

**New venture internationalisation and the cluster life cycle :
interdisciplinary insights on Ireland's indigenous software
industry**

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New Venture Internationalisation and the Cluster Life Cycle: Interdisciplinary Insights on Ireland's Indigenous Software Industry

ABSTRACT

This paper aims to contribute new insights to the burgeoning literature on small firm internationalisation and international entrepreneurship (IE), and the born global (BG)/international new ventures (INV) phenomenon in particular. It takes an explicitly interdisciplinary perspective, building on recent contributions from the BG/INV literature (notably network and resource-based perspectives) and infusing insights from the separate thematic research stream on 'clusters' within economic geography, regional studies and related disciplines¹. The underlying conceptual question explored in the paper is: *(How) is the emergence and internationalisation behaviour of new ventures (especially the propensity to follow a 'born global' strategy) affected by the cluster life cycle context within which they are founded?* This question is explored using a revelatory, longitudinal and historical case study of Ireland's indigenous software cluster. Within the case study, particular attention is focused on the creation and internationalisation of eight 'true born global' software firms (i.e. embedded units of analysis). A notable feature of the paper is that the investigation of these born global firms is - in contrast to many previous studies - fully contextualised within an account of the wider cluster's emergence and evolution over a period of two decades.

The case study findings draw attention to the pivotal importance of the specific geographic and historical context within which the studied born global software firms were created then internationalised. The eight firms studied were founded in the late 1990s, when the Irish software industry was in the expansionary/established stage of its cluster life cycle. By this time, the regional entrepreneurial environment in Ireland was significantly more supportive than that which prevailed in earlier years, and some of the resources that are known to be useful for early and rapid internationalisation (e.g. venture capital, experienced executives and supportive institutions) were relatively abundant. In addition, the studied BG firms had superior resources and capabilities at inception, by comparison with firms founded in earlier stages of the cluster life cycle, due to the extensive prior experiences of their founding team members, acquired during earlier phases of the cluster life cycle.

The case study suggests that the emergence of a certain type of 'truly born global' firm may be specific to particular places and periods in time, and predicated upon a rather unusual convergence of favourable circumstances – as was apparently the case in Ireland in the late 1990s/early 2000s. In terms of wider implications for the literature on internationalisation, the case study suggests that the context for new venture creation (both geographically and historically) may matter to a greater extent than is commonly acknowledged in the IB and IE literature, and should perhaps be given greater attention in future studies. The paper also illustrates the potential 'added value' of an interdisciplinary perspective.

INTRODUCTION

The internationalisation of firms - including new and small firms - has been a longstanding concern of researchers in international business and beyond (Coviello and McAuley 1999; Ruzzier et al. 2006). This topic has been given new life over the last decade by the burgeoning literature on so-called 'born global' (BG) firms or international new ventures (INV) and is now seen as a key research theme in a wider sub-discipline of 'international entrepreneurship' (IE) that straddles IB, entrepreneurship, marketing and strategic management (Rialp et al. 2005; Aspelund et al. 2007; Keupp and Gassmann 2009). However, one slightly surprising feature of this literature, and indeed the wider literature in business and management studies, is the paucity of attention given to geography; for example, whether BG/INVs are more likely to emerge in certain regions/countries or how the home region/country environment might influence their emergence and subsequent performance. A small number of recent BG/INV studies (e.g. Zuchella et al. 2007; Al-Laham and Souitaris 2008; Fernhaber et al. 2008), along with some contributions to the general business and management literature (e.g. Tallman et al. 2004; Gilbert et al. 2006), suggest that a more 'geographically-aware' perspective, drawing on insights from economic geography and related 'spatial' disciplines, might add some value to existing understandings.

Hence this paper seeks to bring new insights to the study of new venture internationalisation by adopting an explicitly interdisciplinary approach. Specifically, it seeks to build on recent contributions from the BG/INV literature (notably network and resource-based perspectives) by drawing on key insights from the thematic research stream on 'clusters' within the disciplines of economic geography, regional studies and industrial dynamics. The underlying conceptual question explored in the paper is:

(How) is the emergence and internationalisation behaviour of new ventures (especially the propensity to follow a 'born global' strategy) affected by the cluster life cycle context within which they are founded?

This question is explored using revelatory, longitudinal and historical case study of Ireland's indigenous software cluster. Within the case study, particular attention is focused on the creation and internationalisation of eight 'true born global' software firms (i.e. embedded units of analysis). Investigation of these born global firms is contextualised within an account of the wider cluster's emergence and evolution over a period of two decades. The choice of the Irish software case was based on three factors. First, Ireland has gained international recognition as an emerging software development 'hotspot' in the technical academic literature (Cochran 2001; Cusumano 2005) and in the literature on technology clusters, entrepreneurship and economic development (Bresnahan et al. 2004; Arora and Gambardella 2005; Roche et al. 2008). Second, studies of software firms have been prominent in the burgeoning literature on the BG/INV phenomenon (e.g. Bell 1995; Coviello and Munro 1997; Moen et al. 2004; Ojala 2009), which has been most frequently (but not exclusively) associated with small knowledge-intensive firms in high tech sectors. Third, the author's familiarity with this regional industry cluster from previous projects suggested it had qualities that would make a good 'revelatory' case on the topic in question (Yin 2009, p.48-9).

The case study findings draw attention to the pivotal importance of the specific geographic and historical context within which the studied born global software firms were created then internationalised. The eight firms were founded in the late 1990s, when the Irish software industry was in the expansionary/established stage of its cluster life cycle. By this time, the regional entrepreneurial environment in Ireland was significantly different from that which prevailed in earlier years, having 'co-evolved' alongside successive waves of new venture

creation, most notably during the 1990s. As a result, some of the resources that are known to be useful for early and rapid internationalisation (e.g. venture capital, experienced executives and supportive institutions) were relatively abundant. In addition, the studied BG firms had superior resources and capabilities at inception, by comparison with firms founded in earlier stages of the cluster life cycle, due to the extensive prior experiences of their founding team members, acquired during earlier phases of the cluster life cycle. This meant these firms were particularly well-placed to capitalise on the increasingly ‘munificent’ entrepreneurial environment in Ireland in the late 1990s/early 2000s, and to exploit emerging niche opportunities in global software markets. Hence, their internationalisation was generally earlier, more rapid, more ‘aggressive’, more multi-modal and wider in geographic scope compared to firms founded during earlier stages in the cluster life cycle.

This specific case study suggests that the emergence of ‘truly born global’ firms may be specific to certain places and periods in time, and predicated upon a rather particular (possibly unusual) convergence of favourable circumstances. In terms of wider implications, the case study suggests that the context for new venture creation and internationalisation (both geographically and historically) may matter to a greater extent than is commonly acknowledged in the IB and IE literature, and should be given greater attention in future studies. The paper also illustrates the potential ‘added value’ of an interdisciplinary perspective. In the specific case examined here, insights from economic geography, regional studies and industrial dynamics proved useful in shedding new light on the BG/INV phenomenon.

The structure of the paper is as follows. The next section reviews key contributions from the (largely disconnected) thematic literatures on new venture internationalisation and clusters,

and makes the case for an interdisciplinary approach to the BG/INV phenomenon. The case study method and data sources are then explained. The fourth section of the paper presents the case study evidence on new venture creation and internationalisation and the cluster life cycle in Ireland's indigenous software industry, with a particular focus on the eight born global firms. Some conclusions, limitations and issues for further research are then outlined.

LITERATURE REVIEW: NEW VENTURE INTERNATIONALISATION AND CLUSTERS

New venture internationalisation: a selective review

Table 1 briefly summarises some of the key questions addressed in BG/INV literature, and some of the key theoretical perspectives and methodological approaches to this topic. A number of recent articles provide wide-ranging reviews of the burgeoning literature on BGs/INVs (Rialp, Rialp, and Knight 2005; Aspelund, Madsen, and Moen 2007; Keupp and Gassmann 2009). For this reason, and due to space constraints, this part of the review is limited to a handful of key points.

The first point to note is that new and small firms are typically faced with a number of significant challenges and barriers to international expansion, particularly by comparison with larger and more established firms; these are sometime be described as the liabilities of newness, smallness and foreignness. In the resource-based view (RBV), new and small firms are often portrayed as resource deficient. Following this RBV reasoning, studies of new and small firm internationalisation have sought to distinguish between non-exporters and exporters on the basis of resource endowments (Westhead et al. 2001). Within the BG/INV literature, the resource-based view has also become popular theoretical perspective in both

empirical and conceptual studies, along with the closely related knowledge-based view (KBV) (e.g. Coviello and Cox 2006; Gassmann and Keupp 2007; Gabrielsson et al. 2008; Casillas et al. 2009). RBV-based empirical studies of BG/INVs have paid a lot of attention to their founders/TMT, since the most of principal resources (and capabilities) of these firms at start-up are likely to be ‘embodied’ in these key individuals (Gabrielsson et al. 2008). These resources may include, for example: technological and marketing knowledge; leadership and managerial capabilities; and social and business network ties (‘relational’ resources). As noted earlier, these resources have often been accumulated and developed during prior international work experience (Bloodgood et al. 1996; Belso-Martinez 2006; Zucchella et al. 2007).

The role of networks is a recurrent theme in studies of BG/INVs. Coviello and Cox (2006, 117) have observed that “networks both generate resources and are a resource in their own right”. Several recent studies grounded in the RBV have highlighted the way in which BG/INVs acquire crucial resources for early internationalization from external network actors (e.g. Laanti, Gabrielsson, and Gabrielsson 2007). BG/INV founders have also been shown to use their existing networks, and to develop new networks, in order to leverage the additional resources required for early internationalization from outside the firm (Loane and Bell 2006; Loane, Bell, and McNaughton 2007). A key resource category considered in many recent empirical studies of BG/INVs is finance. Early and rapid internationalization is said to require significant financial investments, for example to fund new product development and international marketing efforts. Thus, for some BG/INVs, venture capital investment has been found to be a vital resource, as a source of significant ‘up front’ financial resources but also as a provider of additional knowledge and network ties (Gabrielsson, Sasi, and Darling 2004; Fernhaber and McDougall-Covin 2009).

Several recent RBV or KBV-based studies, have de-limited different ‘phases’ in the life cycle of the BG/INV. These phases appear to have different resource acquisition and utilisation patterns. Thus, Coviello and Cox (2006) distinguish between the conception, commercialization and growth stages and show how ‘resource flows’ within three New Zealand INVs vary across these stages. Similarly, Gabrielsson et al. (2008) suggest born globals pass through three phases (an introduction and initial launch phase; a growth and resource accumulation phase; and a break-out phase where the BG evolves into a ‘normal’ MNE) and propose that the resources and networks of the BG develop across these phases. A final interesting point of note comes from Coviello and Cox (2006). Although much of the RBV-inspired BG/INV literature focuses on resource acquisition, these authors have observed that such firms are also able to use certain types of external resource without actually assuming ownership of them (thereby minimising cost and risk); for example, using channel partners and distributors to reach overseas customers. They dub this scenario a ‘resource mobilization flow’ to distinguish it from the more conventional ‘resource acquisition flow’.

