1 Introduction

"The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency."

BILL GATES (1955–)

This chapter at a glance

- Overview, Definitions and Background
- Technology-Based Entrepreneurship Education
- Technology-Based Entrepreneurship and Regional Development
- Organisation of the Book

1.1 Overview, Definitions and Background

In the entrepreneurship academic literature technology-based entrepreneurship (TBE) is referred to in a number of ways including technology entrepreneurship and technical entrepreneurship (MacKenzie, and Jones-Evans, 2012). According to Bailetti (2012) technology entrepreneurship is centred around the growth of firms, and regional economic development and involves the selection of stakeholders to take ideas to market and to educate managers, engineers and scientists. Moreover, Bailetti (2012) outlines technology entrepreneurship as "an investment in a project that assembles and deploys specialised individuals and heterogeneous assets to create value for the firm" (Bailetti, 2012, p. 2) and reports that the first symposium where researchers assembled to report findings on the topic was at Purdue University in October 1970 (p. 3). In a literature search 93 journal articles published in 62 journals on technology entrepreneurship were identified between 1970–2011 with eight themes which were technology entrepreneurs, technology opportunities, university and business incubators, spinoffs and technology transfer mechanisms, government programmes, funding new technology-based firms entrepreneurship education and commercialisation capability (Bailetti, 2012, p. 5). Although most of the technology entrepreneurship articles were published in non innovation or entrepreneurship journals, of the 62 journals publishing the 93 articles there were only eighteen found to be journals that contributed to entrepreneurship or technology innovation management according to Franke and Schreier (2008) and seven journals met the criteria for "good" journals in the area which were ET&P, IEEE, IJTM, JBV, JPIM, R&DM and RP (p. 8).

With regard to definitions in the literature Bailetti (2012) suggests that technology entrepreneurship concerns (a) the operation of enterprises by scientists and engineers, (b) identifying applications or problems with a technology, (c) exploiting opportunities, starting new applications or setting-up new ventures involving technical and scientific knowledge and (d) collaboration for technical change (p. 9). Furthermore, Bailetti (2012) notes that the technology entrepreneurship field, when compared to other fields such as management, economics and entrepreneurship, is in its infancy and provides the following definition "Technology entrepreneurship is an investment in a project that assembles and deploys specialised individuals and heterogeneous assets that are intricately related to advances in scientific and technological knowledge for the purpose of creating and capturing value for a firm" (p. 10). In conclusion Bailetti (2012) notes that technology entrepreneurship over the past four decades has become an international phenomenon and is considered to be important for competitive advantage, differentiation and growth of the firm at national, regional and firm level (p. 14).

In a study of technology-based entrepreneurship and the role of the University Tekic et al (2009) analyse TBE and provide research evidence about characteristics of new technology-based firms (NTBFs), define a technology-based firm as a firm that is depending on technology for its development and survival and note that TBE is a highly regional phenomenon. According to Hsu (2008) TBE is a field formed from the two areas of technological innovation and entrepreneurship (p. 367). In fact, TBE seems to have developed in the early 1960s (Roberts, 2004) from the emergence of NTBFs and research-based new ventures (RBNVs) in areas such as Cambridge in the UK, Munich in Germany, Silicon Valley and Route 128 in the United States of America (Tekiz, 2009). Hsu (2008) further notes that following the entry decision being made for the origin of a new venture there are two types of important knowledge for the entrepreneurial process which include technical and commercial knowledge (p. 369). Here there are three forms of technological knowledge for technology-based entrepreneurship which are intellectual property, knowledge spillovers and technological search (Hsu, 2008, p. 371). In order to overcome local search behaviour technology entrepreneurs will acquire knowledge in varying rates from other technological domains (Hsu and Lim, 2007). The preliminary founding effect will be important although it will not totally affect the organisational practices in innovation (Cockburn, Henderson and Stern, 2000). With technological knowledge absorptive capacity (Cohen and Levinthal, 1990) is important and is an alternative pathway to the exploitation of technological knowledge. Other important factors will be knowledge spillovers (Zucker, Darby and Brewer, 1998), the locality of the patent citations effect (Thompson and Fox-Kean, 2005), and geographic location since in regions where there is an aversion to entrepreneurial failure start-up capital will have higher costs (Landier, 2006). For intellectual property licensing there is the possibility for value enhancement for start-up licences (Shane, 2001a, 2001b), as well as the technology owner such as universities and corporations (Gans, Hsu and Stern, 2002; Arora, Fosfuri and Gambadella, 2001). Further to this whereas Agrawal and Henderson (2002) found that knowledge diffusion through patenting was only a small amount of knowledge flow (especially graduate student training and the publication of papers), Shane (2001a; 2001b) found evidence of new venture formation related to patent radicalness. Although inventors may have to be incentivised to partake in these activities (Jensen and Thursby, 2001). In these areas technology-based entrepreneurship research has tended to investigate medical science areas and there would be benefit from the study of other fields and areas.

