global" technology firms, that "the depth of internationalisation seemed to be enhanced by the small domestic market compared to the global market" (2002, p. 6). Oviatt & McDougall (1994) also used Porter's (1985) value chain in this way and highlight that the value chain focuses on the degree of dispersion among activities.

In this case study, a similar approach has been adopted to understand the depth of internationalisation. Using an indicator of the depth of the internationalisation moves from the numeric simplicity of the measure "number of countries into which the company sells its products". The following international value chain analysis uses Porter's (1985) generic value chain.

The core high value-added activity of the company - software development, is performed in four locations Ireland, U.S., Canada (as a result of acquisition) and China. Corporate Marketing activities are performed centrally in corporate headquarters in Ireland while sales, marketing and consultancy services are performed locally in country offices and headquartered in Ireland. Some additional country sales activities – India, Nordic are supported from the Ireland location, and Iberia from the Italian office.

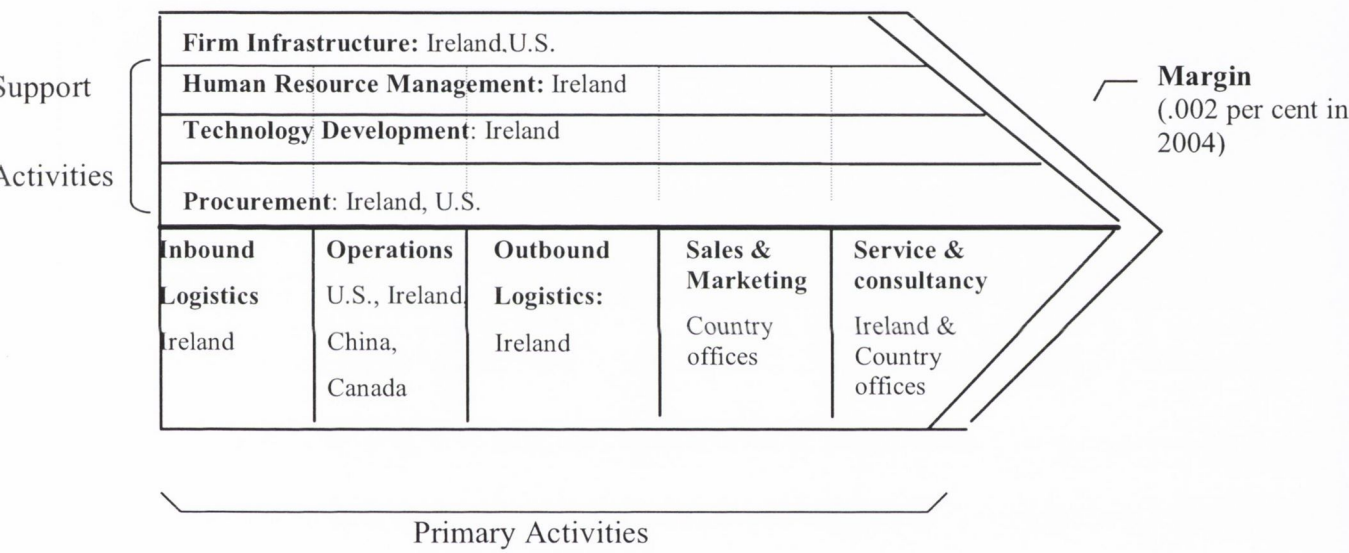


Figure 7-15: Iona Technologies value chain analysis 2004 based on Porter (1985)

One of critical differentiating factors in the Iona Technologies value chain in comparison to the depth of internationalisation in the Finnish case studies mentioned above, is the performance of core value activity – R & D or product development (software development is defined as the core "operations" activity). In all the Finnish cases, this was retained in the home country with some co-operation with foreign partners relating to learning and business model development. Iona Technologies performs R & D in three other locations outside of Ireland – U.S.A, China and

Canada. The following graph illustrates how the headcount is allocated by activity (product development includes all R & D activities). In 2004, 37 per cent of the total company headcount was employed in product development activity spread across these four locations.

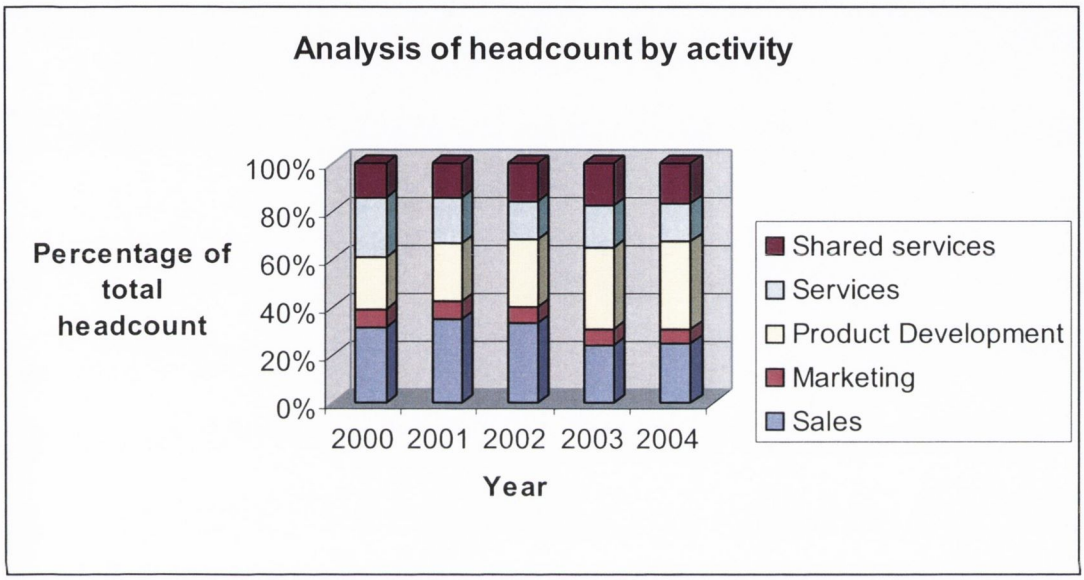


Figure 7-16: Iona Technologies headcount analysis by activity (source: internal data)

An indication of the depth of internationalisation was established using the measurement indicators outlined in Chapter 6, with 60 per cent of value chain activities performed internationally in 2004. The following table shows the **High** level of internationalisation of Iona Technologies in 2004, based on the defined financial and organisational measures.

Table 7-5: Iona Technologies level of internationalisation, 2004

Level of internationalisation	High	Iona Technologies 2004
Financial		
International ratio	>50 per cent international ratio	FS: 100 per cent international ratio
Organisational		
Ratio of full-time employees in international activities (FEIA)	FEIA: > 50 per cent	FEIA: 65 per cent of employees in international activities and locations
Percentage of value chain activities performed outside home country (D).	D: > 50 per cent	D: 60 per cent of primary activities performed internationally

7.7.3. Knowledge Intensity

The following operationalisation of the concept of knowledge intensity was developed and presented in Chapter 6.

Table 7-6: Knowledge intensity indicators

Type of measure	Knowledge Intensity Indicator	Weighting
Input measure	R & D spend as a percentage of sales revenue annually	33.33 per cent
Output measure	Percentage sales from new products annually	33.33 per cent
Human capital measure	Percentage of knowledge workers in the organisation relative to total headcount	*33.33* per cent
	Composite measure	*100* per cent

7.7.3.1. Input measure

This is the most easily calculated due to companies reporting R & D levels in this way and therefore probably the most common measure of knowledge intensity. The following graph illustrates the levels of R & D in Iona Technologies from 1994 to 2004:

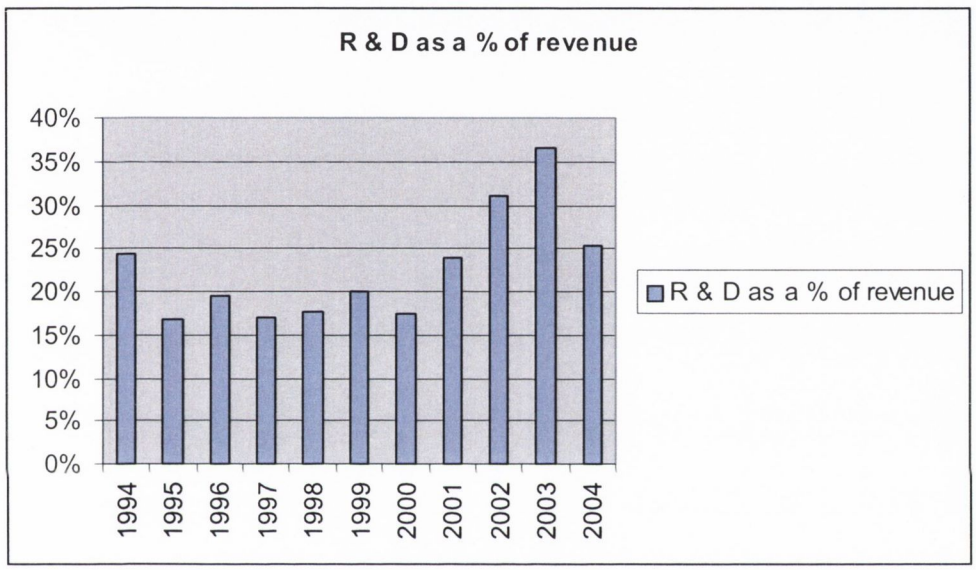


Figure 7-17: R & D as a percentage of revenue, Iona Technologies

The varying levels of R & D over this period are related to the product lifecycle of the first product Orbix and their second product Artix, (with a R & D peak of 37 per cent in 2003) as explained in an in-depth interview:

> *"...I think it will come down again, the reason for that growth was the investment in the Artix product. As we have now got through the first phases of shipping product we will clearly add value but the increase in the last few years has been the investment in Artix product"* – Chris Horn

In relation to an average rate of R & D for the firm:

> *"...we are targeting about 18-19 per cent is generally seen as the average for companies in the range of 100-200 million revenue"* - Chris Horn

The average level of R & D over the period from 1994 to 2004 is 23 per cent. The level of R & D expenditure in the company in a given year relates to the stage of product lifecycle, this is evident from the above graph. The product life cycle of a software product was discussed in detail in interviews with the founders:

> *"...unless a software product has a premature death and that certainly does happen, there is no doubt about that, the tail or the end of the software product life cycle can be extremely long and so once you actually ramp up to have very large number of customers and strategic use, the chances are that that runs stablely and even if you never see another customer in our mature product, but we are still not there yet. I would say 10/12 years from the peak to the tail being so small it is not worth doing and maybe 20 years overall"* –
> - Sean Baker [referring to peak of product lifecycle and tail or decline stage of product lifecycle].

And..

> *"...in Iona Technologies, R & D is skewed by the longevity of the company. If a company is essentially a "one-hit-wonder" and the intent is to build a product, build a business and then sell it there is going to be intensive R & D at the first part of that cycle – building a product/getting it out there, after it reaches mainstream and plateaus the percentage of R & D may come down assuming you don't intend to build another product cycle. It's interesting as in the case of our core product Orbix, it's 12 years now and I didn't expect it to be so long and it's wonderful as it still providing a profitable cashflow from maintenance which we are now re-investing in the Artix business. In a sense there is a long tail at the end of the life cycle"*
>
> – Chris Horn.

With the growth stage of the Orbix product, the company's level of R & D ranged 17-19 per cent between 1995 and 2000. Then with the development of the Artix this ranged from 24-37 per cent between 2001 and 2003. This longer than expected life cycle particularly at the mature stage, also impacts the internationalisation levels in the expected revenues from the new product in the U.S. ("Early adopter") market and expected revenues from the European and Asian ("Early majority/Late majority) markets. Due to the fluctuations in R & D spend relative to product lifecycles, the average R & D levels between 1994 and 2004 is taken as the Input Measure for knowledge intensity.

7.7.3.2. Output Measure

Iona Technologies 2004 company report states that "To date we have derived most of our revenue from the licensing of our Enterprise Integration Products that currently comprise of our Orbix products and fees from related services". Access to internal company information on product revenue revealed that there was no revenue from the new Artix product in 2003 and 10 per cent of the total revenue in 2004 is attributed to the new Artix product. In a Q3 2005 press release, it is noted that the Artix product achieved 62 per cent growth from 2004.

7.7.3.3. Human capital measure

The definition "knowledge workers" is taken from Chapter 6, Stewart's (1994) definition of as "professionals, senior management, technical, engineering and scientific staff" (1994, p.294) and also to Sveiby's (1997) differentiation between professional and support staff in measuring human capital. The first step in establishing a measure of human capital is the classification of employees. Iona Technologies internal headcount is classified as follows:

Table 7-7: Internal headcount classification, Iona Technologies, 2004

Sales
Marketing
Product Development
Services
G&A (Central support functions)

Internal data was only available on internal HR systems from 2000 to 2004. Using Stewart's definition above and also differentiating between support and professional staff, the following classification of employees was completed. Sales, marketing, product development and services were all classified as knowledge workers. Sales and Services staff in this technology niche, tends to be from a technical or scientific background. G & A classification includes financial, HR, IS as well as administration and while this would also have a technical/professional element, it has been largely classified as the central administrative function and not classified as "knowledge workers". The following classification was then applied to the internal headcount data:

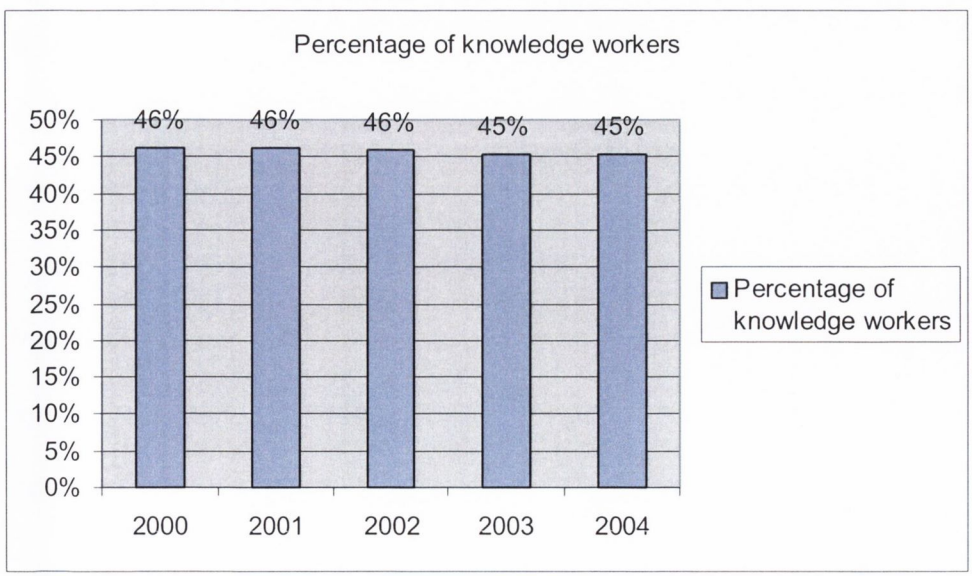


Figure 7-18: Percentage of knowledge workers in the organisation

The above indicates an average percentage of knowledge workers of 46% over the period 2000-2004.

Table 7-8: Iona Technologies composite knowledge intensity indicator

Type of measure	**Knowledge Intensity Indicator**	**Weighting**	**Iona Technologies**
Input measure	23%	33.33%	7.6659
Output measure	10%	33.33%	3.3333
Human capital measure	46%	33.33%	15.3318
	Composite measure		26.33

Using the knowledge intensity scale developed and described in Chapter 6, Iona Technologies has a composite measure of *high* knowledge intensity as illustrated below:

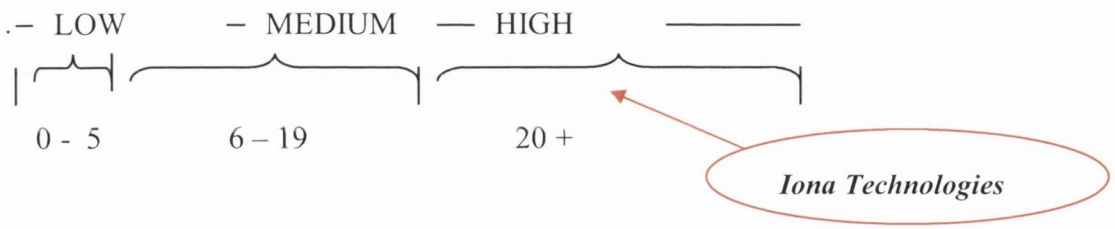


Figure 7-19: Knowledge intensity scale

It is likely that the above *output measure* would increase in 2005 as the market is developed for the new product. It is also likely that the above *input measure* would reduce as the product development effort reduces and in line with a long product life cycle as outlined earlier in this chapter. The human capital measure has not varied hugely over time as indicated in the earlier graph. The relevance of the high level of knowledge intensity is examined further in relation to industry specific context in the case conclusion.

7.7.4. Internationalisation Knowledge Accumulation

As described in detail in Chapter 6, a scale of internationalisation knowledge accumulation was developed from Eriksson's *et al.* (1997) and Hadley & Wilson's (2003) work in this area. A detailed set of questions was developed in each of the three areas to establish a measure of internationalisation knowledge at a point in time:

- Internationalisation knowledge (IK): focusing on senior management/founders international experience, the international vision & growth of the firm, and international marketing experience.
- Business knowledge (FBK): focusing on the firm's knowledge about international competitors, international complementary products/services, foreign distribution channels and foreign business contacts.
- Institutional knowledge (FIK): focusing on knowledge about laws, norms, international standards and foreign language capability.

The objective was to measure internationalisation knowledge accumulation over time and therefore to establish the "stock of knowledge" in a firm. As noted in Chapter 2, research by Eriksson *et al.* (1997) indicates that accumulated internationalisation experience is not related to specific country markets (as assumed in U-Models) but is *firm specific* knowledge related to all markets.

Christensen & Jacobsen (1996) in their study of newly established international firms in Denmark, conclude that firms have different routes to internationalisation based on "knowledge acquired prior to the initiated new business". Similarly, the idea that knowledge can be acquired by hiring individuals with valuable international experience is supported by Barkema & Vermulen (1998), Reuber & Fischer (1997) and Erkko *et al.* (2002).

These key developments in our understanding of knowledge are examined in this case study. Two points in time were identified to measure internationalisation knowledge – In 1993 at the point of formation of the company and in 2004 at the point in time the case study.

7.7.4.1. Internationalisation knowledge accumulation in 1993

Each of the original three founders of the completed the Internationalisation Knowledge Accumulation questionnaire divided into the three knowledge areas noted above IK, BK and NK. The results of this are displayed below in a construct table:

Table 7-9: Internationalisation knowledge accumulation by company founders

Individual	Company status	IK Score	BK Score	NK Score	Organisational Score
Founder 1	CEO	10	12	7	29
Founder 2	Chief Scientist	8	12	9	29
Founder 3	Resigned as director in 2002	6	6	7	19

As noted above, two of the original founders of the company in 1993 hold positions of CEO and Chief Scientist respectively. The third founder above founded another technology company Cape Clear Software in 1999 with three other Iona Technologies executives. He resigned as director of Iona Technologies in 2003. The founders score of internationalisation knowledge accumulated by the company in 1993 on the scale of 0-45 is represented graphically as follows:

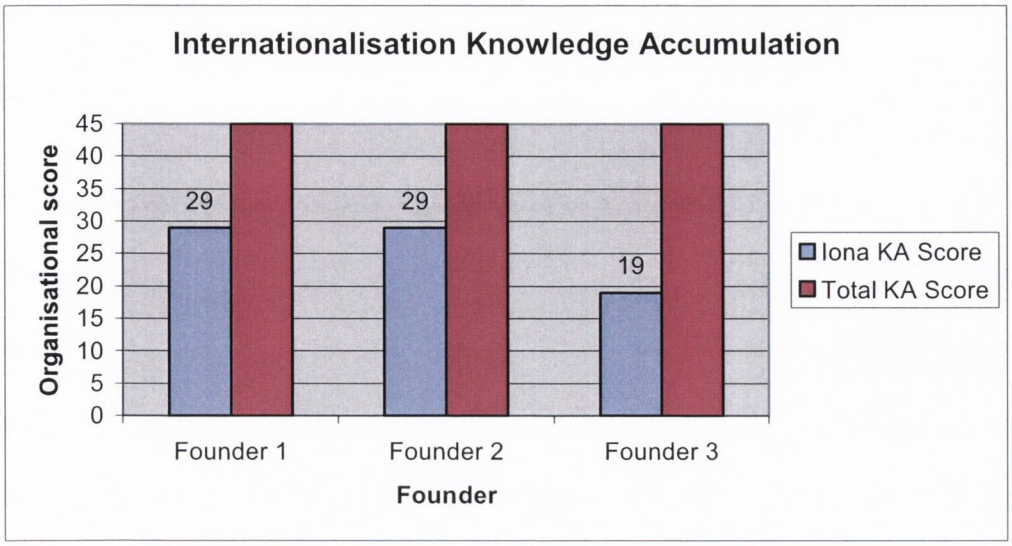


Figure 7-20: Internationalisation knowledge scale

The following examines each of the three areas IK, BK and NK in more detail and the variances across the founders' evaluation of the internationalisation knowledge accumulated in the company.

Internationalisation Knowledge (IK)

The objective here is to gain a measure of the international capability of the firm. To do this there are three areas encompassed in the design of the questionnaire - knowledge & experience of founders and executive management, firm's niche in an international market and the firm international marketing capability. There is evidence of variance across the three founders' scores in this area. One of the founders was very experienced internationally at the time of forming the company with the other two having some international experience. The view of the founders was that they had a "highly competitive value proposition" at that point in time. The strategic marketing capability of the company was evaluated by the founders as being "poor" with little marketing experience in the company. All saw market development (developing new markets for existing products) as critical to the growth of the company at that point

but that further product development was also a significant factor in the longer term growth.

Business knowledge (FBK)

The objective in this area is to develop a measure of the firm's international business knowledge in the context of their firm. This area of knowledge showed some variance in scoring across the three founders for the same company specific questions. Two of the founders (those still with the company) were unanimous on their high scoring of company's knowledge of their international competitors and their knowledge of distribution channels at that time. The third founder (no longer with the company) indicated this was a basic level knowledge. All were in agreement on the existence of an international agreement with Sun Microsystems and the importance of this to the company's development in 1993. Eriksson *et al.* (1997) claim that this construct of knowledge (business knowledge) is likely to reflect the strongest influence of the firm's market, given that it is concerned with understanding other firms in the wider international network.

Institutional knowledge (NK)

The objective is to develop a measure of the firm's knowledge of foreign market norms, regulations and standards. This area of knowledge showed the least variance across all three founders. This may be due to the nature of the knowledge element. Hadley & Wilson (2003, p. 713) highlight that foreign institutional knowledge "is the only form of knowledge that can be conveyed by third parties" and that "it is an easy form of knowledge to collect and transmit". This is typically the focus of government associations and agencies. Two out of three founders were in agreement on their use of government agency (IDA or Enterprise Ireland), the third founder's data did not corroborate with this. This was clarified further at interview with one of the founders and it was an issue of the exact date in which the use of the support agency occurred. The questionnaire focuses on 1993, the IDA agreement was in early 1994. However, there is agreement that they had sought support of IDA in late 1993, early 1994. There is slight variation in the degree of institutional knowledge in the company at that point in time, in most cases varying from "no knowledge" to "poor".

In general, the data on internationalisation knowledge of the company corroborate with each other on a number of areas:

- The existing international expertise in the company on founding;
- The lack of international strategic marketing planning at that point in time;
- The clear focus on market development as opposed to product development in 1993;
- The hiring of international expertise;
- The engagement of institutional organisations;
- The existence of an early international alliance with Sun Microsystems and its importance in their development;

- The level of institutional knowledge within the company in 1993.

There is evidence of variance in their scoring of the degree of international business knowledge within the company. However, this variance is consistent with the slightly lower degree of knowledge of the company indicated by the founder who has since left in comparison to the founders who are still with the company. This may be explained by a more positive bias of those still with the company or a negative bias as a result of legal proceedings between the exiting director and the new company (which occurred in 2002).

7.7.4.2. Internationalisation knowledge accumulation in 2005

The members of the Executive Management Team completed the Internationalisation Knowledge Accumulation questionnaire divided into the three knowledge areas noted above IK, BK and NK. The members of the Executive Management team and their current role in the company are indicated in the table below together with their scoring in each of the areas:

Table 7-10: Internationalisation knowledge accumulation by Executive Management Team in 2005

Individual	Company status	IK Score	BK Score	NK Score	Organisational Score
Executive Mgr 1	CEO	12	10	10	32
Executive Mgr 2	VP Alliances & Asia	10	15	8	33
Executive Mgr 3	VP Investor Relations	8	8	10	26
Executive Mgr 4	Chief Technology Officer	12	13	10	35
Executive Mgr 5	General Counsel	8	9	10	27
Executive Mgr 6	VP	7	10	9	26
Executive Mgr 7	Vice Chair	9	13	10	32
Executive Mgr 8	VP WW Sales	0	0	0	data incomplete

The following examines each of the three areas IK, BK and NK in more detail and discusses the comparative differences with the firm internationalisation knowledge at foundation and how it has since developed.

Internationalisation Knowledge (IK)

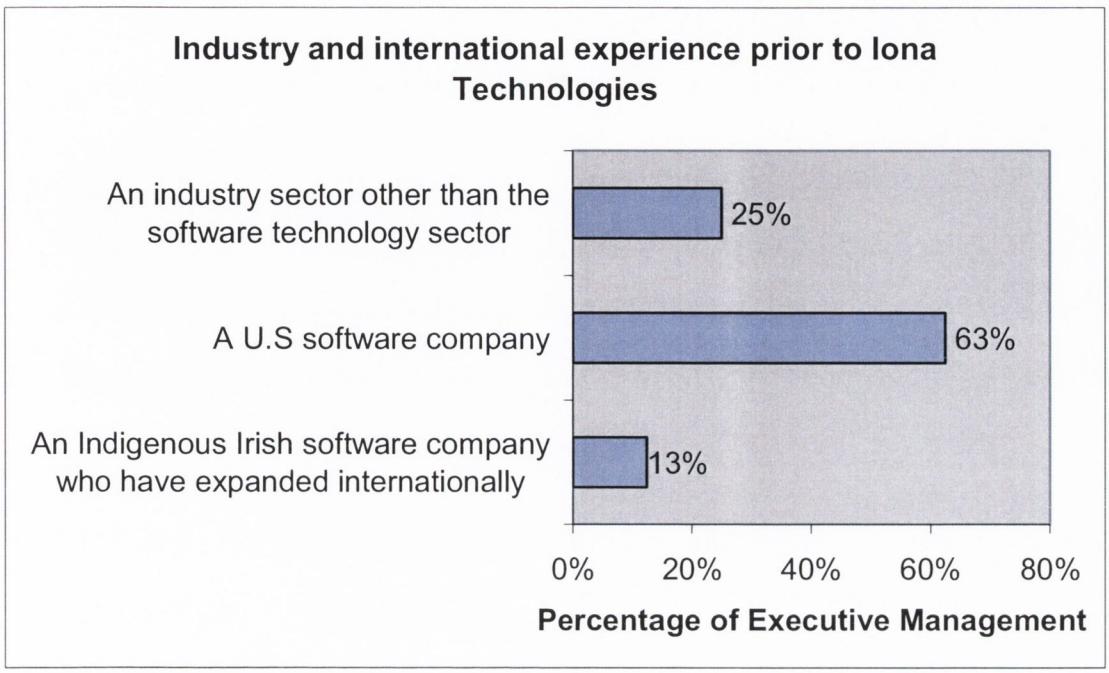


Figure 7-21: Industry and international experience of Executive Management Team

In a separate section of the questionnaire, the individual managers were asked information on their industry specific background and their specific internationalisation experience to date. The above graph indicates the industry specific experience of the Executive Management team.