Whilst impressive strides have been made in the BG/INV and IE research fields over recent years, the literature could perhaps be criticised – at least from an interdisciplinary standpoint - for an overly narrow focus on the firm and entrepreneur as units of analysis and a lack of attention to the geographical (and historical) context for new venture internationalisation². In fact, until very recently the vast majority of BG/INV studies have paid scant attention to the geographical context (e.g. type of regional environment) within these firm emerge or how this home region/country context might influence their emergence and performance. It is here that this paper seeks to contribute, starting with a review of potentially relevant insights from the distinct thematic research stream on clusters.

Key insights from the clusters literature

Research on industry clusters has been one of the hottest topics in the social sciences in recent decades and spans several academic disciplines including economic geography, regional studies, regional science, applied and regional economics, and industrial dynamics. According to the most widely cited definition, a cluster is a geographic concentration of interconnected businesses, specialized suppliers, and associated institutions in a particular field (Porter 1998). Some of the key research questions, research strategies and methodologies and theoretical perspectives in the clusters research stream are summarised in Table 1. The discussion here focuses first on cluster advantages, then on more work on cluster emergence evolution and life cycles.

Cluster advantages

Porter's (1998) ideas on clustering (e.g. diamond model) are perhaps most familiar to business and management scholars but this work has been subject to harsh criticism from leading economic geographers (Martin and Sunley 2003) and shown to have limitations in explaining the existence of some emergent technology clusters (O'Gorman et al. 1997; Nair et al. 2007). Economic geographers' views on industry clusters traditionally drew heavily on Alfred Marshall's (1890) concept of agglomeration economies. Marshall proposed that firms would continue to be localised within the same geographic area because of the costs savings that result from (1) the development of a local pool of specialised labour, (2) the increased local provision of inputs specific to an industry, and (3) the maximum flow of information and ideas between proximate firms (Gordon and McCann 2000, p.516).

Some authors suggested that the pure, cost-based agglomeration economies approach had limited utility in accounting for the clustering of certain knowledge-intensive industries (e.g.

Pinch and Henry 1999; Keeble and Nachum 2002). Hence, more recent work in economic geography and regional studies has sought alternative explanations of clustering, focusing on knowledge, learning and innovation (thereby extending Marshall's ideas on localized spillovers of knowledge) – for example, the innovative milieu, learning regions and regional innovation systems approaches (e.g. Camagni 1991 and 1995; Keeble et al. 1999; Malmberg and Maskell, 2002). These approaches suggest beneficial knowledge dissemination and 'collective learning' are fostered within clusters via various mechanisms including: flows of professionals and "embodied expertise" through the local labour market; high rates of localised entrepreneurship and spin-off of new firms from existing businesses, and firm failure leading to reconfiguration of staff in new firms; and formal and informal networking, including collaboration and personal interaction by professionals and managers of cluster firms and observation and gossip in workplace and social settings.

Another area of work that falls under the heading of 'cluster advantages' concerns the idea that clusters offer beneficial environments for new venture creation and growth, an idea that has also been advanced by Porter (1998). Malecki (2002, 335) observes: "...regions differ in the way they can sustain new businesses ...[in terms of] the diverse assortment of information and other knowledge necessary for firm formation and business success". This point has been illustrated in research on successful high technology regions in the United States. For example, Feldman's (2001) work on the evolution of the biotech industry in the US Capitol region identifies a 'munificent entrepreneurial environment' – comprising the availability of venture capital, supportive social capital and an 'entrepreneurial culture', and entrepreneurial support services, such as intellectual property lawyers and specialist business service firms - as a key component in the emergence of new biotech ventures in this place. Similarly, Stuart and Sorenson (2003) argued that entrepreneurs in the US biotech industry were attracted to

establish their businesses in particular locations that are characterized by a concentration of ‘critical resources’ such as highly-skilled labour and venture capital. Similar ideas can be found in research on Silicon Valley; for example, Lee et al. (2000) describe the fertile entrepreneurial environment or ‘habitat’ within which Silicon Valley’s high-tech industries grow and flourish. Key elements of this habitat include a supportive business and regulatory environment and a wide variety of support firms and consultants whose sole purpose, or a significant component of their business, is related to servicing start-ups.

Cluster emergence, evolution and life cycles

More recent contributions to the clusters literature suggest further useful insights that could be – but have not yet – been incorporated into the BG/INV literature. The chief contributions reviewed here concern: the fact that clusters evolve through life-cycles; and the role of entrepreneurial agency (including spin-offs) in the growth, emergence and evolution of clusters³.

First, research has highlighted that clusters have their own ‘life cycles’ and evolve through a number of stages (e.g. Brenner and Fornahl 2003; Bergman 2008; Menzel and Fornahl 2010). Studies of cluster evolution and of clusters at different stages of their life cycle have suggested that the presumed benefits of a cluster location (as discussed above) may be present once a cluster is fully established but absent during the early stages of its emergence (Bresnahan et al 2001; Feldman 2005), and also that agglomeration economies may fade or even reverse when the clusters reach maturity/stagnation (Potter and Watts 2010).

A second contribution of more recent studies concerns the role of entrepreneurship in emergence and transformation of clusters. Several studies have argued that the origin and early emergence of clusters is not explained by agglomeration economies or collective

learning since these cannot be present without a critical mass of firm (Bresnahan et al. 2001; Feldman et al. 2001). Instead, these studies point the key role of entrepreneurial agency – notably the efforts of pioneering entrepreneurs - in seeding clusters and driving the cluster through phases in its life cycle (Bresnahan et al. 2001; Harrison et al. 2004; Feldman et al. 2005; Mason 2008). Research from the industrial dynamics tradition is also relevant here, since a number of ‘genealogical’ studies of firm populations have now shown that localised spin-offs from incumbent firms are a key mechanism in the growth of clusters (e.g. Klepper, 2001; Brenner and Fornahl, 2003; Dahl et al, 2003). This spin-off process may become reinforcing because most new firms are founded in the same geographical region as the firm that ‘produced’ the entrepreneur (Klepper 2001; Romanelli and Schoonhoven 2001; Dahl, Pedersen, and Dalum 2003) and the number of spin-offs in a region is likely to be a function of the number and size of incubator organisations (incumbent firms) within the region whose fertility is sufficient for the emergence of start-ups (Sternberg and Litzenberger, 2004).

The potential for interdisciplinary insights?

It is a key contention of this paper that an interdisciplinary perspective has the potential to ‘add value’ to the study of IB/IE topics. A second disciplinary perspective can be seen as an alternative ‘lens’ through which to view a phenomenon or problem. It seems that the literature on clusters from economic geography, regional studies and related disciplines has much to offer here, not least because it addresses a ‘conceptual blindspot’ in much of the business and management literature, which focuses on the firm (or entrepreneur) as its primary unit of analysis, thereby tending to neglecting the wider context (Table 1). In contrast, the spatial disciplines focus on the country, region, city or place as the primary unit of analysis has led similar ‘blind spot’ with regards to the firm and entrepreneur, which tend to be under-

theorised and treated as a 'black box'. This all suggests the two disciplines have much to offer each other, if disciplinary prejudices and miscommunications can be set aside.

Turning specifically to potential insights from the clusters literature, the key lesson from the literature on 'cluster advantages' (reviewed above) is that cluster locations may offer a range of benefits to a new venture during the start-up and growth phases, including access to specialised suppliers and service providers and various useful resources such as venture capital and skilled labour. This point has, in fact, recently (and perhaps belatedly) been recognised by a handful of authors in the BG/INV literature, leading to the suggestion that cluster locations may also be beneficial for new venture internationalisation. For example, Al-Laham and Souitaris (2008) find that location of new biotech ventures in a local cluster already dense with international linkages increases their probability of forming international research alliances. Also, Fernhaber et al. (2008) find a cluster location positively influences new IT venture internationalization, and firm characteristics impact the nature of this relationship. Further research along these lines is required.

However, it seems the BG/INV literature has yet to absorb some of the lessons from the more recent literature on 'cluster emergence, evolution and life cycles' (reviewed above). There do not yet appear to be any studies that link the internationalisation of firms (or likelihood of early internationalisation) to stages of the cluster life cycle. For example, Fernhaber et al.'s (2008) landmark study, which is arguably the best example to date cross-disciplinary engagement on the BG/INV topic, takes a static or cross-sectional view of clusters based on location quotient measures of geographic concentration. Also, the potential links between new venture internationalisation and venture origin types requires further exploration; notably the role played by spin-offs and other 'geographically path dependent' venture origin types in the

BG/INV phenomenon. The potential for uncovering new insights from a closer examination of venture origins and ‘hidden ties’ is well illustrated by recent studies highlighting the links between portfolio and serial entrepreneurship and the born global phenomenon (McGaughey 2007; Presutti et al. 2008).

METHOD

Case study design

The empirical part of the paper is based on a revelatory, longitudinal and historical case study of new venture internationalisation within Ireland’s indigenous software cluster⁴. A case study approach is appropriate because the study sought to examine a contemporary phenomenon (new venture internationalisation) within its real-life context (the Irish software cluster). Two of Yin’s (2009, p.48-49) justifications for adopting a single case design are present here: revelatory and longitudinal (studying a case over time). Within the case study, multiple embedded units of analysis are examined, since particular attention is focused on the creation and internationalisation of eight ‘true born global’ software firms, founded between 1997 and 2000.

Yin (2009) suggests a *revelatory case study* is justified when an investigator has access to a phenomenon previously inaccessible to scientific investigation. In this case, the author’s prior familiarity with the Irish software industry, as part of another project, gave access to data that subsequently became useful for a different purpose. Several examples of ‘true born globals’ were identified among the studied firms and in-depth examination of these cases exposed the deep roots of these firms in the cluster, and the apparent links between the emergence of these firms and the features of the Irish software industry and regional entrepreneurial environment

at a particular stage in the cluster life cycle. Thus, the potential relationship between new venture internationalisation and the cluster life cycle was viewed as a phenomenon previously 'hidden' from investigation – or at least not previously exposed - and worthy of wider consideration.

The study is *historical* in nature in that it focuses on past events, going back up to 20 years and relies on to some extent on archival sources. The *longitudinal* dimension (i.e. studying the phenomenon over time not just in a static and cross-sectional way) is considered to be particularly important here, since the study is interested in new venture creation and internationalisation, and the regional entrepreneurial environment, in the Irish indigenous software industry through different stages in the cluster life cycle. Note that many existing published studies of technology clusters give only a static analysis of the cluster in question (i.e. examine it at one only point in time, ignoring the life cycle dimension, or attempting to account for the cluster's existence based on cross-sectional data). Yin (2009, p.49) notes that longitudinal studies can be useful for studying how certain conditions change over time. Further the use of *chronological analysis*, allows events to be traced over time and may permit causal inferences to be drawn (Yin, 2009, p.148); this approach was used to construct an account of the overall cluster life cycle of the Irish software industry.