In terms of commercial knowledge for the entrepreneurial origins of technology-based firms spin-offs from established companies which form new ventures are important (Hsu, 2008). Here there are two different conceptions of the spin-off process (Gompers, Lerner and Scherfstein, 2005). First, there are entrepreneurs who develop links and networks when they are working for a large company. Second, organisations that are bureaucratic tend not to commercialise innovations and as a result employees will leave and try to develop their own company. According to Gompers, Lerner and Scherfstein (2005) employee learning better explains spin-offs with capital backing than organisational failure. Furthermore, Agarwal et al (2004) found, with regard to the hard disk drive industry, that people with technical knowledge and who were pioneers in the market generated less spin-offs. It has been found by Burton, Sorenson and Beckman (2002) that status effects are transferred to the offspring from the parent organisation. Klepper (2002) notes that "while diversifying firms on average outperformed de nova entrants, de nova entrants founded by individuals that worked for leading automobile firms outperformed all firms and dominated the industry" (p. 645). Klepper and Simons (2000) further noted that "no non-producer ever captured a significant share of the television market" (p. 998). Shane (2000) illustrates that information on how to exploit entrepreneurial opportunity will not be standard for different people but will be heterogeneous for potential entrepreneurs. Technology-based entrepreneurship will be based upon serendipity, previous knowledge, the ability to solve problems and will be dependent on active search. Shane and Venkataraman (2000) further elaborate that it appears that venture creation involves entrepreneurial opportunity creation and recognition dependent on entrepreneurial conjectures. With regard to the television industry Klepper and Simons (2000) noted that experienced radio firms tended to enter and succeed in television manufacturing and Helfat and Lieberman (2002) concluded that entry was more likely to be successful if the founders felt that their capabilities and resources suited entry.

Once the business idea has been developed and evaluated the next stage in the technology-based entrepreneurship process is the acquisition of financial and human resources (Hsu, 2008). For instance in the labour market for PhD biologists, encompassing industry and academia, Stern (2004) found that there was a trade-off of financial gain for employment benefits such as being able to follow a line of scientific enquiry. High rating scientists can be attracted by business environments involving open science policies (Hsu, 2008). Further to this Baron, Hannan and Burton (2001) found that changes in organisations could be disruptive causing a high rate of turnover for employees. Through modelling Lewis and Yao (2003) have shown that open R&D policies are a variable business environment function in terms of intellectual property, product development and labour market conditions.

With regard to start-ups and the formation of strategic alliances the role of venture capital has been highlighted (Hellmann and Puri, 2000, 2002; Hsu, 2006). For technology-based entrepreneurial funding two mechanisms have been conceived which are the contractual approach where funding is offered involving tight requirements by financiers to provide screening (Kaplan and Strömberg, 2003) and external actors who make decisions based on the start-up affiliate's quality to indicate the quality of the start-up. Although start-ups, who affiliate with a venture capitalist with a high reputation, will pay a price (Hsu, 2004).

An important dynamic for the success of a start-up is its strategy. One start-up strategy is to enter into a niche market staying out of the sight of established businesses (Yoffie and Kwak, 2001). Another strategy is to differentiate the product or service offerings involving the protection of intellectual property (Hsu, 2008).