A significant percentage, 63 per cent had experience with the U.S. software industry ***prior*** to joining Iona Technologies. Overall, 76 per cent of managers had industry specific international experience either with the U.S. market or with an indigenous Irish firm expanding internationally. When asked to describe their overall international experience (the levels of international experience are defined in the questionnaire and included in Appendix 6), 86 per cent of managers described themselves as "very experienced internationally" (29 per cent) or "experienced internationally" (57 per cent). The international profiles of the executive management team are shown in the graph below:

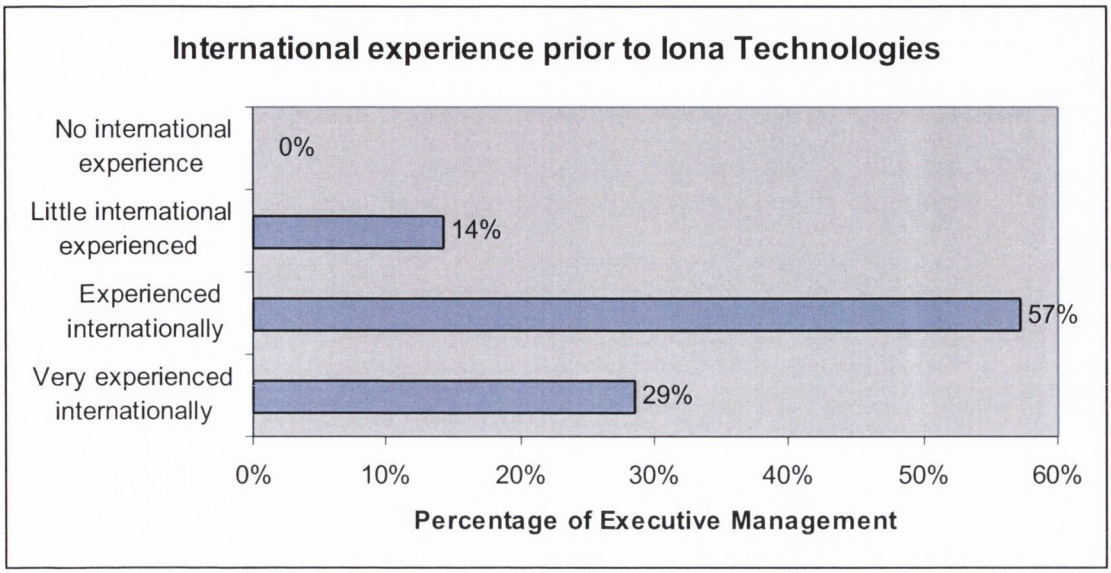


Figure 7-22: International experience of Executive Management Team

The average IK score in 1993 at the formation of the company was 8, and the average IK score in 2005 is 9.42. This indicates that while the international experience of the founders was brought to bear on the formation of the company, it has subsequently gained international experience through the hiring of individuals. This acquisition of internationalisation knowledge, while experientially gained on an individual level is not market specific. However, whether an explicit policy decision of the firm or not, the hiring of individuals with experience in the U.S. software industry (63 per cent) is a significant contribution to the internationalisation experience of the firm. The one area which has significantly changed over the period is the strategic marketing capability of the firm. 57 per cent of the management executives describe the firm as "experienced in strategic marketing" and over 28 per cent regard the firm as "very experienced". Also, while in 1993 geographic market development was seen as critical to the growth of the company, both product and market development are now seen as critical to growth of the company.

Business knowledge (FBK)

This area was a particularly high score in 1993 at the formation of the company, which is further supported by the evidence found in the interviews of their involvement in international industry networks. The average score in 1993 was 11 and this has changed slightly to 11.14 in 2005. Knowledge of foreign distribution channels is scored higher but knowledge of international competitors is scored lower. This may be related to the development of the technological market niche and the number of competitors in 1993 versus 2005. The involvement in international industry networks is still of significance in the firm, potentially contributing to the development of international business knowledge. The following graph illustrates the involvement of management executives in industry networks. 50 per cent of managers indicate an active involvement in industry network organisations. While 13 per cent indicate they do not have active involvement, they do have membership of an industry network.

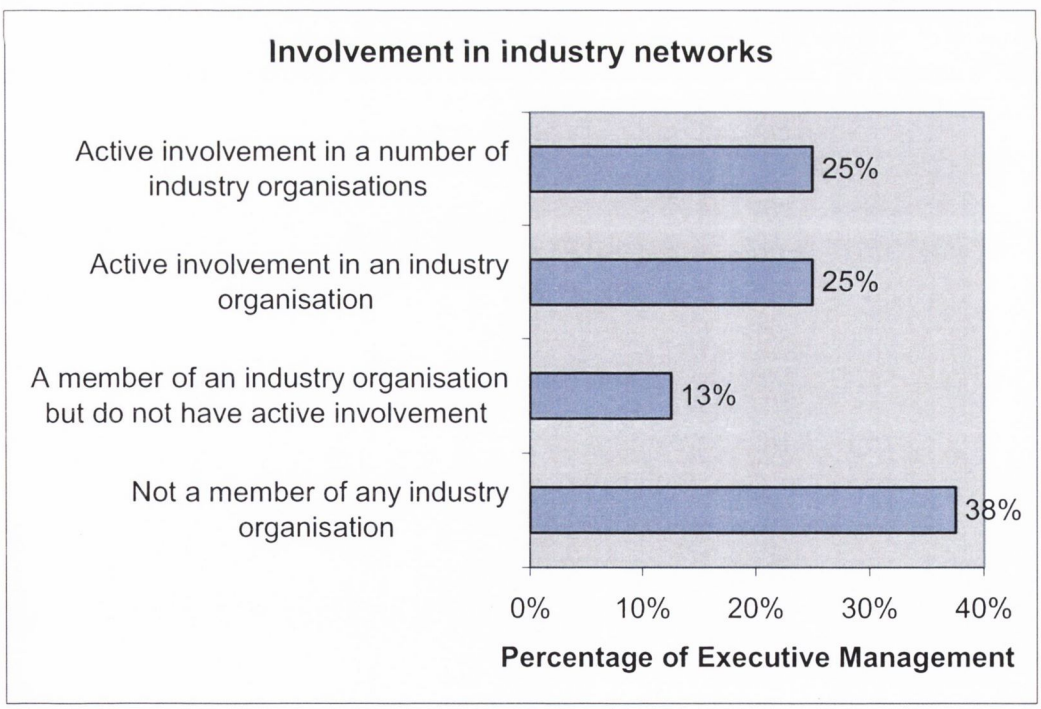


Figure 7-23: Executive Management involvement in industry networks

Institutional knowledge (NK)

This area of internationalisation knowledge showed the most change in the period. The average score for NK in 1993 was 7.66, while the average in 2005 was 9.57. As noted earlier, his may be due both to the nature of the knowledge element and therefore its ease of acquisition. For example, knowledge of market specific legal requirements, market specific business practises and foreign language capability were rated by over 80 per cent of managers as "good – having existing knowledge or experience in the company". With the globalisation of markets and availability of information, institutional knowledge may be acquired more easily that other areas of knowledge above. Hadley & Wilson (2003) found that foreign institutional knowledge is related to the internationalisation of the market, in that high market internationalisation is related to high level of firm institutional knowledge. The findings above would appear to support this also, given the high level of internationalisation of the technology markets. They also note that industries that are more highly internationalised have more specialist export management services. In 1993, the export management service was provided by the IDA, the agency organisation responsible for support services to inward and outward investment at that stage. However, this has since changed with the formation of Enterprise Ireland focusing on indigenous industry development with particular industry specialisation for the ICT sector.

7.7.5. Summary internationalisation knowledge

The findings at this point are consistent with the key points identified in Chapter 2 in relation to the changing role of knowledge in internationalisation some additional findings:

There is already internationalisation knowledge accumulated in the company through individual founders on the formation of the company.

Different constructs of knowledge (IK, BK and NK) are acquired in different ways. There is evidence from the data on internationalisation knowledge (IK) may be gained experientially, acquired through the hiring of individuals with relevant knowledge or acquired through international alliances. From the case data, foreign business knowledge (BK) is critical to the internationalisation of the company and the early and continuous involvement in international industry networks is evident in the case

1. Some constructs of knowledge – e.g. institutional (NK) are more easily acquired than others. This may be industry specific and related to the level of internationalisation of the industry. The more internationalised the industry is, the potentially higher level of institutional knowledge. The existence of government agencies providing export specialist services is more likely to be found in internationalised markets.
2. Knowledge is not necessarily accumulated experientially on a market basis but perhaps on an individual, firm and industry basis. The high level of experience from the U.S. software industry found in the Executive Management may be related to the explicit recruitment decisions of the firm but also the relationship between the Irish and U.S. software market as highlighted earlier in the internationalisation pattern analysis.

There was evidence that internationalisation knowledge was accumulated over time from 1993 to 2005 in a pattern consistent with points 2 and 3 above. The international capability of the firm (measured by IK) that was critical to the initial internationalisation stages of the company and clearly related to the founders was also found in the Executive management team. This capability increased in the development of international marketing capability over time. Eriksson *et al.* (1997) and Hadley & Wilson (2003) have noted that foreign business knowledge may

dependent on internationalisation knowledge (IK). While they do not claim cause and effect and nor could one ascertain that in this case, the two constructs would appear to be closely related. The high involvement in international industry networks sustained over a long period of time would appear to contribute to the international capability of the individual and therefore the firm. The one construct of knowledge that increased the most over the period of time was institutional knowledge (NK), again potentially for reasons highlighted in points 1 and 2 above.

7.8. Case conclusion

An in-depth analysis of a single critical case in the Irish software industry has been completed in this chapter. Referring back to Chapter 4 and the case objective as outlined, is to extend the theory of the "Born Global" phenomenon. Consistent with Donmoyer (1995) view of the role of a single case study in social sciences, the form of theory extension from this study is to develop questions rather than provide answers. Johanson & Vahlne (1990, p.17) in the review of the theories of the mechanism of internationalisation, cite Dunning (1988) in his call for research on the attributes of firms which impacts their internationalisation response to locational, internalisation and ownership advantages. This case on a firm basis includes also the complexity of the whole situation, examining the role of firm, industry and country factors on the internationalisation of the firm. The empirical research on the "Born Global" phenomenon to date has established the theoretical relationships underpinning this phenomenon, this in-depth case is focused on providing a better understanding of the rationale behind these relationships.

The key findings from the case are outlined as follows and related to the conceptual model developed earlier. These findings then form the basis of theoretical inference of phase two of the research, determining the firm and contextual factors to be examined further.

7.8.1. Key findings

7.8.2. Early Adopter characteristic of the market

Moore (1991) first outlined his "Technology Adoption Model" in his seminal text *Crossing the Chasm,* which has since been published twice and twice reprinted. He believes it has provided a vocabulary to a market development problem, experienced

by a large number of high technology firms globally. He describes the Technology Adoption Model (1999, p.8), as "a model for understanding the acceptance of new products". The model depicts market penetration of any new technology product in relation to its progression in the types of consumer groups that adopt the technology. Each group represents a unique psychological and demographic profile that determines its marketing response, different to those in other groups.

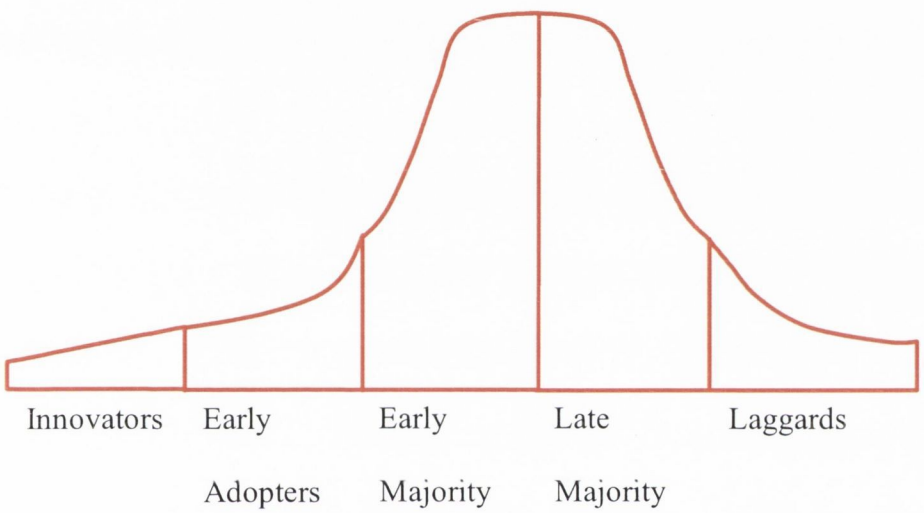


Figure 7-24: Technology Adoption Life Cycle (Moore, 1999, p.11)

According to Moore, each group of consumers react as follows to new technology products:

Innovators: pursue new technology products aggressively, are typically technologists and often see the technology before market launch.

Early adopters: buy into new technological concepts early in their life cycle and are not typically technologists. They can relate to the benefits of a new technology and base their buying decisions on this. Moore describes these as "key to opening up any market segment" (p.11).

Early majority: can visualise the benefit of new technology but are driven by a strong sense of practicality. They are knowledgeable about the technology but need to see well established references before they invest in new technology.

Late majority: These tend to be less knowledgeable about technology, require it to be a standard before they adopt it and require support and therefore buy from large established companies.

Laggards: are perceived as not worth pursuing. They are a small percentage of the market that for various personal, demographic and economic reasons do not pursue new technology.

Moore (1999) highlights two challenges for technology firms – (1) the difficulty in getting product adoption from the "innovators" to the wider "early adopter" group and (2) getting product adoption from the "early majority" to the late majority".

This Technology Adoption Model was key influence in the internationalisation decisions of Iona Technologies. Their first Orbix product was considered a discontinuous innovation - defined by Moore (1999, p.9) as "products that require us to change our mode of behaviour" and therefore it was critical to find a market where this new technology would be adopted. The founders believed at the outset that the U.S. market was an "innovator" and "early adopter" of new technologies, and this is the prime market selection reason for their first product market and not just their first international market. This is consistent throughout the case study, in that the U.S. market is considered of most strategic importance for this reason and should they see that this changes – that other markets emerge as the early adopters of new technology then the company's focus would change accordingly. The size of the U.S. market was not considered at this point, and it could be argued that there are these consumer

groups in every market but rather it's the scale of early adoption also in the U.S. that makes the market attractive.

7.8.3. Role of psychic distance

Various views of the impact of psychic distance on internationalisation decisions has emerged from the literature in this area. From the view in the earlier U and I Models that firms enter markets of increasing psychic distance as experience grows to a psychic distance irrelevance predicted by "Born Global" models (Chetty & Campbell-Hunt, 2003) but not evident in research to date. As highlighted earlier in Chapter 4 Stöttinger & Schlegelmilch (2000) note that psychic distance is said to lend itself well to guiding country selection decisions during the internationalisation process. However, although there is evidence of Iona Technologies entering psychically close market initially (the U.S.), the market selection decision does not seem to be explicitly guided by the psychic distance of the market. Further evidence of this was the later decision to enter into the U.K market after entry to the psychically distant markets of Germany and China. It is possible however, that the psychic distance of the Japanese market, guided the market entry mode is choosing to serve this market from Australia, which is within the Anglo-cluster defined by Ronen & Shenkar (1985). Other factors are identified below in relation to psychic distance of the U.S. market which impacted their success in the U.S. market;

The international experience of the founders mainly through specialist industry association involvement (and later the executive management team);

Their perception that the Irish software industry was an extension of the U.S. software industry and they therefore considered the U.S. of very close psychic distance.

A different view of psychic distance emerges, not on a country basis but on an industry basis. For example, the software technology industry in the U.S. was psychically close, for example in this case psychically closer than the U.K software technology industry. The company has continued to acquire U.S. industry experience and knowledge through the hiring of individuals from the U.S. software technology industry or with experience of same.

This gives a different perspective of the role of psychic distance – not as one guiding market selection but perhaps guiding mode of entry and in relation to the perceived psychic distance of the industry not just on a country basis.

7.8.4. Industry network involvement

The specialist industry network involvement in both Europe through the ESPRIT project and the U.S. though the OMG involvement influenced the rapid internationalisation growth of the firm, consistent with Coviello & Munro's (1997) study of small software firms. This involvement gave them an in-depth knowledge of the software technology industry in Europe and the U.S. and determined how they approached each market. For example, their Internet-based approach with the use of a "Free-Fone" (telephone number) to target individual "innovators" in the Corporate U.S. market was based on their experience of the market. Through these international networks they had also build an international technical reputation and created a visibility. Their approach in the Australian and German markets were opportunistic decision making responding to market requests.

This international technical reputation they had gained at the early stage of the company formation, was key in the formation of an alliance with a large international technology company – Sun Microsystems. This was critical in securing other funding

and in moving from the "early adopter" consumer group to the "early majority" with product adoption with Motorola and Boeing following Sun Microsystems.

The measurement of the internationalisation knowledge accumulation in the firm based on founders and the executive management team indicated that involvement in international industry networks contributed to the high international business knowledge in the firm.

This high involvement in specialist international industry networks sustained over a long period of time has contributed to the international capability of the individual and therefore the firm.

The involvement in international industry networks has influenced the company in a number of ways – in international market selection and entry mode, in the creation of an international profile and attraction of critical investment into the firm and in developing the international business knowledge and therefore contributing to the international capability of the firm.

7.8.5. Industry specific factors

The knowledge intensity of the firm was evaluated in relation to input (R & D level), output (new product development) and human capital measure. While input and output measures vary over time according to the product life cycle, the human capital element has tended to remain high throughout the development of the firm. Overall the high knowledge intensity of the firm may be seen as a characteristic of such a "Born Global" firm.

It also emerged from the case that the product life cycle influenced internationalisation patterns. This was evident in the changing pattern of internationalisation as the initial Orbix product matured and with the launch of the

Artix product – in particular the focus on U.S. market in each case. The originator of the international product life cycle paradigm, Vernon (1966) suggests three stages for international products:

- A new product is developed in an industrially advanced country;
- As the product matures, production is extended to the developed countries to support the demand in these markets;
- The product and production procedures become standardised and the product is produced in less developed countries;

Vernon (1979) notes that due to environmental changes the assumptions of the product life cycles hypothesis are "clearly in question" (p. 260). A further developed perspective on the international product life cycle is synthesised by Jacobs *et al.* (1996, p. 76), they describe the three phases as follows:

1. New high technology products, based on extensive research and development are developed in the industrialised home country;
2. With competition, sales growth and internationalisation, product shifts to those countries with large domestic markets;
3. The final phase occurs when the market is mature and additional reductions in production costs are impossible. At this point R & D declines and production shifts to less developed country which exports the product to the original home country.

They describe an accelerated international product life cycle, due to organisational internal change, external environmental changes, product standardisation and the level of R & D investment. Jacobs *et al.* (1996) research into the international product life

cycle suggest that increased R & D spending together with increased marketing efforts, creates shorter domestic life cycle.

The findings in the Iona Technologies case, while consistent with stage 1 of the international product life cycle above, differs in stages 2 and 3 with no initial domestic market and the continuation of a knowledge-intensive product development centre in the home market. The pattern of internationalisation also shows product development in high cost developed economies such as that of U.S. and Australia. This raises some questions as to how different the product life cycle phases are for a "Born Global" high technology company, how the characteristics of the domestic and international markets impact this and therefore how the product life cycle influences the internationalisation patterns exhibited by these firms. It emerged from the case analysis that revenue from the U.S. market was highest at the early stage of the product life cycle in the first product (Orbix) and then again at the early phase of the second product's lifecycle (Artix). This is graphically represented as follows:

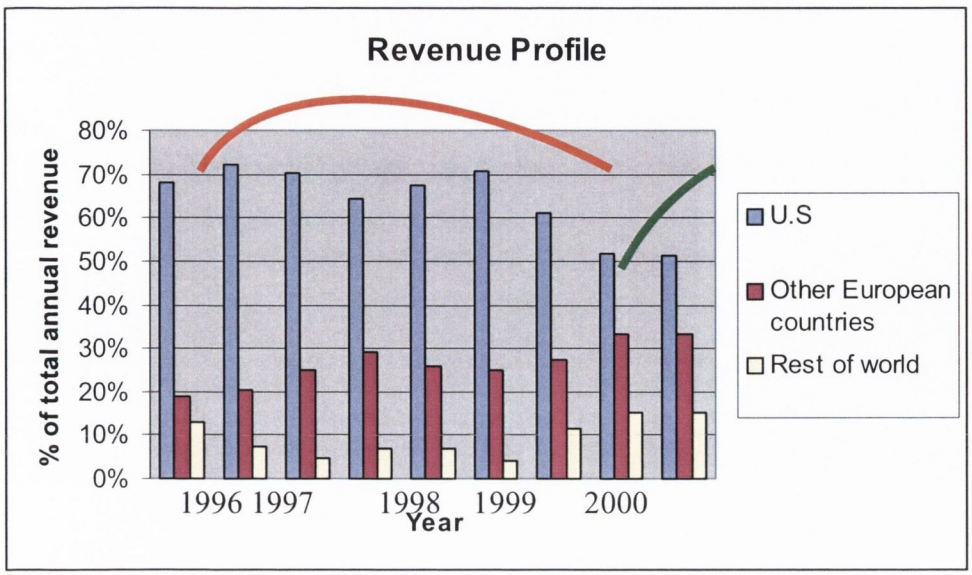


Figure 7-25: International revenue profile and product life cycles

Another industry specific factor that emerged from the case was the linkage between the internationalisation of the industry itself and the high level of internationalisation institutional knowledge accumulated in the firm. This nature of this type of knowledge is that it is more easily acquired, tends to be industry specific and related to the internationalisation of the industry.

7.8.6. Contextual factors

As discussed in Chapter 4, under *External validity*, the research design is such as to take account of time and contextual conditions in understanding their influence on the internationalisation of the firm. Two key issues emerged from the case analysis in relation to this – the point in time and impact of the Internet and the technological industry developments:

The case data indicates that the use of Internet for product marketing and distribution was critical to the development of international markets for the firm. When pattern

analysis was completed with other "Born Global" research: Chetty & Campbell Hunt (2003), Knight & Cavusgil (1996 in particular, the findings differed in relation to the critical impact of the Internet. This is possibly explained by the earlier dates of the studies (i.e. before Internet wide acceptance and use worldwide) and that these studies spanned a number of industry sectors. It is also suggested from the experience and views relayed by the founders on the difficulties in U.S. distribution experienced by an earlier Irish software company, Glockenspiel. It is possible that due to the technological nature of the industry sector and the point in time at which the company adopted wide use of the Internet, that this explains the key impact it had in their success.

The firm's focus on the European software industry was driven by the deregulation of the telecommunications sector and the opportunities this presented. Technological developments such as the industry focus towards Java also drove their decision to move away from their Sun Microsystems alliance and make technologically aligned acquisitions. One of these resulted in a development operation and presence in the Canadian market.

7.8.7. Summary

The use of the conceptual model developed from phase one and from the literature review, gives a picture of the internationalisation of the firm Iona Technologies:

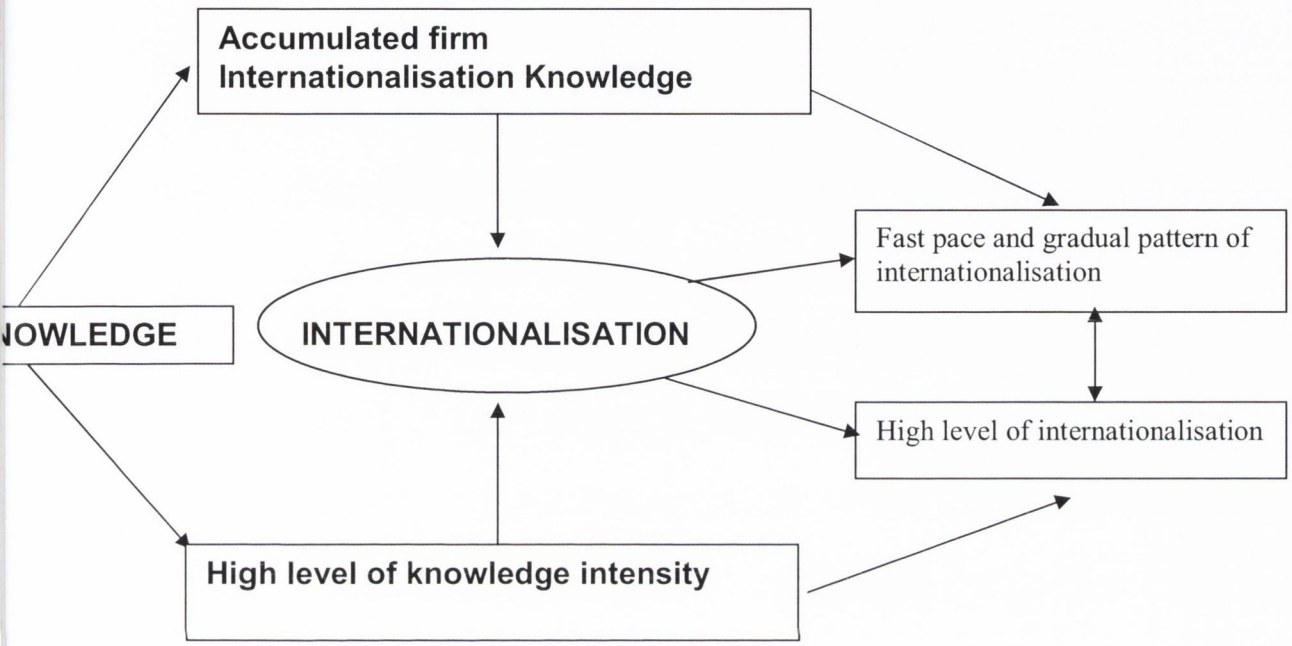


Figure 7-26: Conceptual framework – the internationalisation of Iona Technologies, 2004.