Data sources

The case study is based on in-depth, largely desk-based research using a wide array of secondary data sources, supplemented by a close reading of evidence in several existing academic studies of the Irish software industry (O’Gorman et al. 1997; Ó Riain, 1999 and 2004; O’Malley and O’Gorman 2001; Arora et al. 2004; Sands 2005; Roche et al. 2008) and one in-depth non-academic account (Sterne 2004)⁵. The aforementioned secondary data

sources included individual companies' web-sites - which contained a range of information in the form of press releases, "about us" pages, etc. – and various sector-specific and general on-line news media and other secondary sources. Among the key sources here were:

- TIU TechWatch - TIU is a Dublin-based management consultancy which specialises in the technology, media and communications [TMT] industries in Ireland. *TechWatch* (www.techwatch.ie) is its sector-specific on-line daily news service;
- ElectricNews.net – ENN provides a free-access newswire (www.electricnews.net) focusing on the Irish IT and telecoms sector; and
- Irish Emigrant Publications' *Professional Ireland* (www.emigrant.ie) – an Internet-based news service aimed at the Irish business community worldwide.

Each of these web-sites has a keyword search facility which allowed the identification of news stories pertaining to specific companies. Usefully, several interviews with key figures in the industry, including the founder of leading firms, were also published by these outlets. The secondary data was originally collected between 2001 and 2003, when the Irish software industry was the subject of prolonged and detailed monitoring and observation by the author as part of another project, and subsequently re-examined and supplemented at specific points in 2004 and 2009. A large, structured data archive was produced as a result of this process. Notably, a 'source file' or data array was maintained for each company of interest, comprising many of the 'leading lights' of the Irish software industry. Files were also compiled on a number of key industry figures, including the founders of influential firms and serial entrepreneurs. Additional folders were compiled on thematic topics, such as mergers and acquisitions and venture capital. Analysis of these sources was guided by theories and concepts from the two thematic parent literatures underpinning the study.

Although case study research frequently makes use of secondary sources, the adoption of a wholly desk-based approach is unusual in economic and business research, which tends to rely on official data series, mail surveys or face-to-face interviews with company executives. The approach has some shortcomings but also certain advantages. One of the shortcomings is that the available data suffer from a certain lack of consistency (i.e. not all ‘variables’ are available for each company under investigation). The approach also lacks the systematic rigor of extensive sample-based survey methods. However, the advantages include: the availability of vast amounts of ‘free’ data which offers much more depth and detail than is available using survey methods or interviews; there are no response rate issues (survey fatigue is a growing problem in business research); the data can be re-examined if additional questions arise (and indeed it was); there are no time constraints, unlike limit face-to-face interviews with busy company executives; and, importantly, a longitudinal perspective is facilitated.

Embedded units: the born global cases

Finally, the process used to identify and examine the eight born global cases should be explained. The eight cases were identified from among a wider group (compiled for an earlier study) of 26 Irish indigenous software and technology firms that had been founded after January 1996 and received at least one round of venture capital funding between January 1999 and December 2001. The wider group was narrowed down to a long list of firms where secondary data was available on key variables of interest (e.g. founder background, key customers and markets) and there was sufficient data to construct a rough “event history”. Firms founded before 1997 were excluded at this stage as there was insufficient information about the early post-start-up period of the firm in secondary data. Possible ‘born global’ candidates were then identified from the remaining firms as firms with international customers from inception or very soon after start-up. A data availability filter was applied

again applied resulting in the number of viable case studies being reduced to eight. For these eight firms, a narrative was constructed about the origins and pre-history of the venture; information about the key founders and their backgrounds was compiled; and ‘critical incident’ timelines (chronologies) were constructed covering the period from start-up until Aug 2004. A second sweep of secondary data sources was conducted in October 2009 to update the case stories for the period Sept 2004 to Oct 2009, and to augment earlier data.

All eight of the chosen firms are ‘significant’ examples of (Irish software) new venture internationalisation. All are mentioned as significant ‘Generation 4’ firms in John Sterne’s (2004) story of the Irish software industry. And all can be considered successful in certain terms: e.g. secured high profile international customers; survived the global technology sector downturn of 2001-03; traded independently for at least five years (and mostly longer); and secured key contracts with major ‘blue chip’ corporate clients in distant markets and in multiple global market regions. As of October 2009, all eight were either still trading independently (three firms, including two privately held and one listed on London’s AIM) or had ‘exited’ via a trade sale (five firms, including four sold to US firms – at least one of which was Nasdaq-listed). Although the selection of cases was not initially based on theoretical or representative sampling, the chosen firms do seem to illustrate a range of different ‘types’ in terms of characteristics such as: venture origin, specialism and market niche, and ‘outcome’ (independent going concern or trade sale).

**CASE STUDY EVIDENCE: NEW VENTURE CREATION AND
INTERNATIONALISATION AND THE CLUSTER LIFE CYCLE IN IRELAND’S
INDIGENOUS SOFTWARE INDUSTRY**

Overview of Ireland's indigenous software industry

Ireland has been widely recognised as an example of a late-comer or emergent technology region (e.g. Bresnahan et al. 2004; Arora and Gamabrdella 2005; Roche et al. 2008). Other widely recognised emergent technology/ICT clusters, albeit of differing scales and with different specialities, have been reported in places like Israel, Bangalore (India), Taiwan and Finland (e.g. Teubal et al. 2002; Arora et al. 2004; De Fontenay and Carmel 2004; Roper and Grimes 2005; Nair et al. 2007). In the Irish case, the development has been characterised by significant inward foreign direct investment, notably from the United States, in sectors such as ICT hardware manufacturing, software and pharmaceuticals⁶. However, arguably the most significant component of the Irish experience is the emergence of a dynamic, entrepreneurial, innovative and export-oriented indigenous software industry (O’Gorman et al. 1997; Ó Riain 1999 and 2004; Sands 2005; Roche et al. 2008). By 2000, the indigenous industry comprised over 700 firms, employed around 14,000 people and generated annual revenues of €1.4 billion (Source: National Software Directorate statistics)⁷. During the late 1990s, several of its leading firms underwent IPOs on the Nasdaq stock exchange or were acquired by leading multinational firms, and some firms were global players within their particular market niches. Employment in the industry grew throughout the 1990s but was notably higher (average of 24% p.a.) in the second half of the 1990s than in the first half of the decade. Total revenue grew by nearly 30% p.a. during the 1990s – reaching €1.5 billion per year by 2002-03 - and total exports grew even faster (at 37% p.a.) as the indigenous industry became more export oriented over the decade (Figure 1); the United States, UK and Continental Europe were all significant export markets by the late 1990s. By the late 1990s/early 2000s, leading Irish firms were also making acquisitions (outward FDI) in the US, UK and elsewhere (Crone, 2002).

By the late 1990s, the dominant activity of Irish indigenous software firms was software product development. According to Arora et al (2001) 44% of indigenous software firms were involved in the development of software products. HotOrigin (2001, p.5) also identified at least 250 local companies engaged directly in the development of software products. This product-oriented business model was adopted by the most successful indigenous firms. In terms of product/technology focus, the indigenous product development industry at the 21st century was heavily concentrated on enterprise application integration (including middleware) and wireless technologies (applications and infrastructure). Other strong niches in Ireland were said to be CRM, e-learning, Java components and XML-based tools (HotOrigin Ltd, 2001, p.8). In terms of vertical markets, the main target sectors are the financial services industry, the telecommunications industry and other high technology industries. The main areas of specialisation include: financial services applications/solutions, e-security/secure payment solutions, e-learning/computer based training, open systems-based middleware and telecommunications software.

The indigenous software industry is entrepreneurial in character, being predominantly composed of a large number of small firms. There was a high start-up rate and a low closure rate throughout the 1990s (O’Gorman et al, 1997). In the late 1990s, the rate of new indigenous software product company formations increased markedly. For example, survey evidence suggested that fewer than 30% of the estimated 250 indigenous software product development companies in existence in 2001 were established before 1996, and almost half had been established since the beginning of 1999 (HotOrigin, 2001). Mirroring the increase in start-up activity through the 1990s was an increase in the number of larger indigenous firms. In 1989 there were only 4 indigenous software firms with 50+ employees but this had increased to 24 by 1995, 34 by 1998 and at least 60 by 2001 (Crone, 2002).

Phases in the cluster life cycle and the co-evolution of entrepreneurial agency and the regional environment

In keeping with recent evolutionary accounts of clusters, as discussed earlier, the Irish indigenous software industry has clearly gone through a number of ‘life-cycle’ stages. Table 2 give an overview of this life cycle in four major phases from the late 1970s to the early 2000s, highlighting the key characteristics of both the industry and the regional entrepreneurial environment at each stage. This summary has been informed by the author’s own secondary research and reading of existing studies. In particular, Sterne’s (2004) delimits ‘five entrepreneurial generations’ of Irish software firms in his industry history. However, it is contended that these five generations do not necessarily map neatly onto the main phases in the cluster life cycle. Also of interest here was Roche et al.’s (2008) model that depicts four phases in the emergence and evolution of Ireland as an entrepreneurial technology region.

The key points to note from the summary in Table 2 are as follows:

- An identifiable cluster of firms only became evident in the early 1990s but significant pioneering software entrepreneurship was taking place in Ireland as early the 1970s (Sterne 2004). Some important pre-conditions for future success were ‘accidentally’ sown in the regional environment around this time;
- The industry’s specialisation on niche software products for export markets became ingrained from the early 1990s onwards and it was only at this stage that the Irish State began to establish industry-specific institutions;
- The industry seems to have reached a kind of critical mass in the mid 1990s, after which the rate of new firm formation and employment growth and level of exports accelerated.

The Nasdaq IPOs of CBT Systems in 1995 and Iona Technologies in 1997 could be seen as key watershed events.

- By the late 1990s, the region began to resemble an entrepreneurial technology cluster with apparently self-reinforcing growth dynamics. At this stage, the Irish industry had an international profile and reputation and the Irish state ramped up its support efforts for the industry and new high potential start-ups in particular. An indigenous venture capital industry was seeded and elements of a private sector support ecosystem of specialist business service firms was starting to form.

This chronological account leads to some important findings that accord with some of the recent literature on cluster evolution (e.g. Bresnahan et al. 2001; Harrison et al. 2004; Feldman 2005; Mason 2008):

- Entrepreneurial agency seems to have played a crucial role in the evolution of the cluster and in ‘inducing’ and driving the emergence of a more supportive regional entrepreneurial environment;
- Neither the supportive regional environment of the 1990s, nor the policies and actions of the Irish State, were significant factors in the cluster’s emergence, since these developments came after at least two entrepreneurial generations.
- The story of the cluster’s emergence and evolution appears to fit well with ‘co-evolutionary’ perspectives, since entrepreneurial activities both influenced and were influenced by the wider entrepreneurial environment in a ‘dialectic’ fashion.

