

CHAPTER ONE
INTRODUCTION

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'Entrepreneurship is neither a science nor an art. It is a practice'.

Peter F. Drucker (2001).

1.1 BACKGROUND

It is widely accepted that technology is an important ingredient in any nation's ability to prosper and compete within the global economy. Technology has been described as *'...the engine of economic growth...'* (Research Framework, Institute of Technological Innovation (ITI) 1998:7), which emphasises two critical aspects: Firstly, the core position of technology relative to other role players in the economy and secondly, the importance of growth. The latter aspect leads to the concept of innovation and more specifically technological innovation, which is described in the same publication as *'...the mechanism through which technology can be leveraged to create wealth and to contribute towards a better quality of life'* (Research Framework, ITI 1998:1).

In order to foster these concepts into full-blown and active role players, the endeavours of already established businesses to maintain technological supremacy alone, will not be enough to satisfy the growth requirements. According to Jones (1971:7) this scenario is particularly true for emerging economies, where growth needs are more demanding than in developed countries. A consistent stream of new entrants (entrepreneurs) is required to participate in the economic activities and to satisfy these needs.

South Africa is a classic example of an emerging economy where the critical role of technological innovation has been identified. The White Paper on Science and Technology, 'Preparing for the 21st Century', which was published in 1996 by the then South African Department of Arts, Culture, Science and Technology, proclaimed that 'This White Paper is built upon the twin concepts of 'innovation' and a 'national system of innovation' i.e. NSI', as quoted by the Research Framework, ITI (1998:8).

In addition, the tendency in the global economy is for developed countries to become more services orientated and to source production and manufacturing activities out to emerging economies (Wagner 1997:6). This sets the scene for emerging regions like South Africa to fully grasp the opportunities as part of their drive towards economic growth and prosperity well into the new millennium.

1.2 HISTORICAL DEVELOPMENT AND THE CURRENT STATE OF TECHNOLOGICAL ENTREPRENEURSHIP

1.2.1 Historical perspective

Entrepreneurship is a well-researched and documented term used in the management and business world today. Several pioneers from a wide variety of disciplinary backgrounds have researched and formulated theories on this topic. A research into the history of the term 'entrepreneur' by Herbert & Link (1988) traces it in the writings of Richard Cantillon as far back as 1755 when he used the term to describe '*...someone who exercises business judgement in the face of uncertainty*'.

Another early reference to the term 'entrepreneur' was made by the French economist J.B. Say around the late 1800's according to Drucker (2001:19). Names like Shapero, Schollhammer, McClelland, Timmons, Roberts, Drucker, Vesper, Carland, Gumpert and Sloan (Timmons 1994:189) are all synonymous with the term and theory of entrepreneurship but, arguably, Schumpeter's (1936) work in the early part of the twentieth century laid the foundation in this field.

Drucker (2001:12) cited Schumpeter's early views on the entrepreneurs as follows: '*Schumpeter was the first '...major modern economist ... (who)... concerned himself with the entrepreneur and his impact on the economy'*'.

Contributions towards the theory and knowledge of entrepreneurs and entrepreneurship were made by a diverse set of scholars with backgrounds in education, finance, history, marketing, agriculture, economics, psychology, sociology, political science, communications, engineering and anthropology. Despite the vast number of published papers, Bull, Thomas & Willard (1995:1) argue that no generally accepted theory of entrepreneurship has emerged to date. Several reasons are tabled for this phenomenon of which the most significant are Wortman's (1992) arguments that (a) the (entrepreneurship) field lacks sufficient framework to cut across disciplines and (b) the tendency of researchers to ignore entrepreneurship studies in other disciplines. Shane and Venkataraman (2000) acknowledge this lack of framework and propose a conceptual framework as follows:

- They define the field of entrepreneurship as '*the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited*' (Shane et al 2000:218);
- They explain why organizational researchers should study entrepreneurship;
- They describe why entrepreneurial opportunities exist and why some people, and not others, discover and exploit those opportunities; and
- They consider the different modes of exploitation of entrepreneurial opportunities.

In another effort to produce such a general theoretical framework, Bull et al (1995:2) group the existing literature into five broad categories namely:

- *Definition* of the entrepreneur and entrepreneurship;
- The *trait approach* i.e. the study of the psychological traits of people identified as entrepreneurs;
- *Success strategies* which is the study of reasons offered to explain the success of the new and existing business ventures;
- Study of the *formation of new venture*; and
- The effect of *environmental factors* on entrepreneurial actions.

The complete theoretical spectrum on entrepreneurship will be explored later in Chapter 2, but the five-category framework of Bull et al (1995) above will be used as the basis for the research approach of this study.

Another key concept in this research project is the term 'technology', which is linked to entrepreneurship to form the focal point or study object i.e. technological entrepreneur.

Technology has been described as the application of science to achieve industrial or commercial objectives, where it constitutes the entire body of methods and materials used to achieve such objectives (Buys 2000:2). The same source describes technology as the utilisation of technical knowledge (equipment, materials, processes or systems based on natural sciences) through techniques to perform some useful function i.e. in the transport, communication, design, manufacture or services sectors.

The term technology is perhaps best described by Jones (1971:5) when he explains the differences between science and technology: '*...Technology is 'know-how' while science is 'know-why'. Science produces knowledge, technology helps to produce wealth*'.

The research subject of this study is entrepreneurs who operate in a high technology business environment and are referred to as high-tech entrepreneurs, technical entrepreneurs or technological entrepreneurs. A new term 'technopreneurs' has also been used in recent international publications (e.g. Nieman et al 2004:39), but the term *technological entrepreneurs* will be used throughout this study.

The foundation for research on this specific category of entrepreneurs was laid by two pioneers, Cooper (1972) and Susbauer (1972), who recorded their research findings at the first symposium in the USA on 'Technical Entrepreneurship' as it was named at the time. Cooper & Komives (1972:1) described (high) technology as follows: '*... (High technology).... Is a term used to describe companies which*

engage in researching or producing or marketing a product or service which requires a fairly high degree of acknowledged technical sophistication'. Entrepreneurship was described at the same symposium as *'The act of founding a new company where none existed before'* (Cooper et al 1972:1).

The work of Susbauer, Cooper and Komives involved studies of technical entrepreneurs in Austin, State of Texas and several other centres and industries in the USA, including the then infant semiconductor industry. A more concise definition was formulated later in the proceedings as follows (Cooper et al 1972:68): *'...The Technical entrepreneur is the man who actively initiates a company that has a relative large amount of scientific and engineering labour in its final product or service'*.

The most comprehensive research literature found on this topic was recorded by Edward B. Roberts, Professor at the MIT School of Management, Massachusetts (1991). His research on the technology – based industrial development in Boston's famous Route 128 and California's Silicon Valley is invaluable in establishing a sound theoretical basis, backed by a broad spectrum of solid, practical case studies on the topic.

Other authorities on the subject have contributed significantly to the existing knowledge base, for example Smilor & Freese (1991) that is, however, mainly focussed on developed or industrial countries. Limited references and research results are available on technological entrepreneurs in developing regions or in the environment of emerging economies.

1.2.2 The entrepreneurship concept

The focus of researchers up to the early 1980's was on the entrepreneur as the dominant role player in the process of new venture creation. The focus has shifted away from the person towards the entrepreneurial process. A similar shift in focus was evident in the strategic/business policy field in the 70's. In this case the

strategic process was emphasised rather than the roles and functions of the general managers (Bull et al 1995:130).

Early authors such as David C. McClelland and his associates (1967) contributed significantly toward the understanding of the characteristics of entrepreneurs. McClelland's model of the three basic needs in individuals that influence the attainment of economic ends is well documented. These three needs are defined as (1) the need for achievement or *n Ach*, (2) the need for affiliation or *n Affil* and (3) the need for power or *n Pow*.

Roberts (1991:52) proposed a four-factor model of the development of the (technical) entrepreneur. Later authors such as Bolton & Thompson (2000) presented the entrepreneur within the dimensions of *talent*, *temperament* and *technique*. These two models will be explored in more detail later in the literature research. They all focus on the entrepreneur.

Bygrave & Hofer propagated the paradigm shift towards the process, as quoted by Bull et al (1995:130) when they proposed the following working definitions:

- The *entrepreneurial process* involves all the functions, activities and actions associated with perceiving opportunities and the creation of organisations to pursue them.
- The *entrepreneurial event* involves the creation of a new organisation to pursue an opportunity.

Authors such as Bull et al (1995:2), as well as Roberts (1991:30), Bolton et al (2000:18), Timmons (1994:17) and Gnyawali & Fogel (1994:56) all propagated the entrepreneurial process, plus the external or environmental influences on the entrepreneur and the process. Again, all these theories will be analysed in depth later. The importance of these examples during the introduction is to note that the term *entrepreneurship* encompasses all of these elements, factors, influences, processes, role players and events into one concept. The entrepreneurship concept used further in this study will therefore consist of the following key elements:

- The *entrepreneur* (person);

- The *new venture creation process* (start-up);
- The *mature business* after start-up;
- The *environmental influences* on all the role players and processes.

1.2.3 Modern perceptions

It is appropriate to view modern perceptions on specific related issues against the historical background of entrepreneurship, technology and technological entrepreneurs' development. The following paradigm shifts will be explored briefly to complete the background setting of the research project:

- The shift in focus from viewing the entrepreneur, or the entrepreneurial process, or the entrepreneurial event as individual entities, to a more holistic approach.
- The realisation that innovation and entrepreneurship are disciplines on their own, with their own, fairly simple rules.
- The international trend to move away from reference terms such as 'Third World' to 'Developing Countries' and more recently 'Emerging Economies or Countries'.

Despite the free enterprise revolution that is sweeping the world, there seem to be a reluctance to explore, understand and promote entrepreneurs and entrepreneurship according to Bull et al (1995). Former Soviet Republics are transforming centrally planned economies into free markets; South American countries are privatising large sectors of their nationalised industries; and the last major communist bastion, China, has embarked on the road to free enterprise. Yet students to date have not been able to universally define the ideal entrepreneurial profile.

Furthermore, economists, business academics and especially mathematicians have been unable to fully explain the rise of the entrepreneur and the business enterprise. Bull et al (1995:130) argue that one possible reason is the intractability of entrepreneurship to 'classical' mathematical economics. Schumpeter's (1936) remark that the entrepreneur destroys the equilibrium with a '*perennial gale of*

creative destruction' is perhaps the reason for the uneasiness of mathematicians in a world of quantitative models that are based on analytical and continuous functions.

The trend in the 1990's has therefore been to focus entrepreneurship research away from the entrepreneur itself toward the entrepreneurial process and later to approach the concept of entrepreneurship from a holistic point of view.

Peter F. Drucker (2001) played a major role in the United States of America (USA) in formulating management theories in the years 1950 – 2000. He explored the entrepreneur as an 'innovator'. His persistent view was that up until the early 1980's, most prominent businesses in the Western World '*...believed that innovation is inspiration and entrepreneurship good luck*'. He argued that the successful Japanese firms had re-organised their innovative and entrepreneurial activities during the early 1990's and established the principle that innovation, like entrepreneurship, is a practice with simple purposeful and systematic rules. They are disciplines in their own right that can be mastered through learning, practice and hard work. This research project uses the principles advocated by Drucker (2001) as one of its theoretical cornerstones.

The last modern perception that forms part of the research topic is the focus on emerging economies. Heeks, Bhatt, Huq, Lewis & Shibli (1995:1) expressed the opinion that the term 'Third World' although still in common usage may be of declining value as '*...its apparent homogeneity hides a great range of differences*'. Large discrepancies in recent economic growth rates of regions such as Asia (South Korea, Taiwan and Malaysia), Latin America (Brazil and Argentina) and sub-Saharan Africa have highlighted the need for a more descriptive and refined classification. Hence the increasingly popular reference to 'developing countries' or 'emerging economies' by politicians, academics and journalists. Developing versus developed countries are generally classified by using yardsticks such as Gross National Product (GNP) per head (Jones 1971:2), which again is rigid and non-refined when used for specific reference purposes.

The more appropriate modern and flexible term 'emerging' will be used in this study, which refers to the dynamic, upward movement of any entity such as a country, community, economy, market etc.

1.3 RATIONALE FOR THE STUDY

1.3.1 The importance of the study

The importance of this research can best be illustrated by examining several examples where the lack of or inadequate development of entrepreneurship in the technological world has resulted in poor economic performances of industries, business sectors or even countries.

The modern world has witnessed the dramatic growth and phenomenal emergence of the information technology (IT) industry over the past two decades. Young millionaires from the IT industry dictating international stock markets captured the imagination of technological entrepreneurs worldwide. Examples are the high-tech entrepreneurs from Silicon Valley to whom Drucker (2001:11) refers to as 'from rags to riches and back to rags again in five years'. He regards them as inventors rather than innovators, speculators rather than entrepreneurs. The instant success of these idols in the traditional business world inspired many technically trained participants in the economies of most developed and emerging regions to become IT entrepreneurs.

The rise of this industry was surpassed by its collapse during the first few months of the new millennium. The effect of the poor performing IT sector was one of the major influences in the steep and continuous decline of stock markets during the same period. One explanation for this 'rise and fall' phenomenon is that the IT entrepreneurs were technically competent, well-trained in their disciplines and that they spotted and seized the opportunities which presented themselves. However, they lacked sufficient training, work experience and exposure to entrepreneurship and to a lesser degree small business management skills. Many of these participants could also be classified as opportunists rather than entrepreneurs.

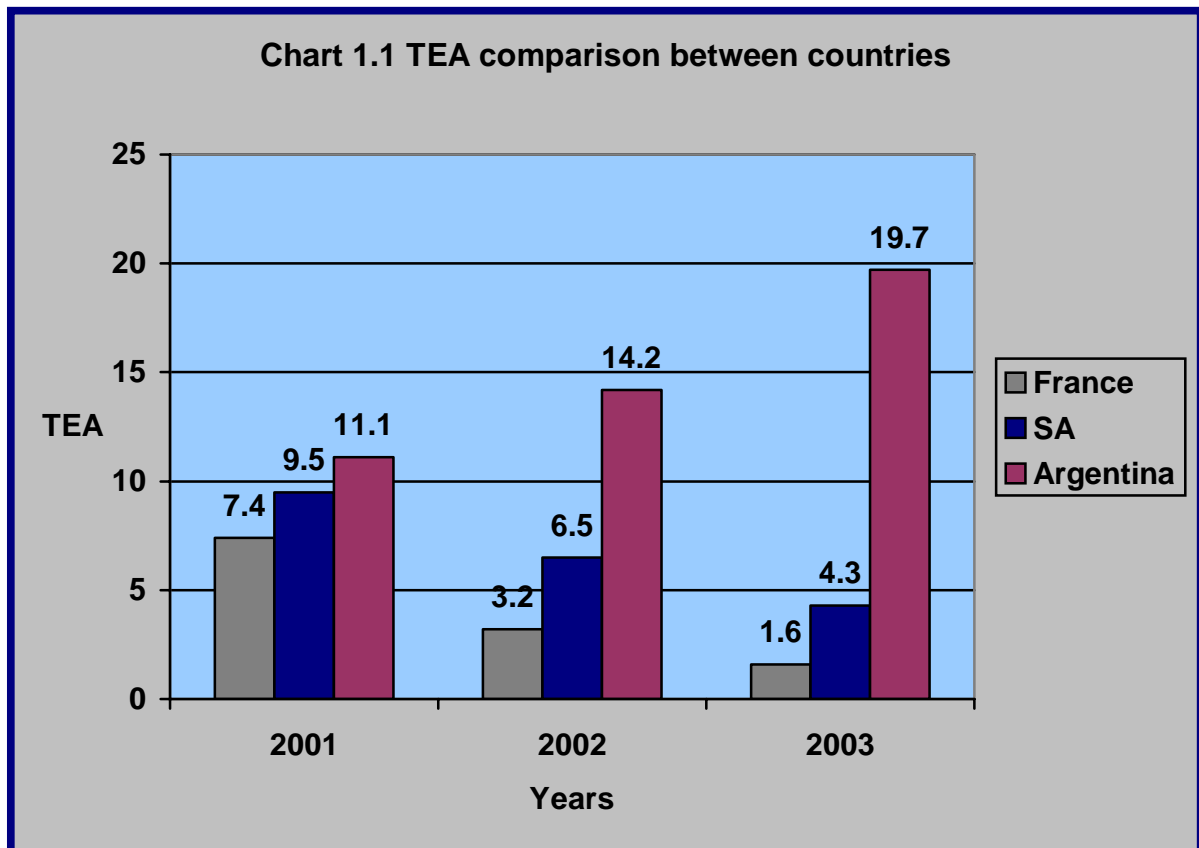
1.3.2 A South African perspective

In South Africa, which is by modern standards classified as an emerging or developing economy, the level of entrepreneurship has been measured since 2001 as part of the Global Entrepreneurship Monitor (GEM) programme. This programme was launched in 1999 with ten countries and in 2003 encompassed over 40 countries with a combined total population of 4-billion, nearly two thirds of the world's total population (GEM 2003:3). GEM 2002 measured the entrepreneurial activities of 37 countries (GEM 2002:2) in accordance with a universal set of indicators and research methodologies. Of the 37 countries participating in the programme in 2002, seven were classified as developing or emerging countries, while the rest form part of the developed world. South Africa was also the only country from Africa to participate in the programme until 2002. The following statistics were released by the 2002 GEM report on South Africa:

- The official unemployment rate was 29.4%;
- Only 6.5% of the country's adult (working age) population was involved in entrepreneurial ventures, which is measured as the *Total Entrepreneurial Activity (TEA) index*;
- Informal entrepreneurs do 88% and formal 12% of all business in previously disadvantaged communities. The term previously disadvantaged refers to population groups who were disadvantaged during the so-called 'apartheid' era in the country's political history;
- Two thirds of informal entrepreneurs do not have a senior certificate at high school level (Grade 12 at secondary education level);
- The country measures high in necessity entrepreneurship but very low in opportunity entrepreneurship. A necessity entrepreneur is involved in a new business because he/she has no other choice for work, while an opportunity entrepreneur is involved to pursue an opportunity;
- The start-up firm versus newly established firm participation ratio of South Africa measured 2.4:1 compared to the 1.3:1 average of the rest of the participating countries. This indicates that South Africa has a higher than normal failure rate of businesses after the start-up phase;

- South Africa is ranked 19th overall on the TEA index, with Thailand rated first and Japan 37th;
- South Africa is also rated last of the seven developing or emerging countries (after Thailand, India, Chile, Argentina, Brazil and Mexico).

The 2003 GEM survey shows a decline in the entrepreneurial activities of South Africa compared to other countries, as shown in Chart 1.1.



Source: GEM (2003)

The following is a summary of the findings (GEM 2003:3):

- South Africa's TEA rate has fallen from 6.5% in 2001/2 to 4.3% in 2003. The GEM average for all the countries was 8.8% in 2003;
- South Africa's ranking has also fallen to 22nd out of 32 countries;
- South Africa ranks last again of the six developing countries (after Brazil, Chile, Argentina, Venezuela and Uganda);

- Uganda, which is the second African country participating in the survey in 2003, had a TEA index of 29.3% and was the highest of all developing and developed countries;
- South Africa's TEA index of 4.3% is substantially lower than the average of 21.2% of the developing countries (excluding South Africa);
- 41% of entrepreneurs in developing countries are motivated by necessity, while only 34% of South Africa's entrepreneurs are motivated by necessity. The average for the G7 countries in the survey is 16%;
- The start-up rate in South Africa has also fallen from 4.7% in 2002 to 2.7% in 2003, compared to the average of 12.8% of developing countries;
- Another key measurement in the GEM is the *Firm Entrepreneurial Activity (FEA)* index (GEM 2003:9), which is a harmonised measure of the proportion of existing firms in each country that are both innovating (introducing new products or services) and that have high short-term employment growth expectations. Again, South Africa ranked lowest of all the developing countries with a FEA index of 1.1 versus the average of 2.7;
- In the adult population survey, there is evidence that South African respondents are not only less likely to report characteristics associated with entrepreneurial activity (such as the belief that you have skills to start a new business), but they are also less likely to report that entrepreneurship is perceived positively in the country as a whole (GEM 2003:11).