The above framework provides a summary of the various internationalisation dimensions and operational measures used in the case analysis. This presents the firm as having a high level internationalisation, exhibiting a fast paced international development in a gradual pattern (according to the measures employed in the case study). The firm had accumulated internationalisation experience at its foundation and has accumulated this further from foundation to 2004. The firm showed a high level of knowledge intensity using the input, output and human capital measures developed. The objective of this phase of the research is to understand better the factors influencing the internationalisation and the relationship between these factors. As outlined in Chapter 4, Miles & Huberman (1995) note that a causal network is useful in illustrating the most important independent and dependent variables in a field of

study and of the relationships among them. The first step in doing this is the generation of a causal network variables list. The following table lists the events, factors and outcomes from the in-depth case study that have emerged as important in the preceding case study analysis:

Table 7-11: Antecedent, mediating and outcome variables of phase two

Antecedent variables	Mediating variables	Outcomes
▪ Nature of technological advantage (F) ▪ Characteristics of home market (C) ▪ Industry development stage (C) ▪ Accumulated international experience of founders (F) ▪ Existence of specialised institutional support (C) ▪ Involvement in international industry networks (C)	▪ Knowledge intensity of the firm (F) ▪ Accumulated internationalisation knowledge (F) ▪ Access to specalised institutional support (F) ▪ Product life cycle stage (F) ▪ Period from firm formation to internationalisation (F) ▪ Involvement in international industry networks (F) ▪ Use of Internet (F) ▪ International alliance agreement (F) ▪ Characteristics of target market (C)	▪ Early internationalisation (F) ▪ High level of internationalisation (F) ▪ Fast pace of internationalisation (F) ▪ New pattern of internationalisation (F)

Legend: (C) Contextual industry and locational factors
(F) Firm specific factors

The following Figure: 7-27 illustrates the important factors influencing the early, fast and high level of internationalisation of Iona Technologies. It has been developed from a logical chain of evidence from the case and identifies the relationships among the key variables. Consistent with Miles & Huberman (1995) approach, variables are rated low, moderate or high ("according to how much of it is in the case", p. 156) and

directional arrows are drawn between variables on the basis of their influence on that variable.

The causal network is explained in more detail below:

One of key firm characteristics exhibited in the case influencing the internationalisation of the firm was the possession of a niche market leading edge technology, "The nature of the technological advantage " (1). The focus on a niche market is also influenced by the " Industry stage of development"(5) at that point in time – as noted in Chapter 3 , earlier firms had focused on wide international markets. Another factor, "The characteristic of the home market" (2) – in that there was not (and still is not) a market in Ireland for the firm's product, was an important factor in the internationalisation. This was a combination of the characteristics of the market in adopting new technology and the size of the market in sustaining a specialised niche product. The lack of domestic market influenced the early internationalisation decisions and subsequently the "Pattern" (13) - the country decision choices and timing of decisions and "Level of internationalisation" (15).

In relation to "The accumulated international experience of the founders"(3), there was evidence that the international experience of the founders together with "Involvement in specialised industry networks" (4) influenced the accumulation of internationalisation knowledge throughout the growth of the firm. The "availability of specialised institutional support" (6) is related to the industry stage of development and provides a mechanism for "accumulated internationalisation knowledge", specifically institutional knowledge.

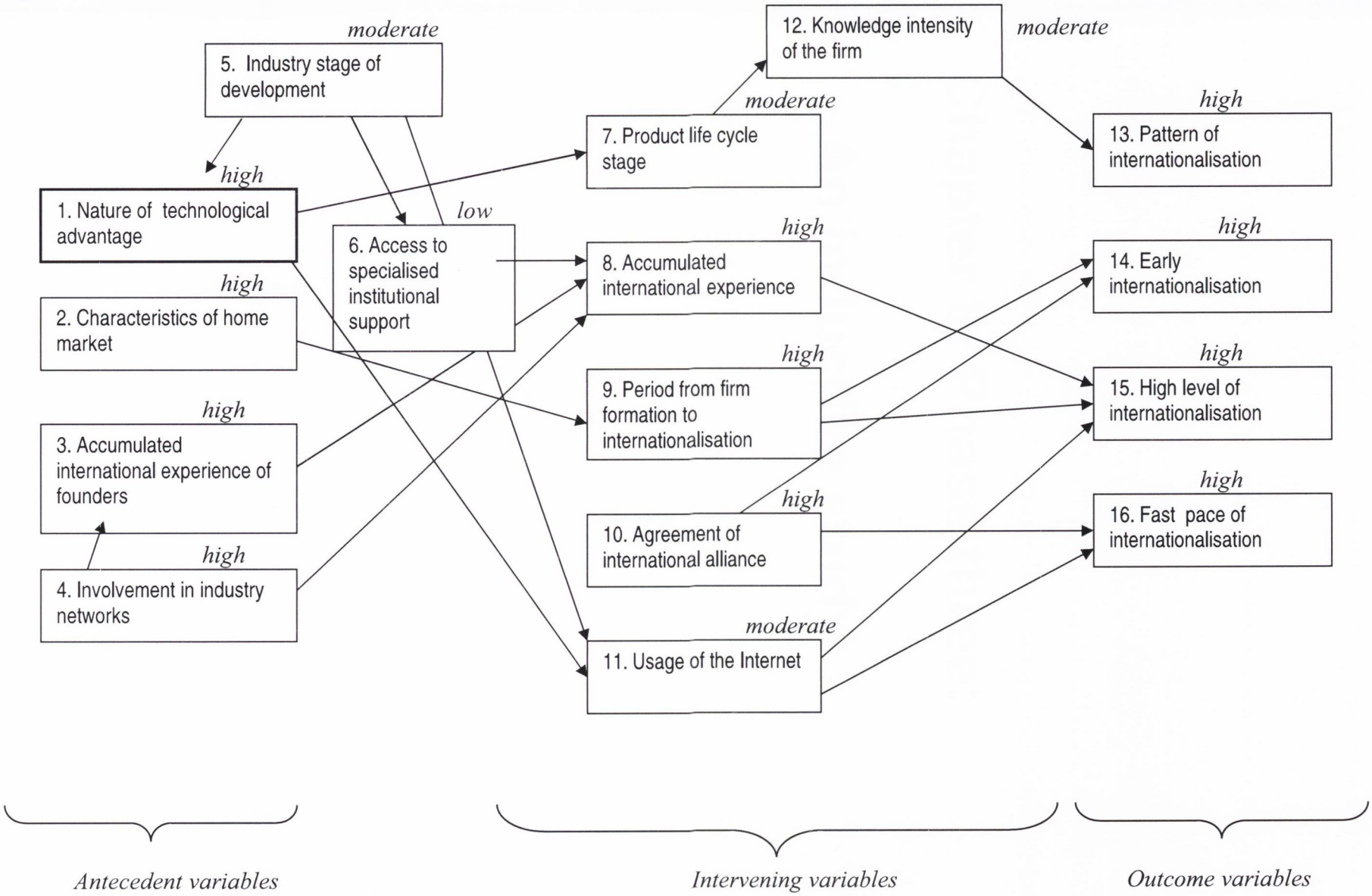
The "Product life cycle stage"(7) showed an influences on the R & D levels which is a major component of the "knowledge intensity of the firm"(12). The "Pattern"(13) of

internationalisation, and specifically country decisions was influenced by the "product life cycle stage" (7).

The "period from formation of the firm to internationalisation"(9), in this case was a short period in comparison to "Born Global" research to date, and this has had a positive effect on the "high level of internationalisation"(15) and "the early internationalisation of the firm" (14). The "agreement of an international alliance" (10) was an influence on the fast pace of internationalisation following this agreement and it also influenced the early international location decisions (13). The "usage of the Internet" (11) was critical in the context of this firm as a means of international product sales and distribution. The "nature of the product" (1) and "the stage of industry development" (5) influenced the importance of the Internet on the pace and level of internationalisation (15 and 16).

This output of the in-depth case study provides the research objectives for phase three in examining further the applicability of the above identified firm and contextual factors influencing the internationalised indigenous software technology sector. It also identifies the relationship between the different constructs of internationalisation knowledge and firm internationalisation to be examined further in phase three.

Figure 7.27: Phase two - Causal network of factors influencing the internationalisation of the firm



Phase three: Inductive Study

8.1. Introduction

As outlined in Chapter 4, the overall objective of phase three is to examine the firm and contextual factors identified in phase two: the in-depth case study and their typicality in the internationalisation of a wider group of knowledge intensive indigenous Irish software companies. Consistent with Gomm *et al.*'s (2004) approach, phase three research was developed from theoretical ideas and information which emerged from phase two. This is based on a set of contextual relationships identified in the case, influencing the internationalisation of the firm. The context chart presented in Figure 7-28 of the factors influencing the internationalisation of Iona Technologies provides the structure for analysis of phase three. First, a profile of the firms in the study is presented and data analysis in completed according to the theoretical ideas and information generated from phase two. This is followed with a discussion in relation to the key firm and contextual characteristics emerging from the research.

8.2. Research objectives

The overall objective of phase three is to examine the firm and contextual factors identified in phase two and their **typicality** in the internationalisation of a wider group of knowledge intensive indigenous Irish software companies. The following are the key firm and contextual factors which emerged from phase two. These are graphically displayed in Chapter 7, Figure 7-27 and described in detail below:

8.2.1. Firm factors

- A high level of knowledge intensity
- Accumulated internationalisation knowledge in the firm
- Possession of a technological asset competing in a global niche market
- Product life cycle stage (or stages)

8.2.2. Firm domestic market factors

- The technology adoption stage characteristic of the domestic market at the time of product availability
- The firm's access to specialised institutions – academic, enterprise support or consultancy

8.2.3. Industry factors

- The internationalisation of the industry
- The existence of active industry network organisations
- The technological development stage of industry – maturity and regulatory factors
- The use of the Internet for product distribution

8.2.4. Country factors

- The technology adoption stage characteristic of the target market or markets
- The psychic distance of industry market

The issue of population transferability is discussed in detail in Chapter 4. The objective of phase three was to examine the transferability of the above firm and contextual factors to the population of internationalised indigenous Irish technology firms.

8.3. Study design and methods

As there was no available listing of internationalised Irish software technology firms, a population listing needed to be established. The author sourced software technology firm profiles from Enterprise and the National Software Directorate and with some further Internet searches, establishing a listing of internationalised software technology firms. Similar to O'Riain (1997 and 2004) and Crone (2002 and 2003) in relation to their research in the Irish indigenous software sector, this list may not be taken as absolute listing but compiled by the author from available data at a point in time. This listing is enclosed in Appendix 9.

A web-based survey was composed of four sections: Section one: The firm profile, Section two: Firm information, Section three: Industry information and Section four: Internationalisation information. The questions were a combination of closed and open questions with multiple choice questions and ranking scales used. The survey is attached in Appendix 10.

A letter was initially sent by post to a list of 93 firms, providing details about the research and the website address to complete the electronic survey. As in phase one of this research, a web-based survey system (Survey Monkey) was used to create distribution lists, distribute and manage the survey response. A telephone follow-up was completed with all companies, and it emerged that one firm on the list has subsequently closed and another was incorrectly classified as a software firm. This left a list of 91 firms, a second telephone follow-up and e-mail follow-up was completed with the outstanding respondents. Following this, a completed survey was received for 34 firms, providing a response rate of 37 per cent. The author has worked in the software technology industry for a number of years and leveraged as many contacts as possible to maximise the response rate.

The following sections describe the firm profile and discuss the key findings of phase three, based on the "ideas and information" generated in phase three of the research.

8.4. Firm profile

A profile of the internationalised software technology firms was developed as follows according to sectoral focus, size and age of the firm. The following chart illustrates the software industry sub-sector of the internationalised firms;

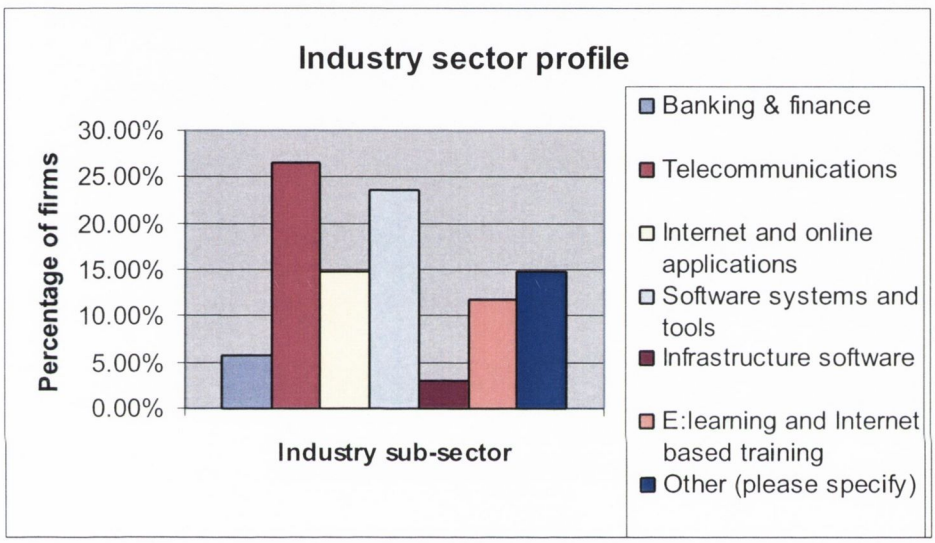


Figure 8-1: Phase three firm sectoral profile, 2006

The data above indicates that telecommunications and software systems and tools were the largest sub-sectors with 26.5 per cent of firms in the telecommunications sector and 23.5 per cent of firms in the software systems and tools sector. The overall indigenous industry sectoral profile presented in Chapter 3 also shows the telecommunications sector as significant in 2004 at over 40 per cent. Both profiles differ in the significance of the financial software sector, at almost 6 per cent of firms in this study and representing over 50 per cent of firms in the overall industry analysis. However, the data presented in Chapter 3 is an analysis of the indigenous software technology sector and the above sectoral profile is an analysis of

internationalised software technology firms. One can possibly conclude that the majority of indigenous software and financial software firms are focused on the domestic market.

8.4.1. Firm size

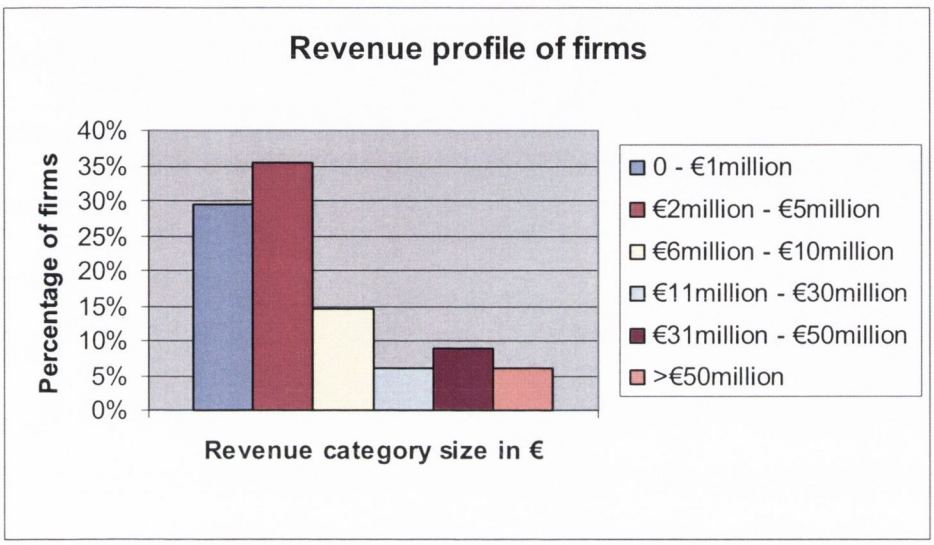


Figure 8-2: Phase three firm size according to revenue

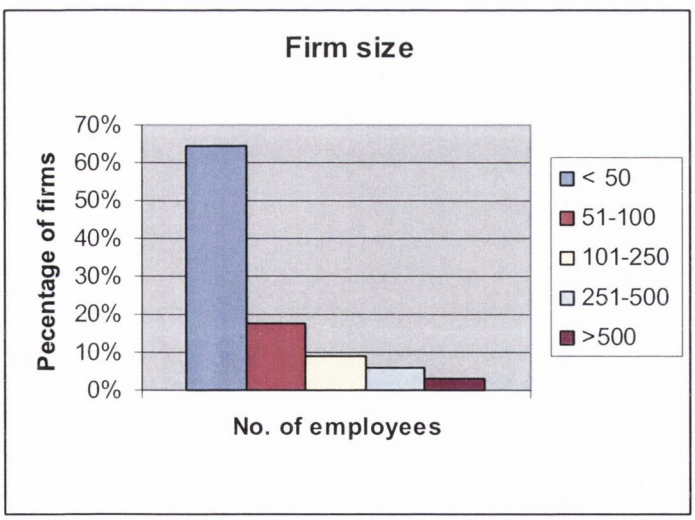


Figure 8-3: Phase three firm size according to number of employees

The majority of firms are micro or medium sized enterprises according to the European Commission (1996) definition of enterprises which provides a common definition across markets using criteria of no. of employees and revenue. Over 35 per

cent of firms have revenues of €2-5 million with over 17 per cent of firms employing 51 to 100 people. One firm indicated it employed over 500 people (this firm was in the telecommunications sector and was the oldest firm in the study) and 2 firms had revenues greater than €50million in the previous financial year. This supports the view of Oviatt & McDougall (1994) and other "Born Global" researchers that a large sized organisation is not a requirement for internationalisation. The synthesis of research to date on the "Born Global" Phenomenon presented in Chapter 2 indicates varying definitions of firm size in the research but with a common agreement on SMEs. Knight and Cavusgil (1996, p.12) have emphasised the size of "Born Global" firms in describing them as "characterized by small size – typically less than 500 employees and annual sales under $100million". In this study, 100 per cent of firms fall within this classification, the majority much smaller in size. A more comprehensive definition of the "Born Global" firm is required, as noted in the definition of "Born Global" developed in Chapter 2. Niche market focus is another defining characteristic of the "Born Global" firm, 71 per cent of firms indicated their product focus was a niche market focus. The other defining characteristics are examined in the following analysis.

8.4.2. Firm age

Following the industry analysis in Chapter 3, different "phases" of the internationalisation of the indigenous software industry in Ireland were developed. Each of the phases has a specific industry and institutional context.

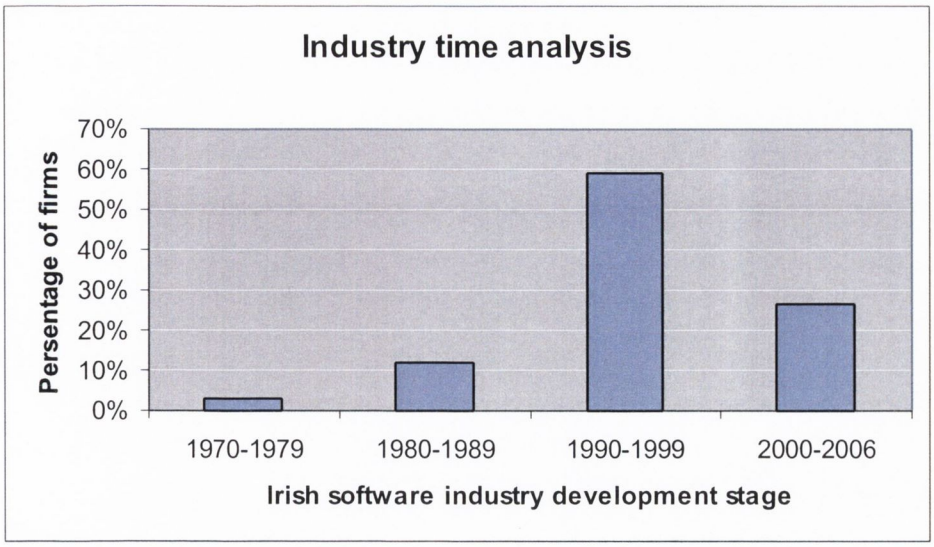


Figure 8-4 : Firm age in relation to industry internationalisation phases

This study supported the internationalisation phases identified in Chapter 3. It indicated that 59 per cent of the internationalised firms were formed between 1990-1999 (described as the "Born Global" phase). Almost 27 per cent of the internationalised firms were formed between 2000 and 2006, (described as the "Irish Internationals" phase).

8.5. Knowledge intensity

A composite measure of knowledge intensity was used in phase two: case analysis. This comprised of input, output and human capital measures and was deployed also to understand the knowledge intensity of the firms in this study, based on their last completed financial year.

8.5.1. Input measure

The following graph illustrates the firms R & D spend as a percentage of revenue:

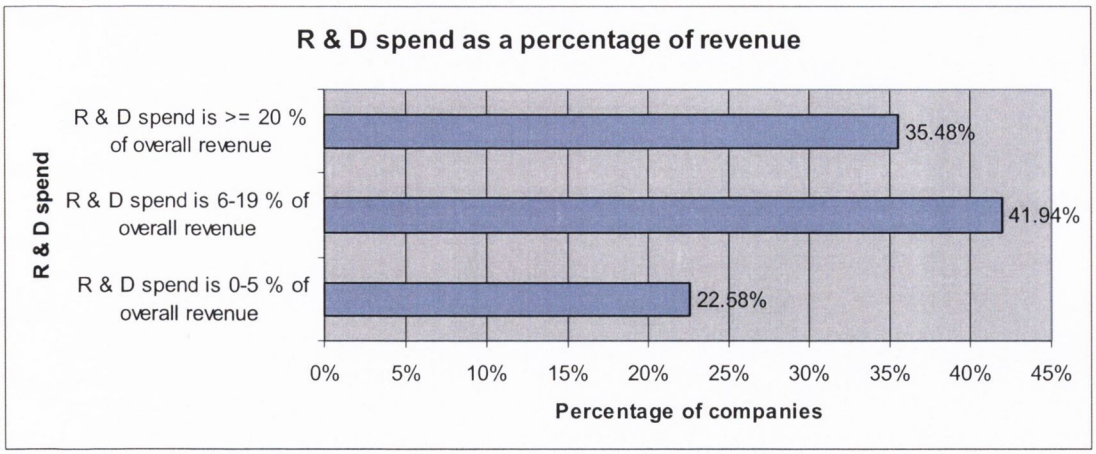


Figure 8-5: Firm R & D spend as a percentage of revenue

Almost 42 per cent of firms had R & D spend 6-9 per cent of their revenue, with over 35 per cent of firms having an R & D spend of greater than 20 per cent of revenue. Given the various measures used in research to date on R & D levels (as outlined in Chapter 4), this indicates comparatively high levels of R & D spend. However, it also emerged from the case analysis that input (and output) measures are related to the stage of product life cycle. Further analysis of those firms with a high spend on R & D illustrates that those firms with the highest R & D spend ("R & D spend > than 50 per cent of revenue" and "R & D spend 6-19 per cent of revenue) were in the "early stage" or "high growth stage" of the product life cycle.

Table 8-1: R & D spend as a percentage of revenue and stage of product life cycle

Stage of product life cycle	**R & D spend of 6-19 per cent**	**R & D spend of >20 per cent**
Early stage of development	15%	64%
High growth stage	31%	36%
Mature	46%	0%
Declining	8%	0%
Other (please specify)	0%	0%
No. of firms	*13*	*11*
Percentage of total	*42%*	*35%*

The concluding discussion in phase three in relation to international revenue profile and product life cycle raises the question of how the product life cycle influences the internationalisation patterns. The following display indicates a similar relationship between a high international ratio and the stage of product lifecycle as indicated in phase two. Firms with the highest international ratio were primarily in the "early" and "high growth" stage of product development, firms with a lower international ratio were in the "high growth" or "mature" stage of product development.

Table 8-2: International revenue ratio and stage of product life cycle

	International revenue as percentage of total	
Stage of product life cycle	**75-100 per cent**	**51-74 per cent**
Early stage of development	38%	25%
High growth stage	38%	25%
Mature	23%	38%
Declining	0%	13%
Other (please specify)	0%	0%
No. of firms	*13*	*8*
Percentage of total	*43%*	*27%*

8.5.2. Output measure

The following graph illustrates the percentage of revenue earned from new products in the previous financial year:

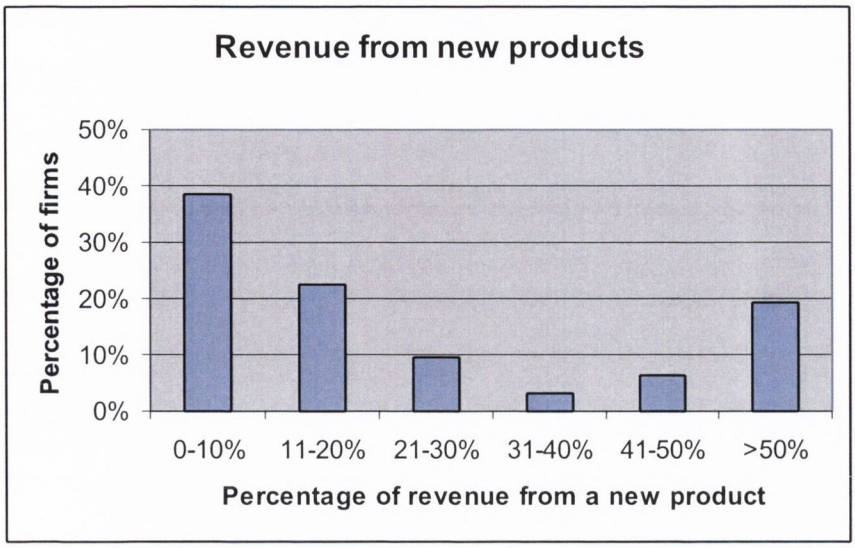


Figure 8-6: Firm revenue from new products

A somewhat polarised response to this question emerged, with over 19 per cent of firms deriving greater than 50 per cent of revenue from a new product and almost 39 per cent deriving less than 10 per cent of revenues from a new product in the last financial year. It emerged from the phase three in-depth case study that the level of revenue from a new product was at a point in time when the existing product was towards the end of its life cycle (also influencing from where it generated revenue). This study indicates that there are more firms with lower revenue from a new product at the high growth/mature stage of their lifecycle. Further in-depth analysis on a firm basis would be required to understand the influence of this on international revenue breakdown by market.

Table 8-3: Output knowledge intensity and product life cycle stage

Stage of product life cycle	**R & D spend of 6-19 per cent**	**R & D spend of >20 per cent**
Early stage of development	15%	64%
High growth stage	31%	36%
Mature	46%	0%
Declining	8%	0%
Other (please specify)	0%	0%
No. of firms	13	11
Percentage of total	42%	35%

The concluding analysis in phase two raises some questions as to how the product life cycle influences the internationalisation patterns exhibited by these "Born Global" software technology firms. Further analysis on the "level of revenue from a new product" and the "international ratio" is displayed below:

Table 8-4: Revenue from a new product and International sales ratio

International sales ratio	**0-10 per cent from a new product**	**>50 per cent of revenue from a new product**
0-10 % of revenue from international markets	9%	0%
11-20% of revenue from international markets	9%	0%
21-30% of revenue from international markets	9%	0%
31-40% of revenue from international markets	9%	0%
41-50% of revenue from international markets	0%	17%
51-74% of revenue from international markets	36%	33%
75-100% of revenue from international markets	27%	50%
No. of firms	*11*	*6*
Percentage of Total	*35%*	*19%*

A pattern emerges;

- Those firms with a high level of revenue from a new product (>than 50 per cent) have also a high international sales ratio; (83 per cent of firms with an international sales ratio of >50, no firms have international sales ratio below 40 per cent).
- Those firms with a low level of revenue from a new product (<10 per cent) have a lower international sales ratio than those with a high level of revenue from a new product; (with 63 per cent of firms with an international sales ratio of >50, 27 per cent of firms have an international sales ratio below 40 per cent).