Profile of the eight born global software firms

A key focus of this paper, albeit within a wider narrative of cluster evolution, is the born global phenomenon and new venture internationalisation. Eight Irish born global software firms were investigated as part of the goal of exploring and exposing the relationship between

new venture internationalisation and the cluster life cycle (Table 3). The eight firms selected were all founded in Ireland (seven in Greater Dublin; one in Galway) between January 1997 and March 2000, in what has been characterised here as Stage III, the accelerated growth/established cluster phase. They were all part of the Sterne's (2004) 4th generation of Irish software firms. All eight firms were founded by teams rather than individuals, with a minimum of two and a maximum of seven founders. In all cases, the founding team had significant prior experience; two firms were founded by habitual (serial) entrepreneurs, three were entrepreneurial spin-offs from incumbent firms, and three were *bone fide* new entrants but had very experienced founding teams; there were no university spin-outs (Table 3). All eight firms were niche software product companies, focusing on technological niches such as 'middleware' and software integration (Cape Clear, Macalla, Xiam) and/or applications for specific vertical markets such as telecommunications (Am Beo, Network365, Openet, Xiam) or banking and financial services (CR2, Macalla, Norkom). All firms were highly innovative - frequently releasing new and upgraded products - and most received had international recognition via industry awards. And all eight firms received multiple rounds of venture capital funding; for example, they raised a total of €114 million in 18 separate deals, ranging from €1.9-15 million in value, between January 1999 and August 2003. Finally, although no consistent series of employment and turnover data was available for the eight firms, secondary data sources suggest that three grew to employ over 200 staff (CR2, Norkom, Openet) and the remainder reached 30-100 employees; several had annual turnovers in the range €10-50 million. Hence, although these firms remained SMEs by commonly accepted definitions, some were quite large for independent software product companies.

The eight firms had the following characteristics that indicated they could reasonably be labelled 'true born globals' (Kuivalainen et al. 2007):

- All were highly export-oriented (i.e. international intensity), indeed some appeared to have no domestic customers (Am Beo, CR2, Openet).
- Each firm had secured a number of key contracts with major corporate customers in at least two (and typically more) major continental markets (i.e. bi- or multi-regional internationalisation) - most firms had customers in the rest of Europe and North America but mobile telecoms software firms Network 365 and Xiam had key early customers in Asian markets, which were enthusiastic early adopters of 3G mobile technology, and banking software firm CR2 had numerous customers in Eastern Europe, the Middle East, Africa and Asia;
- All firms had engaged in some types of foreign direct investment activity (i.e. multi-modal internationalisation). All eight had established overseas offices within their first three-to-five years. Typically these were sales and marketing operations but some firms had also opened offshore development centres in (cheaper and more skill abundant) locations such as India, Sri Lanka and Hungary. In addition, three firms acquired or merged with firms outside Ireland; Cape Clear bought UK firm Orbware in 2000, CR2 bought London-based Interlink in the same year, and Network365 acquired California-based iPIN to form Valista in 2003.
- All eight firms had formed international strategic alliances and partnerships in their early years, either to develop their international market penetration (channel partners, distributors) or to access technological resources (technology partners). In addition, several of the firms participated in global communities of interest, such as industry standards bodies.
- Finally, these firms appeared to make regular use of international trade fairs (e.g. World GSM Congress and CommunicAsia in the case of firms operating the mobile telecoms

market) to launch and promote products and to network with key global industry players and stay apprised of key trends and emerging technologies.

New venture creation, internationalisation and the regional entrepreneurial environment in the embryonic Irish software cluster

New venture origins and internationalisation

This section seeks to provide a historical reference point for the subsequent discussion of the eight born global cases from the accelerated growth/established phase of the Irish software cluster. It examines new venture creation and internationalisation during the earlier embryonic/emerging cluster stages, and also provides some insights on the nature of the entrepreneurial environment in this earlier period in the cluster life cycle.

First, looking at the origins of the early Irish software product firms, it becomes clear that there was no single source of knowledge which was being exploited. Rather, the emergence of these firms can be attributed to the entrepreneurial efforts of a small group of pioneers who sought to capitalise on their own particular expertise - gleaned from their varied work experience in industry, academia and the public sector – and the commercial opportunity presented by the emerging market for software products. Thus, according to Ó Riain (1997), early Irish software product firms emerged by three main routes:

1. Services to products route - Many indigenous software product companies began by providing 'bespoke' or custom services to businesses, then expanded this business into making consultancy kits and subsequently into products, gradually expanding into export markets. Early customers within Ireland - who commissioned various IT development

projects - are said to have provided an important catalyst. Among these customers were MNC subsidiaries in various industries and it has been argued that Ireland's general success in attracting FDI was important in creating additional local demand for fledgling software firms (O'Gorman et al, 1997).

2. Spin-outs from larger firms - Some early indigenous software firms were created when firms in other industries, such as telecommunications or computer hardware, spun off their software divisions. Other firms emerged from divisions of MNCs, semi-state bodies and Irish firm). Ó Riain (1997, p.30) argues the key dynamic in this process was local in that "domestic managers created new competencies and business for their divisions and convinced the management of the parent company to support their projects". A further type of spin out occurred when users of software - in vertical markets such as banking and training – applied their detailed knowledge of these markets to open up opportunities for new software businesses.

3. Firms based on academic research - Whilst the university spin-off/start-up route was probably not the most numerically significant this should not hide the fact that some of the most successful indigenous software companies originated from a university environment (e.g. Iona Technologies, Baltimore Technologies, Trintech) being set up by professors and graduate students based on their on-campus research (Ó Riain, 1997, p.30). These were among the most technically-sophisticated and fastest-growing firms in the indigenous industry, operating in areas such as development tools, system software, computer-based training and telecommunications (Arora et al, 2001, p.8).

If we look specifically at some of the leading firms founded in the emerging cluster stage (see also Table 4), this also reveals that these firms emerged from a variety of sources. CBT Systems (later SmartForce then SkillSoft), the e-learning/computer-based training specialist and Ireland's first Nasdaq IPO, is said to have emerged on the back of an Irish government-led 'courseware' initiative in the mid-1980s (Ó Riain, 1999; HotOrigin Ltd, 2002). Datalex, a provider of IT solutions to the airline and travel industry, was established when the in-house IT development team at Aer Lingus spun-off in 1985 (HotOrigin Ltd, 2002). Parthus (later ParthusCeva), which develops software for semiconductor design, was established in 1993 when Digital Equipment Corporation closed its Irish R&D operations and the core development team stayed together to form a new company (HotOrigin Ltd, 2002). Iona Technologies, the second Irish Nasdaq IPO, was founded in 1991 on the back of research at Trinity College Dublin on distributed computing. Baltimore and Trintech also have their origins in academic research. Euristix, which was acquired by Fore Systems of the USA in 1999 for US\$80 million, was founded by Dr Jim Mountjoy who had a background in academia and the public sector and had been MD of Baltimore in the late 1980s. The founders of Kindle Banking Systems – sold to Misys of the UK in 1995 - came from a background in the banking industry.

The precise internationalisation behaviour and paths of these early software product firms are hard to uncover from secondary research. However, the available evidence tends to suggest that they generally internationalised gradually, having initially focused on providing custom services to domestic customers, or, where they did begin internationalising early in their life (due to a small or non-existent home market for their products) they progressed at a slow pace and/or had a narrow geographical scope, typically focusing on the culturally-proximate UK or US markets. Thus, Sterne (2004, p.65) states “the typical generation two company [founded

in the early-to-mid 1980s] started as a service provider to *local* customers, wrote its first code as a sideline, re-positioned itself as a product developer after a few years” and generation three firms [mostly founded in the late 1980s/early 1990s] were “characterised by product specialisation, more frequent forays into America”. Kindle Banking Systems – which wrote software for ICL minicomputers - first exported to the UK market and subsequently internationalised to former British colonies around the world, based on the ICL connection. Overall, there seem to be similarities with the traditional Uppsala or stage models of internationalisation, and where firms were early internationalisers, their exporting generally progressed quite slowly and with a narrow market scope.

The regional entrepreneurial environment for early software firms

To expose the nature of the regional entrepreneurial environment facing new software ventures in Stage II of the cluster (i.e. late 1980s/early 1990s), I review the experience of Iona Technologies, which became arguably the most successful Irish indigenous software firm of the 1990s⁸. The Iona story serves to highlight the difficulties faced by Irish software companies who were founded in Stage II of the cluster life cycle. The environment was characterised by a weak domestic capital market; a lack of experienced entrepreneurs, managers and sales personnel in Ireland; an absence of specialised supporting business services firms; and a lack of understanding of the requirements of technology start-ups in the State development agencies. In addition, there was also no real precedent of an Irish software firm ‘breaking’ the US market. In the late 1980s the first generation of Irish software firms had either failed commercially (e.g. Generics) or been swallowed up and run-down by foreign multinationals (e.g. Glockenspiel, Software Labs, RTS, Intelligence Ireland, COPS and Workhorse) (O’Riain, 1999). Several other promising Irish software firms were then acquired by foreign multinationals during the late 1980s and early 1990s and continued to operate as

subsidiaries of their new parent companies (e.g. Insight, Kindle, Quay and Credo) (O’Riain, 1999).

Iona was founded in 1991 and underwent an IPO on the Nasdaq stock exchange in 1997. Hence the key phase of Iona’s development falls within Stage II of the cluster life cycle (Table 2). Iona Technologies had its joint headquarters in Dublin, Ireland and Waltham, MA (near Boston). In 2000, it had revenues of US\$153 million (69% from product licences, 31% from services), over 4,500 customers and partners (including numerous Blue Chip clients), and over 900 employees in 30 offices worldwide (including sales force of 300+). Iona’s core product offering was a web services platform for total business integration (Orbix End 2 Anywhere™). This built on the original core product of the company, which was based on the CORBA industry standard for open systems-based middleware (Iona was influential within the Object Management Group industry standards body that founded CORBA).

Between 1985 and 1991, Trinity College Dublin’s Department of Computer Science was engaged in leading edge research on distributed computing (funded by the EU Esprit programme). Iona CEO Dr Chris Horn was one of the original researchers on this programme. In 1991, the EU funding was drawing to a close and the researchers were keen to see the technology commercialised. TCD had an active ‘campus company scheme’ and offered the academic researchers a three year window of opportunity to build a company and commercialise the technology. The academics were offered a reduced teaching load and incubation space by TCD, with the opportunity to either resign their faculty positions or stay on at TCD at the end of the three years. Hence Iona was founded in March 1991 by Chris Horn, along with colleagues Dr Sean Baker and Annrai O’Toole, in a 200 sq ft office in the TCD Innovation Centre.