The entrepreneurial activities of developing or emerging countries are generally higher than those of industrialized or developed countries. Table 1.1 illustrates this difference, as well as South Africa's low TEA index compared with the other developing countries.

Table 1.1: Percentage 18-64 year olds active in starting a business or in owner-managing a business less than 3.5 years old

Country	2001	2002	Average
Argentina	10.5	14.2	12.3
Brazil	12.4	13.5	13.0
India	11.1	17.9	14.5
Mexico	19.7	12.4	16.1
South Africa	9.5	6.5	8.0
All GEM developing countries	12.0	14.2	13.1
All GEM countries	8.4	8.0	8.2

Source: GEM (2003:8).

Interesting findings emerged from the expert's survey conducted as part of GEM 2003. The most important factors limiting entrepreneurship activities in South Africa were identified by the experts as follows:

- Financial support, specifically the availability, accessibility and structure of debt capital, loans and credit (24%);
- Education and training, specifically teaching and encouragement of entrepreneurship skills amongst teenagers and adults in secondary and post-secondary teaching institutions (12%);
- Cultural and social norms, specifically attitudes to women and other discriminated or disadvantaged groups (12%);
- Capacity in society for entrepreneurship, specifically lack of entrepreneurial expertise (12%).

Although the 2003 GEM survey indicates a decline in the entrepreneurial activities since its first participation in 2001, the 2004 survey suggests that South Africa's ranking within GEM has stayed the same since its inclusion (GEM 2004:3). The country consistently ranks in the group of countries with mid- to low TEA rates; data also suggests that annual variations in TEA in South Africa are not significant. This supports the confidence level in the research data published by the GEM report.

The 2004 GEM survey supports the findings of previous years as follows (GEM 2004:10): South Africa has lower than average TEA rates and has significantly lower TEA rates than developing countries on average. In 2004 the average TEA rate for developing countries (including South Africa) was almost four times higher than that in South Africa. In 2003 the average developing country TEA was five times higher than in South Africa.

The statistics above are examples of the necessity to improve entrepreneurial activities in an emerging country like South Africa. The GEM report (2002:5) suggests that the way forward should include:

- Increasing access to and success in secondary and tertiary education will ensure a higher rate of entrepreneurial activity among future generations of South Africans;
- To increase economic growth and employment creation, South Africa needs a higher proportion of entrepreneurs to progress beyond the start-up phase.

GEM 2003 (2003:13) suggests two priorities for South African policy makers:

- Changes in the school education system are required to raise entrepreneurial awareness and create a good grounding in basic financial and business skills;
- Effective training in specific financial administration skills is required on a fairly large scale amongst existing entrepreneurs.

The GEM 2004 report highlights the importance of education for entrepreneurship as follows (GEM 2004:4): *'Preliminary research suggests that entrepreneurship education can have a significant positive influence on four areas crucial to entrepreneurship:*

- *Learners' self-confidence about their ability to start a business;*
- *Learners' understanding of financial and business issues;*
- *Learners' desire to start their own business; and*
- *Learners' desire to undertake higher education'.*

The direct relationship between entrepreneurial success and level of education correlates well with the findings of Roberts (1991:60) in his research of technological entrepreneurs in the USA. His studies indicate that more than 40% of his research population had post high school education.

The most recent findings of GEM (2005) compare technological innovation levels in South Africa with those of the developed and emerging world. Globally, higher levels of use of new technologies are reported by early-stage entrepreneurs in developing countries (30%) than by their counterparts in developed countries (13%). The use of new technologies (less than one year old) reported by South African owner-managers declined from 28% in 2003 to 0% in 2005, while the use of old technologies (more than one year old) increased from 72% in 2003 to 100% in 2005. This suggests that owner-managed firms in South Africa are significantly

less likely to use the latest technology than entrepreneurs in both the developed and developing countries. Three reasons are given for this decline (GEM 2005:34):

- High cost of new technology;
- Lack of science and technology skills of the South African population; and
- Time lag in building new technology into products and services.

Another source that illustrates the importance of research of this nature is the South African Innovation Survey 2001 (Oerlemans, Pretorius, Buys & Rooks 2003:11). A survey was conducted by the University of Pretoria, in collaboration with the Eindhoven University of Technology in the Netherlands, on the innovative behaviour and performance of South African firms in the manufacturing and services sectors for the period 1998–2000. The following is a summary of the main findings of the survey:

- About 58% of the firms were manufacturing firms, whereas 23% were service providers and 19% of the firms were involved in wholesale activities;
- The majority of firms were small to medium-sized organisations, where only 7% of the firms employed 250 or more employees in 2000;
- About 22% of the firms involved in the production of products or services were using foreign sources of production technology (e.g. production licences);
- About 44% of South African firms had technological innovations in the period 1998–2000. This figure is high for a developing country and comparable to that of many developed countries in Europe;
- A relatively large part of the development of new or improved products and/or services was done by or together with a third party (32%), indicating a dependency on external knowledge and contributions;
- About 51% of firms have not implemented any R & D activities. This figure is very high compared to European countries;
- About 18% of innovating firms actively work together with South African partners on innovation, which is significantly lower than the proportion of European firms that form partnerships;
- About 26% of innovating firms participated in innovation partnerships with organisations outside South Africa, particularly with firms located in Europe; and

- About 31% of innovative firms reported that their relative market position improved substantially due to their innovative activities, which is comparable to European levels.

The survey reported further that about 40% of innovating firms experienced seriously delayed innovation projects due to:

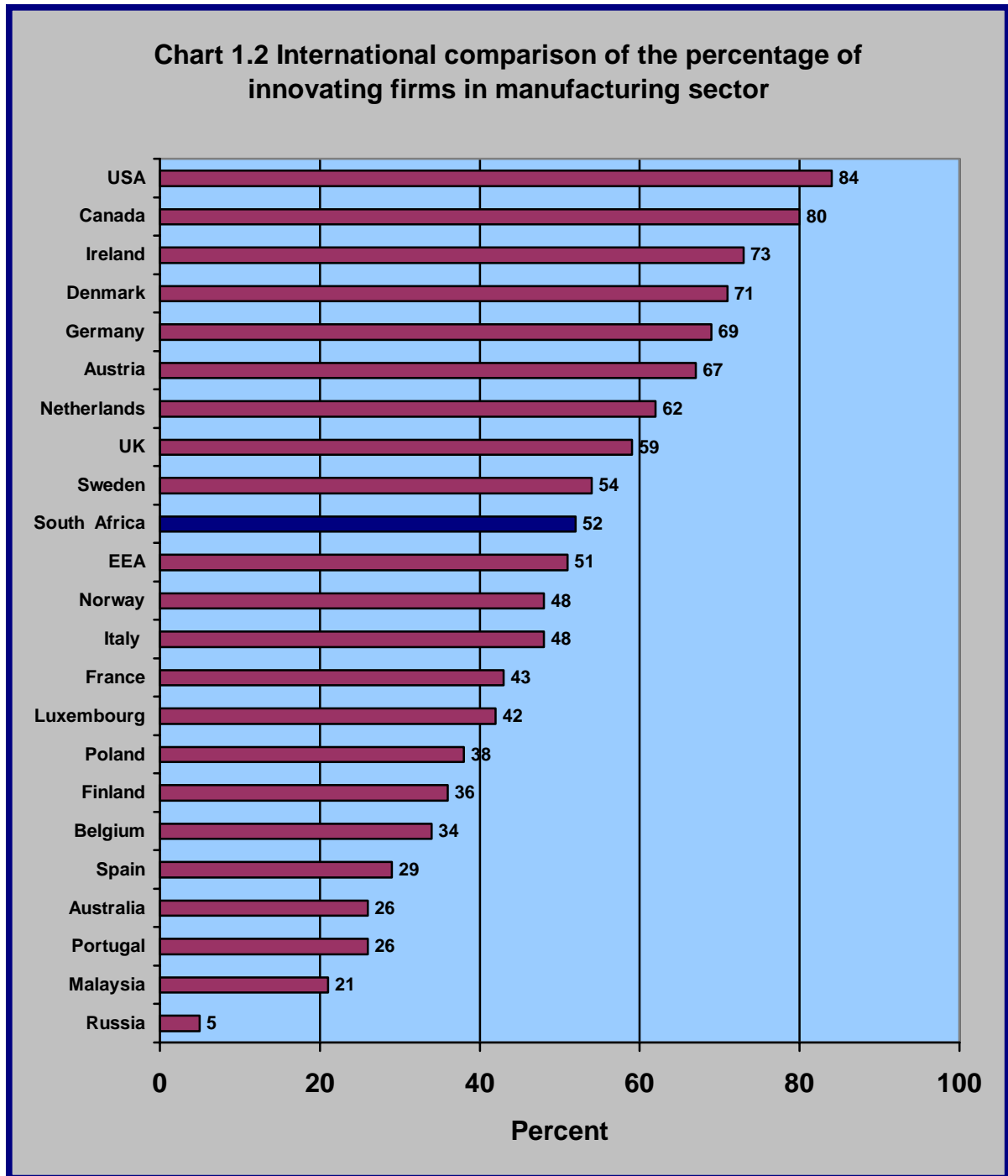
- A lack of qualified personnel;
- A lack of information/familiarity with technologies;
- High costs;
- Economic risks;
- Shortage of financial resources;
- Time constraints; and
- Market problems.

The innovation propensity of South African firms is comparable to that of many developed countries in Europe. It is higher than that of Eastern and South European countries and countries in the Far East such as Australia and Malaysia, although not as high as some countries in Europe and North America.

The international comparison of innovating percentages in manufacturing sector is given in Chart 1.2.

The survey concluded its findings as follows (Oerlemans et al 2003:12): *'In conclusion, the South African industry can be characterised as being predominantly engaged in the improvement of products and processes using foreign technology. South Africa can therefore be characterised as a type of technological colony, whose industries are dependent on foreign technology for the improvement of its products and processes. The primary mode of innovation seems to be imitation rather than invention'*.

The increasing importance over the last three decades of technology versus other resources, measured in terms of its contribution to the GDP, is highlighted by the resource index comparison given in Table 1.2.



Source: Oerlemans et al (2003:98).

Table 1.2: Percentage contributions by resources to South Africa's GDP growth over the past three decades

Decade	Growth in real GDP	Contribution by labour	Contribution by capital	Contribution by technology
1970's	3.21%	1.17%	1.55%	0.49%
1980's	2.20%	0.62%	1.24%	0.34%
1990's	0.94%	-0.54%	0.41%	1.07%

Source: Mohr (1998).

The influence of culture on the entrepreneurship domain is another cornerstone of this research project. The work of Shane (1993) and Aldrich & Waldinger (1990) has significant relevance. Shane (1993:59) examines the effect of the cultural values of individualism, power distance, uncertainty avoidance, and masculinity on national rates of innovation. His findings suggest that '*...nations may differ in their rates of innovation because of the cultural values of their citizens*'. In their research on ethnicity and entrepreneurship, Aldrich et al (1990:111) examine various approaches to explaining ethnic enterprise, using a framework based on three dimensions: an ethnic group's access to opportunities, the characteristics of a group, and emergent strategies. They conclude that '*a common theme pervades research on ethnic business: ethnic groups adapt to the resources made available to their environments, which may vary substantially across societies and over time*'. Frederking (2004:197) supports this notion in a cross-national study of culture and economic activities with findings that '*the structural context of immigration laws, housing and education policies affect the way in which groups organize in the respective neighbourhoods, and it is these patterns of organization that dictate the subsequent relevance of culture in entrepreneurship*'. South Africa is a multi-cultural society with its four prominent ethnic groups, eleven official languages and diverse religious composition (Table 1.3).

The last scenario that is used to illustrate the importance of this research is the work of De Wet (1995), where he discusses the concept of 'technology colonies'. He refers to the many developing countries that gained political independence after World War II, but remained dependant on their host countries for technological 'know-how' and their subsequent long-term economic survival. South Africa was mentioned as an example, where '*...more than 80% of the value in*

industrial business activity is done under (foreign) licence, and more than 50% of this activity is subject to market constraints' (De Wet 1995:2).

It is against this background that the critical need arises to create a better understanding of the technological entrepreneurship concept. It is also important for future research efforts to recognise its importance as a major role player in the economies of emerging and multi-cultural nations such as South Africa. New theory and models to enhance the development of technological entrepreneurship need to be explored to supplement the existing knowledge on entrepreneurship in general.

1.3.3 Study population

The importance of establishing a feasible study population which meets the criteria of the research project was identified during the research proposal stage. The study population had to comply with the following primary criteria:

- The study population has to operate in a geographical region which is classified as an emerging economic region;
- The region has to consist of several relatively large cultural population groups;
- The study population of technological entrepreneurs has to operate a business within this region.

Such a region is the province of KwaZulu-Natal, one of the nine provinces of South Africa. It is situated on the east coast of the country and has the following characteristics:

- It has at least four prominent cultural or ethnic groups as well as four major religious groups;
- The province's economical performance is representative of South Africa as an emerging region. It is the second largest contributor to the South African economy (16.6% of GDP) (Statistics SA 2004), has a comparable economic growth rate, with representative sector contribution ratios and a lower than \$10,000 per annum per capita income; and

- KwaZulu-Natal is the second most populous province of South Africa and has a no-schooling educational profile of 21.9% (Statistics SA 2004).

Category	KwaZulu-Natal	South Africa	Malaysia	Brazil
Population	9.4m	45.5m	24.9m	183.9m
Size (sq km)	0.1m	1.2m	0.3m	8.5m
Prominent ethnic groups	Black 85% Indian 8% White 5% Colour 2%	Black 75% White 14% Colour 9% Indian 3%	Malay 58% Chinese 24% Indian 8% Other 10%	White 55% Mixed 38% Black 6% Other 10%
Religions	Christian 72% Hindu 5% Muslim 2% Other 21%	Christian 68% Muslim 2% Hindu 2% Indigenous 28%	Muslim Budd Daoist Hindu Christian	R. C. 80% Other 20%
Prominent languages	3	11	10	4
Per capita annual income	\$2,920	\$3,630	\$4,520	\$3,000
Economic growth rate	2.5%	3.7%	7.1%	4.9%
Sector contribution to GDP	Agriculture 7% Industrial 33% Services 60%	Agriculture 4% Industrial 31% Services 65%	Agriculture 7% Industrial 34% Services 59%	Agriculture 10% Industrial 39% Services 51%

Sources: <http://www.statssa.gov.za> (2004), <http://www.odci.gov/cia/factbook> (2005), <http://www.worldbank.com> (2004).

In order to benchmark the findings of the research project with available and recent data of other emerging countries, a demographic and economic comparison is presented in Table 1.3. Both Malaysia and Brazil can be classified as multi-cultural emerging countries. Recent data on entrepreneurship levels of Brazil is available in the GEM reports and Malaysia's innovative capacity is explored in the South African Innovation Survey (Oerlemans et al 2003). The multicultural profile of each of the four regions in Table 1.3 is clearly illustrated in their respective ethnic composition and prominent religious groups. Although the annual per capita income of KwaZulu-Natal is comparable to those of Brazil and Malaysia, both these countries display significantly higher economic growth rates. As far as entrepreneurial activity is concerned, the TEA of KwaZulu-Natal as measured in GEM (2003:20) is 7.2% versus 6.5% for South Africa and 13.5% for Brazil.

The province is indicated in lime green in the geographical map Figure 1.1.

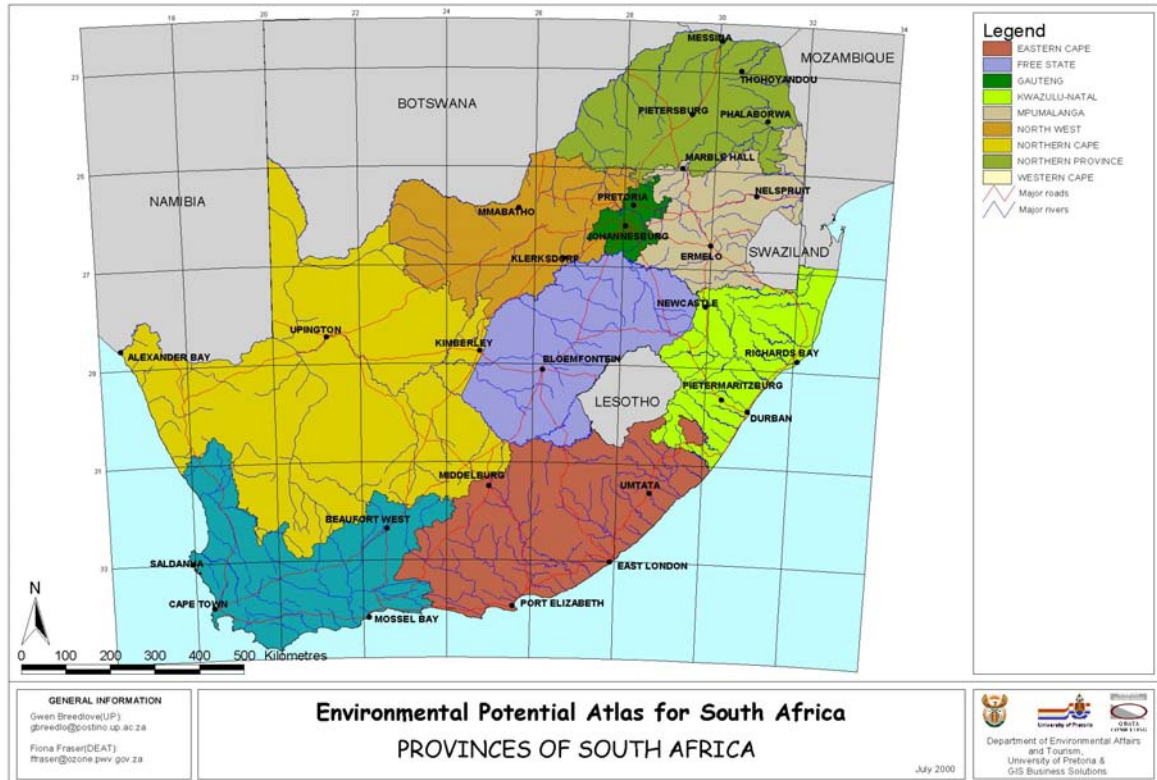


Figure 1.1: Provincial map of South Africa

Source: <http://www.safrika.info> (2005).

1.3.4 Key challenges

The following key challenges have been identified which concern those involved in the development of entrepreneurial capacity in modern day societies:

1.3.4.1 General entrepreneurship is well researched (Bull et al 1995:2) and development drives have traditionally been directed more towards entrepreneurs in sales and non-technical process or services sectors. The result is that the development of entrepreneurs in the technology intensive sectors is lagging behind.

1.3.4.2 Both modern concepts of technology and entrepreneurship are traditionally and historically foreign to the majority of the population in South Africa and other developing countries, according to Du Preez, Van Eldik, Möhr & Van der

Watt (1996). Specific and unique efforts to educate and train future technological entrepreneurs will be required to ensure that future demands are met.

1.3.4.3 The national education and training model in South African and other developing countries has arguably been structured (historically) to produce technically competent participants in the economy, primarily suitable for employment by large established corporations or formal government institutions (Rwigema et al 2004:15). Entrepreneurship and business management skills were traditionally treated on a post-education 'as-and-when-required' basis. The high failure rate of technology-based business ventures and professional practices (Wagner 1997:8), with the resultant high cost to both individual and the national economies, is evidence of this observation.