By adopting a novel business revenue model a new enterprise can differentiate its product which will have operational implications for enterprising businesses (Zott and Amit, 2007). There are different types of product development involving co-operation between well established companies and innovators and these vary from acquisitions, strategic alliances and the licensing of technology (Gans, Hsu and Stern, 2002; Mathews, 2006). Further to this Gans, Hsu and Stern (2002) have examined the factors that can influence the commercialisation strategies of technology-based start-ups and these are intellectual property and patents and their role in the negotiations with larger companies, information brokering and the role of venture capitalists which reduces transaction costs involved with the costs of entry (Hsu, 2008). When testing these factors Gans, Hsu and Stern (2002) found that they had a significant effect on co-operation at start-up. Following this the evidence of the role of patents in creating technology transfer was provided (Gans, Hsu and Stern, 2008), and a dataset was constructed with information on the timing of co-operative licensing and patent allowances by technology based entrepreneurs, using the timing of patent allowances to determine the patent grant's role on technology licence timing (Gans, Hsu and Stern, 2008). It was further found that there was an impact on the market for ideas transfer due to delays in the patent grant system (Gans, Hsu and Stern, 2008).

An important theme for technology-based enterprises is the development of corporate governance and leadership (Hsu, 2008). It is apparent that venture capital supported businesses tend to have "professional" directors (Baker and Gompers, 2003) through directors who are independently linked to corporate value (Gompers, Ishi and Metrick, 2003) in bigger businesses.

It has been found that the tendency towards the founder leaving a company is greater with business size, becomes less with ownership by the founder, and exhibits a relationship with the growth of the firm that is U shaped (Boecker and Karichalil, 2002). Two occurrences that are linked to chief executive officer / founder departure are the completion of product development and venture capital funding. The regional consequences of new venture founding rates for prior biotechnology IPOs have been examined by Sorenson and Stuart (2003) and the entrepreneurial motivations for merging ventures were investigated by Graebner and Eisenhardt (2004).

The above discussion illustrates that there is a broad spectrum of business issues concerning technology-based entrepreneurship. These involve issues at the various stages of enterprise development including the origins of the venture, resources, strategy, growth and business success. As a consequence there is growing awareness of the importance of technology-based entrepreneurship by small business academics.

According to Preston (2001, p. 2) the success factors for technology-based entrepreneurship include attitudes, management talent, patents, passionate behaviour, quality investors, speed of innovation, high quality products to market quickly, flexibility, location and clusters of excellence. With regard to attitudes radical innovations will not originate from a market leader (Utterback, 1994). The sitatuion where there is a top management team with an average technology tends to be better than a leading technology and a lesser management team since top managers have a higher success rate (Preston, 2001, p. 5). Patents provide the basis of sustainable advantage for technology-based entrepreneurship and in the past there have been incremental patents from Japan and from the Unites States laboratories radical breakthrough patents (Preston, 2001, p. 6). Here industries with creativity appear to have higher achievements in the United States (such as software) whereas in Japan those industries where there is improvement appear to perform better (such as consumer electronics where manufacturing techniques are improved) (Preston, 2001, p. 12). In terms of shortening the time to market product development cycles repeated rapidly have led to successful companies in America in the semiconductor, computer, software and electronics industries, and speed to market has been a significant determinant of success and profitability of products (this is also the case for those industries not dominated by intellectual property with less importance given to patents) (Preston, 2001, pp 12–130). Finally, with location clusters create competitive advantage and regional advantage can be gained by clustering enterprises with competitive and complementary skills resulting in regional excellence (Porter, 2008).

Strategies for success to accelerate technology-based entrepreneurship for regional economic development and growth include partnerships, technology alliances and collaboration with business, academia and government (IC², 2007, p. 1). This can be achieved through emerging industry clusters with growth potential involving research and development (R&D) based growth, intellectual property, incubators, innovation based growth and business know-how (also of importance are high tech companies, knowledge-intensive new businesses, new technology-based organic growth ventures, networks, company spinout activity, partnerships for research excellence, collaboration and technology-based education) (IC², 2007, p. 5).