At the outset, the Iona founders had very little capital, little commercial experience, and - as Horn later admitted - a business plan which was not credible. In terms of external financing options for Iona, Irish private investors were wary of indigenous technology firms after a number of high-profile failures in the 1980s; there were no local venture capitalists in Ireland; the major banks would not lend to software firms who had no tangible assets against which to secure a loan; and the Industrial Development Authority was showing only limited interest. Iona then tried, without success, to secure VC from 3i in the UK and some French funds. Finally, Iona found interest from Atlantic Partners in Boston but they wanted Iona to relocate to the United States, a suggestion which was strongly resisted by the founders. Faced with this harsh funding environment, Iona was forced to adopt a 'bootstrapping' strategy (i.e. selling consultancy and training services to generate funds). By mid-1992 Iona was able to hire two full-time employees and by mid-1993 its first product was ready for commercial sale. Iona secured its first customer at a trade show in San Francisco that year but more significantly it met with executives of Sun Microsystems, who became interested in Iona's product. Sun bought a 25% stake in Iona for US\$600,000 and took two board seats, in December 1993. There was also an OEM agreement whereby Sun incorporated Iona's middleware software on their Workstations. Sun's name was also useful as a 'badge of credibility' for Iona, especially in the tough US market. Note that Iona was export-oriented from the outset because the Irish domestic market for its software was almost non-existent. Ireland's Industrial Development Authority became interested around this time and made a significant investment in Iona. Motorola and Boeing were the first Blue Chip customers. In 1996, Sun offered to buy the remaining 75% of Iona for US\$45 million but Iona said no. Iona aspired to an IPO but this was blocked by Sun's board members. Eventually Iona was 'set free' by Sun, who sold their

25% stake for US\$60 million in 1997. Iona's 1997 IPO on Nasdaq was the fourth largest ever, valuing the company at US\$240 million (revenues at this time were only US\$16 million).

The fact that Iona was able to overcome this difficult environment can be attributed to its excellent technology, which coincided with a surge in demand driven by the Internet and the widespread adoption of network computing; to the excellent leadership of CEO Chris Horn (which is widely acknowledged in the industry); to a degree of learning from the commercial shortcomings of earlier Irish firms like Glockenspiel; and to some novel strategies for developing the company (e.g. bootstrapping, OEM agreement with Sun, membership of Object Management Group standards body). However, Iona succeeded in spite of, not because of, the regional entrepreneurial environment in Ireland during Stage II, and many other start-ups from this era were not so capable or fortunate.

The emergence of 'true born global' firms in the accelerated growth/established phase of the Irish software cluster

A transformed entrepreneurial environment in Stage III

In this section, I seek to highlight some important contrasts between the environment for new venture creation and internationalisation in Stage III (late 1990s), as compared with the early Stage II in the life cycle (Table 2). My central argument is that the regional entrepreneurial environment was substantially improved by Stage II, as a result a gradual process of co-evolution driven by the earlier entrepreneurial efforts by pioneering Generation 1, 2 and 3 firms (summarised in Table 2). This transformed regional environment provided many useful resources and supports for new venture creation and internationalisation. Three key changes in the regional entrepreneurial environment were as follows:

1. Institution building and improved government support – One significant distinction from Stages I and II of the life cycle was the development of a set of specialised supporting institutions. Institutions such as the National Software Directorate (an agency charged with the co-ordination of government policy towards the software industry), Irish Software Association (an industry association involving many of the leading foreign and indigenous firms), Irish Internet Association and Centre for Software Engineering (a technology transfer centre and centre of excellence based at Dublin City University) were all founded in the early 1990s *in response* to the emergence of the early industry pioneers. These institutions facilitated knowledge dissemination and learning with the cluster through their various seminars, industry studies, strategy reports, networking events, etc. Of particular importance to the development of effective institutions was the close inter-relationship with industry: the first leader of the NSD (Barry Murphy) and head of the CSE (Robert Cochran) were both experienced industry insiders whose personal career histories traversed the private and public sectors.

Another effect of the emergence of a critical mass of companies during Stage II was increased attention and support from the State development agencies. Notably Enterprise Ireland, formed in 1997 from an institutional re-shuffle, was quick to realize the indigenous development potential of the software industry and offered a range of hard and soft supports to emerging software firms during the late 1990s/early 2000s. Among this support was assistance with internationalisation, including the provision of overseas office space and support in the United States. Sterne (2003) observed that “the state agency structure has shown an admirable flexibility over the years. It has never really instigated

anything new. But it has been a good 'fast follower' and reacted quickly to emerging problems among the client firms”.

2. Development of a thick labour market - By Stage III, Ireland had developed a thick technical labour market in software-related (technical, sales and managerial) skills, particularly in the Greater Dublin region. The prolific output of computing graduates from the third-level education institutions (universities and especially Institutes of Technology) since the mid-1980s – which was ramped up significantly during the 1990s in response to the cluster’s emergence - was supplemented by over decade of on-the-job learning within both the overseas and indigenous software sectors, and related sectors, and by heavy investment in employee training (O’Gorman et al, 1997). Another notable phenomenon during Stage III was the involvement of experienced ‘cluster pioneers’ as non-executive directors (NEDs) on the boards of young software firms. For example, in the early 2000s, high-profile cluster pioneers like Dr Chris Horn (IONA co-founder and CEO) and Dr Jim Mountjoy (Baltimore and Euristix founder) had NED role with numerous young indigenous technology firms. The key point here is that there was no equivalent pool of experienced entrepreneurs and managers available to start-up companies in Stages 1 and 2 of the cluster life cycle.

3. Development of a local venture capital industry (and other specialised support firms) – A very significant development in Stage III was the emergence of a local venture capital industry, and the increasing involvement of international VC investors. As Ó Riain (2000, p.32) notes, it was only in 1998/99 that private investment capital became abundant in Irish software. The Irish VC industry was ‘kick-started’ by an EU-funded Irish government programme, which matched public and private funds with the aim of

stimulating investment in promising technology-based start-ups (Enterprise Ireland 2000). Thus, between 1998 until the early/mid 2000s, venture capital became the dominant source of external finance for 'build-phase' indigenous software companies and was said to be in abundant supply for good business propositions (HotOrigin Ltd, 2001 and 2002). The significance of VC is two-fold. First, VC provides the fuel for new venture growth and internationalisation. Second, and perhaps equally importantly, VCs play an important 'coaching' role through their involvement with young start-up companies (Hellman, 2000; Fernhaber and McDougall-Covin 2009). Specifically, VCs are believed to 'professionalise' the start-ups they invest in by recruiting experienced executives, introducing incentives such as stock options, etc (Hellman and Puri 2002). There is also some evidence that a habitat of supporting business service firms was beginning to form by Stage II – e.g. consultancies, lawyers, recruitment specialists and PR firms (see Box 1).

Origins and internationalisation of born global firms in Stage III

The eight born global software firms investigated for this study, which were all founded between 1997 and 2000 in Stage III of the cluster life cycle, were introduced previously. As noted earlier, the internationalisation of these firms was early, rapid, 'aggressive', multi-modal and focused on multiple global market regions; these were 'true born global' firms. It is argued here that the origins and antecedents of these international new ventures are an important factor in this internationalisation behaviour. Table 5 provides a brief summary of the origins and antecedents of the eight firms. This evidence shows that all of the firms had experienced founding teams. Three of the firms (AmBeo, Cape Clear and Macalla) originated as spin-offs from successful indigenous firms (Saville, Iona and Quay), and inherited significant resources from their 'parent' firms. Two of the firms were second entrepreneurial

ventures for their founding teams (CR2 and Network365). Again, the previous experience of these founders was an important learning experience and source of inherited resources for the new ventures (Table 5). CR2 co-founder Cian Kinsella, who was previously a co-founder of successful Irish banking software firm Kindle, said in an interview in September 2000: "Experience makes it easier. Second time round we have got the real experience of being in the software business and understanding software. Ron has more of a sales leaning. I have more of a products leaning and we are a good combination" (Linnane 2000; cross-refer Table 5). Even, the apparent 'new entrants' in the cohort (Norkom, Openet and Xiam) had very experienced founding teams with important embodied resources, such as deep knowledge of particular vertical markets that were being targeted by the new venture. Two important points to note here are therefore are: (1) the vastly superior resources and capabilities at inception of the eight born global firms, by comparison with firms founded in earlier stages of the cluster life cycle, due to the extensive prior experiences of their founding team members; and (2) the fact that this prior experience was mainly acquired working for earlier generations of Irish software firms during earlier phases of the cluster life cycle (notably Stage II).

Another key factor in the internationalisation of the studied born globals, it is argued, is the ability of these firms to access necessary additional resources for internationalisation from within their (external) home regional environment. As discussed in the preceding section, the regional entrepreneurial environment was significantly improved by Stage III. In particular, some of the resources that are known to be useful for early and rapid internationalisation (e.g. venture capital, experienced executives and supportive institutions) were relatively abundant by Stage III. The superior inherited resource profile of the firms at start-up (embodied in their experienced founding teams) is meant these firms were particularly well-placed to capitalise on the increasingly 'munificent' entrepreneurial environment in Ireland in the late

1990s/early 2000s, and to exploit emerging niche opportunities in global software markets. In the case of venture capital, for example, the studied born globals were all able to attract multiple rounds of funding to facilitate their rapid international expansion (Table 6). For example, CR2 was able to double its size in June 2000 with the £8.1m acquisition of London-based Interlink a global provider of banking channel software for ATM and point of sale devices. Interlink was active in India, Africa, the Middle East and Asia Pacific Rim with 90 customers in over 70 countries; thus CR2 was able to accelerate its global expansion plans with a ready-made international infrastructure” (Linnane 2000). This accelerated growth path would not have been available without VC investment (from ACT and Enterprise Ireland in 1999 then GIMV in April 2000), access to which relied heavily on the founders’ prior track record at Kindle.

CONCLUSION

The paper has sought to contribute to the burgeoning literature on small firm internationalisation and International Entrepreneurship, notably on the topic of ‘born global’ firms or international new ventures. In particular, the paper has explored the relationship between new venture creation and internationalisation and the cluster life cycle, and sought to illustrate the potential ‘added value’ that might be brought to the study of IB/IE topics by adopting an interdisciplinary perspective. A second disciplinary perspective can be seen as an alternative ‘lens’ through which to view a phenomenon or problem. In the specific case examined in this paper, insights from the cluster literature (in economic geography, regional studies and industrial dynamics) were shown to have the potential to shed new light on the question of what influences the emergence and internationalisation of new ventures.

