A MODEL TO PROMOTE ENTREPRENEURIAL COMPETITIVENESS IN THE SOUTH AFRICAN TELECOMMUNICATIONS SECTOR

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A MODEL TO PROMOTE ENTREPRENEURIAL COMPETITIVENESS IN THE SOUTH AFRICAN TELECOMMUNICATIONS SECTOR

By

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DECLARATION:

In accordance with Rule G4.6.3, I hereby declare that the above-mentioned treatise/ dissertation/ thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

SIGNATURE: __________________________________________________________

DATE: 22 November, 2012
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ABSTRACT

The fast pace of technological advancements is a driver of change in the world. In telecommunications, advancements as well as sector transformation pose challenges to entrepreneurs to remain competitive. The purpose of this study is to contribute to the promotion of entrepreneurial competitiveness in the telecommunications sector in South Africa. In order to achieve this purpose, the objective was to develop and test a theoretical model to promote entrepreneurial competitiveness in this sector. The purpose of the study was that if the factors that influence entrepreneurial businesses in this sector can be identified and recommendations applied, the competitiveness of these businesses can be improved. The approach was as follows:

1. Identify the factors, in a literature review, in three areas related to this study, namely, Entrepreneurial Orientation, Telecommunications and Benchmarking;
2. Develop a conceptual theoretical model comprising these identified factors which formed the base for the data collection;
3. Develop a measuring instrument to empirically test the relationships described in the conceptual model;
4. Empirically test the proposed model and suggested hypotheses by means of sourcing data from entrepreneurs in the telecommunications sector in South Africa and thereafter statistically analyse the sourced data;
5. Formulate the final theoretical model to support the research objective and
6. Propose recommendations based on the results of the statistical analysis.

The three areas of literature study analysed were Entrepreneurial Orientation which focused on the entrepreneur, the entrepreneurial process and the positioning of technological entrepreneurs in the sector. The telecommunications section included an overview of telecommunications from a global perspective followed by specific focus on the South African sector. The section on benchmarking covered business performance aspects together with measurement techniques and benchmarking institutions relevant to entrepreneurship and telecommunications businesses.
Initially, the literature study delivered four intervening variables (Entrepreneurial Orientation, Opportunity Recognition, Resource Allocation and Strategic Positioning) which influence entrepreneurial competitiveness. Within these four intervening variables, twelve underlying independent variables were identified. All the variables were hypothesised as they were perceived significantly to influence the dependent variable, perceived to be entrepreneurial competitiveness in the telecommunications sector in South Africa.

These factors, clearly defined and operationalised, were structured in a questionnaire which was sent to entrepreneurs in the telecommunications sector. A response rate of 37% was achieved. Data collected from 301 questionnaires were subjected to various statistical analysis techniques. Cronbach-alpha coefficients were calculated to confirm the validity and reliability of the measuring instrument that was tested whilst the latent variables were confirmed by exploratory factor analysis.

Structural Equation Modelling (SEM) was used to test the hypothesised significance of the relationships between the variables. Due to the sample size limitation, the conceptual model could not be subjected to SEM as a whole and consequently two sub-models were identified and subjected to further analysis. The SEM results presented the factors influencing entrepreneurial competitiveness whereafter the final model was presented for this study.

This study contributed to this specific field of knowledge as follows:
1. New literature contributions are made in the field of entrepreneurial competitiveness in a specific sector;
2. It is the first known research conducted into the promotion of entrepreneurial competitiveness in the telecommunications sector in South Africa;
3. A theoretical model was developed that can be used to promote entrepreneurial competitiveness in the sector and
4. It suggests recommendations on empirically tested factors that significantly influence entrepreneurial competitiveness.
Additional knowledge has been gained through the identification and description of how the following individual factors significantly influence entrepreneurial competitiveness in this sector:

- Benchmarking;
- Entrepreneurial Mindset;
- Entrepreneurial Management;
- Entrepreneurial Orientation;
- Financial Resources;
- Infrastructural Change;
- Regulatory Alignment and
- Technological Entrepreneurship.