1.3.4.4 South Africa and several other developing countries can be referred to as 'Technology Colonies' according to De Wet (1995), due to their position in global production chains. 'Technology Colonies' have traditionally acted as either human resource providers or commodity providers and were importers of foreign developed technologies. The challenge for these importers of technology is to develop their own innovative capabilities and to utilize them for the incubation of local technologies.

1.3.4.5 The legacy of the so-called 'apartheid' policies on the development of South African society is well debated. The influence of these policies on the economic development of the country is significant, especially in the development of entrepreneurship and cultural views on new job creation. The quote by Van Aardt & Van Aardt (as cited by Rwigema et al 2004:14) illustrates this influence on the South African society as follows: *'In general, South Africans are not socialized or educated to become entrepreneurs, but to enter the labour market as employees. In becoming employees, they become consumers of existing jobs instead of creators of new jobs... The trend of people being socialized and educated to become employees appears to be especially true in respect of Africans...'*

1.3.5 Beneficiaries

The following three groups could benefit from the findings of this research project:

- Institutions;
- Individuals; and
- Regions.

Specific examples of such beneficiaries are:

- The tertiary educational institutions in emerging regions such as Universities, Technikons (Technical Universities) and Technical Colleges which offer technological courses, to enhance their entrepreneurship subject contents;
- Technically trained persons who are potential entrepreneurs but lack the necessary formal training in entrepreneurship and small business management skills in a technological environment;
- Emerging regions in general through an improving climate for technological entrepreneurship and its direct positive effect on economical development, new job and wealth creation;
- Development aid institutions and organisations to improve the efficiency of educational and development aid fund applications; and
- Governments, policy formulating and regulatory bodies to structure their frameworks and guidelines in an optimum manner. This will create a healthy climate for sustained entrepreneurship education and training in the technology-intensive sectors of their economies.

1.4 THE RESEARCH PROBLEM

1.4.1 Statement of the problem

The research problem is formulated as follows:

Limited theory and models are available on technological entrepreneurship in emerging regions.

1.4.2 Statement of the research questions

The research problem can be further categorised into the following three research questions:

The first research question is: *Can the domain of technological entrepreneurship in emerging regions be represented by several entities that are sufficiently inter-correlated to form a basic model?*

The second research question is: *Does the profile of technological entrepreneurs in emerging regions differ from the profile of their counterparts in developed regions and what are the similarities, if any?*

The third research question is: *To what extent does formal education and training in all educational structures in an emerging country such as South Africa enhance the development of technological entrepreneurs?*

1.5 RESEARCH OBJECTIVES

1.5.1 The research objectives

The primary objective of the study is to produce a structured model that would lead to the more effective and efficient development of entrepreneurship in technology-based sectors of countries with emerging economies.

This primary objective is achieved by the following two secondary objectives:

- To create *new theory* on technological entrepreneurship in emerging regions;
- To derive *a model* for the development of technological entrepreneurship in these regions.

1.5.2 Specific research goals

The primary and secondary research objectives are supported by the following specific research goals:

1.5.2.1 To investigate the personality traits of people classified as technological entrepreneurs;

1.5.2.2 To investigate the external influences such as culture, society, education, role models etc. on the development of successful technological entrepreneurs;

1.5.2.3 To collect data on the environmental influences such as technology transfer, business environment, government policies and initiatives etc. on new enterprise formation, as well as on further enterprise development;

1.5.2.4 To investigate the specific influence of entrepreneurship training (or the lack thereof) on the development of technological entrepreneurs by formal educational institutions such as primary and secondary schools, Universities, Technikons and Technical colleges;

1.5.2.5 To compare the research data with those from developed regions and draw some analogies between them;

1.5.2.6 To formulate a model which represents the domain of technological entrepreneurship and simulates the optimum development of the specific form of entrepreneurship in emerging regions such as South Africa;

1.5.2.7 To contribute to the knowledge of and theory on technological entrepreneurs;

1.5.2.8 To identify further research areas and topics in this field; and

1.5.2.9 To formulate recommendations for the implementation of the model, as well as for further research.

1.6 KEY ATTRIBUTES OF THE DESIRED THEORY AND THE DERIVED MODELS

1.6.1 Key attributes

The key attributes of the theory and model proffered in this research project are the following:

1.6.1.1 It consists of a model (a graphical, mathematical or schematic description or analogy of a system of postulates, data and inferences) that represents technological entrepreneurship in emerging regions;

1.6.1.2 The model comprises of the following key entities (properties):

- The entrepreneur;
- The new venture creation process;
- The mature business;
- The environmental factors affecting the entities;

1.6.1.3 The model describes the interaction between the entities, their interrelationships and the relative importance of their influences on each other;

1.6.1.4 The theory and model create new knowledge and a better understanding of the concept of technological entrepreneurship in emerging regions;

1.6.1.5 It proposes pointers to policy makers for the development of technological entrepreneurship in these regions; and

1.6.1.6 It identifies further research areas.

1.6.2 The delimitations

The research project has the following delimitations:

1.6.2.1 Only entrepreneurs operating in a technology-based business environment are investigated and not entrepreneurs in the buy, sell, non-technical services or general business sectors;

1.6.2.2 The field of research is limited to emerging or developing regions only and will not include developed or industrialised regions. The literature study however, investigates research results obtained from studies conducted in developed countries such as the USA and the United Kingdom, as well as results obtained from studies in related fields in emerging economies. An example of the latter case is the incubation of technology intensive new businesses at Universities in South Africa (Wagner 1997);

1.6.2.3 The research population is entrepreneurs who have founded a technology-based enterprise registered within the boundaries of the province of KwaZulu-Natal on the east coast of South Africa and who have operated the business for a period of time. A sample will be drawn from this population;

1.6.2.4 The research on the entrepreneurial training in formal technological education programs includes postgraduate students at the University of Pretoria, Department of Engineering and Technology Management; and

1.6.2.5 The effect of other factors such as informal training, private sector and government initiatives etc. which play a role in the development of technological entrepreneurs and their enterprises, are not researched in depth.

1.6.3 The definition of the terms

1.6.3.1 *Technology* - Technology is the utilisation of technical knowledge through techniques to perform some useful function according to Buys (2000:2). Technology utilises the knowledge produced through science to create wealth (Jones 1971:5).

1.6.3.2 *Entrepreneur* – An entrepreneur is a person who habitually creates and innovates to build something of recognised value around perceived opportunities (Bolton et al 2000:5). The entrepreneur always searches for change, responds to it, and exploits it as an opportunity (Drucker 1991:25).

1.6.3.3 *Entrepreneurship* – Entrepreneurship in the context of this study is the collective concept which encompasses the following elements, as well as the interactions between them:

- The *entrepreneur* (person);
- The *new venture creation process* (start-up);
- The *mature business* after start-up;
- The *environmental influences* on all the role players and processes.

1.6.3.4 *Technological entrepreneur* – The technological entrepreneur is the person who practices entrepreneurship in a technology-based industry or enterprise. A technology-based enterprise has a relative large amount of scientific and engineering labour, knowledge and techniques in its final product or service (Cooper et al 1972:68).

1.6.3.5 *Innovation* – Innovation is the act that endows resources with a new capacity to create wealth (Drucker 2001:27). Innovation can also be described as: ‘...the introduction of new and/or improved products, services and production processes’ (Oerlemans et al 2003:11). Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service (Drucker 1991:33). The innovation process takes the technology from the scale of innovation to the state of first commercial application.

1.6.3.6 *Emerging* – The term emerging is used to describe the dynamic upwards movement of any entity such as a country, community, economy, nation or market. The reference to an ‘emerging country’ in the context of this research project has the same meaning as the internationally accepted term ‘developing country’. The qualifying definition of ‘developing or emerging’ countries is an annual per capita income of less than US\$10,000 (GEM 2004:10).

1.7 SUMMARY

This first chapter describes the background to the problem, as well as the historical development of entrepreneurship, modern perceptions and the current state of the industry. The research problems, as well as several research questions were stated, followed by the rationale for the research project and key challenges. The research framework, including the delimitations and definitions, are outlined. The primary research objectives, followed by the specific goals, were identified against the background of value and importance of the study. Finally the key attributes of the desired theory and derived models were proposed.

The next chapter contains the literature overview and focuses on the current available theory on the key concepts of entrepreneurship in general and technological entrepreneurship specifically. This chapter also highlights the theory-gap that exists on technological entrepreneurship within the milieu of emerging economies, markets and communities.

CHAPTER TWO
THEORY
AND
RESEARCH REVIEW

CHAPTER TWO

THEORY AND RESEARCH REVIEW

*'Daring as it is to investigate the unknown, even more
so it is to question the known'.*

Kaspar (Timmons 1994:283).

2.1 THEORY AND RESEARCH REVIEW

2.1.1 General overview

2.1.1 Eclectic perspective on this research project

It is important to present an eclectic perspective on the literature study of this research project as an introductory note. The relevance will be illustrated to the reader as the theoretical framework in Chapter 2 is explored. The perspective is contained in the following three elements:

- The standard academic practice, where the most recent (typically 5 to 8 years) theories, research results and international views are taken as the benchmark upon which new theory is built, still remains the primary assessor of any contribution to the existing body of knowledge;
- There are however, cases where generic contributions to theory were made in the pioneering days, which have been fundamental building blocks in the theory creation process and which remain unchallenged principles up to the present day. References to these contributions, irrespective of the dates on which they were made, are crucial in any literature review. A typical example of

one such contribution is the work of Einstein, who laid the cornerstone of relativity theories during 1905 and 1915; and

- Thirdly, specific scenarios occurred in specific time frames, with specific principles that are relevant to that specific scenario at a given point in time. The contribution may not be generic or universally true for multiple applications, but it has unique relevance to scenarios with similar conditions, variables and circumstances as the original study subject. References to such cases are crucial to offer a complete overview of the available body of knowledge, again irrespective of the time frame. An example of such a scenario is the unique conditions that prevailed when the former East Germany was incorporated into the West German economy. There are several analogue principles in such an occurrence, which are indispensable in creating solutions for later transient economic situations.

It is against this background that the literature review in Chapter 2 should be viewed. It is acknowledged that the theoretical base of the study subject is extraordinarily broad, with four mature, stand-alone topics that constitute the subject, i.e. *technology*, *entrepreneurship*, *emerging regions* and the various aspects of *development*. This necessitates the careful selection of applicable theories and models amongst the huge body of knowledge of these four major study directions.

2.1.2 International perspectives on entrepreneurship research

In the Proceedings of the First Annual Global Conference on Entrepreneurship Research which was held at the Imperial College in London, UK from 18th to the 20th February 1991 (Birley, Macmillan & Subramony 1992), the papers were presented in the following four categories:

- Framework for understanding entrepreneurship;
- Cultural perspectives on entrepreneurship;
- Environment and entrepreneurship; and
- Entrepreneurial strategy and behaviour.

In one of the papers delivered at the same conference, Thomas Köllermeier defined a major problem within the entrepreneurship research fraternity as follows: *'One of the major problems facing the field of entrepreneurship research is the lack of a common set of agreed-upon frameworks and definitions'* (Birley et al 1992:37).

The same sentiments were echoed by Bull et al (1995) in their book *'Entrepreneurship: Perspectives on Theory Building'*. Their view is presented in the following statement: *'Despite the number of published papers that might be considered related to the theory of entrepreneurship, no generally accepted theory of entrepreneurship has emerged'* (Bull et al 1995:1).

It seems as if global research efforts in the entrepreneurship field, primarily concentrate on three elements:

- The entrepreneur, his/her characteristics and behaviour;
- The entrepreneurial process; and
- The factors enhancing or impeding the development of entrepreneurs and entrepreneurial activity.

This perspective forms the basis of the literature research of this research project.

2.1.3 Literature categories

Although the literature on entrepreneurship and small business management has increased significantly in recent years, the knowledge in this field, however, remains fragmented. Due to the lack of an agreed-upon framework and set of definitions, *'...partly contradictory concepts are utilised, such as trait versus behavioural, uni- versus multi-dimensional, or static versus process approaches'* (Birley et al 1992:39).

Gartner (1989) in his paper entitled *"Who is an Entrepreneur?" Is the wrong question'* formulates the characteristics of the trait approaches and contrasts it with the behavioural approach. Gartner's objective in his paper was to initiate a paradigm shift in the field of entrepreneurship research, as he claimed that the trait

approaches do not have predictive power as they focus on a fixed state of existence. He advocates the use of a behavioural approach instead, which views entrepreneurship as the process by which new organisations come into being. This view is also supported by Vesper (1980). The different approaches can be summarised as follows:

- *The trait* approach focuses on the personality of the entrepreneur, while the
- *Behavioural* approach focuses on the activities of the entrepreneur.

The trait approach is based on the principle that entrepreneurs are different from non-entrepreneurs. Researchers such as McClelland (1976), Brockhaus (1982), Carland (1984) and Milner (1990) have all searched for the elusive set of personality-based predictors of new venture success.

The earlier focus of entrepreneurship research was on the personality traits, but the modern notion that there is no 'typical' entrepreneur, has become the driving force to rather focus on the activities of the entrepreneur or on the entrepreneurial process. Low & Macmillan (1990:148) offer a meaningful insight with the following conclusion: *'...being innovators and idiosyncratic, entrepreneurs tend to defy aggregation. They tend to reside at the tails of population distributions, and though they may be expected to differ from the mean, the nature of these differences is not predictable. It seems that any attempt to profile the typical entrepreneur is inherently futile'*.

Bull et al (1995:5) concludes on the importance of the trait approach with the remark that *'...the psychological traits of the entrepreneur are not a significant variable in the theory of entrepreneurship within the economic domain'*.

The behavioural approach with scholars such as Gartner (1989), Kao (1989), Roberts (1991) and Timmons (1994) studied the entrepreneurial process and more specifically the activities of the entrepreneur. The theory and models of later researchers such as Bolton et al (2000), who expanded on this approach, are discussed in more detail in Chapter 3.

The grouping of the literature on entrepreneurship into five categories by Bull et al (1995:2) as mentioned in Chapter 1 has a significant contribution to make in the debate to establish a generally agreed-upon framework. Four of the five categories (with the exception of the definition of the entrepreneur) can be classified into the two broad approaches above as follows:

- Trait approach;
- Behavioural approach – success strategies:
 - Formation of new ventures;
 - Environmental factors.

2.1.4 Entrepreneurship

2.1.4.1 Historical development

Bolton et al (2000:4) records the origin of the word *entrepreneur* as follows: 'The word '*entrepreneur*' is derived from the French words *entre* meaning 'between' and *prendre* being the verb 'to take'. The verb *entreprendre* therefore means 'to undertake'.

The word *entrepreneur* in French means a contractor and the German word *unternehmer* is an undertaker if translated directly. A historical summary of the research focus areas of academics, which contributed in this field, is given in Table 1.

Table 2.1: Summary of research on entrepreneurship.

Date	Author	Characteristic	Normative	Empirical
1848	Mill	Risk-bearing	X	
1917	Weber	Source of formal authority	X	
1934	Schumpeter	Innovation; Initiative	X	
1954	Sutton	Desire for responsibility	X	
1959	Hartman	Source of formal authority	X	
1961	McClelland	Risk-taking; need for achievement		X
1963	Dauids	Ambition; desire for independence, responsibility; self-confidence		X
1964	Pickle	Drive/mental; human relations; communication		X

		ability; technical knowledge		
1971	Palmer	Risk measurement		X
1971	Hornaday & Aboud	Need for achievement; autonomy; aggression; power; recognition; innovative/independent		X
1973	Winter	Need for power	X	
1974	Borland	Internal locus of control		X
1974	Liles	Need for achievement		X
1977	Gasse	Personal value orientation		X
1978	Timmons	Drive/self-confidence; goal-oriented; moderate risk-taker; locus of control; creativity/innovation	X	X
1980	Sexton	Energetic/ambitious; positive setbacks		X
1981	Welsh & White	Need to control; responsibility seeker; self-confidence/drive; challenge taker; moderate risk taker		X
1982	Dunkelberg & Cooper	Growth oriented; independence oriented; craftsmen oriented		X
1982	Hoy & Hellriegel	Preference for technical versus managerial tasks		X
1983	Pavett & Lau	Conceptual, human, and political competence; technical familiarity in a specialised field	X	
1985	MacMillan, Siegel & SubbaNar-isimha	Familiarity with the market; a capacity for intense effort; leadership ability	X	
1986	Ibrahim & Goordwin	Ability to delegate, manage customer and employee relations; interpersonal skills	X	
1987	Aldrich & Zimmer	Networking with people who control important resources and who have relevant skills and abilities	X	
1987	Hofer & Sandberg	Drive to see firm creation through to fruition; ability to clearly communicate goals; ability to motivate others to behave in synergistic manner		X
1987	Schein	Strong management skills with high levels of responsibility and authority; specialist versus general manager		X
1987	Timmons, Muzyka, Stevenson & Bygrave	Ability to recognise and envision taking advantage of opportunity		X
1989	Wheeler & Hunger	Ability to implement strategy with programs, procedures, budgets, evaluations, etc.		X
1992	Chandler & Jansen	Self-assessed ability to recognise opportunity	X	
1992	McGrath, Mac-Millan & Scheinberg	High individualism; poor distance; uncertainty avoidance; and masculinity		X

Source: Timmons (1994:189).

Later authors who contributed significantly to the body of knowledge on entrepreneurship are:

- Kuratko and Hodgetts on contemporary entrepreneurship (Kuratko and Hodgetts 1998);

- Shane and Venkataraman on entrepreneurship research framework (Shane et al 2000);
- Von Hippel on management of technology and innovation (Von Hippel 2005);
- Wickham on strategic entrepreneurship (Wickham 2004);
- Hisrich, Peters & Shepherd on general entrepreneurship and new venture creation (Hisrich et al 2005).

Two recent publications summarize the state of entrepreneurship research:

- Ucbasaran, Westhead and Wright (2001) focus on the contextual and process issues of entrepreneurship research. They suggest that ‘.....*additional research attention should be directed towards understanding of the behaviour of different types of entrepreneur (i.e. nascent, novice, serial and portfolio entrepreneurs) and the different organizational forms selected (i.e. corporate venturing, management buy-outs and buy-ins, franchising and the inheritance of a family firm) by entrepreneurs*’ (Ucbasaran et al 2001:57); and
- Grégoire, Noël, Déry and Bécharde (2006) investigate whether there is conceptual convergence in entrepreneurship research over the past twenty years. They provide evidence that the field relies increasingly on its own literature and the unique contribution that it makes to the management sciences.

The most recent researchers all tend to follow the modern trend to see the personality traits as only one of the ingredients of the entrepreneurial process. Similarly, the activities or the behaviour of the entrepreneur, also do not constitute the full picture. There is still a further dimension that is a crucial ingredient to complete the picture: the environment and its influence on the person and his/her activities.

Bolton et al (2000) in their publication *Entrepreneurs: Talent, Temperament, Technique* differentiate distinctly between the following three components in the entrepreneurial paradigm:

- What entrepreneurs are like – the *personality* factors;
- Where entrepreneurs come from – the *environmental* factors; and
- What entrepreneurs do – the *action* factors.

The work of Bolton and Thompson provides a framework which is not only in line with modern perceptions on the entrepreneur and entrepreneurship, but is concise, simple and contains the three main 'role players' in the entrepreneurial stable: the *person*, the *environment* and the *process*. This particular framework is used throughout this study for:

- The literature review;
- The research design;
- The research results comparison.

2.1.4.2 The person

As mentioned earlier, a single psychological model of entrepreneurship has not been developed to date. The earlier research efforts that supported the trait approach all endeavoured to define the characteristics of successful entrepreneurs. Brockhaus & Horwitz (1986:42) supported the view with their remark: *'The literature appears to support the argument that there is no generic definition of the entrepreneur, or if there is we do not have the psychological instruments to discover it at this time'*.