In the Irish experience, the emergence of ‘truly born global’ software firms during the expansionary/accelerated growth phase (Stage III) of the cluster life cycle appears to owe much to the transformed nature of the regional entrepreneurial environment that existed in Ireland by that period⁹. In this enhanced ‘habitat’ – produced by the co-evolution of entrepreneurial agency and the regional environment over a period of two decades - resources suitable for (early and rapid) internationalisation (such as venture capital, policy support and experienced executives) were more abundant. These resources could be appropriated and exploited by new software ventures, especially those with experienced founders. Significantly, the entrepreneurial generation that founded the leading new software firms of the late 1990s differed from earlier entrepreneurial generations as they were able to draw upon substantial prior experience and accumulated knowledge and expertise. These prior experiences were highly geographically situated (i.e. largely in Ireland, working for Irish firms, including those active in international markets) and were intimately bound up with the emergence of the Irish software cluster; i.e. key embodied resources and capabilities for early internationalisation had been ‘forged’ in earlier phases in the cluster life cycle. This all suggests that a more holistic understanding of the born global/INV phenomenon could be developed by paying closer attention to the geographical and historical context with which such firms emerge. Future studies might wish to give greater consideration to these contextual factors, which are often ‘swept under the carpet’ due to the disciplinary pre-occupation in business and management studies with entrepreneur- and firm-level units of analysis.

This paper faces limitations that are inherent in all case study research, notably the issue of external validity (generalisability) – i.e. are the findings here specific to the Irish software case or common to other emergent technology clusters (e.g. Israeli, Finnish and Bangalore software/IT clusters). Whilst it is impossible to answer this question with confidence, there do

appear to be some parallels with the Israeli (Teubal et al. 2002; DeFontenay and Carmel 2004; Avnimelech and Teubal 2006). However, the focus on a single case, with its very specific context, means caution must be exercised in seeking to generalise the findings. Despite these concerns, Yin's (2003) assertion that case study research is concerned with generalisation to theory rather than populations suggests the links between new venture internationalisation and stages in the cluster life cycle may well merit further consideration in attempts to theorise international entrepreneurship and the born global phenomenon.

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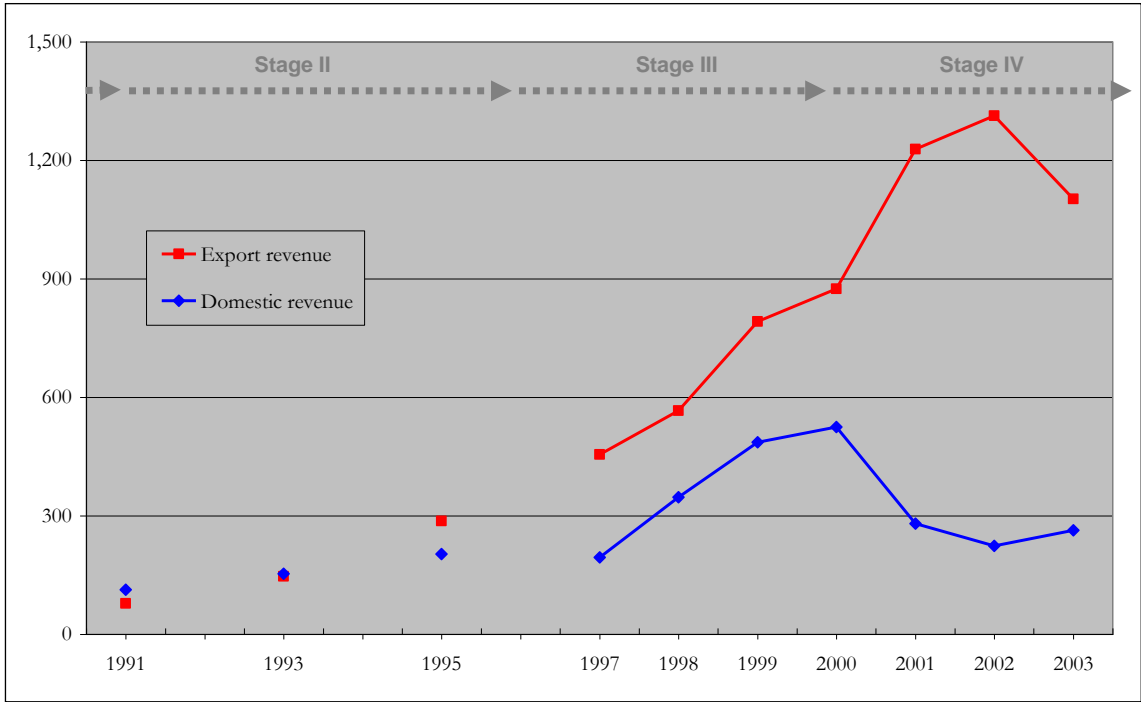
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FIGURES AND TABLES

Figure 1: Total Domestic and Export Revenue of Ireland's Indigenous Software Industry, 1991-2003 (€m)



Source: author's presentation of data from National Software Directorate, Enterprise Ireland.

Table 1: Stylised comparison of research on early internationalizing firms and on clusters.

| | Born globals/international new ventures research stream | Clusters research stream |
|---|---|--|
| Dominant disciplinary background | <p>Business and management studies sub-disciplines:</p> <ul style="list-style-type: none"> ▪ (International) entrepreneurship ▪ International business ▪ International marketing | <ul style="list-style-type: none"> • Economic geography • Regional studies/regional science • Applied and regional economics • [Also: Industrial dynamics] |
| Primary unit of analysis | <ul style="list-style-type: none"> • Firm • Entrepreneur(s)/owner-manager(s) | <ul style="list-style-type: none"> • Cluster/agglomeration • Region/locality |
| Examples of key research themes/questions | <ul style="list-style-type: none"> • Gradual internationalisations versus BGs/INVs • Origins and antecedents of BGs/INVs • Strategies pursued by BGs/INVs (or entrepreneurs) • Search for new or appropriate theory | <ul style="list-style-type: none"> • Reasons for existence of clusters/agglomerations • Nature and sources of regional industry competitiveness • Advantages conferred on firms located within clusters • Origins, evolution and sustainability of clusters |
| Typical research strategies and methods | <ul style="list-style-type: none"> • Primary: positivist tradition; multivariate analysis of quantitative datasets from large-scale surveys or constructed from public or private data sources • Secondary: interpretive tradition; multiple case studies; corporate interviews; qualitative data | <ul style="list-style-type: none"> • Primary (esp. in economic geography and regional studies): in-depth case studies (often single, sometimes multiple); corporate interviews, surveys, histories, genealogies, secondary data analysis; primarily cross-sectional but sometimes longitudinal • Also some studies in quantitative/positivist tradition, especially in regional science and applied/regional economics |
| Theoretical approaches | <ul style="list-style-type: none"> • (Challenge to) traditional process internationalization theory (e.g. Uppsala model, stage models) • International new ventures (Ovairt & McDougall, 1994) • Network perspective • Resource-based view • Knowledge-based view | <ul style="list-style-type: none"> • Marshallian agglomeration economies • Institutional perspectives, including: regional innovation systems, innovative milieu (GREMI group) • Porterian diamond of competitive advantage • ‘New Economic Geography’ (Paul Krugman, etc.) • Evolutionary approaches |

Source: author’s interpretation.

Table 2: Key Developments in Ireland’s Indigenous Software Industry in Four Stages

| | Key industry characteristics and developments | Key developments in cluster ‘habitat’ |
|--|--|---|
| Stage I: Pre-/Proto-cluster (1970s to late 1980s) | <ul style="list-style-type: none"> • Small population of firms • Pioneering 1st generation firms focused on services and custom development for mainframes • Some high profile failures and asset-stripping foreign acquisitions • Small number of 2nd generation firms that were innovative but lacked commercial experience/expertise (e.g. Glockenspiel, Generics) | <ul style="list-style-type: none"> • ‘Accidental’ creation of pre-conditions for indigenous growth • Third-level education reforms: university expansion plus establishment of Regional Technology Colleges (now known as Institutes of Technology) • Upgrading of telecoms infrastructure with EU funds • IDA Ireland attracts FDI by leading ICT hardware and software multinationals |
| Stage II: Embryonic/ emerging cluster (late 1980s to mid 1990s) | <ul style="list-style-type: none"> • Beginnings of critical mass? • 2nd generation firms exporting software products to UK and beyond • Emergence of 3rd generation firms, including future IPO and acquisition exits of Stage III • Move towards niche software product based business model • Recognised technical communities in middleware, courseware and telecommunications software | <ul style="list-style-type: none"> • State agencies slowly begin to recognise potential of indigenous software industry • Industry-specific institutions formed (e.g. National Software Directorate, Centre for Software Engineering, Irish Software Association) • Some internationally significant development work done by indigenous firms (e.g. Aldiscon, Iona) |
| Stage III: Expansionary/ accelerated growth (mid 1990s to 2001/02) | <ul style="list-style-type: none"> • Critical mass attained? • IPOs and acquisition exits of leading 3rd generation firms (e.g. Aldiscon, Baltimore, CBT Systems, Euristix, Kindle, Iona, Trintech,) • Internationalisation of many indigenous firms and growing export intensity of industry • Emergence of ‘true born globals’ among 4th Generation firms • Some examples of outward FDI • Increasing volume of start-ups, incl. spin-offs from incumbents | <ul style="list-style-type: none"> • International recognition of leading Irish software firms and the developing cluster of significant capability • State development agency Enterprise Ireland (established in 1997) develops strong focus on indigenous software firms, provides hard and soft supports • Establishment of local venture capital industry (as well as abundant angel investment) plus inflow of foreign VC • Establishment/attraction of private ‘Economy Two’ support firms as part of developing start-up ‘habitat’ |
| Stage IV: External shock, rationalisation and reinvention (2002 onwards) | <ul style="list-style-type: none"> • External shock: dot.com crash and global technology sector downturn • De-listing of several key players • Rationalisation and cost-cutting plus a limited number of high-profile firm ‘failures’ followed by gradual return to growth by about 2004 | <ul style="list-style-type: none"> • Harsher investment climate/funding crisis • Doubts about scale of firms and sustainability/‘adaptability’ of cluster • Enterprise Ireland broadens focus to other indigenous industry sectors • Some software institutions disbanded or downgraded (e.g. CSE, NSD) |

Source: author, based on own secondary research and reading of existing studies (O’Gorman et al. 1997; Ó Riain, 1999 and 2004; O’Malley and O’Gorman 2001; Sterne, 2004; Sands 2005; Roche et al. 2008).