In order to achieve these strategies for success a constructivist approach for technology-based entrepreneurship can be followed (Giones et al, 2012, p. 1). Although the support of technology-based entrepreneurship has been prioritised by governments with initiatives for success to help technology-based ventures the results have not necessarily delivered the returns expected (Lerner, 2010). According to Alvarez and Barney (2007) there is a need for objective opportunities to promote technology-based entrepreneurship with dynamic environments (Clarysse et al, 2011). In fact, technology-based entrepreneurship has been seen as a process of plan, design and action as activities that are separate and sequential (Baker et al, 2003). There are also uncertainties in the exploitation of technology (Gruber et al, 2008) and in the initial stages of conceptualisation of technology opportunity, and through moving to an objective opportunity from a subjective idea (Sheperd et al, 2007). This iterative interaction has also seen other theoretical perspectives involving bricolage, creation theory and effectuation (Alvarez and Barney, 2007; Baker and Nelson, 2005; Sarasvathy, 2001). For such uncertain contexts there is limited knowledge about the processes and activities that develop the conceptualisation for technology-based enterprises (Fisher, 2011) and the mechanisms used for the conceptualisation of opportunity to develop opportunity from human ideas (Giones et al, 2012). Technology-based entrepreneurship is therefore a process involving technology entrepreneurs who face high uncertainty (McMullan and Sheperd, 2006) with business ideas concerning disruptive market solutions and undetected technologies.

1.2 Technology-Based Entrepreneurship Education

Technology-based Entrepreneurship Education (TEE) (Byers, 2005) has evolved as a particular strand of Entrepreneurship Education (EE) (Frank and Boocock, 2008). Enterprise Education started in the UK in 1976 (Breen, 2001) with the Labour Government strategy to combat anti industry culture in schools and this was developed further by subsequent governments. In the United States it is called entrepreneurship education and includes a business creation focus. A definition of enterprise education is that it 'is directed toward achieving a learning culture which will result in greater numbers of students equipped and enthused to identify, create, initiate and successfully manage personal, business, work and community opportunities' (Ed-ventures Magazine, 1997).

A paper by Clouse (2001) concerning a controlled experiment relating entrepreneurial education to students' start-up decisions notes that over the last two decades institutions of higher education have experienced an increased demand for courses dealing with entrepreneurship education. According to Clouse (2001) this has been based on the substantial effect entrepreneurship education has on entrepreneurial success and the positive relationship between entrepreneurship education and economic development. In response to the growing demand for entrepreneurship education a variety of course offerings have been created by universities.

Dana (1992) researched entrepreneurial education in Europe and found that it was developing rapidly. By comparing trends in Europe with the United States it was found that the principal strength of European programmes was their practical approach. Another difference was that entrepreneurship education had spread more rapidly into European rural areas than American non-urban areas. The strengths of American programmes were a greater diversification of courses. Dana notes that Shigeru Fijii pioneered applied education teaching in entrepreneurial studies in 1938 at Kobe University in Japan. This was slow to gain recognition and it has taken half a century for entrepreneurship education to become universal.

In a study of entrepreneurship education and research outside North America Brockhaus (1991) reports that courses on topics related to entrepreneurship and small business are appearing in the curriculum of many colleges and universities throughout the World. Carter and Collinson (1999) consider the retrospective perceptions of alumni towards the general provision of entrepreneurship education in higher education institutions (HEIs). Although many HEIs provide enterprise training for their students, few have considered extending this provision to their alumni. They attempted to determine the demand for post-qualification entrepreneurship training among HEI alumni. It was found that respondents thought that HEIs should provide a more practical grounding for graduates. Financial management and business communications skills are considered to be the key elements missing from undergraduate courses.

In the UK enterprise education curriculum materials were developed by Gibb (Breen, 2001) at Durham University. Galloway and Brown (2002) have noted that there is increasing attention being paid to the potential of university entrepreneurship education to facilitate high quality growth firms in the UK.

Garavan and Cinneide (1994a) reviewed the literature on the design of entrepreneurial education and training programmes. A number of problems were highlighted including inappropriate learning methodologies, little methodology on development of entrepreneurial competences and a lack of consideration of the outcomes of programmes. Garavan and Cinneide (1994b) followed this with a consideration of six entrepreneurial education and training programmes. This indicated a variety of entrepreneurship education and training programmes in Europe.