The nature of the relationship between international sales revenue and input knowledge intensity is not clear from the above analysis, but it does highlight (as in phase three) that input knowledge intensity possibly influences internationalisation levels.

8.5.3. Human Capital measure

Respondents were provided a definition of knowledge worker (see Appendix 9) and asked to indicate the percentage of knowledge workers in their firm. Over 58 per cent of firms responded that 76-100 per cent of the firm's employees were knowledge workers. The following graph illustrates human capital measure:

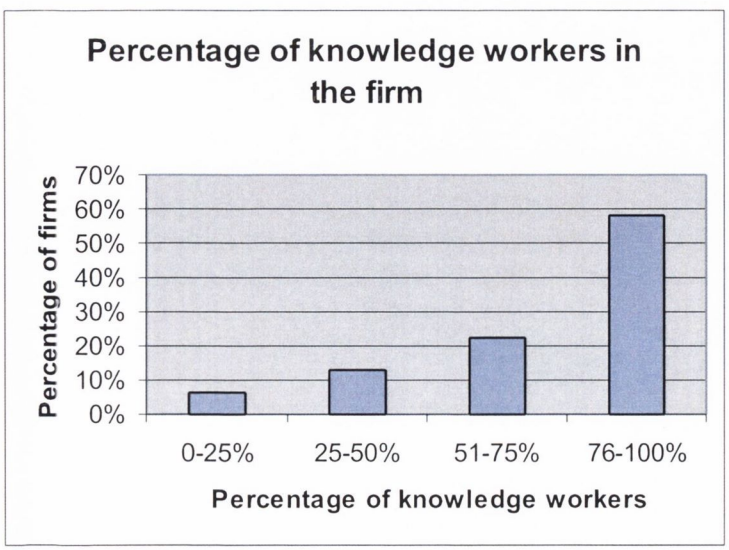


Figure 8-7: Knowledge workers in the firm

As noted in Chapter 4, while this is imperfect as a measure of human capital or investment in it, it is an acceptable way to characterise the knowledge intensity of a business (Stewart, 2001).

Overall, the firms exhibited a high level of knowledge intensity. In comparison with the composite measure used in the case analysis, these firms indicate a lower input level (but higher than comparative industry measures), a higher output level and a high human capital level of knowledge intensity. However, it also emerged from the case analysis that input and output measures are related to the stage of product life cycle.

8.6. Internationalisation of the firms

There are two key data points in understanding the internationalisation of the firm in the context of the "Born Global" phenomenon – when the firm first engaged in international activities and the international sales ratio.

8.6.1. Internationalisation process

The data from this study in relation to when the firms first engaged in international activities is presented below:

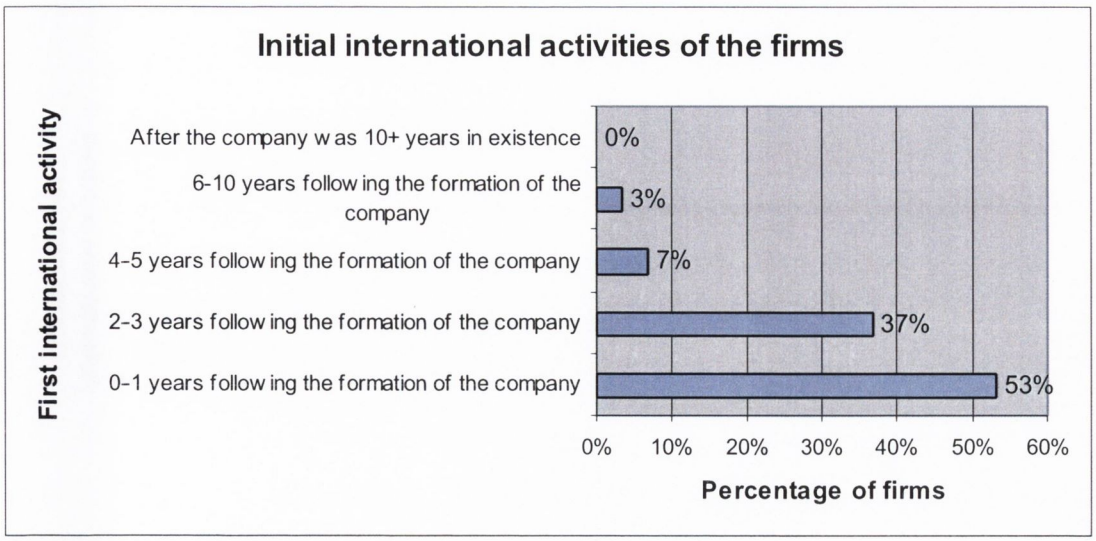


Figure 8-8: Firm age in relation to industry internationalisation phases

The majority (53 per cent of firms) engaged in international activities in the earliest stages of the firm development, with the first year. Almost 37 per cent of firms did so with 2 to 3 years of formation. The most common definition of this characteristic of the "Born Global" firm is one which engages in international activities within 0-3 years of formation. Various researchers relate this characteristic with international sales ratio and/or to the size of the domestic market (as noted in Chapter 2). For example, with a smaller domestic market a higher international sales ratio of >75 per cent is used (Chetty & Campbell-Hunt, 2004) or a higher international sales is expected with a slower internationalisation process, within 0-9 years of formation of the firm (Hashai & Almor, 2004). Overall 80 per cent of firms in this study can be described as having a fast internationalisation process, consistent with the "Born Global" firm, within 3 years of formation.

8.6.2. International sales ratio

This needs to be also viewed in relation to the international sales ratio as presented below:

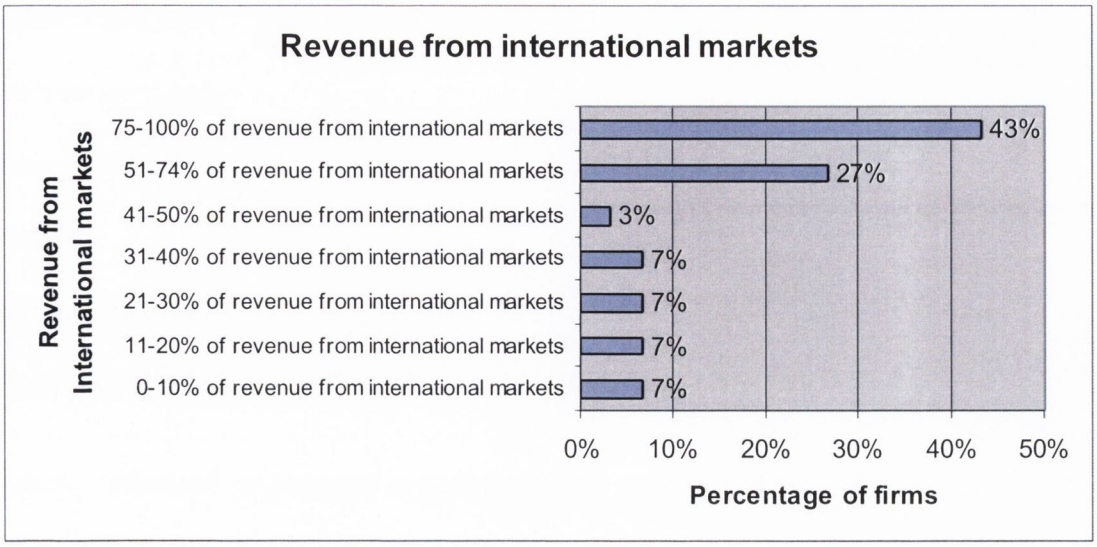


Figure 8-9 : International sales ratio

Researchers into the "Born Global" firms have varied most on this defining characteristic, from a high international ratio of ">75 per cent from international sales" to a lower international sales ratio of ">25 per cent" , with the lower threshold being the most commonly used. Over 43 per cent of firms had the higher international sales ratio and 70 per cent of firms had an international sales ratio of over 50 per cent. Only 14 per cent of firms had an international sales ratio lower then 20 per cent. Consistent with Chetty & Campbell-Hunt's (2004) view, given the small size of the domestic market, there is strong evidence of a high international sales ratio. However, not completely consistent with Hashai & Almor's (2004) expectation that there is a higher international sales ratio (>75 per cent) associated with a slower internationalisation process (0-9 years from formation). This study indicated a high international sales ratio and a fast internationalisation process. The in-depth study in phase two allowed a more detailed measure of internationalisation using International ratio and organisational measures than feasible in phase three, given the nature and objectives of the study. However, to understand the depth of organisational internationalisation, firms were questioned on the configuration of the international

value chain. Phase three firms indicated a lower organisational depth of internationalisation than in the critical case in phase two. All (100 per cent) of the firms in phase three performed R & D activities in Ireland with primarily sales and marketing activities being located in international markets. Most firms also performed product distribution and support from Ireland – with 60 per cent performing product distribution from Ireland and 93 per cent performing product support from Ireland.

8.6.3. "Means" of internationalisation

The other aspects of internationalisation which were examined in this research were the use of international alliances, mode of entry and accumulated international experience. As emerged from the in-depth case study, the formation of an international alliance was a critical incident in the international success of Iona Technologies. In this study, 88 per cent of firms have International alliances or International partner agreements. The most common mode of entry into international markets was the establishment of a wholly-owned sales office, 38 per cent of firms used this mode of entry to international markets. While only 3 per cent of firms used the Internet for product sales as a mode of entry, 42 per cent of firms indicated they used the Internet for company information and product promotion purposes. The study did not indicate that firms used the Internet for product sales and distribution initially, as was evident in the approach of Iona Technologies. It indicated that 42 per cent used the Internet for purposes noted above, 13 per cent of firms used it for product sales and distribution as well. No firms used it for product ordering and distribution only and as noted above, only 3 per cent used the Internet as a means of accessing a new international market.

8.6.4. Market selection

As highlighted earlier in Chapter 2, differing views on the role of psychic distance in market selection has emerged from the research to date into the "Born Global" phenomenon. The relevance also of industry psychic distance was evident in phase two of this research. This study sought to understand the first country markets targeted by these firms and the key factors influencing the decision.

Firms were asked to indicate the first market in which the firm had international sales. The following chart presents the response analysis in relation to this question:

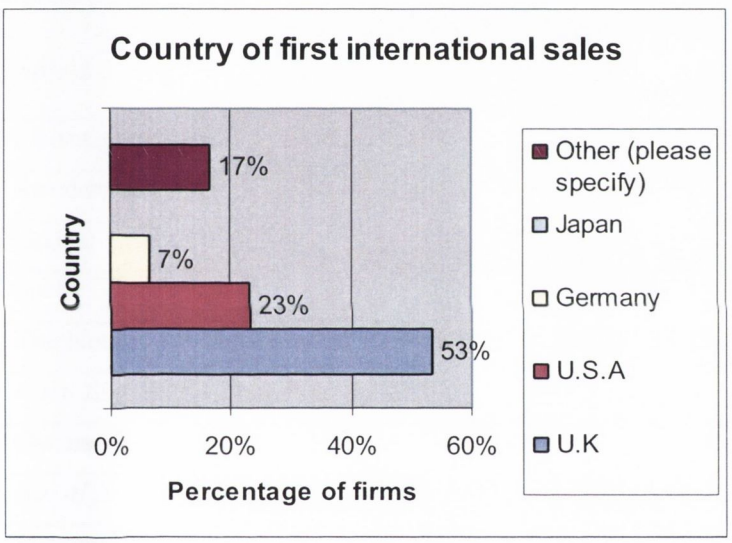


Figure 8-10: Initial international sales of the firm

This first analysis supports the assumptions of the international process models that firms initially target markets that are perceived as psychically close and therefore less risky. Phase three concluding discussion suggests that psychic distance of the industry (or industry subsector) may be an influencing factor. Further analysis on the first country markets targeted by firms is displayed in the tables below:

Table 8-5: U.S.A and U.K. market selection and industry sub-sector

Industry sector	**Country market**	
	U.S.A.	U.K.
Banking & finance	0%	13%
Telecommunications	14%	31%
Internet and online applications	0%	19%
Software systems and tools	29%	6%
Infrastructure software	0%	0%
E:learning and Internet based training	29%	13%
Other (please specify)	29%	19%
No. of firms	*7*	*16*
Percentage of total	*23%*	*53%*

Table 8-6 : Other international market selection and industry sub-sector

Country market	**Industry sector**	**Percentage of firms**
Sweden	Telecommunications	14%
Greece	Telecommunications	14%
Spain	Infrastructure technology	14%
The Netherlands	Telecommunications	14%
Australia/NewZealand	Software systems and tools	14%
Germany	Banking & finance	29%
No. of firms		*7*
Percentage of total		*24%*

Some interesting patterns emerge – the first entry into the U.K. market is primarily by firms in the "Telecommunications" sector. This is also consistent with the industry analysis in Chapter 3, which highlighted entry into the U.K. industry market (and the European market with entry into Greece and Sweden) initially by telecommunications firms. First entry into the U.S. market is primarily by "Software systems and tools" and "Internet based software" firms – similar to the case study firm Iona Technologies. The U.K. and German markets are the initial markets for "Banking and Financial software" firms. This is similar to Bell's (1995) conclusion on psychic

proximity in that the quantitative data supports the notion of psychic distance but the qualitative data indicated that market selection decisions were not influenced by psychic factors. The initial data from this phase three study presented in Table 8-6 : Other international market selection and industry sub-sectorabove, appears to support the view that markets are selected by psychic distance. Phase one of this research concluded that this may not be an explicit and systematic process but that psychic distance did have some role in market selection. Phase three in-depth analysis also indicated this but there also emerged a number of other factors that influenced market selection, one of these the perceived psychic distance of the industry. Respondents indicated that their closest industry relationship was with U.S.A (55 per cent) and U.K. (24 per cent). Similar to Bell's (1995) conclusion above, the first level data supports the notion of psychic distance but as Miles & Huberman (1994, p.256) in citing Glaser (1978) describe "as shuttle back and forth between first level data and general categories", you start to add to the meaning of the category. This second level of analysis based on the theoretical ideas generated from the case, does not support the simple notion of psychic distance as indicated in the first level analysis. It indicated a more complex idea of psychic distance influenced by not one but many factors, which as noted in phase one of the research, are not mutually exclusive. The other factors influencing market selection are examined further below.

Firms were asked to rank in order of importance one to three, the top three reasons for their international expansion and guiding their country market selection. A definition of each factor is provided in the survey in Appendix 10. The following chart illustrates the factors which the firms ranked of most importance in their expansion internationally;

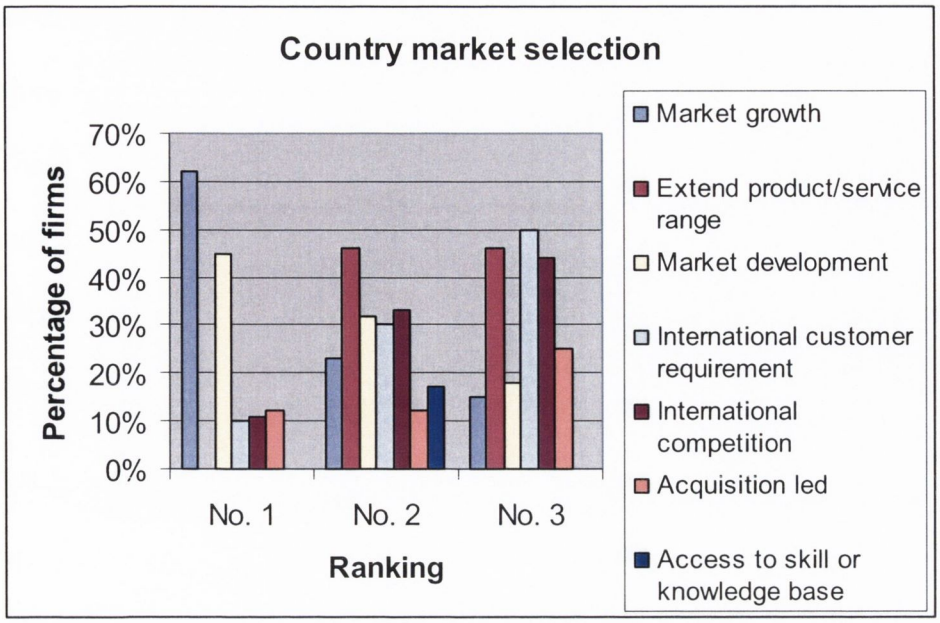


Figure 8-11: Factors influencing country market selection

The three most important factors emerging were:

1. Market growth – International markets provided growth opportunities for the firm in its single product area;
2. Market development – Adoption of new technology: the company had a new technology and a market was selected where this new technology is likely to be adopted the quickest;
3. International customer requirement – The company had an international customer and expanded to meet its needs;

"Client followership" or meeting international customer requirements (factor number three above) has been highlighted to date in the literature and Irish software industry analysis as one of the key factors influencing market selection decisions. The growth opportunity for firms from a small domestic economy with a single niche market product have also been highlighted as one of the key characteristics of the knowledge intensive firms driving early and fast internationalisation. The characteristic of the

international market in relation to its speed in adopting new technology emerged in phase two of this research as one of the key factors influencing market selection There is also evidence in this study as illustrated above that 45 per cent of firms ranked this as the most important factor with 32 per cent ranking it the second most importance factor. This is a new contribution in understanding market selection decisions in the internationalisation of knowledge-intensive firms.

8.6.5. Accumulated international experience

The two aspects of knowledge examined in this study are the accumulated internationalisation experience of the firm and the involvement in industry networks. The in-depth nature case study in phase two analysed individual internationalisation knowledge and developed a "stock of knowledge" in the firm. The objective of this study is to examine further some of the key conclusions in relation to internationalisation knowledge as outlined in Chapter 7;

1. There is already internationalisation experience in the firm accumulated through individuals. Respondents were provided with a definition of each of the levels of internationalisation knowledge and asked to classify themselves according to this. The majority of respondents (64 per cent) described themselves as very experienced internationally, with 21 per cent describing themselves as experienced internationally.

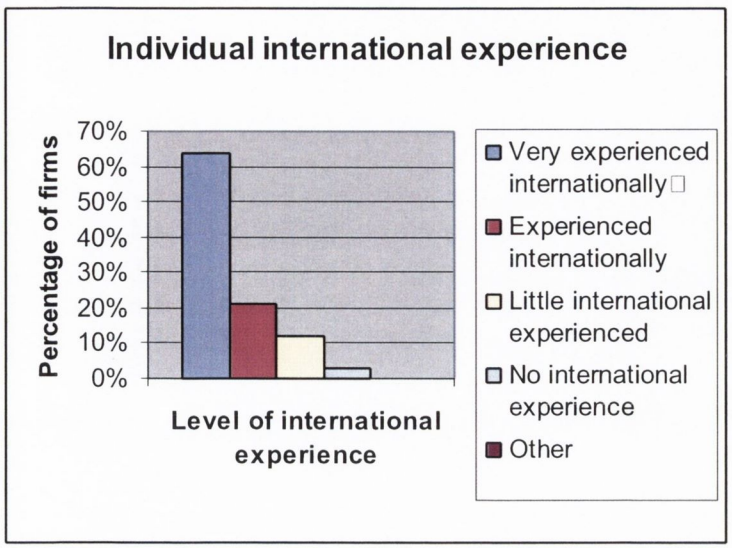


Figure 8-12: Individual international experience

While indicating diverse backgrounds, prior to joining the company, 91 per cent of individuals had experience in Irish, U.S., U.K. or European firms who had internationalised. It can be concluded that a considerable amount of international experience is accumulated on a firm basis through individuals' experience.

2. Different constructs of knowledge (IK, BK and NK as defined in Chapter 2) may be acquired in different ways. Early and continuous involvement in international industry networks was one of the factors influencing the internationalisation of the case company. The following graph indicates the level of involvement industry networks. Over 63 per cent of firms indicated had involvement in one or more industry network, with 37 per cent of firms describing this as active involvement in one or more industry network. This is similar to the level of involvement when questioned on an individual basis, with 68 per cent of individuals involved in industry network organisations. As noted earlier in Chapter 2, internationalisation knowledge is accumulated

through individual network involvement (Madsen & Servais, 1997) and firm network involvement (Sharma & Blomstermo, 2003, Chetty & Campbell-Hunt, 2003, Knight, Madsen et al. 2004).

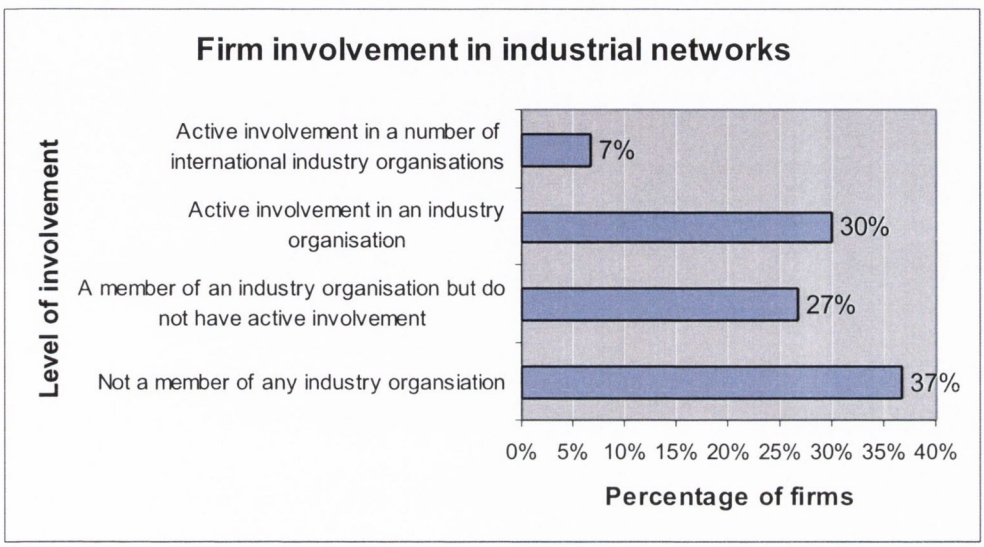


Figure 8-13: Firm involvement in industry networks

Some constructs of knowledge – institutional (IK) more easily acquired than others (IK and BK). The existence of government agencies providing export specialist services is more likely to be found in internationalised markets.

The leveraging of international expertise in the form of institutional support and international consultancy organisations was also examined. Over 53 per cent of firms availed of both institutional support and sought international expertise, with 33 per cent availing of institutional support only. As noted in the case study outcome Chapter 7, specialised government support agencies are typically present in internationalised industries and that international institutional knowledge is more easily acquired through the leveraging of such specialist government support.

Knowledge is not necessarily accumulated experientially on a market basis but perhaps on an individual, firm and industry basis. The high level of experience from the U.S. software industry found in the Executive Management in Iona Technologies

may be related to the explicit recruitment decisions of the firm but also the relationship between the Irish and U.S. software market as highlighted earlier in the internationalisation pattern analysis. The level of involvement in the U.S. market was much stronger in the case firm than evident in phase three. Only 12 per cent of the senior management of firms surveyed in phase three had experienced with U.S. software firms, in comparison to 63 per cent of the executive management in Iona Technologies. However, over 55 per cent described the U.S. technology industry as the one with which its firm had the closest relationship. It is possible that that high level of U.S. based experienced evident in phase two is a result of the experience of the founders, their explicit recruitment decisions and the nature of the their technology and its focus on U.S. market as an early adopter of its technology as noted earlier. Phase three indicates strongest industry links with the U.S. software industry.

8.7. Summary

As initially outlined in this chapter, the objective of phase three of the research is to examine the firm and contextual factors identified in phase two and their typicality in the internationalisation of a wider group of knowledge intensive indigenous Irish software companies. A picture emerges from this phase of the research of the contextual and firm characteristics of the internationalised indigenous Irish technology firms.

A causal network was developed in phase two to illustrating the most important independent and dependent variables and of the relationships among them. Figure 8-14 is revision of this causal network, based on the findings in phase three. The black colour indicates a replication of the findings in phase two and the red colour indicates a revision of phase two findings. An additional influence of "Industry stage of development" (5) on the internationalisation "pattern" (13) was evident in phase 3. This adds to the contextual factors influencing the internationalisation of these firms. The impact of the Internet (11) while still evident was less of an influence in early internationalisation with much less of a role in international product distribution and sales as seen in the case company. There was more evidence in the access of "specialised institutional support" (6) in phase three than in the phase two. This may be related to contextual factors already identified – the increased availability of specialised institutional support with the increased internationalisation of the industry or the internationalisation knowledge of the individual founders. However, it is sufficiently established in both phases that the access to specialised institutional support is one mediating factor which positively influenced the internationalisation of the firm. This leads to the identification of intervening variables (3) and (5).

The following summarises the findings from phase three study as described in detail above.

8.7.1. "Born Global" firms

The study indicates the "Born Global" nature of internationalisaed indigenous software technology firms at this point in time. This is characterised by a high level of internationalisation, an early and fast pace of internationalisation with a low internationalisation depth within the organisation. The small size of the domestic economy may be a contributory factor to the high level and fast pace.

8.7.2. Context

The majority of firms were established between 1990 and 1999. During this industry development phase, the support of specialised industry agency contributed to the acquisition of institutional internationalisation knowledge by firms. There is evidence that the availability of Internet provided a means of internationalisation but not necessarily used as a mode of entry as identified in phase two case study. The study supported the idea that industry developments in major country markets influenced the internationalisation decisions of firms (for example, deregulation in the Telecommunications industry and the U.K. and other European markets).

8.7.3. Firm characteristics

The firms are characterised by small size, high knowledge intensity and targeting of niche markets. They indicated a comparatively high level of input knowledge intensity (R & D levels). Firms with highest R & D spend tended to be at the "Early stage of development" or "Growth stage" of their product life cycle. A possible relationship between high input knowledge intensity (revenue from new products) and

the level and pattern of internationalisation emerged, as in phase two. This highlights an area for further study.