Table 3: Profile of eight ‘born global’ Irish software firms

| Company (Date est.) | Business niche (c.2003) | Locations (c.2003) | Example customers (c.2003) | Known customers by region | | | | | Status as of October 2009 |
|--------------------------|---|---|---|---------------------------|----|----|----|----|--|
| | | | | IR | EU | NA | AP | RW | |
| Am Beo (Mar 2000) | Rating and billing solutions for telecoms | Galway ; Denver, Madrid, Paris | Lycos Europe, Western Wireless, Sonera ZED | X | √ | √ | X | X | Acquired by Nasdaq-listed Embarcadero Technologies (US) in Oct 2005 for total cash consideration of \$6.15 million |
| Cape Clear (Aug 1999) | Web services integration technology | Dublin ; London, California, Massachusetts | Accenture, AT&T, BT, Credit Suisse, Dresdner Bank, GE, HP, Sky | √ | √ | √ | X | √ | Acquired by Workday (US) in March 2008 for undisclosed sum; had revenues over \$5m but was loss-making at time; Dublin operation since expanded |
| CR2 (Jan 1997) | Channel banking and card payment solutions | Dublin ; London, Dubai, Bangalore, Mumbai, Perth, Singapore, Miami | ANZ, American Express Bank India, Standard Chartered, Rothschild, Bank Muscat, Barclays | X | √ | √ | X | √ | Independent (private) ; original founders no longer on board; turnover grew to over €15m and firm was profitable in 2008 |
| Macalla (Mar 1998) | Mobile commerce platforms and solutions | Dublin ; Madrid, London, New York, Frankfurt | ING/Postbank, Telfort/MMO2 (Neth), Vodafone, Dresdner Kleinwort | √ | √ | √ | X | X | Acquired by Roamware (US) in Sept 2009 for unknown sum; had been growing and trading profitably; Dublin operations expected to expand |
| Network365 (Jun 1999) | Enabling technology for mobile services | Co Wicklow ; Japan, Singapore, Hong Kong, USA, Sri Lanka, France | Hutchinson (HK), CSL (HK), Cesky Mobile, Celltel Lanka, O2, NTT DoCoMo (Jap) | √ | √ | √ | √ | X | Acquired by Aepona (N Ireland) in July 2009 in all-share deal (undisclosed value); turnover of €10m and 100 employees in 2007; loss-making but reducing losses |
| Norkom (Mar 1998) | eCRM solutions and customer intelligence tools | Dublin ; London, Brussels, Ontario, Boston (MA), Israel | HSBC, Bezeq (Israel), Canadian Tire Fin Serv, ING Direct, HFC Bank, BA, Actel (Belg) | √ | √ | √ | X | X | Independent (public) ; underwent successful IPO on AIM & IEX in May 2006; Turnover of €48m, profits of €4.9m and MarCap over €100m in 2009; 210 staff (135 in Ire) in 2007 |
| Openet (Jul 1999) | Telecom billing software for real-time charging | Dublin ; London; Paris, Rome, Palo Alto (CA), Reston (VA), Hungary | Orange, Telecom Italia Mobile, Publitel spa (Ita), TMN (Portugal), Verizon Wireless | X | √ | √ | X | X | Independent (private) ; employs 340 people worldwide (incl. US, UK, France, Italy, Brazil, Singapore), including 120 in Dublin; Turnover of €37m and growing in 2008. |
| Xiam (Sep 1999) | Mobile middleware and application software | Dublin ; High Wycombe (UK), Sydney, Tokyo, Singapore | Vodafone, Orange, CSL (HK), Telenor Interactive (US), Midwest Wireless (US) | √ | √ | √ | √ | X | Acquired by Qualcomm (US) in March 2008 for \$32m; 30 staff in Dublin at time; spawned corporate spin-off (PolarLake, also an EIF) |

Notes: Key to market regions: IR = Ireland; EU = Rest of Europe (incl. UK); NA = North America; AP = Asia-Pacific; RW = Rest of world (e.g. Middle East, Africa, Latin America, Oceania); √ indicates firm was known to have customers in this region in 2003 and X indicates no evidence of customers in this region.

Source: compiled by author using information from company websites and various secondary data sources (e.g. sector-specific online news media).

Table 4: Stylised comparison of leading firms founded in embryonic/emerging phase (Stage II) and expansionary/accelerated growth phase (Stage III) of Ireland’s indigenous software cluster

| Cluster stage | II. Embryonic/emerging cluster | III. Expansionary/accelerated growth phase |
|--------------------------|---|--|
| Year founded | mid 1980s-early 1990s | 1996-2000 |
| Status | Leading lights of established cluster Underwent IPO in mid-to-late 1990s or ‘exited’ via foreign multinational acquisition | Emerging or potential future stars VC-funded/growth-oriented start-ups, some tipped as future IPO candidates |
| Examples | Generation 2 survivors: Baltimore Technologies, Kindel Banking Systems; Generation 3 firms: Aldiscon, CBT Systems, Datalex, Euristix, Iona Technologies, Quay Financial Software, Saville Systems, Trintech | Generation 4 firms: AmBeo, Buytel, CapeClear, ChangingWorlds, CR2, Eware, Macalla, Massana, Network365, Norkom, Openet, Qumas, Rococo, Sepro, Vordel, WBT Systems, Xiam |
| Niches | Communications software, middleware, computer-based training, banking and finance applications, security software | Telecommunications, web services integration technology, mobile commerce, financial services applications, CRM |
| Venture origins | Majority were spin-outs/offers from non-software firms, also some university spin-outs | Entrepreneurial spin-offs from incumbent software firms.; serial software entrepreneurs; new entrants with experienced founding teams; only a few university spin-outs |
| Founder characteristics | <ul style="list-style-type: none"> • Pioneers • Technologists as CEOs • Mainly first-timer entrepreneurs • Limited commercial know-how | <ul style="list-style-type: none"> • Mainly experienced (e.g. prior entrepreneurial, senior managerial, vertical market and overseas work experience) • Teams of multiple founders with complementary expertise • Professionalization of executive team |
| Firm-building strategies | <ul style="list-style-type: none"> • ‘Bootstrapping’ (selling services to fund product development) • Custom development services <i>and</i> niche product development • Increasingly export-focused • Some gradual internationalisers and some born internationals? • Mainly targeted (culturally proximate) UK and US markets? | <ul style="list-style-type: none"> • Mainly Venture capital financed • Niche product-focused from outset • Multi-modal internationalisation, including acquisitions and extensive use of alliances and partnerships • Broader international market scope (with market attractiveness being more important than cultural proximity?) • Several ‘true born globals’ |

Source: author, based on own secondary research and reading of existing studies (O’Gorman et al. 1997; Ó Riain, 1999 and 2004; Sterne, 2004).

Table 5: Antecedents and new venture origin for eight ‘born global’ Irish software firms founded in Stage III of cluster

| Company | Origin type | Summary of antecedents/new venture origin | Inherited resources and capabilities at start-up |
|------------|--|--|---|
| Am Beo | Entrepreneurial spin-off from incumbent firm | Am Beo was established in March 2000. There were seven original founders, of which four came directly from Saville Systems [an Irish telecommunications software company specialising in customer care and billing, which was taken over by ADC Systems] and all had a strong technical and applications background in data and voice billing (Source: TIU CEO Interview, April 2002). Founders and TMT also said to include several former Ericsson employees. | <ul style="list-style-type: none"> • Extensive knowledge of vertical market niche (telecoms sector) and key corporate customers • Specialised technical expertise • Experience of senior managerial roles |
| Cape Clear | Entrepreneurial spin-off from incumbent firm | Founded by three former executives of leading Irish middleware firm Iona Technologies, which once employed 800 people and became only the second Irish firm to float on the Nasdaq stock exchange in 1997. Cape Clear subsequently recruited three other key executives from Iona. Like Iona, it initially specialised in middleware systems built to the CORBA operating standard. Embodied knowledge and expertise transferred in spin-off included experience of developing and marketing component middleware products at Iona, plus experience in variety of managerial roles with this leading indigenous software exporter. | <ul style="list-style-type: none"> • Specialised technical expertise • Organisational – appropriate business models and routines for small independent software firms? • Diverse experience of managerial roles • Prior knowledge of technological niche market and key US market |
| CR2 | Established by habitual (serial) entrepreneurs | Cian Kinsella and Ron Downey resigned from Kindle Banking Systems to found CR2 in 1996. Kindle was an Irish banking software firm that they had previously founded and subsequently sold to UK firm Misys Plc. Kinsella gained extensive experience during his 17 years at Kindle, including product development, consultancy, customer service and sales, and had served as Kindle’s Technical Director and Sales Director. Downey led Kindle into its first export market (UK in 1994) and had established Kindle’s regional offices in Singapore, Bahrain and Miami as its Worldwide Sales Director in the early 1990s. CR2 appointed a number of experienced executives and NEDs from within the cluster, including: Brian Caulfield (serial entrepreneur and co-founder of Peregrine, Similarity Systems, Prediction Dynamics); Dr Chris Horn (of Iona Technologies fame) was a NED in 2003; Kieron Nagle (former Kindle CEO) joined as Chairman in 2005 (an example of prior network ties?). | <ul style="list-style-type: none"> • Financial capital from trade sale of previous business? • Organisational – appropriate business models and routines for small independent software firms? • Prior related entrepreneurial experience with Kindle • Experience of senior managerial roles • Extensive experience of international market development at Kindle • Extensive knowledge of vertical market niche and key corporate customers |
| Macalla | Entrepreneurial spin-off from incumbent firm | Founded when a team of key executives and technologists left indigenous firm Quay Financial Software around a year after it was taken over by Japanese multinational CSK. (Embodied) expertise transferred in spin-off included former Technical Director’s experience of developing US market for Quay and | <ul style="list-style-type: none"> • Specialised technical expertise • Organisational – appropriate business models and routines for small independent software firms? |

| | | | |
|----------------------------|---|---|---|
| | | technical knowledge accumulated in related work at Quay, plus managerial experiences in an exporting indigenous software firm. | <ul style="list-style-type: none"> • Experience in various managerial roles • Prior knowledge of vertical and key US market |
| Network365 (later Valista) | Established by habitual (serial) entrepreneur | The two key founders of N365 (Raomal Perera and Denis Hennessey) previously co-founded ISOCOR, a US registered electronic messaging and Internet email server pioneer, which did its development and support work in Ireland, went public in 1996 and was acquired by US MNE Critical Path in 1999. Initial capital for N365 came from key individuals in ISOCOR. N365 targeted Asia-Pacific region (Japan & Hong Kong) and were active in 8 countries within Asia-Pacific and Europe within first 3 years. N365 targeted the emerging m-commerce market. | <ul style="list-style-type: none"> • Financial capital from trade sale of previous business? • Specialised technical expertise • Prior related entrepreneurial experiences with ISOCOR |
| Norkom Technologies | New entrant with experienced founding team | [FILL DETAILS] | <ul style="list-style-type: none"> • |
| Openet Telecom | New entrant with experienced founding team | Founders included Declan Conway and Aidan Doyle. Openet was established with a pre-selected, highly experienced, senior management team of software and telecoms industry veterans (who had worked for Euristix, Vertel, ISR Global Telecom and SUN). Barry Murphy - who founded and led leading Irish software firm Insight in 1980s (sold to Hoskyns in 1988) and was Ireland's first National Software Director from 1988-96 – was recruited as CEO at this time. | <ul style="list-style-type: none"> • Extensive knowledge of vertical market niche (telecoms sector) • Diverse experience of senior managerial roles • Highly networked senior management team? |
| Xiam | New entrant with experienced founding team | The idea for Xiam was conceived together by two key founders; Warren Buckley) had been responsible for developing an innovative SMS system at Bank of Ireland Group Treasury, Robert Baker was running his Dublin-based ICT consulting firm and had previously worked for S3, a Dublin-based (but Philips-owned) firm that did custom software development work for the European GSM mobile telecoms standard. | <ul style="list-style-type: none"> • Specialised technical expertise • Vertical market knowledge (mobile telecoms) • Prior (unrelated) entrepreneurial experience |

Source: compiled by author using information from company websites and various secondary data sources (e.g. sector-specific online news media).