Hynes (1996) remarks that one of the core components of an enterprise culture is education and how various educational programmes can incorporate entrepreneurship as a subject to foster interest in enterprise. It is suggested that a process model for enterprise education can be used to target student groups in an interdisciplinary way. The need to teach entrepreneurship to non-business students is emphasised. These students are often originators of ideas but do not have business knowledge to develop these further.

Binks (1996) argues that, although the Enterprise in Higher Education (EHE) initiative is a product of the perceived needs of larger business it needs to be judged in the wider context. Bisk (2002) addresses the effectiveness of the matching process of third party managed entrepreneurial mentoring programmes. The results of his study suggest that the entrepreneur's age and education are key factors that impact upon whether there is benefit from the engagement.

Chadwick (1999) has considered the facilitation of the progression of modern apprentices into undergraduate business education. The main focus is a case study of the progression links into a new undergraduate business programme (Business Enterprise) that have been established for modern apprenticeships. The work explores the implications for the design of higher education programmes aimed at apprentices.

Ibrahim and Soufani (2002) have undertaken a critical assessment of the entrepreneurship education and training efforts in Canada and have identified common challenges facing this process. Shacklock et al (2000) have explored the emergence of enterprise education in Australian schools in the late 1990s. Claims about the restorative potential of enterprise education as new vocational learning for the "re-invigoration" of education in schools is scrutinised. In relation to policy initiatives for vocational education the link between key competencies and enterprise education is explored. Discursive consequences of new metaphors for teaching and learning linked to enterprise education and their impact on teacher's work are explored.

McMullan and Gillin (1998) provide an industrial viewpoint of entrepreneurship education regarding developing technological start-up entrepreneurs and provide a case study of a graduate entrepreneurship programme at Swinburne University of Technology in Melbourne Australia. This was set against the fact that although universities had been offering courses in entrepreneurship education for over thirty five years graduate level programmes only go back to the early nineties. In their study since 87% of those surveyed started ventures it was apparent that the programme not only launched meaningful entrepreneurial careers but was also of micro-economic significance.

According to Lewis and Massey (2003) the aim of enterprise education is to develop a set of skills and attitudes in individuals that will allow them to be job creators and seekers and to contribute to the "knowledge economy". It is noted that in New Zealand there is interest in the contribution of enterprise education to these objectives and legitimising self-employment as a work option. Sexton et al (1997) report that the existing education literature related to teaching and/or learning skills to grow business do not address the problems created by growth. They remark that studies have examined students in an academic environment. This has been away from real world problems, in a structured setting of specific duration and involving similar levels of knowledge and competency. Bosire and Etyang (2003) have considered the effect of education on business skills cognition and the case of indigenous micro-scale enterprise owners. They argue that one of the expected utilitarian values of education is the development of competencies for effective business practice after school. Kolvereid and Moen (1997) noted that only a small number of studies have investigated the effect of entrepreneurship education. The results of their study indicate that graduates with an entrepreneurship major are more likely to start new businesses and have stronger entrepreneurial intentions than graduates in other areas. Jack and Anderson (1999) have studied enterprise education within the enterprise culture in terms of producing reflective practitioners. They observe that there are very different expectations of those stakeholders promoting entrepreneurship education. Laukkanen (2000) explores alternative strategies in university-based entrepreneurial education in response to the nebulous conceptual and efficacy notions of entrepreneurship and its education, breeding unreasonable and unpredictable expectations.