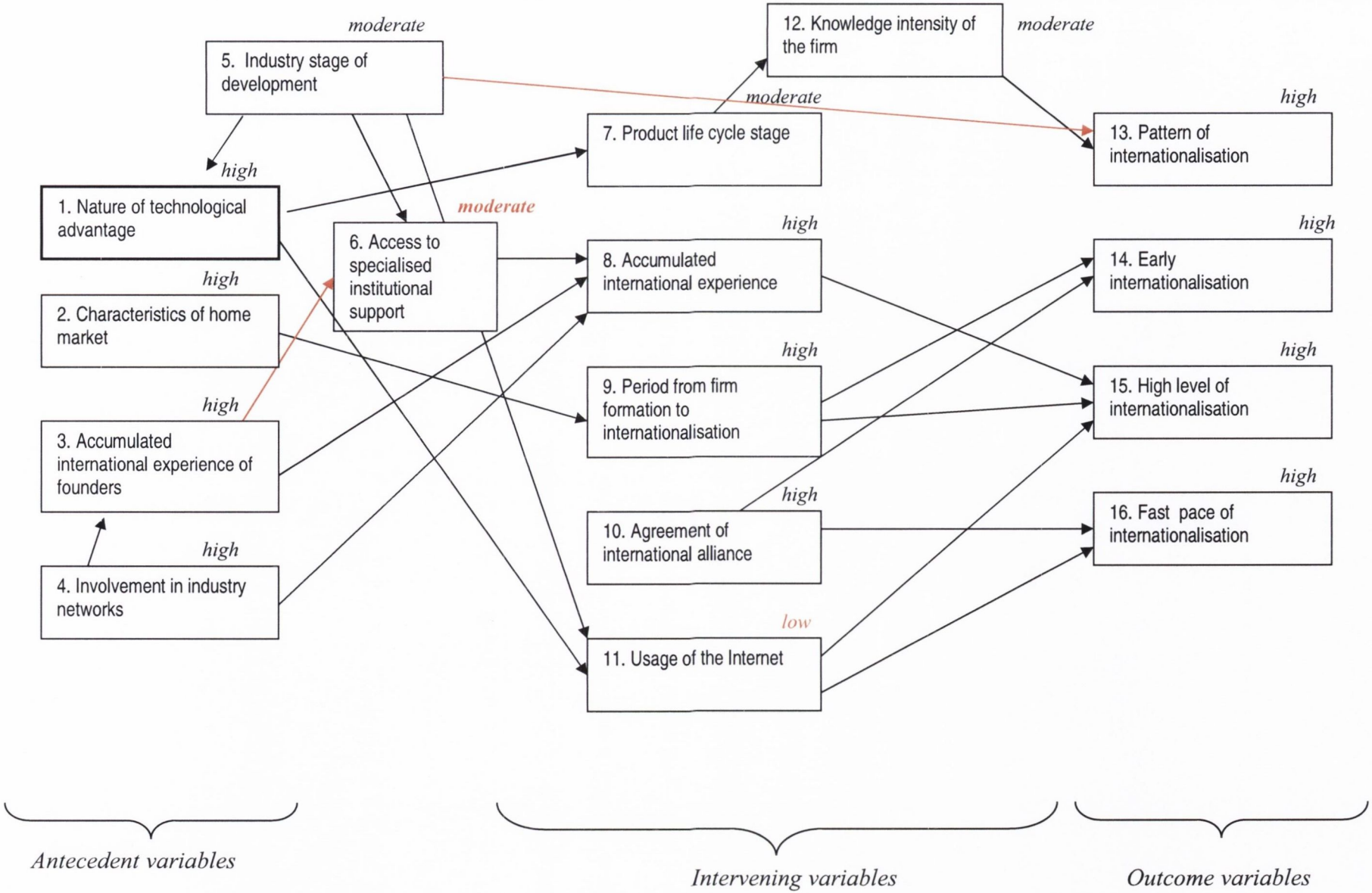
Similar to the phase two case study, firms accumulated international experience through the recruitment of internationally experienced individuals. Firms and individuals within firms confirmed a high level of industry network involvement. The majority of firms also had formed an international strategic alliance.

8.7.4. Other factors influencing internationalisation pattern

The study supported the influence of "market growth opportunities" and "client followership" on market selection decisions as highlighted in Chapter 2 and phase two of this research. It also indicated support for the influence of "new technology adoption" characteristic of the market, as emerged in phase two. The implicit role of psychic distance in the form of industry and sectoral linkages which also emerged in phase two was also evident in phase three. A reconceptualisation of the role of psychic distance in internationalisation is discussed later further in Chapter 9.

This phase of the research has examined the transferability of the theoretical ideas information which emerged in phase two of the research. Firm characteristics and contextual influences of the internationalisation of indigenous Irish software technology sector are identified. The overall contribution of this three phased research to the "Born Global" phenomenon is discussed further in the following chapter.

Figure 8-14: Phase three – Revised causal network of factors influencing the internationalisation of the firm



Chapter 9: Conclusions and recommendations

Conclusions and recommendations

9.1. Introduction

The following chapter summarises the contributions of the three phases of the research. These are discussed in relation to findings in three key areas. A framework of factors influencing the "Born Global" phenomenon is developed from the research. This is discussed in relation to public policy implications. The chapter concludes on the limitations of the research and recommendations for further study arising from this.

9.2. A review of the research

The following is a brief review of the three phases of research, the objectives and key outcomes:

9.2.1. Phase one: An Exploratory Study

Phase one was an exploratory study of the indigenous Irish software technology sector. This initial study identified the key factors influencing the internationalisation of the firms in the indigenous software technology industry. A comparative analysis of similar studies of the indigenous technology sector in Finland, New Zealand, UK and Canada was completed. The study found evidence of "Born Global firms within the industry sector. The key findings of the study were discussed in relation to the pattern and level of internationalisation, the importance of the psychic distance factor and the role of knowledge in internationalisation. A different role of knowledge emerged from this

exploratory study and the literature review - the role of knowledge as a driver of internationalisation as opposed to a barrier to be overcome. The role of knowledge – in particular knowledge intensity and international knowledge accumulation formed the basis of the research objectives and design for phase two.

9.2.2. Phase two: An in-depth case study

Phase two was an in-depth case study (the core phase of the research) of a critical case in the indigenous Irish technology sector – Iona Technologies. The analytical approach taken is one based on theoretical proposition – The "Born Global" phenomenon. The objective in using case study methodology is to examine the phenomenon within a specific context, particularly as noted by Yin (1994, p.13) when "the boundaries between the phenomenon and the context are not clearly evident". The case examined the rapid and high level of internationalisation in a knowledge-intensive firm. It specifically examined how and why this has occurred (how the firm internationalised and why it internationalised). A Programme logic model has been used in this research to analyse the internationalisation of the firm over ten years. This analysis focuses on three main areas – internationalisation pattern analysis, internationalisation level analysis and the role of knowledge in the internationalisation. A conceptual framework of the internationalisation of the firm was developed from the analysis. The key findings were outlined in relation to – the early adopter characteristic of the market, the role of psychic distance, industry specific factors, participation in specialised industry networks and wider contextual factors. The output of the case in the form of firm, country and industry characteristics influencing the internationalisation of the firm formed the basis for the research objectives of phase three.

9.2.3. Phase three: An inductive study

Phase three was an inductive study of internationalised Irish technology firms. This study was developed from the theoretical ideas and information that emerged from phase two. The set of firm, industry and contextual relationships identified in phase two formed the basis for analysis in phase three. The overall objective was to examine the firm and contextual factors identified in phase two and their ***typicality*** in the internationalisation of a wider group of knowledge intensive indigenous Irish software technology companies.

The key findings were discussed in relation to firm characteristics, patterns and levels of internationalisation, the role of psychic distance, industry factors and accumulated international experience through individuals and networks. Phase three concludes on the evidence of the "Born Global" nature of these firms, the context in which this phenomenon has developed, the firm specific characteristics and the new factors that have emerged from this study. The new factors which have emerged are - the " new technology adoption" characteristic of the market and the reconceptualisation of the role of psychic distance and its' relationship to accumulated international experience.

The above contributions of the research are discussed under the following three key areas; (1) The importance of context; (2) The role of knowledge; (3) A reconceptualisation of psychic distance. A framework of factors influencing the "Born global" phenomenon has been developed and this is discussed in relation to further research and potential policy implications.

9.3. The importance of context

As noted earlier, Dunning (2000, p.181) warns of the difficulty in providing any comprehensive explanation of the "contemporary MNE" unless the context in which the explanation is being made is "very narrowly delineated". Much of the research to date spans a wide context – cross industry, spanning different periods of time and therefore technological advances, firms with different levels of knowledge intensity and firms with different marketing approaches (niche or broader targets). There is evidence in the literature to date that each of these contextual factors above influence the "Born Global" internationalisation approach of the firm. The guiding paradigm for this research has primarily been a phenomenological one guided by the purpose of the research and this contextual nature of the phenomenon. This decision on methodology has allowed the researcher to the study dynamics between firm internationalisation and its contextual environment. This section examines these insights further in relation also to the contextual variables outlined in Chapter 2: and presented in Figure 1-4. Dunning's (1988a) Eclectic Paradigm of International Production is used in the research model as a framework of contextual analysis – connecting the literature and ideas. The following section revisits the issues highlighted in the research model in relation to the research findings.

9.3.1. Locational factors

As described in the preceding Chapter 2, the locational factors may be viewed from two perspectives – from the perspective of the country of origin and the influence of the institutional context on the internationalisation of the firm and from the target country perspective as a determinant of MNEs international activity. The first perspective

discussed here is that of the institutional context from which the firms developed. Benito *et al.* (2002) describe the complexity of context in that it not only forms the firm but they also help to create the context. As noted earlier in Chapter 2, in while improvements in locational advantages such as technological infrastructure attract FDI, these improvements are also of benefit to indigenous firms. Chapter 3 provides an analysis of the development of the indigenous Irish software industry from the 1960s onward. Industrial policy in Ireland in the 1970s was based on attracting FDI to Ireland, which it did so successfully. The internationalisation of the Irish indigenous firms at that point, reflected this environment in that international activity by Irish MNEs was primarily a "client followership" approach. This also reflected the developments in the software industry at this time and the relationship between large hardware manufacturers and software development firms. By the 1980s, Irish companies, small and under-financed by international standards competed in wide international software technology markets. The foundations of the institutional frameworks started in the 1980s and although industrial policy was still focused on attracting inward investment, an active network of technical experts emerged.

It would appear that the 1990s was the most critical period in the internationalisation of the Irish software industry. The critical case Iona Technologies was formed within this period and the majority (59 per cent) of the internationalised firms in the indigenous software technology industry were also formed during this period. This period was characterised institutionally by:

- Specialised government agency focused on developing the indigenous sector
- State and EU funding for R & D

- An active domestic network of technical experts
- Participation in international research forums

Industry developments also influenced the international development of firms within this period, but it is clear that the institutional framework in the 1990s helped "form" the international development of today's' indigenous software firms. Interestingly also, they have helped create this institutional framework, and the international firms to date in the early 2000's are emerging as spin-offs of these firms formed in the 1990s.

From the literature review, it emerged that increased knowledge intensity of firms together with agglomeration effects are influencing country selection decisions from internationalising firms. The in-depth case study permitted a detailed measurement of different constructs of knowledge while phase three analysed the knowledge intensity of the internationalised sector on the most common industry dimension. It was evident that by comparative industry standards, the indigenous Irish firms indicated a high level of knowledge intensity. How this exactly influences country selection is less clear. However, it is possible to conclude that for these firms by the nature of their knowledge intensity, market selection decisions are less influenced by structural or spatial market failures (as originally assumed in Dunning's (1988a) locational advantages). The firm specific influences on market selection are discussed later in this chapter, in relation to the role of accumulated international knowledge. Agglomeration effects and asset augmenting theories of FDI were evident in particular in the case study where Iona Technologies were influenced particularly in U.S. market selection. However, it emerged in phase three that specific industry and sub-sectoral developments also influenced market selection needs.

There are varying views in the "Born Global" literature as to whether the size of the domestic market is a factor in the early internationalisation of these firms. It was evident from the in-depth case study that the lack of a domestic market for the specialised niche product was a key factor in the early internationalisation of the firm and the pattern of internationalisation to date. While one cannot conclude a causal relationship in phase three, the "Born Global" firms internationalised early in their existence (earlier than in other "Born Global" studies) and had a high international to domestic market sales ratio (again higher than in other "Born Global" studies). Market growth was ranked in phase three as the key factor influencing their internationalisation decisions; one can conclude that a limited domestic market is an influence on the early and high level of internationalisation.

In summary, a number of locational factors from the perspective of country of origin were evident as an influence the internationalisation of the firm – the institutional support (specialised network, availability of funding), the limited growth potential of the domestic market and the sectoral and subsectoral agglomeration. These are also related to industry developments and market trends which are discussed in the following section.

9.3.2. Industry

Dunning (2000) highlights that ownership competitive advantages tend to be context-specific, specific to an industry or country. The development of firm specific technology advantages of the indigenous technology sector are in the context of the wider industry trends. The presence of large hardware manufacturers in Ireland in the 1970s and the incompatibility of software platforms influenced the "Client followership" approach to internationalisation. Similarly, the increased technological competence of firms in the

1980s saw them compete with the large U.S. players and in the area of systems applications and tools. The difficulties experienced by these under-financed small technology firms in competing against large international players created huge barriers to international success. In addition, there are indications that the software industry was maturing at this stage with increasing standardisation and lower barriers to entry. The combination of a number of these industry factors in the 1980s, influenced firstly their ambitious approach to internationalisation but also the difficulties they encountered. It is notable that only one of the thirty four indigenous international Irish software firms surveyed in phase three had been established in between 1970-1979. As noted in Chapter 3, most firms established during this period were subsequently acquired or ended in the liquidation of the firm.

There were a number of industry factors that emerged in phase two that appeared to influence the internationalisation of the firm and were examined further in Phase three. The stage of development of the industry and the decision by firms to target specialised niche areas as opposed to wider international markets created the need for early internationalisation (particularly given the size of the domestic market). In the case company, the focus of a niche area was the direct result of their involvement in European funded research. While this may not be the case in all firms, the involvement in international research programmes contributed to the technological competence that emerged in the 1990s and possibly sowed the seeds for some of the new technology areas developed. There was evidence also that the widespread usage of the Internet at this point and other industry developments (deregulation, technology developments) also influenced the international patterns of these firms.

In summary, one of the first contributions of this research is in highlighting the importance of context, not just locational but institutional and industry context. The findings by research to date into the internationalisation of indigenous technology firms in particular Bell's (1995) and Coviello & Munro's (1997) research to date, reflect the institutional and industry context at that point in time. The factors influencing the internationalisation level and pattern change over time, depending on the industry and institutional context from which the firms emerge.

9.4. The role of knowledge

The role of knowledge in internationalisation has been one of the central areas of this research. The following figure, from Chapter 2 represents how this inquiry has been led in understanding the influence of knowledge intensity and internationalisation knowledge accumulation on the internationalisation of "Born Global" firms, specifically indigenous Irish software technology firms.

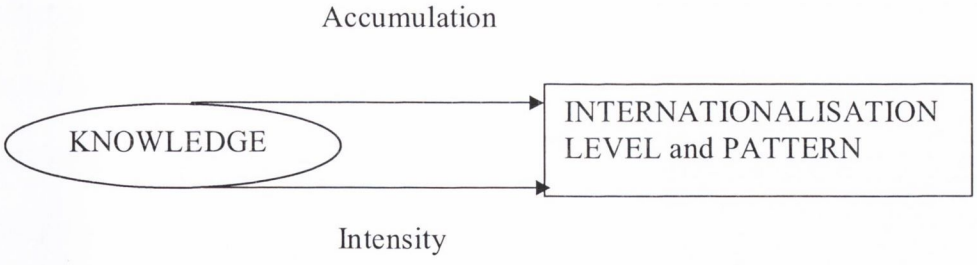


Figure 9-1: The roles of knowledge in internationalisation

9.4.1. Knowledge intensity

It has been noted in Chapter 2, that a high level of R & D (percentage of revenue spent on R & D being a common measure of knowledge intensity) contributes to a faster internationalisation process. Young (1987), Barkema *et al.* (1999) specifically highlight that knowledge-based firms are driven by the need to recover R & D costs. The concept of knowledge intensity as a driver of internationalisation was examined in phase two. It emerged as a key characteristic of the firm (high knowledge intensity) but not necessarily a driver or reason for early internationalisation. In that particular case, early internationalisation was primarily driven by target market characteristic of being "a new technology adopter" and the absence of this characteristic in the domestic market. The high knowledge intensity characteristic of the firm was also evident in phase three of the research.

However, other potential relationships between R & D levels and patterns of internationalisation were identified in phase two. It emerged from the case analysis that revenue from the U.S. market was highest at the early stage of the product life cycle in the first product and then again at the early phase of the firm's second product's lifecycle. This is also related to the firm's perception of the U.S. market as one to adopt new technology quickly. As one might expect, levels of R & D are highest at the early stages of the product life cycle as indicated in phase three analysis. It was also evident in phase three that firms with the highest international sales ratio (> then 75 per cent of sales from international markets) were at the early and growth stages of the product life cycle. This would indicate that the level of R & D and product life cycle stage (or stages if multiple

products) influence the firm internationalisation pattern and internationalisation levels. The exact nature of this relationship needs to be examined further.

9.4.2. Knowledge accumulation

The objective in phase two of the research was to gain a measure of the international capability of the firm, to gain a measure of the firm's international business knowledge in the context of their firm and to gain a measure of the firm's knowledge of foreign market norms, regulations and standards. The key conclusions in relation to phase two and examined further in phase three are noted below;

1. There is already internationalisation knowledge accumulated in the company through individual founders on the formation of the company.
2. Different constructs of knowledge (internationalisation knowledge, business knowledge and institutional knowledge) are acquired in different ways.
   There is evidence from the data on internationalisation knowledge (IK) that it may be gained experientially, acquired through the hiring of individuals with relevant knowledge or acquired through international alliances or network involvement. Both phase two and three indicated existence of international alliances and active involvement in industry networks. It was also evident that the Irish industry had closest links with the U.S. industry.
3. Some constructs of knowledge – institutional knowledge (NK) are more easily acquired than others (Internationalisation Knowledge (IK) and Business Knowledge (BK)). This may be industry specific and related to the level of internationalisation of the industry. It was found in phase two and three that firms availed of specialised government agency and acquired institutional knowledge in this way.
4. Knowledge is not necessarily accumulated experientially on a market basis but perhaps on an individual, firm and industry basis.

9.4.3. Summary

This study supports Eriksson (1997) view that accumulated internationalisation experience is not related to specific country markets (as assumed in U-Models) but is *firm specific* knowledge related to all markets. It is also consistent with Christensen & Jacobsen (1996) Danish study and Crick & Jones (2000) U.K. study, in highlighting that firms have different routes to internationalisation based on knowledge acquired prior to the formation of the firm. It also supports the research by Huber (1991), Barkema & Vermulen (1998), Reuber & Fischer (1997) and Erkko *et al.* (2002) in the notion that that knowledge can be acquired by hiring individuals with valuable international experience.

This study adds to the research in this area due to the in-depth nature of phase two. It contributes to the understanding of the influence of accumulated international experience on the internationalisation of the firm. It also emphasises the importance of industry specific international networks in guiding early internationalisation decisions. It develops an additional firm characteristic of the "Born Global" firm in that these firms have accumulated international experience. It recognises the different ways in which this experience can be acquired and does not identify with a gradual internationalisation process based on internationalisation knowledge gained experientially on a market basis. The accumulated international experience of the firm through its founders prior to the formation of the firm, through its recruitment of individuals with international experience, the leverage of institutional support and its involvement with international industry networks, is central to the internationalisation of the firm.

9.5. Reconceptualisation of the relevance of psychic distance

As noted earlier in Chapter 2, Chetty & Campbell-Hunt (2003) describe the differing role of psychic distance in the traditional approach (U and I Models) versus the "Born Global" approach. The early traditional models assume that a firm enters new markets as a function of psychic distance to the firm. The "Born Global" approach assumes psychic distance has become irrelevant in the internationalisation process, and that the internationalisation does not follow these steps but entering multiple psychically close or distant global markets simultaneously. Research to date on the "Born Global" phenomenon in the software technology sector has not indicated a complete irrelevance of psychic distance, but nor does it suggest that market selection is a function of psychic distance.

The contribution from this research comes from the phenomenological approach used in phase two and the benefit of mixed methods. An interesting illustration of this is Bell (1995, p.67) in his study of Finnish, Norwegian and Irish software technology companies in which he found that psychic proximity did not "provide an adequate explanation for the firm's initial market selection decisions". He notes that although the quantitative data supports the notion of psychic distance, the qualitative data indicated that market selection decisions were not influenced by psychic factors. This raises a number of questions in relation to psychic distance and its role in market selection.

Crick & Jones (2000, p.74) from their in-depth qualitative study of U.K. software technology firms note in relation to the rationale for market selection and mode of entry, that "serving markets that were perceived as having a low psychic distance did not feature as an important decision. Instead the markets served were perceived to be those

with growth opportunities for the firm's particular niche product". As noted in Chapter 2, Bell (1995) concurs with this in that there is strong evidence that the internationalisation process for small computer software firms is influenced by domestic and client followership as opposed to the psychological or geographical proximity of export markets. Earlier in this chapter, it is highlighted that contextual factors may also explain market selection influences such as client followership. Phase one findings suggested that there is evidence of psychic distance being a factor in the first market selection decisions ***but also*** other influences (for example following client international requirements). The two are not necessarily mutually exclusive and while firms might not undergo complex systematic analysis, perhaps it is an implicit bias in decision making on international markets.

The findings in phase two were consistent with Bell's conclusion that psychic proximity did not explain the rationale for the firm's initial market selection decisions, although the initial market was psychically close. Through in-depth interviews with the founders, a number of other factors influencing market selection were identified and examined in phase three. The findings in phase three were consistent with Bell's (1995) conclusion and with phase two of this research. This was that the quantitative data supported the idea of psychic distance but the qualitative analysis (phase two) and second level analysis (in phase three based on the ideas generated from phase two) supported other factors influencing market selection decisions. It is possible that markets are perceived to be close psychically and less risky due to experience, knowledge and linkages with the market. This view that the impact of psychic distance on market selection reduces after

first market entry decision (experience) is also supported by Chetty & Campbell-Hunt (2003), Dow (1998), Coviello & Munro (1997).

It is evident from this three phased study that while firms do not explicitly select markets on the basis of their psychic distance, they initially select markets for other reasons (for example market growth) and these initial markets may be psychically close. Also, psychic distance may guide mode of entry to the market rather than market selection. For example, in phase two the psychic distance of the Japanese market influenced the mode of entry to that market (through Australia) but not the decision to enter that market or not.

There is emphasis in recent research on the measurement of psychic distance. Dow (1999) highlights that despite the long history of the concept of psychic distance, he believes that the instruments used to measure psychic distance have been flawed. Stöttinger & Schlegelmilch (2000, p.172) highlight the need for a more qualitative approach to "capturing the various facets of the construct". Sousa & Bradley (2006) note that psychic distance is based on the individual's perception of psychic distance and therefore should be assessed at individual level. Dow & Karunaratna (2006) also highlight measurement issues in relation to national versus individual measures and question the underlying dimensions accepted to date of psychic distance.

While cognisant of the issues highlighted above in relation to the measurement of the concept, this study's contribution is in relation to its challenge to the generally accepted role of psychic distance in internationalisation. The role of psychic distance as accepted and presented in the literature to date is one of guiding market selection decisions, illustrated in the following;

> *"...The Nordic multinationals have been widely accepted as the starting point for the concept of psychic distance ..in that.. companies expanded overseas business by successive stages to markets that were characterized by greater psychic distance" (Child et al., 2003, p.37).*
>
> *"...the extension of activities in the market is related to psychic distance suggesting that firms enter new markets with successively greater psychic distance" (Sousa & Bradley, 2006, p.50).*

in relation to Nordic studies which they term "the starting point for research on this concept".

> *"...it is based on the assumption that managers are less likely to initiate and/or pursue business relations with countries perceived to be dissimiliar" (*Stöttinger & Schlegelmilch , 2000, p.169).
>
> *"...identifying its' (the construct of psychic distance) potential applications, such as predicting export and FDI market selection, and choice of entry mode"* (Dow & Karunaratna, 2006, p.579) [in relation to the Nordic researchers development of the construct in the 1970s].

In sectoral specific studies the conclusions on factors influencing market selection tend to emerge as mutually exclusive. The findings of this study suggest that a reconceptualisation of the role of psychic distance and the nature of this role is needed.

Instead of presenting the role of psychic distance as one which explicitly guides market selection, a view of psychic distance emerges as one in which accumulated internationalisation knowledge is implicit in their decision making about international markets. Other firm and contextual (industry and locational) factors may also influence the market selection decision as well as this accumulated internationalisation knowledge.

These decisions are not just in relation to market selection but also mode of entry, timing and level all of which comprise the firm's internationalisation pattern and level. Dow & Douglas (2006) highlight in relation to their specific research on measurement of psychic distance that the results are specific to the form of international exchange (exporting) and the industry itself. They also note that geographic distance is "still the most influential trade inhibitor" for what they describe as industries having low transportation costs (p.593). As highlighted in Chapter 2, the intangibility and mobility of knowledge based assets in "Born Global" software technology firms make international expansion more economical and faster than in traditional firms with tangible assets. It is possible that role of psychic distance is specific to the nature of the industry and the characteristics of the firms (with minimal transportation costs). This study does not specifically examine the influence of geographic distance but nor does it exclude this given the nature of the study in exploring factors influencing the internationalisation of the firm. Geographic proximity did not emerge as a significant barrier given the nature of the international exchange (knowledge) and the internationalisation of the industry.

.6. Extending the "Born Global phenomenon"

Knight & Cavusgil (1996) highlight the need for additional research in the form of a framework "a roadmap capable of assisting scholars in a systematic study of the "Born Global" phenomenon. They describe how this framework should identify internal and external factors in the environment of the firm that can engender and mediate the "Born Globals" development and progress (1996, p23). As noted earlier in Chapter 2, Dunning (2001) highlights the emergence of new explanations of MNE activities and their contribution to the robustness of Eclectic Paradigm. Dunning & Wymbs (2001) in their

examination of the challenge of electronic markets in relation to the Eclectic Paradigm reiterate that "the paradigm identifies three sets of contextual variables likely to affect the extent, pattern and form of MNE activity" (p.289). In a similar approach, the following framework developed from this research identifies the firm and contextual factors likely to affect the extent, pattern and form of the "Born Global" phenomenon. It presents the firm characteristics as central to the framework, but linking a set of contextual variables surrounding the firm. Gomm *et al.* (2004) highlight that the case study method because of the observer's "knowledge of the connections linking the complex set of circumstances" and "knowledge of the linkages among the events in the case" provide the "optimum conditions in which general principles can be shown to manifest themselves" (2004, p.182).