Table 6: Details of venture capital investments in eight ‘born global’ Irish software firms (between January 1999 and August 2003)

| Date | Recipient of investment | Investor(s) | Value (€m) | Amount |
|------------|-------------------------|--|------------|-----------|
| 30/03/2001 | Am Beo | (1 st round) ACT VC | 3.80 | IR€3M |
| 05/04/2002 | Am Beo | (1b) Enterprise Ireland | 3.00 | |
| 09/05/2002 | Am Beo | (2 nd round) Advent Venture Partners and ACT VC | 10.00 | |
| 03/12/2002 | Am Beo | (2b) Advent Venture Partners and ACT VC | 2.50 | |
| 14/04/2000 | Cape Clear | ACT VC | 2.08 | \$2M |
| 01/07/2003 | Cape Clear | (at least 3rd) Accel VC, Greylock VC & ACT VC | 10.00 | |
| 07/04/2000 | CR2 | (1 st) GIMV, Alpinvest and ACT VC | 10.92 | US\$10.5M |
| 03/11/2000 | CR2 | (2 nd) GIMV, NIB Capital and ACT VC, Goodbody Stockbrokers and AIB Corporate Banking. | 9.28 | US\$8M |
| 23/10/2001 | CR2 | (3rd) GIMV, NIB Capital, ACT VC | 8.43 | US\$7.5M |
| 15/09/2000 | Macalla | The Reuters Greenhouse Fund (the venture capital arm of Reuters) 3i Group and Guinness Ulster Bank Equity Fund. 3I Group and Guinness Ulster Bank Equity | 8.60 | €8.6M |
| 01/12/2000 | Network365 | Amadeus Capital Partners, Trinity VC | 15.00 | €15M |
| 20/06/2003 | Network365 | (3rd) Advent Venture Partners, Amadeus Capital Partners, Trinity VC, JAFCO and Enterprise Ireland | 10.00 | |
| 27/08/1999 | Norkom Technologies | (1 st) Trinity VC | 1.90 | US\$2M |
| 21/01/2000 | Norkom Technologies | (2 nd) Trinity VC | 2.97 | \$3M |
| 12/12/2002 | Norkom Technologies | Trinity VC and other shareholders (at least 3rd rd) | 3.10 | |
| 17/03/2000 | Openet Telecom | XATF (Cross Atlantic Technology Fund) | 3.24 | €2M |
| 23/09/1999 | XIAM | Delta Venture Capital of Ireland and Vertex Venture Capital of Singapore | 2.54 | IR€2M |
| 27/04/2001 | XIAM | (2nd rd) ADD Partners, Vertex Manangement, Delta Partners and Enterprise Ireland | 6.75 | €6.75M |
| Total (€m) | | | 114.11 | |
| Max | | | 15.0 | |
| Min | | | 1.9 | |
| Mean | | | 6.4 | |

Note: funding rounds in US dollars converted to Euro by author using historic €/€ exchange rate data obtained from <http://fx.sauder.ubc.ca/data.html>

Source: author’s searches of TechWatch.ie technology news archive in January 2002 (covering January 1999- January 2002) and September 2003 (covering January 2002-August 2003)

Box 1: Examples of 'Economy Two' firms in Stage III of the Irish software cluster life cycle

HotOrigin Ltd - Is an early-stage venture capital and specialist consultancy company. HotOrigin was founded in March 2000 in Dublin by an experienced team from corporate, consulting and start-up backgrounds. Three of its founders, including its CEO David Dalton, are former consultants with Accenture in Dublin and its CTO was formerly Head of IBM's eBusiness Services in Ireland. HotOrigin's advisory board includes Chris Horn and Jim Mountjoy (x-refer Box 4). HotOrigin aims to facilitate the growth of young software companies during critical stages of development, by providing essential services such as management team building, business strategy development, technology strategy, strategic alliance partnerships and venture financing. HotOrigin has made 8 early-stage investments in Irish tech companies over the last 18 months.

International Ventures – Provides strategic consulting services for high technology companies supplemented by “tactical implementation support”. The founders of International Ventures are two high profile figures in the Irish software industry. Paul O’Dea was a founder of banking software company Credo, which was acquired by Misys in 1994. He has a BE and MBA from University College Dublin. He has advised, invested in and mentored numerous high technology companies. O’Dea is the current chairperson of the Irish Software Association and has advised the government on strategy for the software industry. Donal Daly is one of Ireland's most successful IT entrepreneurs. His first company, founded in 1986 as Expert Edge Computer Systems and later known as Software Development Tools Inc (SDTI), was sold to Wall Data for IEP2 million in 1997. Daly then formed e-marketing company NewWorld Commerce which in February of 2002 merged with IQ Commerce to form NewWorld IQ (Daly remains as chairman). Daly is a former chairperson of the ISA.

Brown Rudnick Berlack Israels - The major Boston-based US law firm Brown Rudnick Berlack Israels opened an office in Dublin in early 2002. Brown Rudnick has annual worldwide revenue in excess of \$100m and employs over 200 lawyers. The Dublin office advises Irish technology firms doing (or planning to do) business in the United States about issues such as employment legislation, legal disclosure, product licensing, intellectual property protection, raising venture capital and setting up a US office. The firm is already working with nearly 20 Irish technology companies, including Eurologic Systems and Fineos.

Eurolink Global – This English multinational firm opened a Dublin office in late 2001. Eurolink specialises in the supply of hard-to-find and rare skilled IT professionals (both contract and permanent). Eurolink clients have instant access to a candidate bank of over 120,000 IT professionals and candidates can view up to 500 assignment opportunities received on a daily basis.

Simpson Financial & Technology Public Relations Ltd – Is a Dublin-based public relations company, founded in 1995, focusing on technology companies. Clients in the Irish software industry include Allfinanz, Horizon Open Systems, Norkom Technologies and the Irish Software Association. Simpson FT PR aims to help companies to build corporate profile and reputation and promote their products and services. Founder Ronnie Simpson is a Trinity College Dublin graduate (Business Studies) and was previously MD of the Irish subsidiary of Edelman PR Worldwide. Simpson FT PR is a member of the Eurocom PR Network, a global network of technology focused PR firms with offices in 50 locations worldwide.

Notes

¹ Interdisciplinary here refers to the use of insights from *outside* the broad field of business and management studies; in this paper this means economic geography, regional studies and related ‘spatial’ disciplines. Several authors describe IE as a multi-disciplinary field but these refer to sub-fields within business and management such as entrepreneurship, marketing, strategic management and international business.

² Conversely, it should also be noted that EIFs, or wider questions of international entrepreneurship, have so far received little attention in the economic geography literature (Yeung 2009).

³ Another notable recent theme in the more recent literature on clusters highlights the role and importance of international connections for dynamic clusters. Such connections, dubbed ‘global pipelines’, are said to act as conduit for learning and knowledge transfer between leading global centres in particular industries and a complement to localised learning within clusters (Bathelt et al. 2004; Wolfe and Gertler 2004). Other studies have highlighted the role played by ‘diaspora networks’ and connections to the United States in the growth of new technology clusters in emerging economies such as Taiwan and India (Saxenian 2007; Sonderegger and Täube 2010). However, the primary unit of analysis in cluster studies tends to be the cluster itself and these diaspora studies are more focused on internationally-mobile entrepreneurs; there has been less focus in this literature on the creation and internationalisation behaviour of new ventures.

⁴ Note that the overall aim in this paper to expose and examine the conceptual question [*(How) is the emergence and internationalisation behaviour of new ventures (especially the propensity to follow a ‘born global’ strategy) affected by the cluster life cycle context within which they are founded?*] and not to understand/explain the existence or emergence of the Irish software cluster; several existing studies give good accounts of the cluster’s emergence and evolution, or particular aspects of it (e.g. O’Gorman et al. 1997; Ó Riain, 1999 and 2004; Sterne 2004; Roche et al. 2008).

⁵ John Sterne is a Dublin-based journalist who has written about the information technology business in Ireland and internationally for more than 20 years. His 2004 book ‘Adventures in Code’ is based on original primary sources, including dozens of interviews with key industry figures, and it draws on Sterne’s extensive experience covering the sector as a journalist throughout the cluster life-cycle. Although the book is not an academic or theoretically informed account, it provides an arguably unparalleled secondary source of insights on individual firms and entrepreneurs, and the wider cluster.

⁶ The software industry was one of the leading sources of employment growth in Ireland’s ‘Celtic Tiger’ economy, with employment in the sector growing at a rate of 16% per annum during the 1990s (compared to 6% for the economy as a whole). By 2000, the Irish software industry comprised approximately 900 companies, with an estimated 30,000 employees and a combined annual turnover of €10 billion (National Software Directorate statistics cited in HotOrigin Ltd, 2002). Part of the story was a major influx of foreign direct investment in the sector, starting in the mid-1980s and continuing through to the present day (see Coe 1997; NSD 1997; Ó Riain 1997; Crone 2002; Grimes 2003). The ‘overseas’ segment of the Irish software industry included many of the world’s leading software multinationals (e.g. Microsoft, Oracle, IBM/Lotus, Symantec, Sun Microsystems).

⁷ The National Software Directorate, within Enterprise Ireland, provides the best series of statistics on the Irish software industry (covering employment, the number of companies, revenue and exports - disaggregated into indigenous and overseas segments). NSD began collecting this data in 1991 due to shortcomings in existing official statistics (e.g. various segments of the software industry being reported in different categories with the NACE industrial classification system).

⁸ This section draws heavily on Horn (2002) and O’Riain (1999), as well as O’Neill (2001).

⁹ Analysis in this paper has focused on Stages II & III of the Irish software cluster. A question of further interest, but beyond the scope of the present paper, is what happened to new venture internationalisation during the difficult Stage IV period (after the global technology downturn of 2001-02). For example, how did the cluster habitat change during this period and did this have implications for the internationalisation behaviour of new ventures? Did a more cautious and reticent VC industry result in a change in the business models of indigenous companies (including new ventures) and a more cautious approach to international expansion? Further research is required on these questions.