The background to TEE in the United Kingdom (UK) developed from the UK Government's "Third Mission" for Higher Education (DTI, 2000). This influenced universities to take their mission further than research and teaching to develop linkages with local communities and businesses and empower science and technology transfer to businesses (Franck and Boocock, 2008). Although the broad agenda has evolved the philosophical underpinning has been kept and has influenced universities in the UK to (i) deliver entrepreneurship and enterprise education to Science, Technology, Engineering and Mathematics (STEM) students, and (ii) engender the development of new firms through start-up businesses especially spin-off firms with inventions and innovations by faculty staff and students (Boocock and Warren, 2005; Boocock and Frank, 2006; Boocock et al, 2008; Frank and Boocock, 2008). To further this Torres et al (1996) perceives Technology-Based Entrepreneurship courses to be based on the methodology of the "Business Assembly Engine" to promote creative and innovative thinking involving creative problem-solving techniques to emulate technology-based industries and the technology-driven business environment. Hamilton et al (2005, p. 239) have described their experiences on a technology-based entrepreneurship course with a course model to "spin-in" high technology product concepts into the environment of the university involving issues of intellectual property (IP), and the influence of the course on alumni in terms of entrepreneurship and business.

1.3 Technology-Based Entrepreneurship and Regional Development

With regard to regional development the concept of technology-based entrepreneurship is considered to be an important phenomena in terms of regional growth which involves new technology-based firms (NTBFs), spin-off processes, research and development (R&D) and technology development (Dahlstrand, 2007). In fact, technology-based entrepreneurship has become ever more important over recent decades and has an important role for economic growth and industrial renewal, especially with new technologies and fast growth knowledge based sectors. This is further supported by the OECD (2001) which has observed that not only is technology advancement important for growth and economic development but that industries which are technology intensive are increasingly significant for trade at an international level. The focus on technology-based entrepreneurship has consequently arisen from the importance of technology and entrepreneurship within this context (Dahlstrand, 2007). Interest and research into technology-based entrepreneurship originated in the United States of America (USA) and following this it has become important in Europe in the last twenty five years (Dahlstrand, 2007). This has been evidenced with the ever increasing number of NTBFs across the World (Keeble et al, 1998; Autio, 1997). Although these developments have taken place technology-based entrepreneurship has only been explored to a limited extent and consequently there is incomplete knowledge on its effect on economic development and growth (Dahlstrand, 2007). Therefore technology-based entrepreneurship can be considered to be a phenomenon that is regional (Venkataraman, 2004). Characteristics that are prevalent with NTBFs include that they tend to be established by entrepreneurs linked with higher education, there are teams of founders, they contribute to technology transfer, benefit from science parks and incubators, usually cluster in certain regions, have a need for internationalisation, and involve product development and growth potential (Dahlstrand, 2007).

With the regional perspective the requirement by businesses to source technology and innovations (Chesbrough, 2003) causes firms to join innovation networks and in these networks NTBFs who provide science based inputs are important. Very often "high tech" clusters will be created and these are important for NTBFs and can be influenced by personal contact networks and also dependence on externalities (Dahlstrand, 2007). Here the role of technology-based entrepreneurship is important in the transformation of the region (Venkataraman, 2004). According to Dahlstrand (2007) for a regional cluster to operate as a network there should be learning processes which are collective and there needs to be local interaction. Part of this local interaction involves staff mobility and recruitment, know-how and technological expertise and the diffusion of technological competences for collective learning between businesses and universities which have a crucial role for the renewal of regional technology (Dhalstrand and Jacobsson, 2003). The way in which universities contribute to technological change will vary according to the field of knowledge (Salter and Martin, 2001). Furthermore, the technological profile of a good university will affect regional technology-based entrepreneurship (Dhalstrand and Jacobsson, 2003). University spin-off companies will enhance learning processes and knowledge development through managerial and technological expertise being transferred within a region. Here technology-based entrepreneurship will require 'talent' and the production of talent (Cooke, 2005). Both human and technological resources will be required if technology-based enterprises are to become successful (Mustar, 2001; Clarysse et al, 2005).

1.4 Organisation of the Book

This book contains chapters concerning the academic field of technology-based entrepreneurship and considers technology transfer policy, diffusion of innovation into technology-based firms, technology clusters, university technology small firms, university business partnerships, university models of technology transfer offices and the growth of a technology concept (Figure 1.1).