Another researcher on the subject Gartner (1989), came to the conclusion that while a large number of traits have been attributed to the entrepreneur, a clear picture of the entrepreneur in comparison with other occupational groups in the population is still to emerge. This has not transpired in the past decade and the theory is still lacking the same structure as mentioned by the early 90's researchers. On a more local note, Boshoff, Bennett & Owuso (1992:51) concluded with reference to the South African context: *'Our knowledge of the traits of an entrepreneur is consequently inadequate'*.

It is appropriate to review the major contributors to existing theory on the entrepreneur as a person, and in particular the work of early pioneers in the field. The work of McClelland (1967) arguably is worth mentioning, mainly due to its contribution to the understanding of the need hierarchy of entrepreneurs.

McClelland's theory of psychological motivation is a fundamental part of the literature on entrepreneurial behaviour. The theory states that people are motivated by three principal needs, as quoted by Timmons (1994:187):

- The need for achievement – *n Ach* – is the need to excel and for personal accomplishment against self-imposed standards;
- The need for power – *n Pow* – is the need to influence others and to achieve an 'influence goal' i.e. the goal of outperforming someone else or an externally derived standard; and
- The need for affiliation – *n Affil* – is the need to attain an 'affiliation goal' i.e. to build a warm relationship with someone else or to enjoy mutual friendship.

McClelland (1967) concluded that the *n Ach* is the source of the motivational drive shown by the entrepreneurial personality. He and his associates also postulated that the *n Ach* can be strengthened or developed. They designed an educational program for developing *n Ach* in the individual and attained satisfactory results in their training programs. Their efforts are summarised by Schöllhammer & Kuriloff (1979:22) who states that '*...n Ach may be significantly heightened through appropriate training*'.

Timmons (1994:191) formulated six dominant themes into which the characteristics of successful entrepreneurs can be categorised. These themes have emerged from what successful entrepreneurs do and how they perform, rather than what their personality traits are. It confirms the paradigm shift from the trait approach to the behavioural approach. These six themes are:

- **Commitment and determination**

Entrepreneurs are often confronted with challenges and obstacles during their venture establishment process, which require persistence and commitment to resolve. In order to overcome these hurdles, they have to be disciplined, tenacious and persistent in their efforts. Most entrepreneurs live under constant pressures, first to survive the start-up, then to stay alive and finally to grow into a sustainable enterprise.

- **Leadership**

Successful entrepreneurs have amongst other qualities strong leadership characteristics. They are experienced in their specific technologies, have an intimate knowledge of the market place in which they will compete and they have good general management skills. Unlike their counterparts in the corporate world, successful entrepreneurs have '*...a well developed capacity to exert influence without formal power*' (Timmons 1994:193). This ability is important for entrepreneurial success, as they are required to get along with a large spectrum of different personalities, such as accountants, bank officials, government employees, suppliers and many more. They are diplomats rather than autocrats, mediators rather than dictators. Above all, they have to inspire colleagues and employees, show strength and courage in the face of adversity and offer insight and vision for the enterprise's future – all leadership qualities which are essential for the young enterprise to survive.

▪ **Opportunity obsession**

The remarks of Mark Twain on opportunity, as cited by Timmons (1994:87) are quite appropriate: '*I was seldom able to see an opportunity until it has ceased to be one*'. Timmons (1994:194) also calls the successful entrepreneur someone who is '*..obsessed with opportunity*'. These may be harsh words and the word 'orientated' in stead of obsessed may have been more appropriate, but the intensity of the entrepreneur's drive to spot and exploit opportunities is perhaps best illustrated with the inherent analogy.

It is important to note that there is a distinct difference between an idea and an opportunity. An opportunity '*...has the qualities of being attractive, durable, and timely and is anchored in a product or service which creates or adds value for its buyer or end user*' (Timmons 1994:87). Schöllhammer et al (1979:28) classify entrepreneurs according to their ability to exploit opportunities as follows: '*Entrepreneurs are those persons who search for and see the opportunity latent in a novel idea, then to work energetically to convert the opportunity to the reality of business*'. Similarly, Bolton et al (2000:95) echo the holistic sentiments of Schöllhammer in their views on opportunity: '*Entrepreneurship is about opportunity. Successful entrepreneurs spot opportunities, often where others fail to see the same idea at the same time, although the same information is available to*

them'. It is evident that successful entrepreneurship is closely associated with the ability to recognise and commercially exploit opportunities in the business world.

- **Tolerance of risk, ambiguity and uncertainty**

Successful entrepreneurs are not gamblers. They calculate the risks facing them carefully, try to get the odds in their favour and then only decide whether to take the risk or not. Risk, ambiguity and uncertainty are almost a given in the world in which entrepreneurs operate and their ability to deal with these factors will often determine their success. The well-known phrase by Adam Smith '*The ordinary rate of profit rises...with the risk*', as quoted by Bolton et al (2000), are well appreciated by entrepreneurs. Bolton et al (2000:331) suggest that entrepreneurs might see risk (or the threat that it poses) differently than other persons. Doing something new or in a different way than before inherently contains risk elements, but entrepreneurs might not notice them or will just accept it in their stride.

Peter F Drucker (2001:128) remarks about the entrepreneur and risk as follows: '*The successful entrepreneurs have one thing – and only one thing – in common: they are not risk takers*'.

- **Creativity, self-reliance, and ability to adapt**

The ability to innovate and apply creative ideas in the world of the entrepreneur is not only crucial for survival, but it is also part of the personality make-up of successful entrepreneurs. Successful entrepreneurs are typically dissatisfied with the status quo and are restless initiators (Timmons 1994:195). They believe in themselves, are self-reliant and independent. They show initiative, are action orientated and are adaptive and resilient. They can adapt rapidly to changes in the dynamic world of business and are not afraid of failure. Instead, they have the ability to use incidents of failure as a way of learning. This is particularly evident if the high previous business failure rates of successful entrepreneurs are analysed.

- **Motivation to excel**

The last of the six themes of entrepreneurs' characteristics is their motivation to excel beyond the norms of their peer group. It is commonly believed that entrepreneurs '*...are self-starters, who appear to be driven internally by a strong*

desire to compete against their own self-imposed standards...' (Timmons 1994:196). The strong need to achieve according to McClelland (1967), strongly dominates the need structure ahead of other needs such as the need for power or the need for status. Entrepreneurs also have a high self-imposed set of personal standards that include aspects such as integrity, loyalty, reliability and discipline. They know their strengths and weaknesses, as well as those of their partners and competitors. The ability to gain and maintain perspective in all circumstances, plus a good sense of humour, is all characteristics that have been attributed to successful entrepreneurs.

Bolton et al (2000) categorise the personality factors in their framework in the following four components:

- **Motivation and emotion**

The notion that motivation comes from the head and the heart according to Goleman (1996) affirms the link that psychologists draw between motivation and emotion. The work of McClelland (1967), Roberts (1991), Whybrow (1991) and Buttner (1992) are all relevant in this field, of which most of the significant contributions were included in the six main themes summarised by Timmons (1994) in his work mentioned earlier.

- **The born or made debate**

The debate whether entrepreneurs are 'made' or 'born' has been debated by several disciplines, for example by the management and leadership fraternities. In order to obtain a better understanding of the complexity of the problem, it is necessary to review what the subject discipline of psychology contributed to theory.

Psychologists believe that *genetics* shape a certain proportion of a personality and *environmental influences* shape the remainder. The figures vary between researchers from 75% genetic (Woods 1998) to 40% genetic (Whybrow 1999). Whatever the ratios, it is important to understand that personalities have an inborn component and an environmental component. Contrary to the findings of psychologists, other contributors to the literature on entrepreneurs (Burns &

Dewhurst 1989 and Kent 1984) have concluded that only environments shape entrepreneurs. This argument supports the notion that entrepreneurs are 'made' and not 'born'. Drucker (2001) certainly holds the strong opinion that entrepreneurship, like innovation, is a discipline with its own unique set of rules that can be learned.

Bolton et al (2000:15) believe that entrepreneurs are both 'made' and 'born'. They conclude as follows: *'Whilst it may be true that the techniques of entrepreneurship can be 'taught' or more correctly 'learned', we do not believe that educators can make people into entrepreneurs'*. The debate is most certainly not concluded yet and for the purpose of this study the notion that a significant portion of the person's (entrepreneur) activities (the process) is influenced by environmental factors, is presupposed. The person or the personality aspect, over which the question is debated, is left out of the research equation for this purpose.

▪ **Behavioural characteristics**

Similar to the contribution of Timmons (1994), Bolton et al (2000) list eight dominant characteristics from a list of forty-two which was drawn up by Hornaday (1982).

This list includes the following:

- Perseverance and determination;
- Ability to take calculated risks;
- Need to achieve;
- Initiative and taking responsibility;
- Orientation to clear goals;
- Creativity;
- Honesty and integrity; and
- Independence.

The correlation with the list of Timmons (1994) and other researchers is obvious, but the inclusion of two ethical issues in the list i.e. honesty and integrity, needs more focus. It is generally accepted that ethical issues such as trust and honesty form part of the business society today and social responsibility and business

ethics are key subjects in most of the courses taught at modern business and management schools.

- **Personality attributes**

The last category proposed by Bolton et al (2000) is the personality attributes of entrepreneurs. This aspect of people has been studied extensively and a wide range of tests, termed 'psychometric testing', has been developed and applied with significant results in practice. One such popular test is the Myers-Briggs type Indicator (MBTI) that researchers such as Roberts (1991) have used in their research on technological entrepreneurs. Research of this aspect in particular falls outside the scope of this study and is mentioned for the sake of completeness of the literature survey.

A recent publication by Mitchell, Busenitz, Lant, McDougall, Morse and Smith (2005:93) states that *'...the failure of past 'entrepreneurial personality'-based research to clearly distinguish the unique contributions to the entrepreneurial process of entrepreneurs as people, has created a vacuum within the entrepreneurship literature'*. They suggest that *'...the constructs, variables, and proposed relationships under development within the cognitive perspective offer research concepts and techniques that are well suited to the analysis of problems that require better explanations of the contributions to entrepreneurship that are distinctly human'* (Mitchell et al 2005:93).

2.1.4.3 Environmental influences

Earlier researchers, who mainly focussed on the person and the behaviour of the entrepreneur, neglected the environment in which entrepreneurship is conducted. It is only late in the 1980's when researchers like Drucker (2001) and Roberts (1991) acknowledged the importance of the environmental influences on the development of the entrepreneur, as well as on the entrepreneurial process. Most entrepreneurship models recognise the importance and role that different environments play in entrepreneurship and the entrepreneurial process. Such models, which are discussed more in detail in Chapter 3, include:

- The model of Birley et al (1992) for entrepreneurship in transition;
- The integrative model for entrepreneurship education and training of Gnyawali et al (1994);
- The entrepreneur development model of Roberts (1991);
- The model for economic development of the Technology and Development Institute of Hawaii as presented by Tran (1975);
- The model for entrepreneurship education of Klandt & Müller-Böling (1993); and
- The entrepreneurship-training model of the University of Tulsa in the USA (Klandt et al 1993).

The acknowledgement of the importance of entrepreneurial environments and the growing body of knowledge on the subject is evidence of the importance of this element. Despite the recent growth, gaps are still evident in the literature. Gnyawali et al (1994:43) formulated a model to resolve the problems in the literature spectrum, which addressed four major areas:

- A conceptual framework to integrate the available literature on entrepreneurial environments;
- Establish links between the needs of entrepreneurs and how environments can fulfil these needs;
- Propose guidelines to conduct empirical research on entrepreneurial environments; and
- Address the needs of policy makers as an important audience for research on entrepreneurship.

According to Gnyawali et al (1994:84), an entrepreneurial environment is '*...a combination of factors that play a role in the development of entrepreneurship*'. It refers firstly to the overall economic, socio-cultural, and political factors that influence people's willingness and ability to undertake entrepreneurial activities. Secondly, it refers to the availability of assistance and support services that facilitate the start-up process. Their work also distinguishes between three broad streams in the available literature on entrepreneurial environments:

- General environmental conditions for entrepreneurship;

- Descriptive studies of the environmental conditions of a particular country or region; and
- The role of public policy in shaping the entrepreneurial environments.

Research results indicate a strong potency of regional factors in influencing entrepreneurial behaviour in communities. Cécora (1999:74) suggests the following important factors in the cultural and socio-environment of entrepreneurs:

- Socio-structural variables (size and composition of populations, including age, gender, ethnic origin);
- Norms of society and culture (tastes and interests, cultural contexts);
- Institutions and power structures (legal and political contexts) and
- Social networks and peer groups (informal affiliations).

The remarks of Cécora (1999:122) sum up the mood that should prevail in regulatory bodies when the entrepreneurial environment is considered: *'In conclusion, formulation of adequate policy measures for sustainable regional development must be founded on better understanding of non-economic determinants of endogenous innovation and entrepreneurship which are dismissed by conventional, neoclassical economists'*.

In his book 'Entrepreneurship and Self-help amongst Black Americans', John Butler (1991) examines the tradition of entrepreneurship and self-employment amongst ethnic groups in general and specifically black Americans. He categorises his work as a study of the *'...sociology of entrepreneurship, which takes as its subject matter the relationship between group characteristics and the development of business activity'* (Butler 1991:1). The following fundamental issues presented by Butler are relevant to this research project:

- The primary group characteristics examined were race and ethnicity;
- The notion that the more a group is assimilated into society, the higher the probability of economic stability for that group;
- The notion that groups develop economic stability as a result of entrepreneurship;
- The role of minority groups as the 'middleman' as documented in the literature, where oppressed ethnic groups resorted to negotiate products between the

producer and the consumer, owner and renter, elite and masses and employer and employee;

- Literature references to the Jews in Europe, the Asians in East Africa, the Japanese in the USA and the Chinese in Southeast Asia as middlemen in the capital societies are given;
- The study of the relationship between collectivism and business activity and the interaction of cultural attributes of ethnic groups and the development of entrepreneurship within the group;
- The ethnic enclave theory, where the development of minority business enterprises within a central economy occurs, with the resultant dynamics of such an enclave with its surroundings;
- The effect of political and social hostility on the Afro-American and the resultant strong drive of self-help and entrepreneurship;
- The effect of Governmental programs which forced Afro-Americans on an 'economic detour';
- The evolvement of Afro-Americans from the 'economic detour' culture to the 'middleman culture'.

2.1.4.4 The process

Bolton et al (2000:27) use two process models to illustrate the body of knowledge of the entrepreneur termed 'expertise'. The first model is the process model as given in Figure 2.1.

The second entrepreneurial process model condenses the action factors (i.e. what entrepreneurs do) into two distinct phases as indicated in Figure 2.2. The first stage or area of activity is *spotting the opportunity* and the second stage is the *project championing* of the opportunity. The true entrepreneur is the person who is able to combine and execute both roles of spotting the opportunity and project champion successfully.

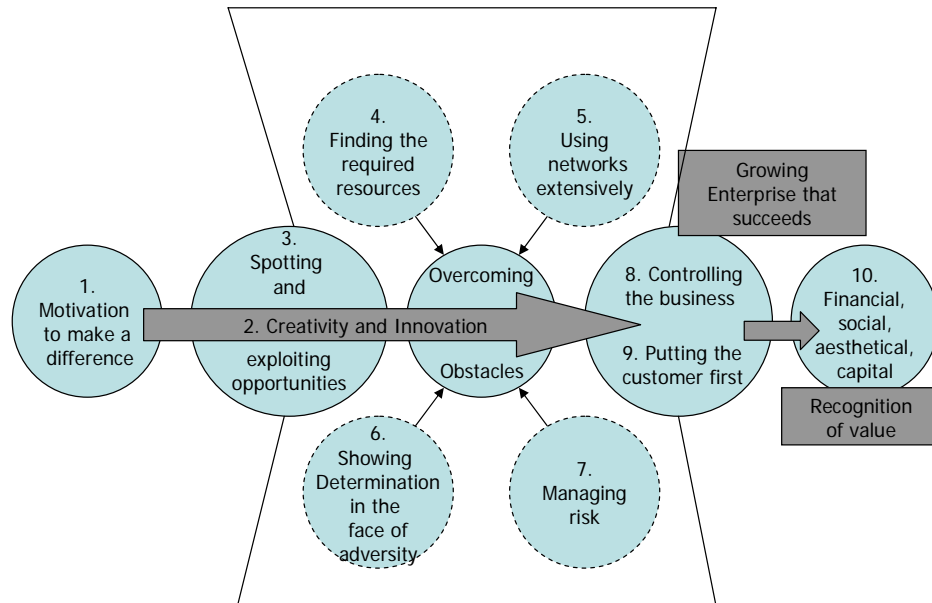


Figure 2.1 The entrepreneurial process diagram

Source: Bolton et al (2000:27).

2.1.4.5 Small business management

Literature has for several decades acknowledged the difference between entrepreneurs and managers of small businesses. The notion that the entrepreneurial founder of an organisation is a different type of person from the manager, who is required at subsequent stages of growth, had already been propagated by early researchers such as Chandler (1962), Steinmetz (1969), Thain (1969), Greiner (1972), Clifford (1973) and Smith & Miner (1983). Schöllhammer et al (1979:181) analyse the differences between small and large businesses and conclude as follows: *'Although the scope and complexity of management problems and decision making may be different, the basic managerial functions and the operational activities are essentially the same in both small and large companies'*.

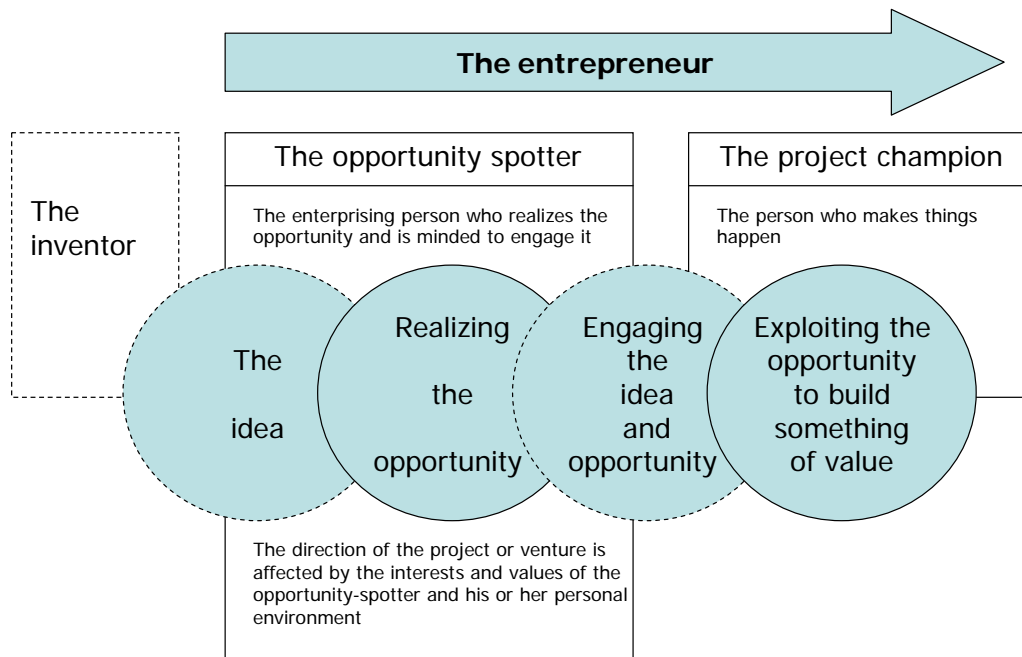


Figure 2.2 The entrepreneur, the opportunity spotter and the project champion

Source: Bolton et al (2000:28).

It is the management portion of the small business that is important to this study, as the ingenuity and capabilities of management team (including the entrepreneur or founder) determine the success of the newly established venture through its development stages.