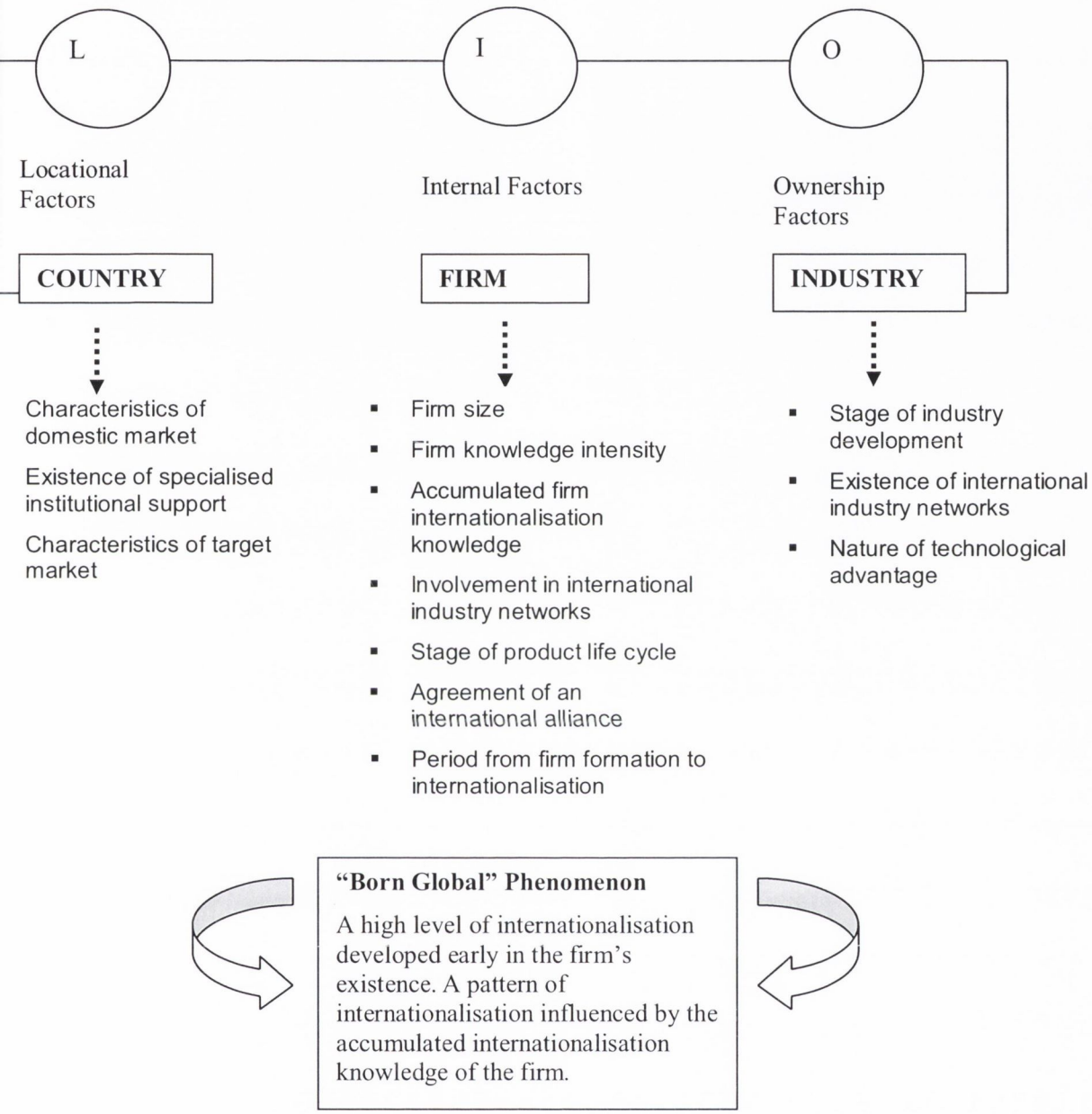


Figure 9-2: Firm specific characteristics and contextual factors influencing the "Born Global" phenomenon

The following briefly describes the framework, which is discussed in more detail in the preceding chapters at each phase of the study from which it is induced.

9.6.1. Characteristics of the firm

The following are the factors identified as influencing the internationalisation of the "Born Global" firm:

- Firm size is typically small;
- Firms exhibit a comparatively high level of knowledge intensity;
- Firms accumulate internationalisation knowledge through individuals' internationalisation experience, through involvement in international industry networks and leveraging of institutional internationalisation knowledge. Internationalisation knowledge is implicit in decision making about market selection and mode of entry;
- Firms exhibit a high level of involvement in international industry networks, a mechanism of accumulating international experience;
- The stage of the product life cycle has a potential influence on the market selection and pattern of internationalisation as levels of internationalisation vary over the product lifecycle;
- The existence of an international alliance is a factor in the internationalisation process and pattern;
- The period from firm formation to internationalisation is a critical characteristic in the definition of the "Born Global" firm and possibly influences the internationalisation level and pattern.

9.6.2. External contextual factors

The following are the external contextual factors identified as influencing the internationalisation of the "Born Global" firm;

9.6.3. Locational factors - Country of origin

- Nature of the domestic market – the size of the domestic market and its characteristic as a technological innovator or adoption of leading edge technology;
- The existence of specialised institutional support is a factor linked to the accumulation of internationalisation knowledge and the acquisition of this knowledge other than experientially.

9.6.4. Locational factors - Target country markets

- Characteristics of the market – its growth potential and its characteristic as a "technological innovator" or adopter of leading edge technology.

9.6.5. Industry factors

- The stage of development of the industry – the characteristics exhibited by an industry at its different development stages (early development stage to mature stage) influence the internationalisation of the firm. This includes technological and legal developments also;
- The existence of specialised industry networks and the active involvement of firms in these networks;
- The nature of technological advantage, in particular the focus on niche global markets is a potential driver of early internationalisation.

This framework is an explanatory model with potential to be developed further with an empirical study.

9.7. Implications for public policy

O'Malley & O'Gorman (2001) described the indigenous Irish software industry as having a strong competitive performance. They note that the role of government in "factor-creating" mechanisms has been a "significant influence" (p.319). The skilled labour force and "technical elite" which emerged in the 1990s were a product of these factor creating mechanisms such as investment in education systems and acquisition of specialised skills. However, these were the result of government policy specifically targeted at attracting foreign investment into Ireland. It was evident in the phase two, up to the early 1990s there was a lack of focus on indigenous firms and a lack of expertise:

> *"...at that stage, EI really didn't have the competence in our industry sector. They had one individual, in fact they didn't exist at that stage it was IDA.. but they had one person for all electronics and software which was huge scope and one individual didn't have any experience in the niche area" - Chris Horn.*

The firm's involvement in international industry networks was critical in attracting an international alliance partner. It was only following this international alliance that the IDA matched the investment in the company. O'Riain (2004) highlights in relation to investment into the industry in the late 1990s that individual and institutional investors have "followed rather than led growth of the high-tech industries" (p.96).

It has been highlighted by the NSD (1993) and generally accepted in the industry that given the small size of the domestic market (and this was identified in the preceding research as an important factor) that indigenous Irish software firms need to export early in their existence.

The R & D intensity of high technology sectors is much cited in the literature (Young, 1987, Barkema *et al.,* 1999) as one of the key factors accelerating internationalisation. The logic behind this being, that the size of the domestic market is not large enough to sustain competitive levels of R & D[5]. A Forfás report (1997) noted that R & D expenditure has been increasing for Irish firms, their data showing 7.1 per cent of sales on R & D in 1993 and 9.6 per cent in 1995. Phase three of this research, showed that the "Born Global" indigenous Irish technology firms had significantly higher levels of R & D (35 per cent of firms had R & D ratio of >20 per cent, 42 per cent of firms had R & D ratio of 6-19 per cent). So given the size of the domestic market, these firms are characterised by high levels of R & D and they internationalise early in their existence.

In his analysis of R & D funding, O' Riain (2004, p.98) concludes that government funds provided a *stimulus* to R & D within the indigenous software sector. He also notes that Ireland received the highest amount per R & D employee of any country in the EU (p.98). However, Ireland's progress to a knowledge-based economy with high levels of outward investment by comparative country measures investment is lagging behind leading developed economies.

In a recent report by the Irish Software Association (ISA) and technology consultants Select Strategies, *Barriers to Growth* (2005), they are critical of the level of investment into the sector. They highlight that indigenous Irish software companies need to develop

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[5] Karagozoglu & Lindell's (1998) exploratory study of U.S. based small and medium sized technology firms also define "competitive levels of R & D" as 35 per cent R & D-to-sales ratio.

their expertise in international markets and at the same time build their in-house R & D capability. They estimate that an initial investment of €5 million is required and a lifetime investment of €10-20 million is required per firm. While they note that EI has a very important role to play in early stage funding, they highlight the need for "setting the bar high and invest infrequently" (p.39).

This research has identified contextual factors and specifically institutional factors influencing the internationalisation of the firm. The role of the government agency (IDA at that time) in the internationalisation of critical case of indigenous "Born Global" firm Iona Technologies in the 1990s indicates:

- Investment which has followed growth rather than been growth led;
- Specialist institutional support developed for attracting inward investment in wide technology markets rather than supporting indigenous niche firms targeting niche international markets;

As outlined in Chapter 3, a government agency focused on the indigenous software sector (NSD) was developed in 1991. A more positive role of EI emerged in phase three, in which internationalisation knowledge (specifically "institutional knowledge") is accumulated through leveraging of specialist government support agencies (although this role is fulfilled by EI not NSD).

Phase two and three of this research further developed the characteristics of the "Born Global" firm. As noted in phase three, these firms are characterised by small size, high knowledge intensity and targeting of niche markets. They internationalise early in their existence, at the most extreme "Born Global" firm before having any domestic market

(Iona Technologies), the majority (53 per cent) within the first year of formation or within first two years of existence (37 per cent).

Enterprise Ireland's most recent published strategy 2005-2007 *Transforming Irish Industry (2005)* outlines their approach for developing Irish companies to a scale capable of competing more aggressively in international markets (p.23). They outline their criteria for identifying high potential growth firms;

These firms have achieved a sustainable platform for further international growth

Size – have already €5 million in export sales and have approximately 50 employees

However, by definition of size – this excludes much of the software technology sector. Only 18 per cent of the indigenous software technology sector (HotOrigin, (2004) presented in Chapter 3, have more than 25 employees. Over 64 per cent of the "Born Global" firms surveyed in phase three have less then 50 employees. While these firms have a high international sales ratio, 65 per cent of the firms in phase three had less than €5 million total revenue. These firms are characterised by their small size. By their nature do not have established domestic markets as a platform for further growth.

Cognisant of the characteristics of these "Born Global" firms and their locational context – the need for investment for the parallel process of sustaining R & D levels and developing international markets has been highlighted above. These firms will be excluded from EI's net of high potential indigenous companies by the criteria for selection (small size) which is a definitive characteristic of these firms.

This also questions the role of the National Software Directorate and its charter as a specialist industry support organisation. The identification of the "Born Global"

phenomenon in the Irish context and its characteristics is an important step in understanding the role the NSD can fulfil in the internationalisation of these firms. In addition to developing the further characteristics of the phenomenon and the factors influencing it, new data is available from this study on the knowledge intensity of the firms and their internationalisation patterns.

By identifying the characteristics of "Born Global" firms, it has been shown that these firms are excluded from this net of high potential firms. It is also evident from this study that the international revenue is required for growth by the characteristics of their technology markets. Therefore, it then needs to be examined how these firms can get the investment and support required for international growth given the current policy. In this institutional context, would Glockenspiel achieve sustainable international growth?

9.8. Limitations and recommendation for further study

The originality of this research lies in its methodological triangulation and the use of a single critical case in the core phase. The key contributions are outlined above in relation to the importance of contextual factors, the role of knowledge and a reconceptualisation of psychic distance. The research extends the theory of the "Born Global" phenomenon by the development of a framework of firm characteristics and contextual factors influencing this relatively new phenomenon in International Business. However, while the originality and contribution of the research emanate from the methodology employed, the limitations of the research are also related to the methodology. As noted above, the framework is explanatory in nature. As noted earlier in Chapter 4, under the discussion on mixed methods, the use of qualitative data "...may suggest directly theory that can then be strengthened by quantitative support" Eisenhardt, (1989, p.538) . This "Born

Global" framework has the potential to be strengthened further by an empirical study. There are also possibilities to examine this framework in comparative national contexts or comparative "Born Global" sectors in industries other than software technology.

The conclusions of this study in relation to the role of psychic distance and the approach to measuring the concept provide opportunities for further research. Cognisant of the questions raised by Stöttinger & Schlegelmilch (2000) Karunaratna (2006) and Sousa & Bradley (2006), the contribution of this study goes further in relation to these questions. A more holistic and inclusive approach is required in examining the factors guiding market selection decisions, one of which psychic distance. The influence of psychic distance on other internationalisation decisions (for example, market entry mode or human resource decisions) is also a potential area for study.

Due to the narrowly delineated context and the methodology employed, generalisation is potentially a limitation of the research. However, the issue of generalisation is much cited in the case methodology literature as not a limitation of the methodology itself but rather a limitation of the thinking about generalisation - Yin (1994), Stake (1995), Donmoyer (2004). This research adopts Yin's (1994) approach of *analytical* generalisation and Lincoln & Guba's (1985) reconceptualisation of generalisation as *transferability*. This is driven by the nature of the research topic and the difficulty in separating the phenomenon from its context. Developing an understanding of the factors influencing the "Born Global" firm requires understanding also the complexity of "its embeddedness and interaction with its context" (Stake, 1995). As noted by Dunmoyer (2004, p.32), "...accepting generalisations (to whatever extent they may be possible) as indeterminate,

relative and time and context bound, while not a wholly satisfying solution, is at least a feasible one".

Therefore, while the research has limitations in generalisability, there are limitations in how researchers think about generalisability. Adopting Dunmoyer's (2004) view above on generalisation, the research could be strengthened by further analytical generalisation to a larger set of cases. Gomm *et al.* (2004, p.103) highlight in relation generalisation that theoretical inference involves reaching conclusions about "...what happens within a degree of probability in a certain type of theoretically defined situation". To develop this analytical generalisation further would require similarly narrowly defined context and examination of the phenomenon with its context, therefore *literal replication*.

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Appendix 1: Phase one - Firm listing

Appendix 1:

Phase 1: Exploratory Study Company listing

Company name	E:mail address	Contact	
Abacus Communications	infor@abacus-communications.com	Byrne	Stephen
AccPac Europe Ltd	ivan.macdonald@accpac.com	McDonald	Ivan
ACRA Control Ltd	mail@acracontrol.com	Bonner	Fergal
Adapt Technologies	adaptt@adaptt.com	Fitzgerald	Michael
Adest	info@adest.com	Tunney	Stephen
Advance Learning Ltd	info@advancelearning.com	Egenton	Roisin
Aerosoft Ltd	info@aerosoft.ie	Doyle	James
Airtel ATN Ltd	info@airtel-atn.com	Jones	Kevin
Alatto Technologies	info@alatto.com	Flanagan	Neil
Alchemy Software Ltd	info@alchemysoftware.ie		
Allegro	allegro@cahillsoft.com	Cahill	Jimmy
AllfinanzTM and FM Systems Ltd	marketing@allfinanzlnc.com	Keane	David
Allies Desgin	info@alliesgroup.com	Costello	Damian
Altion	info@altion.com	O'Driscoll	Magnus
Am-Beo	info@am-beo.com	Brady	John
Anam Mobile Ltd	info@anam.com	Finnegan	Louise
ApTest Ireland Ltd	stephen@aptest.ie	McNamara	Stephen
Ardbrook Ltd	info@ardbrook.ie	Furlong	Peter
Arekibo	askus@arekibo.com	Cunningham	Dervla
Avail Corporation	info@availcorp.com	Haydon	Peter
Avonbrrok Ltd	sales@avonbrook.com	Merrick	Gerry
Baltimore Technologies	INFO@BALTIMORE.COM	Duffy	Denise
Bantry Technologies	info@bantry-technologies.com	Trane	Patrick
Baydon Solutions	info@baydon-solutions.com	Blake	Margaret
Beacon Integrated Solutions	info@bisl.ie	Gardener	Nick
Bearatech Ltd	sales@beartech.com	Deegan	Rick
Bind Systems Ltd	info@bindsys.com	Caffrey	Colm
Bizmaps Ltd	info@bizmaps.ie	Aislind	Brady
Blue Tree Systems Ltd	info@bluetree.ie	Cahill	Charles
BoCom International Ltd	info@bocom.ie	O'Halleron	Barry
Bowne Global Solutions	sales@bowneglobal.ie	Naismith	Emma
Braxtel Communications	info@braxtel.com	MacDonnell	Katherine
Broadcom Eireann Research Ltd	enquiries@broadcom.ie	Cahill	Gerry
BSM Ireland Ltd	info@bsm.ie	O'Grady	Brian
Business Integrated Services	info@bis.ie	Murphy	Neil
CamusIT Ltd	info@campusit.net	Sheeran	Sandra
Cape Clear Software Ltd	info@capeclear.com	Cleary	Sarah
CAPE Technologies Ltd	mail@captec.ie	Kennedy	Fred
Cardbase	careers@cardbase.com	Lonergan	Carol
CBE Software Ltd	cbe@iol.ie	Concannon	Gerry
CCSI Ltd	info@ccsi.ie	Hoffman	Louis
Celerity	info@celerity.ie	Halpin	Ken
Cell Media Ltd	marketing@cellmedia-interactive.com	Veigh	Sean
Celtech Software International	info@celtech.ie	Fanning	Darragh
Changing Worlds	info@changingworlds.com	O'Mally	Olwyn
Ciarrai Computer Systems Ltd	webmaster@ciarrai.com	Kirkpatrick	Gerry

Cinehub	info@cinehub.com		
Clear System Solutions	info@clearsys.ie	Lear	Cathy
Client Solutions Ltd	enquiries@clients.ie	Murphy	Gerard
Codec Ltd	info@codec.ie	Costigan	Fiona
Colman Computer Services Ltd	colman@eirenet.net	MacKessey	Richard
Compupac	compupac@iol.ie	McManus	Gerry
CompuPharma Ltd	info@compupharma.net	Birchill	Anthony
Concept	paul@concept-designgroup.com	McCann	Paul
Conduit Software	software@conduitsoftware.com	Brennan	Winnie
Contiuum Technologies	info@continuum.ie	MacFarlane	Michael
Courseware Interactive Ltd	info@courseware.ie	Watts	Niall
CR2	info@cr2.com	O'Driscoll	Niamh
Crannog Software Ltd	info@crannog-software.com	Glynn	Paul
Croskerry Systems Ltd	crskerry@iol.ie	Van	Peter
Cryona	info@cyrona.com	Duggan	Keane
CSA Computing Services Ltd	vbyrne@csa.ie	Byrne	Viv
CSR Ltd	careers@csr.ie	Neligan	Elizabeth
Curam Software	info@curamsoftware.com	Hearne	John
Cyantel Ltd	info@cyantel.com	Murphy	Padraig
Dara Design	jwalsh@daradesign.ie	Walsh	Jimmy
Databank	databank@iol.ie	Wright	John
Datacare Software Group Ltd	info@datacare.ie	Toye	Paul
Datalex	sales@datalex.ie	Beck	Niall
Datanet	info@datanet.ie	Hickey	David
Datapac	ecreely@datapac.com	Creely	Edel
DB Computer Solutions	info@dbaireland.com	Costello	John
Deal Dynamics	john.sheehan@dealdynamics.com	Sheenan	John
Deecal	info@deecal.com	Coburn	John
Delphi Technologies	info@delphi.ie	O'Dwyer	Ultan
Dendron Technologies Ltd	trevor_oconnell@dendrontechnol.ie	O'Connell	Trevor
Desktop Systems Ltd	desktop@iol.ie	Peat	Declan
Dessa Systems	info@dessasystems.ie	Keogh	Paul
Diatec Ltd	tech@diatec.ie	Harpor	Celsus
Digerait Software	info@digeratisoftware.com	Brennan	John
Digital Crew Ltd	info@digital-crew.com	McCarthy	Cormac
DMS Software Ltd	info@dmtintl.com	McNamara	Matthew
DP Systems Ltd	info@dpsnet.com	Holland	John
DSR Systems Ltd	dsr@iol.ie	Houlton	David
Duolog Technologies Ltd	info@duolog.com	Bulger	Ray
Eberon	info@eberon.com	Gorman	John
Educational Multimedia Corporation	info@educationalmultimedia.com	Kirwan	Sean
Eland Technologies Ltd	contact@elandtech.com	Healy	Robert
Elive	info@elive.ie	Ryan	Sean
Emergesmart	contact@emergesmart.com	Johnson	Ultan
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Created from National Software Directorate company database on www.nsd.ie, February 2004

Appendix 2: Phase one – Online survey

Design Survey

Show All Pages and Questions

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To change the **look** of your survey, select a choice below. Click 'Add' to create your own custom theme.

Theme: Blue Ice Add

Survey of indigenous Irish firms in the software technology industry

Edit Title | Edit Numbering | Add Logo

Add Page

1. Company Profile

Edit Page | Delete Page | Copy/Move | Add Logic

This section focuses on information relating to the company background and current profile.

Click "Next" to get started with the survey. If you'd like to leave the survey at any time, just click "Exit this survey". Your answers will be saved.

Add Question | Add Page

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1. In what software sector is the company engaged?

Banking & finance | Telecommunications | Internet and online applications | Software tools | Infrastructure software | E:learning and internet based training | Other

Add Question | Add Page

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2. In what year was your company established in Ireland?

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3. Who is the founder (s) of the company?

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4. How many people does your company employ ?

1 - 10 | 11 - 50 | 51 - 100 | 101 - 250 | 251 - 500 | 501-1,000 | 1001-5000 | 5000+

Add Question | Add Page

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5. What was the total revenue of the company in the last financial year?

< €250,000 | €250k - €1m | €1m - €5m | €5m - €10m | €10m - €20m | > €20m

Add Question | Add Page

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6. What % gross margin does your company earn?

<1% | 1 -10% | 11 -20% | 21 -30% | 31 - 40% | 40 -50% | > 50%

Add Question | Add Page

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7. What % of the company's costs are in R & D?

None | 1% - 10% | 11% - 20% | 21%- 30% | 31-40% | > 40%

Add Question | Add Page

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8. What % of your employees have had experience in international companies prior to joining your company?

0-10% 11% - 30 % 31% - 50% >50%

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9. In what country is the company's headquarters/corporate office?

Add Question Add Page

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10. What % of revenue comes from international markets (outside of Ireland)?

None 1% - 5% 6%- 10% 11% - 20% 21% -30% 31% - 40% 41% - 50% >50%

Add Question Add Page

2. Internationalisation of the company

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This sections looks at the reasons for expanding internationally, the nature of company's international activities and how it has approached international expansion.

If the answer to Section 1: Q10 is "none", then please skip this section and go to section 3.

Add Question Add Page

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11. What activities are currently performed in Ireland?

- R & D
- Manufacturing
- Sales & marketing
- Distribution
- Central support activities (HR, Finance, IT)

Add Question Add Page

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12. What activities are currently performed outside of Ireland?

- R& D
- Manufacturing
- Sales & marketing
- Distribution
- Central support activities - Human resources, Finance, IT

Add Question Add Page

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13. If activities are performed outside of Ireland, please indicate where are these activities performed? Please select a country (or countries) for each activity below.

	Country 1	Country 2	Country 3	Country 4	Country 5
R & D					
Manufacturing					
Sales & marketing					
Distribution					
Central support activities					

Add Question Add Page

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14. Please rank the following reasons from 1 to 11 for expanding internationally according to importance to your company (1 being the most important and 11 being the least):

Market growth - enter new country markets

Access to technology

Access to lower cost base

International customer requirement

International competition

Extend product/service range

Diversify into new business areas
Investor expectations
Achieve economies of scale
Risk management
Access to skill or knowledge base
Other

Add Question | Add Page

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15. Which international markets are the most important to your company strategically for future growth. Please select countries 1 to 3 according to strategic importance, 1 being the most important strategically.

Market

1-
2-
3-

Add Question | Add Page

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16. Which international markets are the most important to your company for revenue generation currently? Please select countries 1 to 3 according to the highest revenue, 1 being the highest.

Market

1-
2-
3-

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17. Are your company's key suppliers..

Primarily local companies | Primarily international companies | Both local and international companies

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18. In what year did the company first engage in international activities?

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19. Was this first international activity:

- Product export
- License/franchise agreement/alliance
- Setting up of sales office
- Setting up of product development or manufacturing
- Acquisition
- Other (please specify)

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20. What was the first country in which the company engaged in international activity?

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21. Did the company establish international activities in more that one market simultaneously?

Yes | No

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22. Did the company co-operate with any Irish institutional organisation (i.e. Enterprise Ireland) on the company's

international expansion?

Yes No

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23. If the answer to question 22 above is Yes, please indicate in what country or countries was this support provided by selecting the country from the list below.

Country

Country 1-

Country 2-

Country 3-

Country 4-

Country 5-

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24. Did the company avail of any investment incentives in any of the countries in which they have expanded internationally

Yes No

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25. If the answer to question 24 above is yes, in what country or countries did the company avail of this investment incentive. Please select from the list of countries below.

Country

Country 1-

Country 2-

Country 3-

Country 4-

Country 5-

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26. Did the company work with any Irish educational institute (i.e. University) on the company's international expansion?

Yes No

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27. If the answer to Question 26 above is Yes, please indicate in what country or countries the company worked with an educational institute by selecting from the list below.

Country 1-

Country 2-

Country 3-

Country 4-

Country 5-

Add Question Add Page

3. Potential for internationalisation Edit Page Delete Page Copy/Move Add Logic

This section focuses on companies not currently involved in international activities but with potential to do so in the future.

Add Question Add Page

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28. Why has your company not engaged in international activities to date? Please rank the list of reasons below in order of importance from 1 to 5 (1 being the most important reason)

Order of importance

Sufficient market growth in domestic market (Ireland)-

Sufficient supply base in domestic market (Ireland)

Lack of international experience-

Lack of financial support-

Nature of product/service is tailored to the local market rather than international markets-

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29. Does your company plan to engage in international activities in the future

Yes No

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30. If the answer to question 29 above is Yes, please indicate the type of international activity your company intends to perform from the list blow

- Product export
- License/franchise agreement/alliance or joint venture
- Setting up of sales office
- Setting up of product development or manufacturing
- Acquisition
- Other (please specify)

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31. If the answer to question 29 above is Yes, in what year does your company plan to engage international activities ?

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32. If the answer to question 29 above is Yes, please indicate the first country in which your company plans to engage in international activities and then select the type of activity from the list below.

	Country	Type of activity
Country and type of activity-		

Add Question | Add Page

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Appendix 3: Phase two - Case protocol

Case Study Overview

Background

In the context of Ireland's increasing levels of outward FDI, the strategic importance of the indigenous software technology sector to Ireland and emergence of the "Born Global" phenomenon –an exploratory study was done of the indigenous Irish software technology sector (Phase 1). The objective of this exploratory study was to gain insight into the factors influencing the internationalisation of these firms. In addition, as there is no exiting sector specific data, this also provides some initial data on the sector.