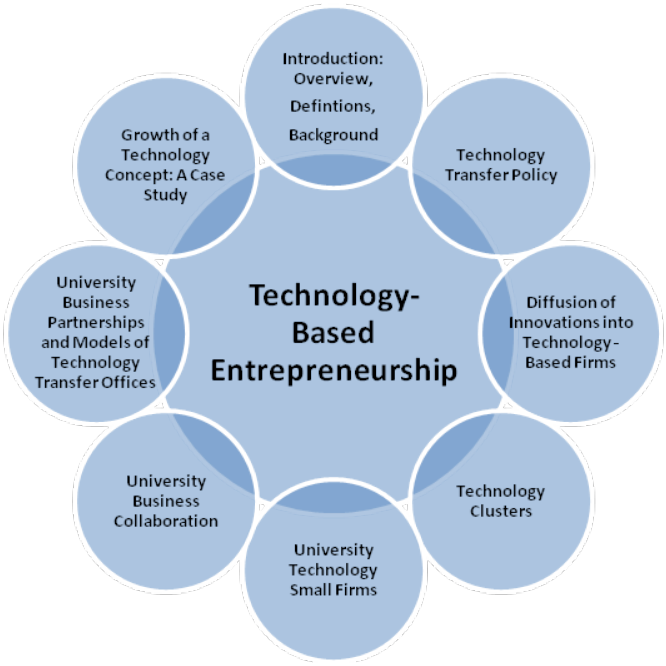

Figure 1.1 Organisation of the Book

Chapter 2: Technology Transfer Policy

The aims of the opening chapter are to examine technology transfer policy and the technology-based firm (TBF) sector, especially the importance of external sources of inputs in the development of successful technological innovation within TBFs.

Chapter 3: Diffusion of Innovations into Technology-Based Firms

The objectives of the chapter are threefold: first, to investigate technology diffusion in the form of new or improved technology through formal and informal networks enabling learning by interacting; second, to develop a model of technology diffusion including external sources, channels of technology transfer, and mechanisms involved in the transfer of technology into the innovative TBF; and third, to relate the model to "best practice" and to note situations where "low activity" can be improved. Finally, the implications for policy relevant to technology and entrepreneurship arising from the model of technology diffusion are investigated and conclusions drawn.

Chapter 4: Technology Clusters

This chapter investigates the movement of labour in technology-based clusters. Labour mobility and knowledge spillovers in clusters are interrelated phenomena with knowledge embodied in entrepreneurs and specialised workers spilling over from one enterprise to another through labour mobility and direct revelation (Guarino and Tedeschi, 2006). The mobility rate of labour in clusters is considered with reference to the growth of the clusters. Through the study of the mobility of labour the value of intellectual capital (IC) in the cluster can be considered (Oliver and Porta, 2006).

Chapter 5: University Technology Small Firms

The chapter relates the formation and outcomes from university-based technology small firms (UTSFs) through examination of the genesis of Further and Higher Education spinout companies which add value to their existence by their owner-managers who network, share experiences and update knowledge in areas such as management, finance, marketing and selling. In this context universities are seen as crucial components by regional and national governments in developing and transferring knowledge to the commercial market place.

Chapter 6: University Business Collaboration

In this chapter the organisational aspects of university/business collaboration are considered followed by the investigation of the motivations for university/business relationships, the formation process, university/business inter-organisational relationships and conclusions concerning the management of university business collaboration.

Chapter 7: University Business Partnerships and Models of Technology Transfer Offices

This chapter compares business partnerships in different universities by considering a sample of six UK universities. Three models of university technology transfer offices (TTOs) are investigated which have different approaches to university business partnerships with industry. University TTOs/business development units are central to the exploitation of university business partnerships and they undertake many activities to bridge the academic industry divide including the creation of networks of industrial links.

Chapter 8: The Growth of a Technology Concept: A Case Study

The chapter considers the case study of the exponential growth of the Technium 'concept' on the Internet in relation to business incubation and support for new and existing enterprises in Wales. The Technium 'concept' was a new form of incubation developed in Wales which resulted in new participants entering the incubation industry (Thomas et al, 2004). This new wave of incubation can be related to regional dynamism (Gonzalez and Lucea, 2000, 2001) and the creation of new incubators. A simple calculation of the rate of increase in the posting of items on the Internet on the Technium concept has been made. This involved the net rate of multiplication (geometric rate of increase) over the period 2001 to 2005.

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