2.1.4.6 Intrapreneurship

People with entrepreneurial talent who are motivated to use their abilities and initiative and do something on their own, but who may not want to start their own business, are important role players in the innovative enterprise or service institution. These internal entrepreneurs have been called *intrapreneurs* by

Pinchot (1985) and *corporate entrepreneurs* by Kanter (1983). The term is derived from *intra-corporate entrepreneurs*. Bolton et al (2000:63) define intrapreneurship as follows: *'Intrapreneurship then is the term given to the establishment and fostering of entrepreneurial activity in large organisations which results in incremental improvements to existing products and services and occasionally to brand new products'*.

Intrapreneurship's broadest definition is perhaps *entrepreneurship within an existing organisation*. According to Antoncic & Histich (2003:9) previous researchers have defined intrapreneurship as:

- A process by which individuals inside organisations pursue opportunities independent of the resources they currently control (Stevenson & Jarillo 1990);
- Doing new things and departing from the customary to pursue opportunities (Vesper 1990);
- A spirit of entrepreneurship within the existing organisation (Hisrich & Peters 1998); and
- Creation of new organisations by an organisation, or as an instigation of renewal and innovation within that organisation (Sharma & Chrisman 1999).

The views of Antoncic et al (2003:9) are contemporary within the modern paradigms of innovation and entrepreneurship and are relevant to the domain of this project as follows: *'Intrapreneurship refers not only to the creation of new business ventures, but also to other innovative activities and orientations such as development of new products, services, technologies, administrative techniques, strategies and competitive postures. Its characteristic dimensions.... are new business venturing, product/service innovation, process innovation, self-renewal, risk taking, proactiveness, and competitive aggressiveness'*.

There is a strong similarity between entrepreneurs and intrapreneurs. The most significant difference is that intrapreneurs do not necessarily want to start their own businesses or manage an independent business. Hisrich et al (2005:46) provide a comparison between entrepreneurs, intrapreneurs and traditional managers. As for the rest of the personal attributes, literature (Drucker 2001:131,

Wickham 2004:574, Rwigema et al 2004:78) suggests that these two categories of entrepreneurs display virtually similar profiles.

2.1.5 Entrepreneurship education and training

2.1.5.1 Formal education

One of the contentious issues still debated by scholars of entrepreneurship is the question: Can you teach someone to become an entrepreneur? Despite the importance of the issue, few have studied entrepreneurship education from a research point of view. According to Brockhaus in a paper delivered in Dortmund at The International Conference on Entrepreneurship IntEnt 92, even fewer have done empirical research and very few have compared a group that have received entrepreneurship training with a similarly matched group that have not received the education (Klandt et al 1993:3).

Entrepreneurship education in formal programs such as universities and colleges, are well-researched and documented in the following regions, as presented in the annual Proceedings of the Conference on Internationalizing Entrepreneurship Education and Training (IntEnt):

- America;
- Western Europe;
- Central and Eastern Europe;
- Africa;
- Australia; and
- Asia.

Apart from Eastern Europe, Africa and certain parts of Asia, most of the other regions represent developed and industrialised countries. The Asian and African experience, as well as the South American scenarios, is significant in their relevance to this research project. It is appropriate, as the research will be conducted in South Africa, to take a closer look at the educational background in South Africa, with particular reference to entrepreneurship education.

South Africa has several unique characteristics as an emerging economy, as well as common grounds and similarities with other emerging countries. A typical unique characteristic of South Africa is the political inheritance of the post-apartheid era. South Africa also has typical characteristics of an economy in transition similar to the former East Germany. Several universities in South Africa, including the Potchefstroom University, University of Stellenbosch, University of South Africa, University of Pretoria and University of Cape Town all have active entrepreneurship education and training programmes, which are primarily aimed at the local conditions and indigenous population groups. The work of Antonites (2000) on educational models for entrepreneurship training also has relevance to this research project. The South African context will be discussed in more depth in Chapter 4 when the research methodology and design are discussed.

One of the key issues in the formal educational program restructuring in the 1990's in South Africa is the formulation of new course structures at tertiary educational institutions. In this instance, experience of the developed world is of significant value and this includes the experience gained by other emerging countries such as Korea, Taiwan, Malaysia and the former East Germany.

In an effort to synthesize available research on the process of entrepreneurial learning, Politis (2005:399) formulates a framework which identifies three main components:

- Entrepreneurs' career experience;
- The transformation process; and
- Knowledge in terms of effectiveness in recognizing and acting on entrepreneurial opportunities and coping with the liabilities of newness.

In order to formulate a course structure for any entrepreneurship-training program, Brockhaus (Klandt et al 1993) suggests that the following questions be asked:

- *Who are the entrepreneurship students?*

To which categories of potential entrepreneurs will the training be given – will it be future potential entrepreneurs, current entrepreneurs who have started their own business already, others who have bought an existing business or franchise, or

who have inherited a business and want to learn more about aspects such as marketing, management of finances? Another group could be entrepreneurs within large corporations who want to practice the principles of entrepreneurship within their current environment – the so-called ‘intrapreneurs’?

- *What are the needs of the students?*

Some students may require knowledge about entrepreneurship; others may want to learn more about management aspects, others about the procedures and start-up process.

- *Who provides the education?*

In formal training programs presented by educational institutions it may be a permanent faculty member or an entrepreneur from the business fraternity who teaches on a part time basis. It could also be somebody with a particular skill who teaches students to be entrepreneurial in that particular area of expertise.

- *How does it all occur?*

Is it a credit course at university or college taught at pre- or post graduate level, or is it part of continuous education which is open to the general public?

- *How long is the program?*

If the course is an elective subject or is it a major for the student? It could also be in the form of a seminar lasting a few days or at the most, a few weeks.

- *In what format is it presented?*

Another aspect is whether the program is presented in a passive or experiential format. Passive would be reading a book, listening to a lecturer or watching a video. Experiential methodology would include case studies, or working in simulated or real business situations under mentorship.

- *What are the outcomes?*

Certainly one of the key issues of any educational process is the expected outcome of the program. And how are these outcomes measured? There is also the short-term versus the long-term outcomes. The short-term outcomes would be measured in terms of the student enrolment figures or their formal class performance statistics, while the longer-term measures could be the level of entrepreneurship stimulated by the course amongst ex-students. How many start-ups occurred after say five years and how many businesses survived and prospered after ten years?

Another building block in the process of understanding the role of formal education in the development of entrepreneurship is highlighted by Visser as stated in Klandt et al (1993:397). The role of student resources at tertiary institutions of developing countries was assessed as a major contributor in the process of entrepreneurial stimulation and education. The summary of the research findings is significant in its support for the rationale of this particular study (Klandt et al 1993:406): *‘Tertiary institutions, by their very nature, are the captive markets and the homes of the intellectually and academically-minded youth of a country. These persons have a duty towards those individuals who do not have the means, financially or otherwise, of improving skills to assist them with their endeavour to provide consumer and industrial goods, products and services. Failing such assistance will be an injustice to all. In development models tertiary institutions increasingly feature as one of the key components that work together to conceive of, and give birth to, new businesses’*.

The need for training in disciplines such as entrepreneurship, innovation and even invention has been recognised in most of the modern economies, even the developed countries such as the USA. Furthermore, it is proposed by researchers to commence formal education in these subjects at an early as possible age and at all levels of the curriculum. Kleppe (2002) reported positive results from research conducted on a group of high school pupils in Northern Nevada, USA. Apart from the need to broaden the base of students in technology at tertiary educational institutions, which is crucial in developing the technological base of emerging countries (Beute 1992), the content of engineering courses also came under the spotlight. The commercialisation of technology and the need to include entrepreneurship in formal engineering educational programs is recognised by Whittaker (2001). According to Whittaker, two sets of traits are to be developed in the training of engineers:

- Typical traits which engineering favours, such as conservatism, pro-active approaches, risk-aversion and a commitment to technological feasibility;
- Typical traits which entrepreneurship favours, including being visionary, optimistic, risk seeking and being good communicators.

As the full set of skills seldom resides in any one individual, the educational outcomes should be directed to develop both sets in an optimum manner.

2.1.5.2 Informal training

In Europe, the training of entrepreneurs beyond formal education has been studied extensively. Johannisson in his paper at IntEnt 92 (Klandt et al 1993:96) suggests that the *practice* of entrepreneurship must also be the generic training ground for entrepreneurship. He proposes the following key points of departure for a training strategy for entrepreneurs:

- Entrepreneurs should be provided with contexts for self-organised learning, not just with training programmes which are planned in detail;
- Entrepreneurial training should be integrated with everyday business operations;
- The personal network of the entrepreneur should be mobilised during the learning process; and
- Formal education must be actively mediated in order to become an integrated feature of the entrepreneurial company's rationale.

Business simulation games as an entrepreneurship training aid were developed in the early 1990's. The business game 'Eva' (Klandt et al 1993:192), which simulated the start-up and early development phase of a software firm, was used in the entrepreneurship education of a range of groups including business students, engineering students, employees, executives and real entrepreneurs. Similarly, computer-based methods, artificial intelligence and multi-media systems have also been applied successfully in training and educational programmes for entrepreneurs in Europe (Klandt et al 1993:201). Schumacher & Summers (2001) also explore management simulations as an ideal change agent or teacher and concludes that it facilitates learning without risking the business itself.

One of the main challenges facing policymakers and educators in South Africa is the urgent need to train and bring into the economic mainstream the so-called 'lost generation' of South Africans whom have been relegated to the mass of illiterate, semi-illiterate, unskilled and therefore basically unemployable group of inhabitants (Klandt et al 1993:333). Nortje (in Klandt et al 1993) in his paper entitled 'A

training concept for entrepreneurs' at the IntEnt 92 proceedings, outlines five phases of basic training of entrepreneurs, starting with functional literacy in the mother tongue to the more advanced 'B' and 'M' phases, where business skills training and mentorship and guidance are provided for entrepreneurs commencing their own businesses.

2.1.5.3 Government initiatives

The role of government on the development of entrepreneurship in developing countries is stated by Tran (1975:12) as follows: *'Scarcity of entrepreneurship has important political significance as well, for, unless capable entrepreneurs come forward in sufficient numbers, the government must necessarily play an increasingly active role in the field of economic development. As agents of economic development, entrepreneurs perform the coordinating function of bringing into existence new enterprises. They create jobs for a growing population, improve terms of trade for local producers of raw materials, turn the country toward industrialization, and free the national economy from dependence by promoting exports'*.

Tran (1975:159) proposes the following strategy for the development of entrepreneurship in developing countries:

- The creation of a substantial market-orientated, profit-orientated sector of the economy;
- The development of a class of indigenous and economically rational traders and craftsmen and the provision of opportunities for the more capable of them to acquire business experience and capital; and
- The provision of opportunities and economic incentives for the indigenous businessmen to move into larger-scale organisations and modern industry.

2.1.5.4 Private sector initiatives

The private sector is, together with the public sector, a major role player in the activities of any modern economy. Where the public sector is the policy instrument whose regulatory influence is primarily of an external nature, the private sector has to influence the economy from within the playing field. Being an active participant in the competitive markets, both locally and internationally, the private sector is on many occasions at a disadvantage to exert its influence effectively. Own company benefits and profit driven considerations are determining factors when private sector initiatives alone are the driving forces behind for example, entrepreneurial development. The very nature of the benefits that are to accrue to companies from such initiatives carries the label of self-beneficiation, which largely overshadows any national or group benefits that might result from the initiatives. The embedded difference between the driving mechanisms of these two sectors and the interdependence between them, make co-operation between them of critical importance. Acceptable limits of government regulation are difficult to determine and too much interference can eventually blunt private initiative and result in an increasing bureaucratisation of the private sector.

In a country such as South Africa, co-operation between the public and private sectors is severely impeded by certain politico-economic factors (Falkena 1980:74). With its diverse cultural composition and rich political history, public sector dominance by certain cultural groups is a common phenomenon. In the apartheid era, the public sector was dominated by the Afrikaans speaking population, with the English speaking fraternity resorting to participating in the economy through the private sector. In the post apartheid era, the situation has changed dramatically. Within the first decade of political supremacy representatives from previously disadvantaged population groups are dominating the ranks of all levels in the public sector.

2.1.5.5 Small, medium and micro enterprises

The role of small enterprises in the modern economies of the developed and emerging world is unique. Konecna (in Klandt et al 1993:298) sees the uniqueness of small enterprises as follows: *‘They represent an element of competition and*

counter monopolistic tendencies, provide consumers with a broader choice and push prices down. Their great flexibility drives them towards innovations and structural changes. Small- and medium-sized enterprises can effectively meet individualized demand and specific needs. Due to their flexibility and adaptability to change they are well equipped to deal with market fluctuations. The experience of foreign countries has shown that, in the periods of recession, they can partly outbalance the increase of unemployment’.

Despite their flexibility, simple structures and other attributes, SME’s also have a number of disadvantages such as limited access to capital, higher unit production costs due to economics of scale implications, limited research and development capabilities, small and unreliable markets, limited foreign trade abilities and limited marketing and promotion budgets. If their importance as a key role player in the economic growth of a country is accepted, then it becomes a primary function of government institutions and policy making authorities to do everything in their power to remove these barriers and obstacles in order to create a fertile environment for SME prosperity.

In the 1990’s, national governments of both the developed and emerging worlds recognised the importance of the small and informal business sectors in the economic growth of modern economies. Their contribution to job and wealth creation were acknowledged to the point that special public policies and legislation were introduced to address the specific environment in which these enterprises operate. The trend was to classify these sectors according to enterprise indicators such as performance, size, investment capacity and employment category. The most accepted and widely used terminologies used in this regard are Small, Micro and Medium Enterprises (SMME) or simply Small and Medium Enterprises (SME). Another terminology that is used by the Indian government is Small, Tiny and Village Enterprises (Awasthi & Sebastian 1996:24). Liu (1998) refers to them as small and medium businesses (SMB’s).

Small and medium-sized firms play a strategic role in the creation of resources and employment. In most European countries they represent more than 99% of all

firms and they provide approximately 75% of employment (Oakey, During & Mukhtar 1999:52).

Worldwide, the most popular method used to define a small business is to use economic (qualitative) and statistical (quantitative) guidelines. The most popular approach is to define SMME's using four quantifiable aspects, namely (Kroon et al 1998:28):

- Turnover or income: Typically the figure is \$100 000 (services) to \$500 000 (construction and wholesalers) per annum (maximum);
- Employees in full-time service: Less than 100;
- Total assets (excluding property): Maximum \$100 000; and
- Number of business units or branches: Maximum 5.

2.1.5.6 Entrepreneurship and the economy

The importance of entrepreneurs in the economies of the modern world has been recognised by economists in all spheres of society, from the Schumpeterian era to modern students of the global economy. According to Radley (1996:37) *'...entrepreneurial activities are a pre-condition for successful economic growth, development, social well being and political stability'*. Kuratko & Hodgetts (1998:10) state that: *'Economic as well as social contributions by entrepreneurs worldwide made the most significant impact on job creation, innovation and economic renewal compared with the formal sector'*.

The modern inclination to promote 'bottom-up' strategies for sustainable regional development is perhaps the answer to the centralisation of the global economy. Sustainable regional development is not on the global agenda. The view of Cécora (1999:1) provides a clear perspective: *'Independent, innovative, and enterprising owner-managers of small and medium-sized firms are identified as key players in regional development, as contrasted to corporate managers often mistaken in regional development policy for entrepreneurs but who are shown to have many characteristics of bureaucratic, organisational man'*.

A mistake often made by policy-makers in economic development programs, is that sustainable regional development depends largely on their ability to attract exogenous capital into the region. In many cases, induced investments prove to be, outright disadvantageous, especially in the long run. Quite often, internationally mobile investment companies cash in on localised incentives, up to the point that regional markets cease or more lucrative opportunities arise outside the region. In such instances, key personnel are relocated, factory equipment and facilities are moved and subsidiaries are sold off or liquidated, which leaves only bank loans and empty premises. The counter-practice, according to Cécora (1999:1) is the following strategy: *'A very common community development policy for inciting capital investments ('commercial and industrial recruiting') is granting financial incentives (tax rebates, subsidies) to draw investors into target areas'*.

Cécora (1999:3) also refers to 'spontaneous combustion' of entrepreneurship, with the focus of policy makers and economists shifting to the 'indigenous entrepreneur'. They are firmly rooted in their regions and are those least prone to relocation outside of the region. Cooper & Dunkelberg (1987) noted that three-quarters of entrepreneurs do not move from their places of residence when starting their own firms. This, plus the tendency in the developed world such as the USA towards self-employment and smaller, more efficient and controllable businesses, provide fertile ground for the emerging regions upon which to base their development strategies. This perspective is paramount in the literature survey of this study, as it supports the underlying hypothesis that the development of indigenous technological entrepreneurship is a key aspect of emerging regions' success in the modern global economic arena.

Tran (1975:11) defines economic development in emerging countries as *'..the process of overcoming the three main problems facing the developing countries:*

- *technology*
- *employment*
- *export'*.

The relationship between these three factors according to Tran (1975) is the following:

- The diffusion of technology, if adapted to local conditions, increases production, which in turn increases the level of local employment;
- In this process, part of the increased production can be exported for needed foreign exchange earnings; and
- Entrepreneurs, through the institutional framework, play the role of change agents: They form the critical link in the process of technology adaptation, employment creation, and export-promotion to further the course of economic development of the country.

Tran (1975:12) also states the role of the entrepreneur in the economic development process as: *'The entrepreneur is by definition the organizer of society's productive resources and contributes much to economic development. His role is particularly important in developing countries where capital is scarce, investors cautious, and markets severely limited because of low purchasing power'*.

The important role of the entrepreneur in the economies of both the developed and the emerging world is generally supported by the available literature. What is not so clear, is how entrepreneurship with particular emphasis on the technological fraternity, could be enhanced to meet the unique demands of the globalising economy. Cécora (1999:23) refers to the global economy as *'...the sea on which National and Regional economies sail'*.

2.1.6 Technology

2.1.6.1 Technological base

The importance of Small Technology-Based Firms (STBF's) in the hierarchy of SME's has been recognised in recent economic models. SME's have increased their influence upon innovative activities (Acs & Audretsh 1988). Technology is

being increasingly recognised as a strategically competitive weapon, not only in large companies, but also in small enterprises (Oakey et al 1999:52). Typically, a STBF has a disproportionate number of R & D employees (i.e. scientists and/or engineers), is active in a recent or emergent technology (e.g. biotechnology, microelectronics, information technologies), a large need for funds to finance R & D projects, and often links with Universities and/or public laboratories in order to access to new knowledge (Forrest 1990; Dodgson et al 1991).

The accurate and universal classification of firms into high-, medium- or low-technology sectors have been debated over the past decade, without significant agreement amongst role players. The existing classification schemes have focussed on broad aggregate characteristics when classifying individual industries (Oakey et al (1999:186). The Organisation for Economic Cooperation and Development (OECD 1997) proposed a high-tech classification scheme that has certain deficiencies in that it focuses mainly on the manufacturing sector while ignoring the activities of the services sector. Secondly, other classification schemes treat industries as homogeneous entities in which all firms within an industry are treated as if they share the same key characteristics. Baldwin & Gellatly in their efforts to develop a more accurate high-tech classification scheme (in Oakey et al 1999:184) explore the notion of 'technological prowess' as a measure of a firm's technological capacity. The following existing concepts used to classify industries, their weaknesses and their influence on technological prowess, are tabled by them:

- Intensity of R & D as a measure of technological prowess;
- Innovation as technological prowess; and
- Technology use as technological prowess.

Baldwin & Gellatly (in Oakey et al 1999:190) propose a firm-based approach versus an industry approach as a more accurate classification scheme. Their suggestion is to measure the following firm specific competencies:

- Innovation competencies;
- Technological competencies; and
- Human capital development.