What has emerged from this exploratory study and review of the literature to date in this area is - the role of knowledge in perhaps a different way. The role of knowledge and in particular experiential knowledge has been one of the key assumptions underlying the internationalisation models to date. This role may be seen as an influence from two different but related perspectives – *knowledge intensity* as a driver of internationalisation and *knowledge accumulation* as an influencer of the pattern and pace of internationalisation. This in-depth case is a follow-on from the Phase 1: Exploratory study, to explore in more detail the role of knowledge - knowledge intensity and knowledge accumulation in influencing the pattern, pace and level of internationalisation in this sector.

Yin's (1994) case methodology is primarily used in this phase of the research while also integrating this with Eisenhardt (1989) work on building grounded theory from case studies.

Study propositions

1. *Firms with high knowledge intensity internationalise early in their existence (knowledge intensity and the need to internationalise – (the why)*
2. *Firms with accumulated internationalisation knowledge have a rapid and more direct internationalisation process (knowledge accumulation and how the firm internationalises – the how)*

Theoretical relevance

According to Eisenhart (1989, p. 544) an essential feature of theory building from case studies is a comparison of emergent concepts with extant literature. The key questions then are - What is similar? What does it contradict and why?

Existing theories of internationalisation

- **U and I Models:** Incremental process based on gaining market knowledge experientially
- **Born Global firms/International New Ventures (INV):** Firms in knowledge intensive industries internationalising more rapidly and from inception

What is similar?

- The role of psychic distance in internationalisation
- Experiential knowledge

What does it contradict?

- The importance of firm knowledge in internationalisation rather than market knowledge
- The pace and pattern of internationalisation

Why does it contradict existing theories?

In earlier U and I Models of internationalisation, market knowledge is seen as a barrier to be overcome by experience on a market basis. In the Born Global/INV model of internationalisation, knowledge intensity is one key characteristic of firms internationalising early in their existence. Internationalisation knowledge accumulation on the a basis is impacting the internationalisation process and determining the pattern of internationalisation.

The role of knowledge in internationalisation

The objective of this case study is therefore to *extend* the theory of "Born global firms" – the early internationalisation of knowledge intensive firms.

Case selection

Phenonenom: The phenonenom to be studied is the early and rapid internationalisation indigenous Irish technology companies.

Context: The study is at firm level within an institutional, industrial, organisational context. The independent variables are *knowledge intensity* and *internationalisation knowledge accumulation.* The dependent variables are the *level of internationalisation* and *the pattern of internationalisation.*

According to Yin (1994), a single case is appropriate under three circumstances:

1. The case represents a critical case
2. It is an extreme or unique case
3. It's a revelatory case – the situation when a researcher has an opportunity to investigate a phenomenon previously inaccessible to scientific investigation

A single in-depth case (Iona Technologies) was chosen on the basis of a critical case. Yin (1994) highlights that the requirement for a single critical case is that the research has a clear set of theoretical propositions as well as circumstances within which the propositions are believed to be true. If the case objective is to confirm, challenge or extend the theory, there may exist a single case meeting all of the conditions for testing the theory. As the case objective in this research is to *extend the theory,* the following criteria were established from the research to date on the "Born Global" phenomenon to determine the existence of a single criteria case.

- An indigenous firm with high level of internationalisation
- A knowledge intensive firm
- A firm which has Internationalised early in its existence
- A firm which has had a fast pace internationalisation as opposed to a gradual market based approach
- A firm which has a small or no domestic market
- A firm that focuses on a high-technology niche in international markets.
- Longevity – the firm has been established for at least five years to enable analysis over a significant period of time

Iona Technologies was selected as a critical case in the indigenous Irish Technology sector meeting the above criteria of a "Born Global" firm.

Field Procedures

The following outlines the process and procedures proposed for data collection

1. Letter of introduction and seeking permission for study
2. Follow-up telephone to discuss
3. Letter of confirmation/outline schedule of activities
4. Data collection:
   Individual interviews – Permission to record interviews
   Internal surveys – Permission for distribution of electronic survey
   Internal documents – Identification of internal documents required and copied on-site
5. Resources required on-site: Laptop, paper, pens, files, meeting room/office for document review, tape recorder

Case study questions

The following are the questions posed to the inquiry, the case study itself (level 2 questions):

1. How does knowledge intensity influence the internationalisation in these firms?
2. How does knowledge accumulation influence the pattern and level of internationalisation of the firms?
3. What else influences the pattern of internationalisation in the firm?

Knowledge intensity

What is the knowledge intensity of the company?

The data needed to develop a measure of the knowledge intensity of the company is identified as follows:

Type of measure	**Knowledge Intensity Indicator**	**Data needed**
Input measure	R & D spend as a % of sales revenue annually	Annual R & D expenditure Annual revenue
Output measure	% sales from new products annually	Annual revenue by product
Human capital measure	% of knowledge works in the organisation relative to total headcount	Internal headcount data
	Composite measure	

Sources:

The following are the sources identified for each:

R & D indicator: Company reports

New product indicator: Company reports, internal documents

Human capital indicator: Internal company HR records

Internationalisation knowledge accumulation

What is the firms accumulated internationalisation knowledge? How is the knowledge obtained?

Eriksson's *et al.* (1997) and Hadley & Wilson's (2003) constructs of internationalisation knowledge have been further developed with the objective of measuring knowledge accumulation over time and therefore to establish the "stock of knowledge" in a firm.

To conceptualise this further, a detailed set of questions was developed in each of the three areas to establish a measure of internationalisation knowledge at a point in time:

- Internationalisation knowledge (IK) questions focus on senior management/founders international experience, the international vision & growth of the firm, and international marketing experience.
- Business knowledge (FBK) questions focus on the firm's knowledge about international competitors, international complementary products/services, foreign distribution channels and foreign business contacts.
- Institutional knowledge (FIK) questions focus on knowledge about laws, norms, international standards and foreign language capability.

Data needed:

Individual's internationalisation experience (top management, founders)

Firm internationalisation experience

Individual's business knowledge (top management, founders)

Firm business knowledge

Individual's institutional knowledge (top management, founders)

Firm institutional experience

Sources:

- Company internal documents
- Interviews with founders
- Survey of senior management

Internationalisation level

Level of internationalisation: What is the level of internationalisation of the company? How has this level changed over time?

The following is the data needed to establish the internationalisation level of the firm:

Level of internationalisation	**Pattern**
Financial measure ▪ Foreign sales/revenue as % of total (FS) **Organisational measure** ▪ Ratio of full-time employees in international activities (FEIA) ▪ Depth of internationalisation: % of value chain activities performed outside home country (D)	▪ Time mapping of internationalisation decisions together ▪ Psychic distance mapping of the location of the decisions ▪ Geographic distance mapping ▪ Pattern of factors influencing each of major internationalisation decisions

Data Sources:

- Current and historical company reports
- Internal company - organisational charts
- Internal company documents – activity locations

Pattern of internationalisation: How have internationalisation decisions been made? What was the first country in which the company engaged in international activities? What factors affected that decision? What were second, third etc countries in which the company engaged in international activities?

Data needed:

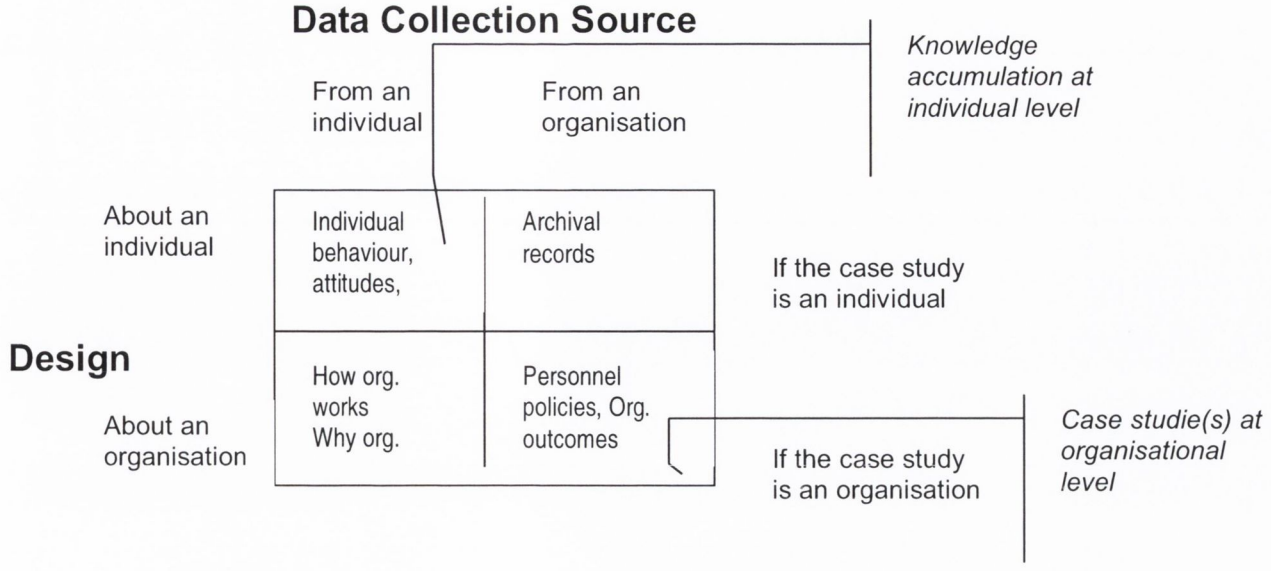
- Dates and details of major internationalisation decisions
- Details of decision makers/management at that point in time

Sources:

Company documents

Interview with founders and/or decision makers

The key principles of data collection Yin (1994) – using multiple sources of evidence, creation of a case study database and maintaining a chain of evidence will be followed in data collection.



Design versus data collection: Different units of analysis, Cosmos Corporation (Yin, 1994, p. 72)

Although the case study unit of analysis is organisational level, the accumulated internationalisation knowledge must be measured at individual level.

Data collection methods

Interviews

Two types of interviews were used in the case research, focused and structured interviews as follows. Focused interviews were completed with each of the original founders of the company.

The objectives in doing this were:

1. To gain the facts of early internationalisation decisions as well as the founder's opinion about these events
2. To gain insight from the founders on contextual factors of industry, locational and organisational factors
3. To establish the founder's level of internationalisation experience at the point in time of the first internationalisation decision

The interviews were each one hour long and followed questions developed in the case protocol but remained open-ended to explore contextual factors. The senior management team were required to complete a web-based questionnaire, the objectives of the questionnaire were:

1. To establish the individual internationalisation experience

2. To corroborate facts on internationalisation decisions
3. To collect data to corroborate with the level of internationalisation of the company

Case analysis

Yin (1994) describes two main approaches to case study analysis;

1. Analysis based on theoretical propositions – which led to the case study inquiry.
2. Analysis based on a case description – when the objective of the case is a descriptive one and when theoretical propositions are absent.

The analytical approach is one based on theoretical proposition. The mode of analysis used as part of this mode of analysis is a Programme Logic Model. There are four dominant modes of analysis according to Yin (1994): pattern-matching, explanation-building, time-series analysis and program logic models.

Programme logic model is a combination of pattern matching and time series analysis. It is particularly useful in analysing a complex chain of events (pattern) over time (time series) covering dependent and independent variables. Programme logic model will used in this research to analyse the internationalisation pattern over ten years, including in the analysis, knowledge intensity and internationalisation knowledge. The type of pattern matches used is "rival explanations as patterns". The theoretical propositions as outlined earlier are:

1. Firms with high knowledge intensity internationalise early in their existence (why)
2. Firms with accumulated internationalisation knowledge have a rapid and more direct internationalisation process (how)

The outcome that the case examines is a rapid and high level of internationalisation in a knowledge-intensive firm. It specifically examines how and why the outcome occurred (how the firm internationalised and why it internationalised). The objective also in using case study methodology is to examine within a specific context. This context may provide alternative or rival explanations. To perform analysis on "rival explanations as patterns", Yin (1994) describes how the analysis requires the development of rival theoretical propositions in operational terms. The important characteristic of rival explanations is that each involves a pattern of independent variables that is mutually exclusive. This method of analysis was examined in relation to this study, but having mutual exclusivity of the both independent variables would threaten the validity of the study. However, "time-series analysis" analyses the theoretically significant trend specified in the theoretical proposition (early and rapid internationalisation) and also the rival trends:

1. Firms internationalise in an incremental way, marketing commitment increasing with market specific knowledge (how)

2. Firms internationalise to psychically close markets initially and move to more distance markets later in their internationalisation process (how)

The objective in the case study is not just to observe the pattern of internationalisation but also to examine the how and why of the internationalisation pattern. The complexity of the events linked together by the different concept of knowledge (knowledge intensity and internationalisation knowledge) makes the case an appropriate one for the use of a Programme Logic Model. The analytical approach outlined above determines the structure for the case study report as follows:

1. Company Overview
2. Company History
3. Case analysis
   - 3.1. Internationalisation pattern analysis
   - 3.2. Internationalisation level analysis
   - 3.3. Knowledge intensity
   - 3.4. Knowledge accumulation
4. Case conceptual framework
5. Case conclusion
6. Conceptual framework for Phase 3

Case Study Schedule

The following is the outline schedule developed for the case study. As is common in case studies, data collection and data analysis were planned for completion in parallel in an iterative way.

ID	Task Name	Start	Finish	Predecessors
1	**Case Study - Phase 2**	**Mon 06/12/04**	**Fri 14/01/05**	
2	Notification & acceptance	Mon 06/12/04	Fri 31/12/04	
3	Archival sources	Mon 06/12/04	Fri 31/12/04	
4	Finalise/revise protocol	Mon 03/01/05	Fri 14/01/05	3
5	**In-depth case**	**Mon 11/04/05**	**Fri 30/12/05**	
6	**Data collection**	**Mon 11/04/05**	**Fri 02/12/05**	**4FS+60 days**
7	Interviews	Mon 11/04/05	Fri 23/09/05	
8	Internal doc	Mon 11/04/05	Fri 29/07/05	4
9	Survey	Mon 26/09/05	Fri 02/12/05	7
10	Analysis & write-up	Mon 05/12/05	Fri 16/12/05	9

Cover letter – page 1

Dear DIRECTOR

I am completing research on the indigenous Irish software technology sector.

There has been much focus in recent times of Ireland's need to move from technology-importing to a technology-generating economy. In the context of Ireland's increasing levels of outward Foreign Direct Investment FDI and the continuing integration of global markets, the indigenous software technology sector is of strategic importance to the Irish economy.

I have done an initial exploratory study on the sector, and specifically its development internationally. I would now like to complete more in-depth case study research on medium-sized indigenous technology companies of similar age who have expanded internationally.

I have identified a number of companies meeting those criteria; YOUR COMPANY is one of those. I am writing to you to request permission to complete a case study on YOUR COMPANY. This would involve a number of interviews, surveys and access to some internal documents. All of the above would be with prior agreement and arrangement with the company. The company names will remain confidential (identified as Case 1, 2, ..) and the company will also have an opportunity to review the case report before finalisation if required.

In return, I hope this will provide you some more detailed insight into the industry and comparative companies in this sector. It will also provide you with an external analysis of your internationalisation decisions, which may be useful in the future, development of the company.

I will contact you by telephone in the coming weeks to discuss further. I attach some details on my own background/profile for your information.

Best Regards,

Cover Letter – page 2

Deirdre Garvey: Summary CV

I am currently employed as a Management Specialist at the Irish Management Institute. I currently have responsibility for programme direction for the Diploma in Business Strategy and BA Degree in Management. I teach in the area of business strategy and international strategy. I am completing a Doctorate in the School of Business Studies in Trinity College.

I have worked in the high technology sector over the past 15 years having held a number of senior positions in international and Irish companies:

- Microsoft European Product Development Centre (EPDC) – World-wide management of international product outsourcing
- Stream International – Operations manager of localisation division
- LaserType Ltd. – Training & support manager
- Agfa-Compugraphic – PostScript font design manager

I have a Masters Degree in Business Studies (First Class honours) in International Business from Smurfit Business School, a BA in Management (First Class honours) from the IMI. I received the TSB Gold Medal for distinguished academic achievement. I also hold a Diploma in Graphic Reproduction Technology from Bolton St College of Technology.

Research Supervisor:

Dr. Louis Brennan, School of Business Studies, Trinity College, Dublin

Appendix 4: Phase two - Case listing

Phase 2: Company listing of potential case study

Company Listing 1					
Company name	**Size (empolyees)**	**Size (revenue)**	**Age**	**Size category**	**Age category**
Norkom technologies	150	9.7m	6 years	Medium	6-10 years
Eontec	300	20m	10 years	Medium	6-10 years
CR2	200	13m	7 years	Medium	6-10 years
Exaxe	62	6m	7 years	Medium	6-10 years
Information Mosaic	75	7m	7 years	Medium	6-10 years
Navara software	52	n/a	8 years	Medium	6-10 years
Performix Technologies	100	$11	6 years	Medium	6-10 years
QUMAS	80	$11.5	10 years	Medium	6-10 years

Company Listing 2					
Company name	**Size (empolyees)**	**Size (revenue)**	**Age**	**Size category**	**Age category**
Datalex	230	15.5m	19 years	Medium	16-20 years
e-blana	65	n/a	16 years	Medium	16-20 years
Intuition Publishing		n/a	19 years	Medium	16-20 years
Precision Software	90	n/a	20 years	Medium	16-20 years
S3	220	35.7m	18 years	Medium	16-20 years
Trintech	336	$12.3	17 years	Medium	16-20 years

Company Listing 3					
Company name	**Size (empolyees)**	**Size (revenue)**	**Age**	**Size category**	**Age category**
Curam software		17.8m	14 years	Medium	11-15 years
Fineos		17m	11 years	Medium	11-15 years
Qset	90	$20m	12 years	Medium	11-15 years
Softco	90	11m	14years	Medium	11-15 years

Company Listing 4					
Company name	**Size empolyees)**	**Size (revenue)**	**Age**	**Size category**	**Age category**
Alphyra	150	$63.80	15 years	Large	11-15 years
Cognotec		100m	15 years	Large	11-15 years
Iona Technologies	120	72.8m	14 years	Large	11-15 years

EU Commission SIZE definition		
	No. employees	Turnover Euro
MEDIUM	<250	<50million
SMALL	<50	<10million
MICRO	<10	<10

Age category

0-5 years
6-10 years
11-15 years
16-20 years
20+ years

Appendix 5: Phase two – Internationalisation knowledge construct

Internationalisation knowledge accumulation (KA)

1. Internationalisation knowledge (IK)
   1.1. Senior mgt international experience
   1.2. International vision – ability to identify international growth
   1.3. Possession of a unique competence not possessed by indigenous companies
   1.4. International marketing and strategic planning experience
   1.5. Ability to modify marketing mix elements for foreign markets
2. Business knowledge(FBK)
   2.1. Ability to develop international co-operative agreements/alliances
   2.2. Knowledge about international competitors
   2.3. Knowledge of international complementary products/services
   2.4. Knowledge of foreign distribution channels
   2.5. Foreign business contacts
   2.6. Foreign sales development
3. Institutional knowledge(FIK)
   1.1. Knowledge about laws, norms and standards
   1.2. Language of knowledge

Survey questions (IK)

Question 1 Score

How would you describe your personal international experience ?

1. Very experienced internationally 3
   Spent time 2years + on overseas assignments
2. Experienced internationally 2
   Working in international environment
3. Little international experienced
   Had some international exposure during worklife 1
4. No international experience
   Experience related to domestic markets 0

Question 2 Score

How would you describe your product's value proposition ?

Unique value proposition 3

No other product or company with the same competence in the target market

Highly Competitive proposition 2

We possessed a product that competed on all dimensions with products in the target market

Competitive 1

We possessed a product that competed on one or more dimensions with products in the target market

Uncompetitive 0

Our product did not compete well with other products in the target market at that point

Question 3 Score

How would you describe your company's approach to strategic marketing?

Very experienced in strategic marketing 3

We had a well developed strategic marketing plan based on research in the market

Experienced in strategic marketing 2
We had a strategic marketing plan but not based on research in the market
Poor strategic marketing 1
We had very little marketing experience in the company at this point but did develop some outline plans
No strategic marketing 0
We had no marketing experience in the company and did not develop a strategic marketing plan at this point.

Question 4 Score
What do you see as the critical to the growth of the company?
Product development 1.5
Developing more products for the existing domestic market
Market development 1.5
Developing international markets for existing products

Question 5
How did your company approach the "marketing mix" for the first target market?
No changes to English (Irish product) 0
Translation/adaption of promotional material 1
Adaption of product features for the market 2
Specific product development for the target market 3

Score range for IK = 0-15 (scale)

Survey questions FBK
Question 1
Did you develop any alliances or agreements with companies internationally?
Yes (3)No (0)

Question 2
How would you describe your knowledge about your international competitors?
None 0
Poor 1
Detailed knowledge 2
Comprehensive and used in decision making 3

Question 3
How would you describe your knowledge about of international complementary or related products?
None 0
Poor 1
Detailed knowledge 2
Comprehensive and used in decision making 3

Question 4
How would you describe the company's knowledge of foreign distribution channels?

No knowledge	0
Some knowledge	1
Good knowledge based on research	2
Good knowledge based on research and experience of distribution channels	3

Question 5
Had the company developed any international sales contacts/prospects?
Yes (3) No (0)

Score range for FBK = 0-15

Survey questions FIK
Question 1
How would you describe the company's knowledge of international law

None	0
Poor – some basic knowledge	1
Good – existing experience in the company	2
Excellent – Existing experience and acquired international expertise	3

Question 2
How would you describe the company's knowledge of international business practices

None	0
Poor – some basic knowledge	1
Good – existing experience in the company	2
Excellent – Existing experience and acquired international expertise in country	3

Question 3
How would you describe the company's knowledge of foreign languages?

None – no foreign language capability in the company at this stage	0
Poor – >5% of company with foreign language competency	1
Good – Foreign Language expertise in critical areas	2
Excellent – Over 50% of company have foreign language competency	3

Question 4
Did the company hire any individuals with the specific market experience before internationalisation into the target market?
Yes (3) No (0)

Question 4
Did the company seek expertise from any international legal, accounting or consultancy or government organisation?
Yes (3) No (0)

Score range for FIK = 0-15
Total internationalisation knowledge accumulation = FIK (15) + IK (15) + FBK (15) = 45 (equally weighted knowledge elements)

Internationalisation knowledge accumulation scale of 0-45

Appendix 6: Phase two – Online survey of senior management

Design Survey

Show All Pages and Questions << Back Preview

To change the **look** of your survey, select a choice below. Click 'Add' to create your own custom theme.

Theme: Blue Metal Add

Iona Senior Management

Edit Title | Edit Numbering | Add Logo

Add Page

1. Individual profile

Edit Page | Delete Page | Copy/Move | Add Logic

The following section has a number of questions relating to your individual role, background and experience:

Add Question | Add Page

Edit | Delete | Copy/Move

*** 1. What is your current position with the company?**

Add Question | Add Page

Edit | Delete | Copy/Move

*** 2. In what year did you join the company?**

Add Question | Add Page

Edit | Delete | Copy/Move

3. In your opinion, is there any Irish software company which served as a role model for Iona Technologies expanding internationally?

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

4. Prior to joining the Iona Technologies had you worked with:

- An Indigenous Irish software company focused only on the domestic Irish market
- An Indigenous Irish software company who have expanded internationally
- A U.S software company
- A European software company
- An industry sector other than the software technology sector

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

5. What was your educational background?

- Technical/science
- Finance
- Marketing
- Business
- Other

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

6. Please indicate your involvement in any software industry organisation:

- Not a member of any industry organisation
- A member of an industry organisation but do not have active involvement
- Active involvement in an industry organisation
- Active involvement in a number of industry organisations

Add Question | Add Page

2. Internationalisation experience

Edit Page | Delete Page | Copy/Move | Add Logic

The following section has a number of questions relating to your internationalional experience and the company's internationalisation.

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

7. How would you describe your personal international experience?

- Very experienced internationally (Spent time 2years + on overseas assignments)
- Experienced internationally (Had worked in international environment)
- Little international experienced (Had some international exposure during working life)
- No international experience (All experience related to domestic markets)
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

8. How would you describe the company's value proposition?

- Unique value proposition (No other product or company with the same competence in the target market)
- Highly Competitive proposition (We posses a product that competes on all dimensions with products in the target market
- Competitive (We possess a product that competes on one or more dimensions with products in the target market
- Uncompetitive (Our product does not currently compete well with other products in the target market)
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

9. How would you describe the company's approach to strategic marketing?

- Very experienced in strategic marketing (We have a well developed strategic marketing plan based on research in the market)
- Experienced in strategic marketing (We have a strategic marketing plan but not based on research in the market)
- Poor strategic marketing (We have very little marketing experience in the company but develop some outline plans)
- No strategic marketing (We have no marketing experience in the company and do not develop any marketing plans)
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

10. What do you see as the critical to the growth of the company?

- Product development: Developing more products for the existing markets
- Market development: Developing international markets for existing products
- Both product and market development

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

11. How does the company approach the "marketing mix" for the each market?

- No changes to English product
- Translation/adaptation of promotional material
- Adaptation of product features for the market
- Specific product development for the target market
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

12. Has the company currently any alliances or agreements with other companies internationally?

Yes No

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

13. How would you describe the company's knowledge about international competitors?

- No knowledge
- Some knowledge
- Detailed knowledge
- Comprehensive and used in decision making
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

14. How would you describe the company's knowledge about international technologically related or complementary products?

- No knowledge
- Some knowledge
- Detailed knowledge
- Comprehensive and used in decision making
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

15. How would you describe the company's knowledge about international distribution channels?

- No knowledge
- Some knowledge
- Good knowledge based on research
- Good knowledge based on research and experience of distribution channels
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

16. How would you describe the company's knowledge of market specific legal requirements on entering new geographic markets?

- No knowledge
- Poor – some basic knowledge
- Good – existing knowledge/experience in the company
- Excellent – Existing experience and acquired international expertise on market entry

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

17. How would you describe the company's knowledge of country specific business practises

- No knowledge
- Poor – some basic knowledge
- Good – existing knowledge/experience in the company
- Excellent – Existing experience and acquired expertise in country
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

18. How would you describe the company's foreign language capability?

- None: Currently no foreign language capability in the company
- Poor: Less than 5% of company have a foreign language competency
- Good: Foreign Language expertise in critical areas
- Excellent: Over 50% of company have foreign language competency
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

19. Which of the following best describes the company's current approach to hiring individuals with international experience?

- All new employees hired are required to have relevant international experience
- International experience is a key requirement in hiring new employees

- International experience is desirable but not a requirement in hiring new employees
- International experience is not considered when hiring new employees
- Other (please specify)

Add Question | Add Page

Edit | Delete | Copy/Move | Add Logic

20. Does the company seek external expertise from any international consultancy organisation (legal or accounting) or from government organisation?