2.1.6.2 Technological innovation

Peter Drucker (2001:27) defines innovation as follows: *'Innovation is the act that endows resources with a new capacity to create wealth'*. Technological innovation was defined by the first OECD study in 1971 as (OECD 1997:24): *'...the first application of science and technology in a new way, with commercial success'*.

Although the definition is somewhat restrictive, the focus in later literature has shifted to the 'process of innovation' and 'innovation activities' and these terms indicate that traditional separations between discovery, invention, innovation and diffusion may be of limited relevance. The report also suggested (OECD 1997:30): *'The innovation process involves the use, application and the transformation of scientific and technical knowledge in the solution of practical problems'*.

Innovation is described in the South African Innovation Survey 2001 (Oerlemans et al 2003:11) as follows: *'Innovation – the introduction of new and/or improved products, services and production processes – is the driving force behind a nation's economic development and the improvement of the competitiveness of its firms'*.

Knowledge as a resource has become increasingly important in the modern business world. Gibbons et al (1994:57) stress the reliance on knowledge itself as a creator of prosperity with the reference: *'Increasingly, there is less and less return on the traditional resources: land, labour and (money) capital. The main producer of wealth has become information and knowledge'*.

One of the paradoxes of modern technological innovation theories, is the concept that 'big is beautiful' in the knowledge and resources era. It is commonly propagated in recent literature that large enterprises have a distinct advantage in the race for technological supremacy. Being big has been particularly regarded as a necessary attribute in knowledge production, with distinct disadvantages for the smaller firms. The view of Tedd et al (1997:247) sums up this school of thought: *'But not all firms can afford to invest in R & D: for many smaller firms the challenge*

is to find ways of using technology generated by others or to complement internally generated core technologies with a wider set drawn from outside'. But small firms have a distinct advantage in certain circumstances, according to Hakan Hakansson et al in their chapter 'The greatness of being small in business networks' (in Okay et al 1999:6). They air the view that there may be many situations where High Technology Small Firms (HTSF's) operate in heterogeneous and multifaceted structures where different actors are bound together in a special way. These HTSF's have unique advantages over their larger counterparts. The viability of the typical HTSF depends on its innovative ability in the short term, and on the development and commercialisation of new products or processes in the medium term. Nathalie Chaillou in Oakey et al (1999:52) sees the typical characteristics and environment of HTSF's as '*... small size, the rapid pace of technological evolution, a lack of management and financial skills, and restricted marketing and distribution resources...*'.

A leading journal in the USA presents an overview of the research published on technological innovation, product development and entrepreneurship over the past fifty years. The authors, Shane and Ulrich (2004:134), decompose the broader subject of innovation into 12 subjects. These subjects are:

- The role of the individual;
- Organizational design;
- Basic research and advancement development;
- Technology strategy;
- Knowledge transfer;
- Product planning and portfolios;
- Development process management;
- Concept development;
- Product design;
- Adoption and diffusion of innovations;
- Public policy; and
- Entrepreneurship.

Eric von Hippel (2005) propagates the *democratization* of innovation in modern day industries, especially in software and information products, as well as in

physical products. At the root of this concept is user-centred innovation processes versus manufacturer-centred innovation development systems, which have been the mainstay of commerce for hundreds of years. Von Hippel (2005:1) proposes the main advantage as follows: *'Users that innovate can develop exactly what they want, rather than relying on manufacturers to act as their (often very imperfect) agents. Moreover, individual users do not have to develop everything they need on their own: they can benefit from innovations developed and freely shared by others'*. He cites examples such as the development of high-performance windsurfing techniques and equipment in Hawaii, library information services and other outdoor consumer products such as mountain biking equipment, abseiling (rappelling) and snowboarding.

2.1.6.3 Technology and the economy

Schumpeter (1936) proposed the premise that economic growth and performance are dependent on the creation of new technology, diffusion of technology and efforts reacted to the economic exploitation of innovation and diffusion. Technological competence is an important determinant of international competitiveness and the differential growth rates of firms (Tolentino 1993:121).

The notion economic growth as it has relevance to this research topic, can be described as *'...a sustained expansion of the productive potential of the economy which – in the long run – converges with the growth of aggregate output'* (OECD 1997:168).

Economists have acknowledged the important role of investment in the economic growth process, not only in physical capital, but also referring to human capital, for several decades. The so-called 'new growth theories' developed by pioneers such as Romer (1987), Lucas (1988), Scott (1989) and Baldwin (1989) (in OECD 1997) have focussed on the economy *'...as being composed of two distinct economic activities: first, the production of goods using capital and labour, as in the standard model: and second, the production of knowledge (i.e. R & D), also using capital and labour'* (OECD 1997:173).

The effect of investment on the productivity growth of a country has also been researched extensively and applied by policy makers, as well as the relationships between technology and the environment, technology and globalisation, technology and competitiveness and of significance to this research, the impact of technology on emerging regions. In this regard, emerging regions are increasingly lagging in the increasingly competitive global markets, due to structural constraints, weaker physical infrastructure and most important of all, underdeveloped human resources.

The work of Romer (1986), in which an equilibrium growth model of endogenous technological change was proposed, suggests that growth is driven primarily by accumulating knowledge. It also reinforces the central role of human resources in the economic development process.

2.1.6.4 Technology transfer

The technological diffusion process follows the technological innovation process, which is part of the transfer of technology from the original developer to other users and applications. The 1992 OECD report of (OECD 1997:48) sees the diffusion process to: *'...include adoption by other users as well as more extensive use by the original innovator'*. The report goes further to propose that (OECD 1997:48): *'...every act of adoption involves certain transformations and is thus an act of incremental innovation in itself'*.

Distinction in the literature is made between disembodied and equipment-embodied technology diffusion (OECD 1997:48). Disembodied diffusion is the process whereby technology and know-how is spread through channels other than being embodied in machinery. Equipment-embodied diffusion on the other hand describes the process in which innovation is spread in the economy through the purchase of technologically intensive machinery and components.

In the disembodied technology diffusion process, where knowledge is spread, two terms are worth mentioning according to Cohen & Levinthal (1989:571). The first is the research spillovers, which is defined as *‘..any original, valuable knowledge generated in the research process which becomes publicly accessible, whether it be knowledge fully characterising an innovation, or knowledge of a more intermediate sort’*. Secondly, the actions of receiving firms and industries determine to what extent innovations developed elsewhere are actually adopted into production processes. This is referred to as the absorptive capacity of the recipients (OECD 1997:51).

Ronald Dore in his chapter on Technological Self-reliance (Fransman & King 1984:65) defines the transfer of technology to developing countries in a pragmatic manner: *‘..getting knowledge that is only in some foreigners’ head into the heads of one’s own nationals’*.

The transfer of technologies from developed countries to the lesser-developed world has contributed significantly towards the development of the technological competencies of these emerging countries. The primary vehicle, through which this transfer occurred in the early stages, is through direct foreign investment (DFI). This culminated in the countries developing their own technological competence and it also stimulated the growth of local technical and entrepreneurial capabilities, which provided major sources of innovation during the more advanced stages of technological development. This led to the development of outwards investments capabilities in these countries, also in terms of physical and human capital, as well as technology.

Various methods are used to transfer skills and technology. Methods include joint ventures, licensing agreements, turnkey plants, technical assistance, subcontracting, patent arrangements and other forms of non-equity investments.

In their article ‘Technology Transfer – Entrepreneurship and the University’, Trune and Goslin (1997:905) highlighted the history of the universities in the USA as an agent for technology transfer. Prior to 1980, there were no incentives for universities to claim commercial rights on technologies developed through their

efforts. Legislation changed in 1980 through the Dole-Bayh Act, which gave patent rights to universities and thus expanded technology transfer from the university to commercial entities. The result was that technology transfer generated \$265 million in royalties for USA universities in 1994. This affirmed the important role of universities as both research institution and the incubator for these technological innovations which brought products and services to full commercial exploitation. The possibility of income generation has caused many university administrations to openly encourage entrepreneurship activities within the academic environment.

Deeply rooted in the transfer of technology process, is the influence of the previous organization on the transfer process itself and on the new innovation. Moorman and Miner (1997:91) explore the impact of organizational memory on new product performance and creativity. They (Moorman et al 1997:93) define organizational memory as '*...collective beliefs, behavioural routines, or physical artefacts that vary in their content, level, dispersion, and accessibility*'. They further propose four dimensions of organizational memory and explore the interrelationships between them. These four dimensions are:

- Organizational memory level;
- Organizational memory dispersion;
- New product short-term financial performance; and
- New product creativity.

They conclude as follows (Moorman et al 1997:91): '*These findings provide some initial evidence that knowledge is not an unconditionally positive asset and suggest that developing and sustaining valuable organizational memory may require attention not only to the appropriate levels of memory but also to managing subtle aspects of memory dispersion and deployment*'.

2.1.7 Technological entrepreneurship

2.1.7.1 Developed world

The history of technological entrepreneurship in the developed world can be traced to a symposium on Technical Entrepreneurship that was held at Purdue

University in the USA between 7 and 8 October 1970. The proceedings described the symposium as ‘...*the first time that those doing research on the founding of high-technology firms had gathered together to exchange findings and observations*’ (Cooper et al 1972).

In research findings presented at the symposium in 1970, Susbauer (1972) presented the profile of the technical entrepreneur in Austin, Texas as follows: ‘*The technical entrepreneur, at least in this university spin-off environment, is likely to be relatively young, have gained a wide degree of experience in several companies, including marketing and contract administration. He has moderate to high education, and he probably had close relatives with entrepreneurial experience. He is more likely to form his company today in combination with a group whose talents compliment his own, and he probably views company formation as relatively riskless*’.

Shapero (1970) at the same symposium described the technical formation process in terms of the following elements:

- The technical entrepreneur;
- Source of technical entrepreneurs;
- The triggering event or situation;
- Phases and factors;
- The first phase – the company formation;
- The second phase – accumulation and incubation period;
- The third phase – sustained growth;
- Sequence and mix of industries;
- Differentials in rates of formation;
- Company growth; and
- Community factors.

It is interesting to note that several of these elements identified by Shapero in the early seventies, still occupy later theoretical models.

The most significant contribution to the present understanding of technological entrepreneurship is the research work done by Edward B. Roberts in his book entitled ‘Entrepreneurs in High Technology: Lessons from MIT and Beyond’ (1991).

In the book, his research findings of nearly thirty years on the formation of technology-based companies in the Greater Boston area and in particular Route 128, Massachusetts, USA are presented. The research includes studies of spin-off companies founded by MIT staff as well as independent companies, studies of personal characteristics of technological entrepreneurs and studies of high-technology financing. The work on the entrepreneurial profile and development of technological entrepreneurship is of particular importance to this research project, as it forms a major part of the theoretical basis of the research objectives. *In essence, the work of Roberts (1991) in identifying a typical profile for technological entrepreneurs in developed regions will form the benchmark against which the research findings of this study will be tested.* The model developed by Roberts for the development of technical entrepreneurship, which is discussed in depth in Chapter 3, is also one of the key building blocks of the proposed model for this study. It is therefore appropriate to mention the following extracts of Robert's (1991:27) most significant research findings:

- Entrepreneurs are very likely to have had self-employed fathers;
- First-born sons are not more likely than their siblings to become high-technology entrepreneurs;
- Entrepreneurs are not all alike; they display wide ranges of personalities, motivations, and goals for starting new enterprises;
- Initial capitalization is typically very small and provided from the entrepreneurs' personal savings;
- Widespread deficiencies in business plans and in team composition hurt the new enterprise's ability to raise 'outside' capital;
- Family background has no impact on entrepreneurial success: Successful entrepreneurs are made, not born!
- Prior supervisory, managerial, and especially sales experience by founders contributes to successful enterprises;
- Entrepreneurs with a high need for achievement are more likely to succeed;
- Multifounder teams generally perform far better than single founders;
- The more technology transferred initially from the entrepreneurs' 'source' organisation, the greater the eventual success;
- 'Founder's diseases' are widespread; and

- The future for high-technology entrepreneurship in the USA and the world is very promising.

The Canadian Academy of Engineering (1998) broadly defines technological entrepreneurship as ‘...*new enterprise formation based on innovative technology in response to clearly identified market needs*’”. Interesting to note, is the prerequisite of ‘innovative’ technology versus technology per se. This sentiment is not found in all the definitions of technological or technical entrepreneurship.

Drucker (2001:238) refers to ‘high-tech entrepreneurs’ and compares their importance in the job creation hierarchy to that of the lesser technologically based sectors. His remark is particularly significant to create an understanding of the inter-dependence of high-technology entrepreneurship with the other categories. Drucker says that ‘...*to have high-tech entrepreneurship alone without its being embedded in a broad entrepreneurial economy of ‘no-tech’, ‘low-tech’, and ‘middle-tech’, is like having a mountain-top without the mountain*’.

Drucker (2001:239) also refers to high-tech entrepreneurship as being the leading edge, but emphasises that there cannot be an edge without a knife. In other words, there cannot be a viable high-tech sector by itself and it is most unlikely for a country to be innovative and entrepreneurial in high-tech without an entrepreneurial economy.

Apart from the contribution that Roberts (1991) made in his work on the background and profile of technological entrepreneurs in the developed world, he also researched the various sources for early stage seed capital and venture capital funding for the technology based enterprise (Roberts 1990). His later publication (Roberts 1991) explored venture capital decision-making in the technological domain from various perspectives. More recent contributions came from Thomas Astebro (2004:314) whose research findings on key success factors for the assessment of R & D projects of technological entrepreneurs are presented in the form of a success prediction model with four main characteristics namely:

- Expected profitability;
- Technological opportunity;

- Development risk; and
- Appropriability conditions.

Contributions to the specific literature on technological entrepreneurship have also been made by the following authors, both in developed and developing regions:

- Astebro (1998) explores the success rates and profits for independent investors in technology-based ventures in Canada;
- Burke et al (1998) describe the development experience of technological entrepreneurship in China;
- Carayannis et al (1997) investigate early seed financing strategies for technological entrepreneurs in the south western USA; and
- Liu (1997) presents findings of research on technological entrepreneurship in Taiwan's industrial development.

Although these contributions enhance the body of knowledge on technological entrepreneurship, no benchmarking with Roberts' (1991) model which he developed for the MIT case study, could be found. Specific aspects of Roberts' research are addressed by other authors such as the financing of early-seed technological ventures (Astebro 1998, Carayannis 1997), while the technological entrepreneurship environment of particular countries is explored by Burke et al (1998) and Lui (1997). No other empirical studies could be found that significantly modify the model of Roberts as far as environmental influences on the technological enterprise or the technological entrepreneur's family background and education are concerned. The argument whether Roberts' model will apply to emerging regions is therefore a valid basis for the research questions asked at the outset of this research project.

2.1.7.2 Emerging world

Studies have shown that firms from emerging countries with high levels of indigenous technological capabilities have demonstrated their ability to absorb rapidly the more advanced technology generated in the developed world and to catch up in the dynamic process of international investment (Tolentino 1993:120).

The theory of technological competence as seen by Cantwell (1991) suggests that the impact of foreign technology on local development is dependent upon the level of domestic technological competence. The indigenous technological capabilities of a nation are therefore of particular relevance to this study, as it is a fundamental building block of the technological entrepreneurial capability of a nation or country.

The body of knowledge on technological entrepreneurship in the emerging world is not well developed. Research studies have been recorded for only a handful of countries, and there are often general studies which have little reference to the entrepreneurial profile of the technological entrepreneur. Furthermore, few empirical studies have been done on the training and education of technological entrepreneurs in the developing world.

In China, studies were done on the influence of economic policy on the fostering of technological entrepreneurship, as well as the effect of technological entrepreneurship on job creation (Burke, Boylan & Walsh 1998). Their research has highlighted the exceptional difficulty of finding available financing commercialising technologies and the inherent proclivity of the Chinese people for capitalism and entrepreneurial activity.

Similar studies by Koekemoer & Kachieng'a (2002) on financing technology-based enterprises in South Africa emphasise the importance of venture capital as a critical success factor in the technological enterprise formation process. The critical role of government regulation and participation in the creation of a conducive environment for technological innovation, plus the commercialisation thereof, is highlighted.

The issue of technology transfer in developing countries is addressed by Ahmadi & Qassemzadeh (1997) in their paper presented at the PICMET 1997 Conference where they suggest that there is not a single policy option that can be prescribed to all developing countries for the technology transfer process. They argue that *'...several factors contribute to effective policy implementation, which include proper balance between the capital, and work force along with socio-cultural infrastructure and work habits of the recipient country'*. Perhaps the most

significant relevance of their paper lies in their remark that we cannot explain the differences of regions or societies in technological innovative capabilities '*...by tendencies which have their roots in socio-cultural infrastructure, religion, race, or geographical locations etc.*'. They argue that, while certain research results show innovation and the 'spirit of entrepreneurship' lies at the root of technological innovation and economic development, the conditions leading to such innovations in a given society are not fully known. This argument is of paramount importance to this research study as one of the main research objectives of this project is indeed to get a *better understanding of the socio-cultural influences on the process of technological entrepreneurship in developing regions.*

Plenert (1997) at the same 1997 PICMET Conference, explored whether ethical considerations are culturally specific in international technology transfer processes. He came to the conclusion that ethics are definitely cultural specific and that there are many ethical systems in the world, each having their own strong and weak points. The key to being successful in a cultural-ethical integrated model is compromise. This underlines the fundamental and influential role that socio-cultural influences play in the technological domain.

2.1.7.3 Technology incubators

The science parks phenomenon, which is the forerunner of business incubators, has its roots in the USA according to Kung (1995). Dating back to the 1950's, science parks were established to meet the needs of entrepreneurial-minded academics. The Stanford Research Park in California, established in 1951, is often regarded as the genesis of the science park movement. By 1960, there were six science parks in the world, of which five were in the USA and one in the former Soviet Union. Denmark, Australia, Canada, France and Israel followed in the 1960's, with Sweden and the UK to establish their first in the 1970's (Oakey et al 1999:246). In the past two decades, science parks were also established in Belgium, Japan, Korea and Taiwan and by the 1990's this had resulted in a total of 50 projects in 13 countries (Kung 1995). Most of the European and other parks

were based on the American model, and later adapted to local conditions and requirements.

Originating from the science park model, a need by entrepreneurial USA Universities to play a more direct role in supporting new business development activities emerged. One mechanism to meet this need was the establishment of business incubators, where the emphasis has shifted to the further development of the innovations into commercially viable entities (Main 1994). Kung (1995) identified as many as 188 Innovation Centres, 57 Business Incubators and 103 Science parks world-wide in the early 1990's.

If research studies on the subject are analysed, five different terms are used to describe the various forms of science parks or business incubators – business parks, innovation centres, research parks, science parks and technology parks (Oakey et al 1999:246). The term business incubator is equivalent to the innovation centre and was formalised by Smilor & Gill (1991).

Dahlstrand in Oakey et al (1999:247) classifies the study subject into the following four categories:

- Research Parks, which are closely linked to Universities;
- University Science Parks;
- University and Industrial Incubators; and
- Business (or commercial) Parks.

Cooper and Folta (2000) explore the formation of high-technology clusters and the reasons why they start where they do. They define clusters as '*groups of firms within one industry based in one geographical area*' or alternatively as '*geographic concentrations of interconnected companies and institutions in a particular field*' (Cooper et al 2000:348). They argue that location does seem to make a difference, both in influencing the formation of new firms and in their subsequent performance. They conclude that it is ironic that geography has re-emerged as important at a time when instantaneous global communication is possible. A number of unanswered questions remain, which need to be addressed to add to

the present understanding of clusters and their role in the formation and development of new firms.

2.1.8 Technology in emerging economies

2.1.8.1 Technological capabilities of emerging countries

The post-war European experience, where countries were reconstructed primarily by importing foreign capital and capital goods, enabled these countries to rebuild their shattered economies in relatively short periods of time. The experience in developing countries however, was less encouraging. The mere import of foreign capital was not sufficient to achieve the same results and even with abundant natural resources and suitable labour, the emphasis was shifted in development drives to export technology, or 'know-how', to these countries.

The disparity between the technological capabilities of the richer and poorer countries became more evident as technological development progressed. As many of the major innovations in Western technology have emerged in the capital goods sector of the economy, underdeveloped countries with little or no organised domestic capital goods sectors simply have not had the opportunity to make capital-saving innovations because they have not had the capital goods industry necessary for them. Such countries have typically imported the capital goods and they have not developed the technological base of skills, knowledge, facilities and organisation upon which further technical progress largely depends (Rosenberg 1976:146).

Fransman et al (1984) also argue that the focus of study in the technology transfer process prior to the 1970's was on the problems associated with the technology transfer between countries. These problems related typically to cost, suitability and effectiveness of the technology transferred. In addition, the technology itself was often not suitable for local resources, conditions and objectives and it often operated in an inefficient way in the recipient country.

Inherent in the policies of the time, but which was seldom stated openly, was the assumption that the process was driven by the extremely poor technological capabilities of the recipient countries. It was only in the late 1970's that the assumption about the weak technological capabilities of the emerging world was being challenged. The focus of attention shifted to the examination of technological processes and change in these countries. Researchers became increasingly interested in what happens to the technologies once they were imported and assimilated. A lot of energy was directed to the processes involved in the mastering and adaptation of this technology in the recipient countries. It was increasingly realised '...that technology was implicit, in the sense that the seller always possessed more information about its use than could be embodied in blueprints, training etc. transferred to the buyer and that its transfer accordingly involved a significant degree of uncertainty' (Fransman et al 1984:5). Fransman et al (1984:9) define technology as follows: '*..technology is defined broadly so as to encompass everything pertaining to the transforming of inputs into outputs. Technological change involves change, however minor, in the way in which inputs are transformed into outputs, including changes in the quality of the output*'.

Frances Stewart in his paper 'Facilitating Indigenous Technical Changes in Third World Countries' (Fransman et al 1984:81) identifies the three areas that have the most significant effects on the indigenous technological capabilities at national level. These three areas are:

- *National policies* including:
- Trade policies towards the import of goods and services and the import of technologies;
- Industrial policies to enhance local and international competition;
- Economy wide policies to encourage incentives for local technical change, to introduce mechanisms for technology transfers from abroad, to set-up local linkages, to develop macroeconomic policies and to address the issue of monopolies/oligopolies versus competition;
- Institutional policy in the relationship between R & D institutions and the productive sector;
- Training and education;

- *The political economy of creating local technology;*
- *Alternative theoretical approaches to technical change* such as:
 - Empirical case studies at micro-level;
 - Neoclassical approach;
 - Political economy approach; and
 - Institutional explanations.

One of the key issues that any emerging country's government faces in determining policies to develop indigenous technological capacity, is the balance between the promotion of indigenous enterprises and the induction of the best technologies from abroad. India's experience in this regard for the period 1950's to 1980's is described by Sanjaya Lall in Fransman et al (1984:225). Lall argues that the 'highly interventionist regime' that characterised the Indian economy in this period, ignored the careful balance required for policies to enable growth and investment by innovative enterprises. The consequence was overprotected technologies and industries, with a resultant inability to sustain moderate rates of economical growth.

The South Korean experience in the 1980's is also worth mentioning. In this example the international economic term 'Direct Foreign Investment' (DFI) was seen as not an important source of investment finance in South Korea (Fransman et al 1984:279). Instead, the level of DFI was promoted as an effective means of transferring technology from industrial countries. However, Korea's industrialisation has been structured around export-led policies, with a strategy to obtain competence through indigenous efforts and 'learning-by-doing'. The purchase of technology through licensing has been of modest significance as the initial source of technology. Instead, more emphasis was placed on machinery imports and turnkey projects, with a significant amount of know-how that entered the country as Koreans returned from study or work abroad. Koreans have been extremely successful in their efforts to assimilate technological know-how and the phenomenal success of this strategy is well documented.

Another emerging country, Brazil, relied heavily on inflows of technology in the form of direct foreign investments, disembodied technology (patents, licenses and

technical services) and capital goods says Fransman et al (1984:317). The Brazilian government counteracted the heavy dependence on foreign technology by the Brazilian economy by giving explicit attention to the role of technology in economic development and to the stimulation of technological development through government policy.

2.1.8.2 The role of science and technology in emerging countries

The importance of technology and science in any country's economic growth has been recognised by governments of emerging countries for many decades. As early as 1961, the African ministers of education met in Addis Ababa and published a powerful pledge for investment in education. Twenty-one years later in 1982, the same African Governments issued the Harare Declaration where they confirmed the importance of scientific and technological capacity via education. The following statement reflects the sentiments of the Harare conference (Fransman et al 1984:44): *'Science and technology form the basis of industrialisation; the fact that they can be used as such effective instruments and vehicles of development means that the entire population must be associated with scientific and technological advance, that they must be given pride of place in education..'*

Kenneth King in Fransman et al (1984:31) investigates the role of science, technology and education in the development of the 'Indigenous Technological Capability' (ITC) of what is referred to as the 'Third World' in the paper. Case studies in Africa, Latin America and Asia are tabled where the interaction between learning and technology and the concept of ITC within the third world are explored. The inter-relationship is investigated in the following four modes of education:

- Informal education, local knowledge systems and non-cognitive aspects;
- Formal primary, secondary and tertiary education;
- Formal off-the-job training; and
- Learning on-the-job.

Particular emphasis is placed in the paper on the entrepreneurial activity. King's remark (in Fransman et al 1984:42) is relevant to illustrate the interrelationship between entrepreneurship and technological capacity: *'Whatever the skills imbedded in the local knowledge systems, and whatever the environment, there is apparently another element operating on technological capacity – entrepreneurial activity. Like the search for 'the effective teacher', the analysis of successful entrepreneurship has proved immensely problematic, and yet it looks as if family and community cohesion is a vital non-cognitive aspect of the ITC'*.

2.1.8.3 Technological colonies

The concept of technological colonies was discussed by De Wet (1995) in the working paper *'Emerging from the Technology Colony: A view from the South'*. The notion that, even though many developing countries gained political independence after World War 2, they still remained 'technological colonies' due to their dependence on foreign technologies, imported innovations and technical expertise. Despite the fact that manufacturing of relatively high-tech products were transferred to developing countries, either as part of foreign direct investment programs or due to low-cost factors such as labour and natural resources, most of these products were made under licence agreements or protected by patents. This resulted in limited stimulation of indigenous technological capabilities such as R & D programs and the development of local technological entrepreneurship. It is estimated that in the case of South Africa, more than 80% of the value in industrial business (for the 1990 period) was done under foreign licence. The drive in several of these emerging countries have been primarily focused on obtaining technological independence and De Wet suggests five strategies for the naturally rich 'colonies':

- Backwards integration through the product development life cycle;
- Beneficiation, which is the increased value-adding to raw materials before they are exported;
- Solving local infrastructure problems;
- Clustering of industries and services; and

- White space initiatives, where the drive is to establish new industries and ventures where none existed in the country before.

The South African Innovation Survey 2001 (Oerlemans et al 2003:11) also confirms that South Africa can be characterised as a type of technological colony, whose industries are dependent on foreign technology for the improvement of its products and processes.

The paper presented by Buys (2004) at the IEEE Africon 2004 Conference explored the innovation capability of South Africa within the context of a technological colony heritage and compared it to the innovation benchmarks used in Europe.

2.1.9 Entrepreneurship in emerging economies

In order to understand the fundamental and underlying principles of entrepreneurship in emerging countries, it is necessary to review the literature of research studies available on this topic. The following countries fall in this category and the available literature on entrepreneurial development are summarised as follows:

2.1.9.1 Nigeria

Nigeria was created as a British colony between 1898 and 1914 with treaties between England and France. During the sixty years of colonial rule following the creation, the indigenous political systems within Nigeria were virtually undisturbed, but the economy became more capitalistic and much more productive with increased trade in crops and cattle between the north and south (Oduşina 1973:5). It was however, in the social system of this country that many far-reaching changes were affected during the period of colonial rule. Christianity and Western education were introduced in the southern part of the country and the inherent work ethic of sweating from 'sun-up to sun-down' gave way to the leisurely, white-collar manner of life as the mark of success. Monogamy was part of the

Christianity package and literacy was seen as a measure of civilisation, although technical education was not encouraged at all (Odusina 1973:6). In the northern part of the country, the social systems were left virtually untouched. The Islamic culture remained dominant and the practice of quadrigamy and wives in 'purdah' almost completely eliminated women from the nation's economic production activities.

At the beginning of Nigeria's independence in 1960, the social class consisted mainly of graduates in the liberal arts and human sciences, with a limited number of engineers, doctors, scientists and technologists. There were few productive industrial establishments and most of the commercial banks, marketing and wholesale business activities of industrial goods were under the control of foreigners. The agricultural sector was controlled by quasi-government agencies and was mainly stimulated by export of crops like cocoa and peanuts to the lucrative world markets. The developing nation of 80 million people (1973 Nigerian National Census) was characterised by a lack of creativity, managerial and technological expertise. The Nigerian government introduced a National Development Plan from 1970-74 with as principal objective to '*...establish Nigeria firmly as: a united, strong and self-reliant nation; a great dynamic economy; a just and egalitarian society; a land of bright and full opportunities for all citizens; and a free and democratic society*' (Odusina 1973:10).

The training model proposed by Odusina (1973) was titled TIPS and GEM – 'Training for Increased Profits' and 'Greater Efficiency in Management' – and it was tailored to the needs of the small entrepreneur in Nigeria. The model further used the term 'course-aids' rather than 'curriculum' and the model was based on the following three approaches:

- *The Concept Approach* where "*...course-aids are selected on the basis of promoting learning through concepts; where the broad ideas constitute internalisation through mental imagery; where a concept is a summariser of experience; an invention of the mind to explain and classify perception – shape, colour, size etc.*" (Odusina 1973:79).
- *The Process Approach* refers to the construction or selection of course-aids to specifically achieve the learning of fundamental skills needed in scientific activities. The philosophy of the approach is '*..that such skills should be*

separately learned as curriculum essentials which facilitate the understanding of most educational challenges, foster self-reliance and promote creativity' (Odusina 1973:80).

- *The Life-living Approach* that makes use of the first two approaches together in a comprehensive and tailored way. The philosophy of the approach is to use living experiences to socialise the learner and to live from the inside out, from his/her immediate environment to the world at large.

Perhaps the most significant relevance of the research done by Odusina is his characterisation of the personal attributes and habits of the average Nigerian business person (1973:130), whom Odusina describes as follows:

- He is a complacent 'conspicuous consumer';
- He is individualistic in acquisition;
- He is customarily socialistic in consumption;
- He is nepotic in environments that are far away from 'home' because of high affiliation needs;
- He is a spender on children's education at any cost;
- He entered business because his quest to become an academic failed;
- He despises agriculture and manual labour;
- He respects status, tolerates power and acknowledges high class as something to aspire towards;
- He is apathetic to political ideologies, but pragmatically sensitive to the effects of political decisions; and
- He sees married status as evidence of maturity and views parenthood as a 'mission' that must be accomplished for social respect.

Reference to this profile and the relevance thereof to the environmental influences on the development of the entrepreneur in a developing environment will be made later in this study.

Another study that contributes to the understanding of entrepreneurship in developing countries is the work of Nafziger (1977) entitled 'African Capitalism: A case study in Nigerian Entrepreneurship'. The study focuses on the footwear manufacturing industry in Nigeria, which consisted largely of indigenous firms and technology. The findings of the study are summarised as follows:

- The education level of entrepreneurs is higher than the education level of the population as a whole. It was found that the sample of entrepreneurs had completed an average of 7.1 years formal education successfully versus the 4 years of the rest of the population;
- There is a positive relationship between the entrepreneurial education and the value of output of the firms in the survey sample. Entrepreneurs in larger firms had an average of 10.5 years of formal education versus the 6.7 years formal education of entrepreneurs in smaller firms; and
- There is a significant negative relationship between entrepreneurial education and profit rate among the survey sample firms. Entrepreneurs in the low percentage profit group (-18% profit rate) had 13.5 years formal training versus the 6.0 years of the high profit group (13% or more profit rate).

The first two findings concurred with findings of other economical studies, but the latter finding was contrary to other research results and popular belief in the entrepreneurial literature. The study also concluded that the lack of previous entrepreneurial or managerial experience was a major barrier to success among entrepreneurs in large industries (Nafziger 1977:183). In conclusion, Nafziger (1977:217) proposes the following focus areas for the development of entrepreneurship in Nigeria:

- Training programs;
- Direct entrepreneurial assistance to small firms;
- Industrial extension centres;
- Industrial estates;
- Small loan agencies;
- Training in large firms;
- Management institutes and schools for large firms;
- Technical education;
- Academic education;
- Apprentice standards;
- Economic data and their utilisation;
- Research and development;
- Banks;
- Nigerianisation and foreign firms;

- Policies towards multinational corporations;
- Joint foreign-indigenous enterprises;
- The reservation of industrial sectors for Nigerians;
- Foreign managers and consultants;
- Government assistance in obtaining foreigners;
- Foreign experience;
- Tax-subsidy policies;
- Tariff policy;
- Government attitudes and capabilities;
- Entrepreneurship in government;
- Anti-monopoly measures; and
- Achievement motivation training.

2.1.9.2 Former East Germany

The transitional state of entrepreneurship education and training in the post-socialist Eastern Germany was presented at the first Annual Global Conference on Entrepreneurship Research held at Imperial College, London in February 1991 (Birley et al 1992:37). The author of the paper 'Entrepreneurship in an economy in transition: Perspectives of the situation in the ex GDR', Thomas Köllermeier, argued the appropriateness of existing models for the analysis of entrepreneurship in an economy in transition. He did so under the following main categories:

- In the historic development of East Germany after the Second World War, the Soviet Union started to nationalise private firms in accordance with the communist ideology of the ruling party at the time. The so-called VEB or state-owned companies were formed. In addition, the government started to combine some of the VEB's into large-scale enterprises called 'Kombinate', which ultimately led to a strong concentration of the structure of the economy;
- Forty-five years of different policies created a vast inherent difference between the centralised economy of the eastern part and the profit driven, decentralised free economy of the western part;

- Typical problems encountered were to estimate the number of potential entrepreneurs accurately and the distinction between entrepreneurial ventures and small businesses;
- The behavioural approach seems to be the more appropriate method to study the process of venture creation than the trait approach. The paper propagated the focus on the ‘activities’ of the entrepreneurs and ventures that successfully survive the time of reconstruction and started to grow, versus the search for the ‘ideal’ entrepreneur under these circumstances;
- The framework suggested for the research design of entrepreneurship in a transitional environment comprises a model of four dimensions as indicated in Figure 2.3. These dimensions focus on activities, but also refer to historic facts. They stem predominantly from the behavioural approach, but also represent a few concepts from the trait approach; and

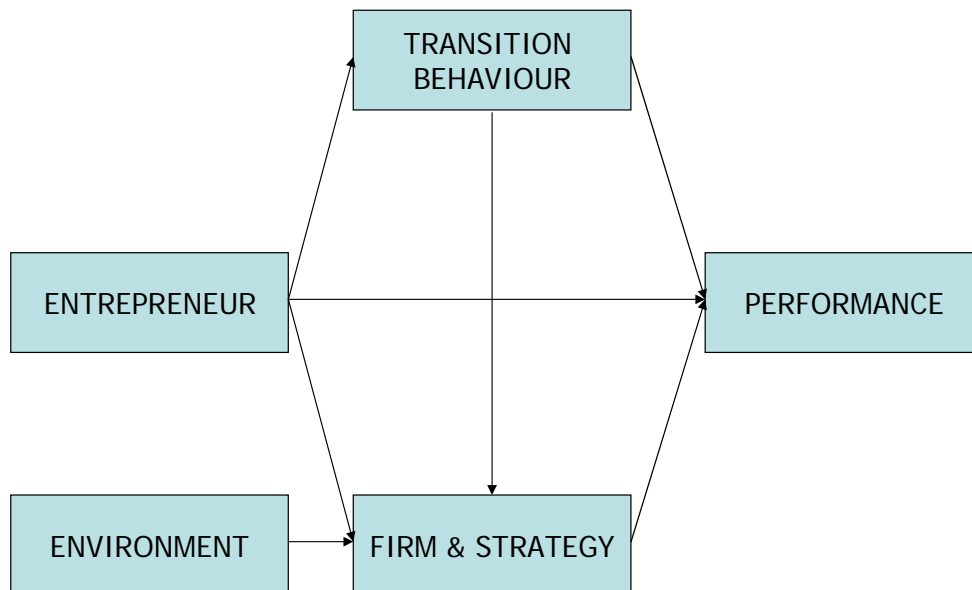


Figure 2.3: Interrelation of Venture Dimensions and Performance

Source: Birley et al (1992:51).

- The traditional theories of entrepreneurship and small business management are predominantly based on relatively stable environments with abundant resources and role models. They fail however, to capture specific aspects of entrepreneurs who operate in an economic environment that is in transition, or entrepreneurs who operate in a difficult environment with minimal resources.

In summary, the paper proposes a customised model for the research of entrepreneurship in transitional economies such as the former East Germany. This model has been significant in terms of theory building in the study of entrepreneurship in emerging economies, which can also be categorised as economies-in-transition.

2.1.9.3 Singapore

The Malay community in Singapore is one ethnic group that is lagging behind other groups, particularly the Chinese and Indians, in terms of economic development in Singapore today (Birley et al 1992:89). Since becoming independent in 1965, Singapore has made great strides in economic development. According to the 1980 census, the population of Singapore is made up of 76.9% Chinese, 14.7% Malays and 6.4% Indians. But the distribution of opportunities and economic rewards show that Malay participation is lagging behind those of the Chinese and Indians. In analysing the reasons for this phenomenon, Chong Li Choy and Abdul Jalil Ismail (Birley et al 1992:90) conclude that the Malays in Singapore are caught between present day Singapore and their traditional socio-cultural system. While this may be true for all communities within Singapore, the contrast between modernity and traditions of the Malay group is stark in comparison to the other groups. The Malay community has remained rooted in their past traditions and did not adapt to the modern urban, industrial and commercial society at the same tempo as the Chinese and Indians. In their research, Choy & Ismail (Birley et al 1992:97) proposed the following reasons for the lack of entrepreneurial activities within the Malay community:

- The influence of Islam in the daily activities of Malay Singaporeans is dominant; wealth is not considered to be essential for salvation, nor is wealth

proof of social or moral worth. Achievement in economic terms and in particular in entrepreneurial activities is unacceptable within the dominant Malay social structures;

- Lack of incentives to save or gather financial collateral within the Malay culture is a further stumbling block in the attainment of capital for new ventures;
- Lack of expertise due to the poor educational system and the lack of entrepreneurial tradition in the Malay culture; and
- Lack of opportunities created for Malay business development, is one perception of Malay entrepreneurs.

In summary, the lack of cultural tradition and a value system that supports an entrepreneurial ideology are evidently the underlying reasons for the problem of Malay participation in entrepreneurial activities in modern Singapore. A community-based entrepreneurial development approach is proposed to address the problem, with emphasis on improved education, perceptions within the family unit, the social status of entrepreneurs in the community and the creation of role models.