- Yes from both international consultancy and government organisation
- From international consultancy only
- From government organisation only
- Does not seek any external international expertise
- Other (please specify)

Add Question | Add Page

<< Back | Preview

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Appendix 7: Phase two – International revenue profile

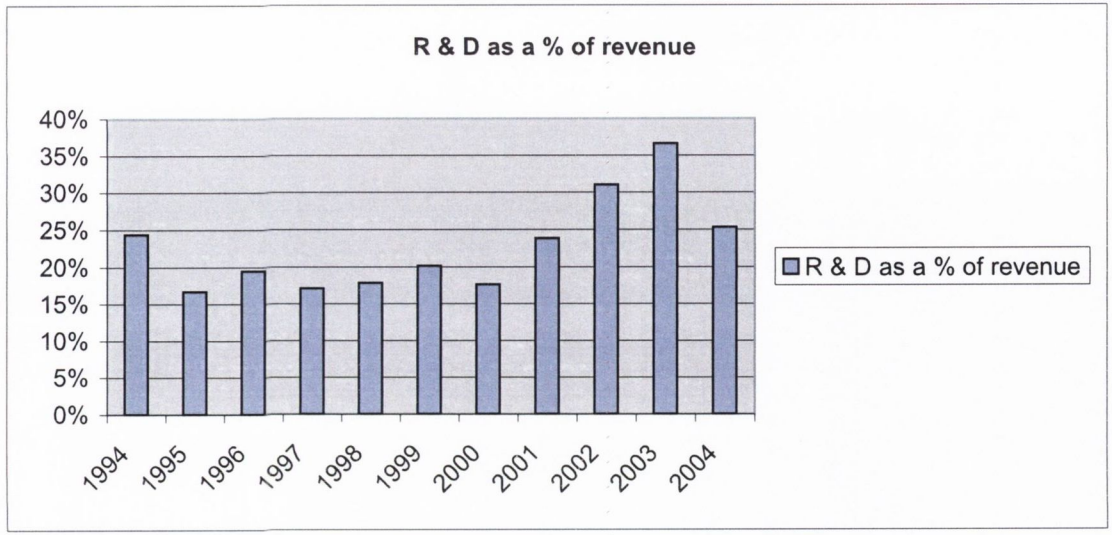
Phase 2: Iona International revenue profile

	1996		1997		1998		1999		2000		2001		2002		2003		2004	
U.S.A	$14,357	68%	$35,007	72%	$58,878	70%	$67,577	64%	$103,107	67%	$119,698	71%	$75,472	61%	$38,338	52%	$34,860	51%
Other European countries	$4,050	19%	$9,954	20%	$20,717	25%	$30,717	29%	$39,552	26%	$42,357	25%	$33,696	27%	$24,657	33%	$22,804	34%
Rest of world	$2,784	13%	$3,623	7%	$4,032	5%	$7,146	7%	$10,404	7%	$7,146	4%	$14,062	11%	$11,195	15%	$10,355	15%
Total	$21,191		$48,584		$83,627		$105,440		$153,063		$169,201		$123,230		$74,190		$68,019	

Appendix 8: Phase two – R & D profile

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Revenue	$1,877.00	$6,104.00	$15,277.00	*	*	$105,440.00	$153,063.00	$169,201.00	$123,230.00	$74,190.00	$68,019.00
R % D costs	$457.00	$1,018.00	$2,970.00			$21,195.00	$26,906.00	$40,260.00	$38,256.00	$27,134.00	$17,204.00
R & D as a % of revenue	24%	17%	19%	17%	18%	20%	18%	24%	31%	37%	25%
Average over 10 years	*23%*										

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
R & D as a % of revenue	24%	17%	19%	17%	18%	20%	18%	24%	31%	37%	25%



* This breakdown was unavailable but the overall spend on R & D as a percentage of revenue was available in company reports for 1997 and 1998

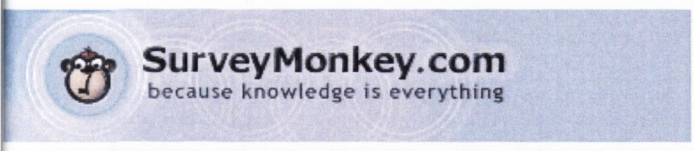
Appendix 9: Phase three – firm listing

	Internationalised indigenous Irish software companies			
	Company	**Contact**	**Address**	**E:mail**
1	Abacus communications	*Stephen Byrne*	12 Main Street, Lucan, Co Dublin	stephen@abacus-comr
2	Alphyra	*John Nagle*	Alphyra House, Heather Road, Sandyford Industrial Estate, Dublin 18	
3	Alatto Technologies	*Neil Flanagan*	Linden Court, Stillorgan Plaza, Dublin	
4	Amhanta	*Brendan O'Gorman*	Unit 63, Guinness Enterprise Centre, Taylor's lane, Dublin 8	
5	Anam	*Gerry McKenna*	Hospitality House, 16-20 South Cumberland Street, Dublin 2	
6	Arantech	*Brendan McDonagh*	Unit 6, Blackrock Business Park, Carysford Avenue, Blackrock, Co Dublin	
7	Asavie Technologies	*Ralph Shaw*	24 Herbert Lane, Dublin 2	
8	Aepona	*Isaac Olasoko*	AIB Investment House, Percy Place, Dublin 4	
9	Broadcast Learning Ltd	*Tony Conolly*	NovaUCD Innovation Centre, Belfield, Dublin 4	
10	Baltimore technologies	*Denise Duffy*	39/41Parkgate Street, Dublin 8	
11	Baydon Solutions	*John Hughes*	8 Dawson Street, Suite 511, Dublin 2	jhughes@baydon-solut
12	Cape Clear	*Annrai O'Toole*	Donnybrook Rd, Donnybrook Dublin 4	
13	Cape Technologies	*Philip Sharp*	Maple House, Temple Road, Blackrock, Co. Dublin	philip.sharpe@capetecl
14	Cardbase	*Keelan O'Donnell*	BIM House, Crofton Road, Dun Laoghaire, Co. Dublin	
15	Changing worlds	*Luke Conroy*	Trintech Building, South County Business Park, Leopardstown, Dublin 18	luke.conroy@changing
16	Cibenix	*Garry McCollum*	The Digital Depot, The Digital Hub, Thomas Street, Dublin 8, Ireland	
17	Codec	*Ronan Stafford*	Hyde House, Adelaide Road, Dublin 2	mkennedy@codec.ie
18	Columba Global Systems	*Brendan McKittrick*	M1 Technology Park, Swords Business Campus, Co. Dublin	
19	CompuPharma	*Barry Doyle*	20B Beckett Way, Park West Business Park, Dublin 12	jegan@compupharma.
20	Cognotec	*Breen Macaba*	2-4 Ely Place, Dublin 2	hilary.guiney@cognotec
21	Corvil networks	*Donal Byrne*	Corvil, Unit 15, Enterprise Centre, Pearse Street, Dublin 2, Ireland	susan.brindley@corvil.c
22	CR2	*Martin Dolan*	CR2 House, Block 16, Joyce Way, Park West Business Park, Nangor Road, Dublin 12	martin.dolan@cr2.com
23	Curam software	*John Hearne*	15 Joyce Way, Parkwest Business Park, Dublin 12	
24	CNG Travel Group Plc	*Finbarr Power*	Kilmurry, Kenmare, Co. Kerry, Ireland	fpower@cnghotels.com
25	Customer Management Technologies	*Paddy Hayes*	3 Argyle Square, Morehampton Road, Donnybrook, Dublin 4	paddy.hayes@cst-inter
26	Daon	*Fiona D'Arcy*	IFSC House, Custom Quay	fiona.darcy@daon.com
27	Datalex	*Cormac Whelan*	Block U, East point Business Park, Dublin 3	cormac.whelan@datale
28	Datacare	*John Kelly*	M:Tek Building, Monaghan, CO. Monaghan	jkelly@data-care.com
29	Deecal	*Des Cahill*	52 Upper Mount Street, Dublin 2	
30	Duolog Technologies	*Ray Bulger*	NovaCenter, Belfield, Dublin 4	
31	e-blana	*James O'Gorman*	Trinity College Enterprise Centre, Pearse Street, Dublin 2	
32	Emuse	*Patrick Rainsford*	Unit 24, Trinity College Enterprise Centre, Pearse Street, Dublin 2	
33	Exaxe	*Norman Carroll*	Unit 5a, Sandyford Business Centre, Sandyford, Dublin 18	

34	Fineos	*Michael Kely*	Pembroke House, 8-10 Lower Pembroke St, Dublin 2	
35	Gamma	*Feargal O'Neill*	4 Inns Court, Winetavern Street, Dublin 8	feargal.oneill@gamma.
36	GlobeTrack	*Sean McCann*	9 Walterland Road, Stillorgan	sean@globe-track.com
37	Inish Technologies	*Leo Moore*	No. 33 Exchequer St, Floor 1-3, Dublin 2	lmoore@inish.com
38	Innovada	*Ben Hurley*	Invent Centre, Dublin City University, Dublin 9	ben.hurley@innovada.c
39	Information Mosaic	*Michelle Hoban*	Styne House, Upper Hatch Street, Dublin 2	
40	Intuition	*David Harrison*	IFSC House, International Financial services centre, Custom house quay, Dublin 1	bmcardle@intiution.cor
41	Kinematik	*Thomas J. Cassidy*	Eastgate Hall, Eastgate, Little Island, Co. Cork	tcassidy@kinematik.co
42	Learning Union	*Ciaran O'Connell*	NovaCenter, Belfield, Dublin 4	ciaran@elearningunion
43	LeT Systems	*Fionan Murray*	National Software Centre, Mahon, Cork	
44	Mapflow	*Richard Bryce*	4 Merrion Square, Dublin 2	
45	Macalla software	*Niall O'Cleirigh*	4th Floor, Styne House, Upper Hatch Street, Dublin 2	
46	Mentec	*Kevin Haverty*	Mentec House, Pottery Rd, Dun Laoghaire, Co Dublin	
47	Microsol	*Denis O'Connor*	The centre for monitoring and control, Entreprise complex, Pearse St, Dublin 2	martink@microsol.ie
48	Mobileaware	*Kevin McCloskey*	3094 Lake Drive, Citywest, Dublin 24	nuala.watters@mobilea
49	Newbay Software	*Paddy Holahan*	Wilson House, Fenian Street, Dublin 2	
50	Netvoyager	*DAKSHESH PATEL*	Block H, Centrepoint Business Park, Oak Road, Dublin 12	dakshesh.patel@netvo
51	Norkom technologies	*Paul Kerley*	55 Strand Street Great, Millenium Walkway, Dublin 1	
52	OpenJaw Technologies	*John McGuillan*	Suite 36, Guinness Enterprise Centre, Taylor's Lane, Dublin 8	john.mcguillan@openja
53	Opennet	*John Rainger*	6 Beckett Way, Park West Business Park, Dublin 12	
54	Orbiscom	*Garry Lyons*	Block 1, Blackrock Business Park, Carysford Avenue, Blackrock, Co Dublin	garry.lyons@orbiscom.c
55	Ossidian Technologies Ltd	*Rupert Bowen*	The Enterprise Centre, George's Place, Dun Laoghaire, Co Dublin	rupert.bowen@ossidiar
56	Performix Technologies	*Conor Sheahan*		
57	Percana Group	*Paul O'Kane*	9D Beckett Way, Park West Business Park, Dublin 12	paul.okane@percana.c
58	PixAlert	*John Nolan*	Digital Hub,10-13 Thomas Street, Dublin 8	
59	PolarLake	*Philip Crawford*	Block F1, East Point Business park, Dublin 3	
60	Precision Software	*Brendan O'Donoghu*	Castlewood House, Castlewood Avenue, Rathmines, Dublin 6	brendan.odonoghue@p
61	Prime carrier	*Geoff Butcher*	33-41 Lower Mount Street, Dublin	aoife.ward@primecarri
62	Prime Learning	*Shane McAllister*	2052 Citywest Digital Park, Co Dublin	
63	Propylon	*Paul McKeon*	45 Blackbourne Square, Rathfarnham Gate, Dublin 14	
64	Puca Technologies	*Eamon Hession*	15D Gilford Road, Sandymount, Dublin 4, Ireland	eamon@puca.com
65	Qset	*Mary Walsh*	Parkmore West Business Park, Galway	
66	QUMAS	*Paul Hands*	Monahan Road, Cork, Ireland	
67	Riverdeep	*Teresa hagan*	Styne House, Upper Hatch Street, Dublin 2	
68	Revfacto	*Nicholas Breakwell*	1A Darthmouth Terrace, Ranelagh, Dublin 6	
69	Rococo Software	*Sean O'Sullivan*	9-11 Upper Baggot ST, Dublin 4	

70	Saadian Technologies	*Dave McCarthy*	11 Clanwilliam St, Dublin 2	smcneill@saadian.com
71	Servecast	*Mark O'Meara*	Broadcasting House, 3A Prince's Street South, Dublin 2	
72	Shenick Networks	*Alan Robinson*	1-2 Windsor Terrace, Dublaoghaire, Co. Dublin	
73	Softco	*Jim Coffey*	South County Business Park, Leopardstown, Dublin 18	
74	Soft-ex	*Nick Koumarianos*	South County Business Park, Leopardstown, Dublin 18	
75	Softedge systems	*Declan Kavanagh*	Dublin Docklands Innovation Park, 128/130 East Wall Road, Dublin 3	
76	Similarity Systems	*Garry Moroney*	Wilson House, Fenian Street, Dublin 2	
77	Skillsoft	*Chuck Moran*	Belfield Office Park, Clonskeagh, Dublin 4	
78	The Electric Paper Company	*Jonathon Parks*	No 4 Deansgrange Business Park, Blackrock, Co Dublin	jparkes@electricpaper.
79	Trintech	*Cyril Maguire*	Trintech Building, Sough County Business Park, Leopardstown, Dublin 18	valerie.ivers@trintech.c
80	Traventec	*Greg Cawley*	Galway Business Park, Dangan, Galway	greg.cawley@traventec
81	Teamsoft	*Ted Murphy*	Burden House, Cloverhill Industrial Estate, Clondalkin, Dublin 22	tmurphy@teamsoft.ie
82	Vordel	*Vic Morris*	37 College Green, Dublin 2	vic.morris@vordel,com
83	Valista	*Raomal Perera*	Glencormack Business Park, Kilmancogue, Co. Wicklow	
84	Voxpilot	*Finbarr Coughlan*	6-9 Trinity Street,, Dublin 2	
85	WBT systems	*Declan Kelly*	Block 2, Harcourt Street, Harcourt Centre, Harcourt Stree, Dublin 2	
86	Virtual Access	*Thomas Hughes*	Unit 18, Trinity Enterprise Centre Pearse Street Dublin 2	tom.hughes@virtualac
87	Xsil	*Peter Conlon*	Unit 3, Trinity Enterprise Centre Pearse Street Dublin 2	rdaly@xsil.com
88	Xiam	*Colm Healy*	Block S, East Point Business Park, Dublin 3	
89	Zamano	*John O'Shea*	Digital Depot, Thomas St, Dublin 8	
90	Zarion	*Gerry O'Connor*	3 Westland Square, Pearse Street, Dublin 1	goconor@zarion.com
91	yq? International	*Tony Scanlan*	Hollyhill Industrial Estate,Holyhill, Cork	tony@vendlink.ie

Appendix 10: Phase three – Online survey



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Friday, May 18, 2007

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Theme: Blue Metal Add

Internationalisation of Irish software companies

Edit Title Edit Numbering Add Logo

Add Page

1. Company Profile

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This section focuses on information relating to the company background and current profile

Add Question Add Page

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1. In what software sector is the company engaged?

- Banking & finance
- Telecommunications
- Internet and online applications
- Software systems and tools
- Infrastructure software
- E:learning and Internet based training
- Other (please specify)

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2. In which period below was your company founded?

1970-1979 1980-1989 1990-1999 2000-2006

Add Question Add Page

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3. How many people does your company employ ?

- 1-50
- 51-100
- 101-250
- 251-500
- >500

Add Question Add Page

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4. What is the total € revenue of the company in the last completed financial year?

- 0 - €1million
- €2million - €5million
- €6million - €10million
- €11million - €30million
- €31million - €50million
- >€50million

Add Question | Add Page

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5. In what country is the company's corporate headquarters?

- Ireland
- U.S.A
- U.K
- Other (please specify)

Add Question | Add Page

2. Individual profile

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The following section has a number of questions relating to your individual role, background and experience:

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6. What is your current position with the company?

Add Question | Add Page

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7. How long have you been employed by the company (in this or in other roles)?

Less than 1 year | 1 - 2 years | 3 - 5 years | 6 - 10 years | 10+ years

Add Question | Add Page

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8. Prior to joining this company had you previously worked with:

- An Indigenous Irish software company focused only on the domestic Irish market
- An Indigenous Irish software company who has expanded internationally
- A U.S software company
- A European software company
- An industry sector other than the software technology sector
- Other (please specify)

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9. What was your educational background?

- Technical/science
- Finance
- Marketing
- Business
- Other

Add Question | Add Page

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10. Please indicate your involvement in any software industry organisation:

- Not a member of any industry organisation
- A member of an industry organisation but do not have active involvement
- Active involvement in an industry organisation
- Active involvement in a number of industry organisations

Add Question | Add Page

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11. How would you describe your personal international experience?

- Very experienced internationally (Spent time 2years + on overseas assignments)
- Experienced internationally (Had worked in international environment)
- Little international experienced (Had some international exposure during working life)
- No international experience (All experience related to domestic markets)
- Other (please specify)

Add Question | Add Page

3. Company information

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The following section has a number of questions relating to your company and its product(s).

Add Question | Add Page

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12. What was the company's annual spend on R & D as a percentage of revenue in its last completed financial year?

- R & D spend is 0-5 % of overall revenue
- R & D spend is 6-19 % of overall revenue
- R & D spend is >= 20 % of overall revenue

Add Question | Add Page

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13. What % of the company revenue was derived from a new product in the last completed financial year?

- 0-10%
- 11-20%
- 21-30%
- 31-40%

- 41-50%
- >50%

Add Question | Add Page

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14. Approximately what % of the company's employees are "knowledge workers" (knowledge workers are defined as "professionals, senior management, technical, engineering and scientific staff"):

0-25% 25-50% 51-75% 76-100%

Add Question | Add Page

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15. Which of the following best describes the company's revenue profile?

- Product revenue only
- Service revenue only
- Product and service revenue
- Primarily product/some service revenue
- Primarily service/some product revenue

Add Question | Add Page

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16. Which of the following best describes the company's product market?

- Niche market focus
- Broad market focus
- Other (please specify)

Add Question | Add Page

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17. What do you see as critical to the growth of the company?

- Product development: (Developing more products for the existing domestic market)
- Market development: (Developing international markets for existing products)
- Both product and market development

Add Question | Add Page

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18. What is typically the current product life cycle of the company's product (or products):

- 0-3 years
- 3-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- > 20 years

Add Question | Add Page

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19. Which of the following best describes how the company uses the Internet with its external market?

- Provision of company information and creation of product awareness
- Product ordering, distribution and support
- Both of above
- None of above
- Other (please specify)

Add Question | Add Page

4. Internationalisation of the company

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The following section has a number of questions relating to your company and its approach to international markets.

Add Question | Add Page

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20. From the date of formation of the company, when did the company first engage in international activities:

- 0-1 years following the formation of the company
- 2-3 years following the formation of the company
- 4-5 years following the formation of the company
- 6-10 years following the formation of the company
- After the company was 10+ years in existence

Add Question | Add Page

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21. What % of the company's revenue comes from international markets (outside of Ireland)?

- 0-10% of revenue from international markets
- 11-20% of revenue from international markets
- 21-30% of revenue from international markets
- 31-40% of revenue from international markets
- 41-50% of revenue from international markets
- 51-74% of revenue from international markets
- 75-100% of revenue from international markets

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22. Does the company currently have any alliances or partner agreements with international companies?

Yes No

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23. Please indicate which of the following best describes the company's mode of entry into international markets

- Use of Internet for product sales
- Third party distribution
- Company owned sales office
- Company owned development, sales and support office
- Acquisition of another software/technology company
- Other (please specify)

Add Question | Add Page

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24. What was the first country in which the company had international sales?

- U.K
- U.S.A
- Germany
- Japan
- Other (please specify)

Add Question | Add Page

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25. What activities are currently performed in Ireland?

- R & D
- Manufacturing
- Sales & marketing
- Product distribution
- Product support
- Central support activities - Human Resources, Purchasing, Finance, IT, etc.
- Other (please specify)

Add Question | Add Page

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26. What activities are currently performed outside of Ireland?

- R & D
- Manufacturing
- Sales & marketing
- Product distribution
- Product support
- Central support activities - Human Resources, Finance, Purchasing, IT, etc.
- Other (please specify)

Add Question | Add Page

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27. What approximate % of your employees have had experience in international companies prior to joining your company?

- 0-10% of employees
- 11-30% of employees
- 31-50% of employees
- > than 50% of employees
- Other (please specify)

Add Question | Add Page

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28. Which of the following best describes the company's primary reasons for expanding internationally and guiding the country market selection. Please select the top 3 reasons from the following, in order of relevance to your company.

	1	2	3	N/A
Market development – adoption of new technology: (the company had a new technology and a market was selected where this new technology is likely to be adopted the quickest)				
Market growth – (International markets provided growth opportunities for the firm in its single product area)				
International customer requirement – (The company had an international customer and expanded to meet its needs)				
International competition – (Competitors in the market are international competitors and the company needed to compete on this basis)				
Extend product/service range – (International markets provided growth opportunities for the firm to extend its product range and services)				
Acquisition led- (The company acquired another company in this country market)				
Access to skill or knowledge base (The company wanted to access the technology skills and experience in this country market).				

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29. Did the company establish international activities in more that one market simultaneously?

Yes No

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30. How would you describe the company's knowledge about international competitors?

- No knowledge
- Some knowledge
- Detailed knowledge
- Comprehensive and used in decision making

- Other (please specify)

Add Question | Add Page

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31. How would you describe the company's knowledge about international technologically related or complementary products?

- No knowledge
- Some knowledge
- Detailed knowledge
- Comprehensive and used in decision making
- Other (please specify)

Add Question | Add Page

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32. How would you describe the company's knowledge about international distribution channels?

- No knowledge
- Some knowledge
- Good knowledge based on research
- Good knowledge based on research and experience of distribution channels
- Other (please specify)

Add Question | Add Page

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33. How would you describe the company's knowledge of market specific legal requirements on entering new geographic markets?

- No knowledge
- Poor – some basic knowledge
- Good – existing knowledge/experience in the company
- Excellent – Existing experience and acquired international expertise on market entry

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*** 34. How would you describe the company's knowledge of country specific business practises**

- No knowledge
- Poor – some basic knowledge
- Good – existing knowledge/experience in the company
- Excellent – Existing experience and acquired expertise in country
- Other (please specify)

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35. How would you describe the company's foreign language capability?

- None: Currently no foreign language capability in the company
- Poor: Less than 5% of company have a foreign language competency
- Good: Foreign Language expertise in critical areas
- Excellent: Over 50% of company have foreign language competency
- Other (please specify)

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36. Which of the following best describes the company's current approach to hiring individuals with international experience?

- All new employees hired are required to have relevant international experience
- International experience is a key requirement in hiring new employees
- International experience is desirable but not a requirement in hiring new employees
- International experience is not considered when hiring new employees
- Other (please specify)

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37. Does the company seek external expertise from any international consultancy organisation (legal or accounting) or from government organisation (i.e. Enterprise Ireland)?

- Yes from both international consultancy and government organisation
- From international consultancy only
- From government organisation only
- Does not seek any external international expertise
- Other (please specify)

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5. Industry information

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The following section has a number of questions relating to the software technology industry:

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38. How would you describe the development stage of your industry sector?

- Early stage of development
- High growth stage
- Mature
- Declining
- Other (please specify)

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39. With which one of the following country technology industries does your company have the closest relationships?

- U.K
- U.S.A
- Germany
- China
- India
- Other (please specify)

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40. In your opinion, is there any Irish software company which served as a role model for your company expanding internationally?

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41. How would you describe your company's involvement in international industry networks?

- Not a member of any industry organsiation
- A member of an industry organisation but do not have active involvement
- Active involvement in an industry organisation
- Active involvement in a number of international industry organisations

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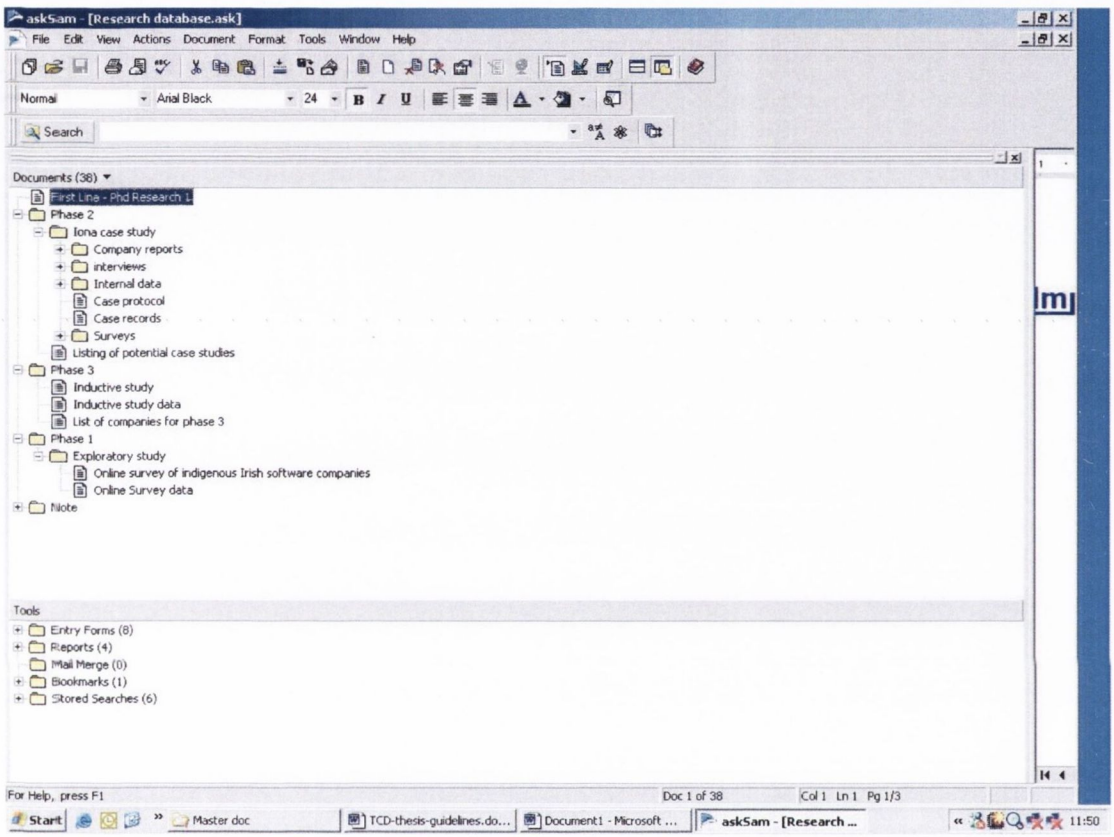
Appendix 11: Structure of research database

Appendix 11: Structure of the research database (askSAM)