2.1.9.4 Vietnam

In a study of the importance of entrepreneurship in the economic development of the Republic of Vietnam (commonly referred to as South Vietnam) and the effect of public policy on the rate of flow of entrepreneurial talent into the economy, Tran (1975:96) came to the following conclusions:

- Entrepreneurs from 'outside' (Chinese and North Vietnam) are more successful than local or indigenous entrepreneurs;
- Entrepreneurs from Christian beliefs, in proportion to their numbers, account for as many as four times the entrepreneurs as from Buddhist beliefs;
- Secondary education (Baccalaureate degree) is associated with the most successful entrepreneurs;
- The profile group of entrepreneurs are between twenty-four and fifty-two years of age; they have been relatively successful in employment; they have been

highly mobile in terms of their occupational background and they come from a variety of trade or skill backgrounds;

- A high economic status of the father is a major factor related to a high degree of entry into entrepreneurial activity by the children;
- Pecuniary motives are the overwhelming reasons for entering business, followed with family traditions and the need to be independent;
- Lack of working capital was given as the greatest difficulty of entrepreneurs, followed by the lack of confidence and the mistrust of the suppliers and customers; and
- Entrepreneurs look first to their relatives for help, counsel, initial capital, partnership formation and employment.

The research findings of Tran also addressed the important issue of public policy and its effect on entrepreneurial response. He tables the following key findings in this regard (Tran 1975:142):

- The importance of political factors in the economic structure of Vietnam and the identification of two types of entrepreneur-politicians: first the individuals who were successful entrepreneurs prior to entering politics and secondly those who entered politics from non-entrepreneurial backgrounds. Both these groups used politics to further their own pecuniary motives;
- The majority of manufacturing entrepreneurs rely on their own experience and knowledge to choose their product, but prefer to rely on foreign technicians to choose the technology to be used. They rely very little on governmental assistance in their choice of technology;
- Entrepreneurs indicated that they would only enter the export field if the government provides the motivation, incentives, and assistance;
- Entrepreneurs blame the government for lack of economic growth due to its alleged corruption, favouritism, lack of continuity and uniformity in public policy, lack of adequate support to industries, inability to prevent inflation and monetary instability and for capital flight as well as the negative role of state enterprises;
- Entrepreneurs are favourable towards foreign investment, as long as it is not 'exploitative' or 'colonialist'; and

- Opportunities are characterised by low investment and entrepreneurs favour endeavours with simple technological requirements.

2.1.9.5 Soviet Union

The Soviet Union has experienced significant difficulties in their post-1990 drive to move away from bureaucratic dominance in the economy and to decentralise the ownership of businesses. In a case study on the management of transition by a Soviet State firm in the publishing industry, which is viewed as typical of the Soviet situation, three important issues of global entrepreneurship are raised by Birley et al (1992:104):

- Conceptualisation of firms as entrepreneurial;
- Introduction of environmental variations to entrepreneurial firms; and
- The structure and composition of stakeholders.

Similar research questions to those raised in the analysis of the former East German transitional economy are posed in this case study. Fundamental to this issue, is the question: *To what extent is the Western model appropriate for understanding entrepreneurship in countries that have moved from centralised economic planning to that of a free market?*

2.1.9.6 India

India has done significant ground-breaking work on the implementation of Entrepreneurship Development Programmes (EDP's), which began as an experiment by Gujarat State Industrial Corporation and which gained momentum at national level in the early seventies (Awasthi et al 1996:14). This led to the creation of Centres for Entrepreneurship Development (CED) in 1979 and a national resource organisation, the Entrepreneurship Development Institute of India (EDI-I) in 1983. At present a large number (about 686) of institutions and organisations are engaged in conducting a variety of training and research activities which are directed towards developing entrepreneurship in India. If the

fact that the strategy of training potential entrepreneurs through EDP's constitutes an important policy instrument and that a substantial amount of funds is annually committed to train potential entrepreneurs, a need was felt to undertake a systematic and comprehensive evaluation of the programmes. The study of Awasthi et al (1996:22) based its approach to the assessment of the EDP's on a combination of two approaches. The first approach is to view it as an enterprise-building activity and the other approach is to treat it as a human resource development strategy. Both the approaches are geared towards creating an overall environment where entrepreneurship germinates and grows. Their research results measured the costs incurred in the training activities and the benefits accrued at national level. This is a useful example for other countries to follow.

The EDP's in India can be regarded as a process of 'grooming' entrepreneurs and can be divided into three distinct phases:

- Pre-training phase;
- Training phase; and
- Follow-up phase.

The pre-training phase consists of activities such as centre selection, promotional campaigns, and the identification and selection of potential entrepreneurs for the programme. The training itself mostly consists of a six-week course with three primary focus areas: Firstly the entrepreneur (behavioural traits), secondly the enterprise establishment (decision-making process to set up a new venture) and thirdly the enterprise management (successful and profitable operation of the enterprise). The two most critical training inputs besides behavioural and information inputs are on the issues of opportunity identification and guidance and managerial skills (Awasthi et al 1996:119).

Another significant perspective proposed by Kris Murthy (1997) is the notion of 'autopoiesis', which is the Greek word for 'self-production'. It is referred to as the new paradigm of self-organisation and spontaneous phenomena in physical, biological and social systems. It is defined by Murthy (1997:67) as '*a process for the production of order according to some plan*'. India as an emerging economy

suffers from symptoms such as a lack of global perspective/vision, inferior quality products, the myth that India is a low-cost centre and the lack of a level playing field. Murthy proposes that India, as well as other emerging countries adopt a change in strategic outlook by applying the principles of autopoiesis.

2.1.9.7 South Africa

The general state of entrepreneurial activities in South Africa was discussed briefly in Chapter 1 against the findings of the Global Entrepreneurship Monitor (GEM 2002, 2003 and 2004) program. The most significant contribution of these studies, apart from providing guidance to policy makers in development strategies, is the relative position that South Africa was ranked compared to the position of other developing or emerging countries. South Africa was rated last after five other countries in this category for 2003 (Brazil, Chile, Argentina, Venezuela and Uganda) and was rated last again after the six other developing countries in 2002 (Thailand, India, Chile, Argentina, Brazil and Mexico). South Africa was also last of the four countries in the 2001 GEM report. Earlier studies of the entrepreneurial activities in South Africa can be found in the work of Falkena (1980) in 'The South African State and its Entrepreneurs', as well as Van Daalen (1989) in 'Individual Characteristics and Third World Entrepreneurial Success'. The latter work researched the personality traits of indigenous black entrepreneurs in the former Ciskei region on the southeastern coastal belt of South Africa. Other work mentioned by Van Daalen (1989) included research done by Redelinghuys (1969) on several ethnic groups of entrepreneurs and in particular the Tswana ethnic group, by Hart (1972) also on entrepreneurship in the Transkei and urban areas, by Van der Merwe (1976) on the Xhosa ethnic group, by Churr (1978), by Maasdorp (1978), by Davies (1987), by Booyens (1987), Boshoff & Van Vuuren (1992), by Marx (1992), by Bagshaw (1996), by Nieuwenhuizen & Van Niekerk (1997) and others. Although most of this research data is outdated and bears little relevance to this study, there are some conclusions that are universally true for the country and its historical development. Such is the conclusion of Hart (1972:204) in her remark: *'..the fundamental irrationality of the present legislative framework...; the system represents an attempt to stimulate enterprise in areas*

where a number of major obstacles exist in the economic environment, while prohibiting or placing extremely stringent restrictions on African entrepreneurship in areas which have been shown to be inherently favourable for development’.

The conclusion reached by Van Daalen (1989:104) is ‘*..that the African entrepreneur in South Africa not only has to contend with the usual problems common to most developing economies, but also with the ‘labyrinth of restrictive legislation’ that regulates the status of the African in designated white areas to that of a temporary immigrant*’. This conclusion underpins the inherent cultural heritage of the modern day indigenous entrepreneur in South Africa. The prohibiting legislative and political structures referred to by the authors, are no longer in existence in South Africa since 1994. However, this cultural heritage will have to be addressed in the research design of this study to make the findings representative of a society with this specific historical background.

Significant contributions to the understanding of entrepreneurship in Southern Africa were made by Boshoff, Bennett & Owuso (1992), and Boshoff & Van Vuuren (1992) in their paper ‘Towards understanding the entrepreneurial personality – A South African study’ which was delivered at IntEnt 92. Their research investigated two questions:

- Do successful and less successful entrepreneurs differ from each other in terms of biographical variables, personality traits and interests?
- Do entrepreneurs differ from individuals in other occupational groupings, i.e. state employment and banking, in terms of biographical variables, personality traits and interests?

The research sample included three groups, i.e. central government employees, bank officials and entrepreneurs from the private sector. The most important findings of their research can be summarised as follows (Klandt et al 1993:385): *‘The more successful entrepreneurs and less successful entrepreneurs differ significantly in only one out of the sixteen personality variables measured i.e. superego strength and on none of the fields of interest; In terms of biographical variables like age, marital status, religious affiliation, education and family*

background, no correlation or profile for the successful entrepreneurs could be found'.

Where entrepreneurs were compared with bankers and government employees, entrepreneurs differed significantly from the other groups. The dominant biographical profile of the entrepreneurs emerged as:

- English-speaking;
- Older;
- More likely to be born outside South Africa;
- Male rather than female;
- White;
- Married;
- Not formally affiliated to a religious denomination;
- Less likely to have had tertiary education; and
- Had fathers who were themselves in business or did managerial work.

Although the research findings are not of a generic nature, it is significant both from a comparative and contextual point of view. Their contribution relative to this research study is relevant from two perspectives:

- No other findings on typical entrepreneurial traits in the South African context could be found which did not represent a particular population group only;
- The biographical variables in particular, provide a control model to which research results of this study can be compared with to obtain some level of credibility within the study framework.

Another recent study that is relevant to this research is the work of McKenzie & Turner (2003). Their research focuses on identifying the traits and factors that contribute to entrepreneurs' success within the South African context. They collected data from 26 past finalists of the Ernst & Young Entrepreneur of the Year competition for the past six years and conclude as follows (2003:55):

- Entrepreneurs with the ability to work hard, who had a positive attitude and were prepared to take risks, are more likely to succeed;

- It is unlikely to make an informed decision with regards to what enabled this group of South African entrepreneurs to succeed, based solely on their personalities and traits;
- Formal tertiary education, or the lack thereof, did not play a significant role in determining entrepreneurial success;
- Two thirds of the entrepreneurs indicated that they acted largely on their own in running the business for a number of years after they become profitable;
- When selecting a support team, almost all the entrepreneurs opted for staff who would complement their own strengths and weaknesses;
- Most of the entrepreneurs suggested that their past business failures were valuable learning experiences and did not view them as an indication of personal weaknesses. They did indicate however, that the South African society should develop a more positive view with regards to business failures;
- The majority of entrepreneurs used their own funds, or those of family, to finance their businesses. The raising of funds through traditional lending sectors in South Africa such as the banking sector was seen as a problem for prospective entrepreneurs.

Perhaps the most significant result of this study is the key factors that were identified which hindered the development of entrepreneurial firms in South Africa. These key factors are:

- Lack of the education system to expose school leavers to sufficient business knowledge;
- Gearing of the education system towards developing corporate skills rather than entrepreneurial skills;
- Poor access to experienced and knowledgeable people by start-up firms as most of the government and non-government (NGO) organisations that were set up to offer assistance are staffed by individuals who do not have the necessary business experience or skills to offer practical, effective advice; and
- Government legislation and excessive bureaucratic red tape such as onerous labour law and tax provisions were highlighted as major stumbling blocks in the development of start-up firms.

The entrepreneurs surveyed were involved in all types of businesses operating in all the economic sectors and did not provide specific information on technology-based enterprises or entrepreneurs.

2.1.9.8 Other emerging countries

Other research findings on entrepreneurship in emerging countries that are of significance to this study are the following:

- In the research findings of the study of industrial development and structural adaptation in Taiwan, Liu (1998:338) concludes: *'...that learning capability and human capital will determine the endurance of Taiwan's industrial success, and that entrepreneurship must be learned by the state, as well as by private firms'*.
- The findings of Xu, Chen & Guo (1998) on the evolutionary process of technological innovation and technology management in China.
- The illustration of Taiwan's technological development model of government-guided and knowledge-linked industrial networks (Liu 1997).
- Development of technological entrepreneurship in China, with specific reference to role of SME's and the creation of Economic Development Areas (Burke et al 1998).
- The exploration of the 'new generation of African entrepreneurs' and their networking capabilities in changing the entrepreneurial landscape of Africa (McDade and Spring 2005).
- The fundamental differences in venture capital practices between emerging and developed economies, as researched by Ahlstrom and Bruton (2006).

2.2 CURRENT THEORIES

2.2.1 Primary theories

The main body of applicable theory underlying the study subject can be summarised in the following four primary categories:

2.2.1.1 The generic entrepreneurship theory, as proposed by Bolton et al (2000) in their work, 'Entrepreneurship: Talent, Temperament, Technique';

2.2.1.2 The profile of technological entrepreneurs in developed regions, as proposed by Roberts (1991) in his book 'Entrepreneurs in High Technology: Lessons from MIT and Beyond';

2.2.1.3 The development of technological entrepreneurship, as proposed by Roberts (1991) in the same book mentioned above;

2.2.1.4 The environments for entrepreneurial development, as proposed by Gnyawali et al (1994).

2.2.2 Secondary theories

There are several secondary or supplementary theories that are relevant to the subject. The following is a summary of the most significant theories:

2.2.2.1 Knowledge of *technology*, with emphasis on:

- Technological base;
- Technological innovation;
- Technology and economical growth;
- Technology transfer;
- The commercialisation of technology.

2.2.2.2 Knowledge of *entrepreneurs and economic growth*, with emphasis on:

- Small, medium and micro enterprises;
- Intrapreneurship;
- Roles of government policies, private sector initiatives and education and training.

2.2.2.3 Knowledge of *technology in emerging regions*, with emphasis on:

- The role of science and technology;
- Technological colonies.

2.2.2.4 Knowledge of *entrepreneurship in emerging regions*, with emphasis on:

- The experience of several countries classified as emerging, such as the former East Germany, Nigeria, South Africa, Taiwan, and China etc.

2.3 THE NEED FOR NEW THEORY

2.3.1 Theory categories included

The existing theory as reviewed in Chapter 2 is categorised broadly into the following two categories:

- Entrepreneurship Education and Training; and
- Technological Entrepreneurship in Emerging Regions.

The theory gap in these two categories is identified against the background of the research topic.

2.3.2 The theory gap

As previously mentioned, this research is classified as *theory-based empirical research*. According to international research guidelines, research studies of this nature review available literature, explore the existing body of knowledge and identify gaps in the theory. The theory gap in this research field identified from the two theory categories listed above is that of *entrepreneurship education* and *technological entrepreneurship in emerging regions*.

2.3.2.1 Entrepreneurship education

There is a definite need for hypothesis-testing research in entrepreneurship education research as indicated in various literature references (Klandt et al 1993:6). In particular, there is a need to develop research methodologies to measure entrepreneurship education. There is a further need for more substantial, reliable and valid research results than case studies, with control groups measuring those who have received entrepreneurship training versus those who have not. Klandt et al (1993) also suggest that attempts should be made to control all extraneous variables and those studies should contain pre- and post-measurements.

Brockhaus summarises the theory gap in entrepreneurship education as follows (in Klandt et al 1993:7): *‘There are many challenges for us as entrepreneurship educators if we truly want to do the best job that we can in educating entrepreneurs. Hopefully, we could improve what we do if we took the effort to*

conduct entrepreneurship education research. Entrepreneurship is more of interest today than probably at any other time. And yet, there is very little known about entrepreneurship education from a research perspective. There are theories of education and learning that other fields have developed for us that we can utilise in our own efforts. We must combine the knowledge that we have about entrepreneurship with the learning theories in education. With the need for improved entrepreneurship education to meet the high demands of entrepreneurship education around the world, this is an exciting time for all of us. The opportunity to focus our attention on entrepreneurship education must not be missed'.

This was the predominant view at IntEnt 92. Ten years later however, the educational needs have increased, without the accompanying growth in appropriate knowledge in the field. The specific gap in entrepreneurship education theory is that *little is known about the efficiency of entrepreneurship training and education in emerging regions, especially in the technological disciplines.*

2.3.2.2 Technological entrepreneurship in emerging regions

The key subject in the research, the technological entrepreneur, is well researched in developed regions, but little is known on the characteristics of this group of entrepreneurs operating in developing regions with emerging economies. The following specific gap in the existing theory of technological entrepreneurship is that:

- *There is not a representative model for the technological entrepreneurship domain in emerging regions which consists of specific entities and their inter-relationships;*
- *Little is known about the profile of the technological entrepreneur in emerging regions, with specific references to the family background, personality traits, educational profile and work experience and how it compares with profiles in developed regions.*

2.3.3. Conclusion

In closing the chapter on the literature survey that identified the need for new theory, the original research problem is revisited. The research problem states that: *Limited theory and models are available on technological entrepreneurship in emerging regions.*

The preceding review of current literature on the broad field of entrepreneurship research, as well as specific overviews of sub-categories of related fields such as technology and innovation, revealed that a substantial body of knowledge has been accumulated over the past decades. The knowledge is extensive for developed societies and industrialized regions, and to a lesser extent for emerging economies. Specific knowledge on the field of technological entrepreneurship in emerging regions is insignificant compared to that of other regions and forms of entrepreneurship. The review highlights the status on contemporary issues such as the born-or-made debate, influence of policy strategies and decisions on new venture creation and the human influence on the entrepreneurial process. These generic issues are complex in itself and even more so if studied in a specific environment with its own added dynamics. Such an environment is technology-based business formation in regions that have a strong economic growth profile.

Indications are that the research questions posed in Chapter 1 are not addressed adequately in existing knowledge on the subjects. This leads to the logical question: Can the existing knowledge base for generic entrepreneurship in developed societies be applied to societies that differ substantially in terms of demographic composition and economic characteristics? The following expectations are created at this stage of the research project:

- There are elements of models and principles in existing theory that should be applicable to the entrepreneurial process in a different environment;
- Some of these models or elements are more appropriate than others;
- The existing theory provides sufficient grounds for the notion that individual traits are equally important in the technological entrepreneurship process, both in single cultural developed regions and multi-cultural economically emerging regions;

- This is equally applicable to the family background, educational development and experience profile of the technological entrepreneur;
- The process of new venture creation and the development to a mature enterprise thereafter, will be influenced by generic environmental influences such as government policies, macro-economic drivers and major technology improvements in both domains;
- The environmental influences such as socio-economic factors, cultural and demographic composition, educational framework and policies at micro or regional level are not necessarily generic in its effects on the entrepreneurship process or the entrepreneur in both domains; and
- An approach to research multiple aspects of the study population over a broad spectrum, rather than lesser topics in more depth, is the most appropriate strategy to follow in the research planning.

These expectations provide a platform for the next phase in the research design. Specific models that are most applicable to the identified environment of technological entrepreneurship in multi-cultural emerging regions will be reviewed. The proposition of a new or modified model framework to address this potential gap in theory should follow. Field research is then necessary to provide the required theoretical data base from which such a model can be substantiated. This will serve to enhance the understanding of said technological entrepreneurship.

2.4 SUMMARY

In Chapter 1, the introduction to this research project was formulated. Chapter 2 contains the theory and research survey or overview, which is a crucial ingredient of any theory-based empirical research project. Due to the magnitude and span width of the research topic, care was exercised in selecting the most relevant theory. After a general overview is given, the chapter continues to present the most significant contributions by researchers using the following framework:

Firstly, the theory and research review is discussed under:

- General entrepreneurship theory;

- The development of entrepreneurship as a subject;
- Technology as a body of knowledge;
- Technological entrepreneurship;
- Technology in emerging regions; and
- Entrepreneurship in emerging regions

Secondly, current theories are reviewed:

- Primary theories; and
- Secondary theories.

Lastly, the need for new theory is presented:

- Theory categories; and
- The theory gap.

Chapter 2 contains the primary body of theory on the research subject, from which the desired new theory is developed in Chapter 3, as well as setting the propositions for the research.