The present study was conducted in a time frame where sector transformation is prevalent in South Africa. The current circumstances relating to sector transformation and infrastructural changes will not last forever. The theoretical model therefore is limited to the specific sector conditions in a specific time cycle.

In conclusion, the model and managerial recommendations that are presented can act as a guideline for entrepreneurs to adopt in order to improve the competitiveness of their businesses.

Keywords: Entrepreneurial competitiveness, Entrepreneurial Orientation, telecommunications sector in South Africa, Entrepreneurial business, Sector transformation.
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**SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

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CHAPTER 1
INTRODUCTION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND TO THE STUDY

Telecommunications is “the science and technology of communication at a distance by electronic transmission of impulses, as by telegraph, cable, telephone, radio, or television” (Polak and Kleiner, 2001:29). Data communications, in particular broadband networks, form an essential part of telecommunications in the global information society and enable overall economic growth and the creation of new employment opportunities. They bring about innovation and enhance national competitiveness (Intel World Ahead, 2009).

Telecommunications reform in South Africa started in 1997 when government embarked on privatisation and in the process ended the monopoly of the country’s only telecommunications operator, Telkom. The telecommunications sector experienced a rapid process of transformation in terms of its growth, technological content and market structure through the government-introduced policy. The sector was previously characterised by a monopolised regime in a landscape where the cost of telecommunications services was amongst the highest in the world (ITU, 2009).

Recently, regulatory changes, together with the promulgated Electronic Communications Act of 2005 (ECA, 2005) brought about a transformation stage in the telecommunications sector, where possible new opportunities opened for entrepreneurs to develop their full potential in this transformed technological market space. In addition, large deployment of data communications infrastructure by major telecommunications companies including Telkom, Vodacom, MTN and Neotel contributed to this transformation process. This, in return brought about uncertainty as to how entrepreneurs could engage in business activities in this sector. These factors pose challenges to the competitiveness of entrepreneurial business activities in the telecommunications sector.
A country’s telecommunications sector is divided into highly competitive and advanced technological industry segments (Levin and Schmidt, 2010). Businesses in the telecommunications sector engage in activities in different categorised sections in telecommunications. Some provide fixed or mobile telephony, others data services while the larger operators build network infrastructure. Data communication networks in particular, are widely considered an essential telecommunications infrastructure for the global information economy as they provide businesses, students and consumers with fast access to Internet based services, content and applications. Since the emergence of the Internet, governments, globally, have increasingly recognised the direct impact of data communications on the economics of businesses, communities and nations (ITU, 2009).

Jackson and Crandall (2001) postulate that economic benefits associated with data communications become evident in both developed and emerging nations. Benefits associated with data communications can be achieved when emerging markets establish enabling environments that support long-term, cost-effective broadband deployments (Intel World Ahead, 2009). Existing infrastructure, regulatory environments, urban-rural divide and other factors that affect broadband diffusion are often different in emerging markets (Boorsma, 2009). These differences reinforce the need to adopt entrepreneurial activities, such as innovation and creativity that facilitate the rapid and cost-effective deployment of broadband technologies, along with other Information and Communication Technologies (ICT) and services (Boorsma, 2009; Jackson and Crandall, 2001).

Entrepreneurial activity can be seen as the driving force for economic development in a country (Nieman, Hough and Nieuwenhuizen, 2003). In the telecommunications sector in South Africa, entrepreneurs are concerned with business activities in an industry that is characterised by continuous technological change, regulatory alignment, deflationary pricing models and increased competition (WTO, 2008). The field of entrepreneurship emphasises value creation through innovation, creativity and opportunity seeking. Technological entrepreneurs must be able to cope with significant ambiguity in the sectors in which they operate to ensure competitiveness. Technologically orientated entrepreneurial businesses usually operate in unsettled industries or unsettled segments of stable industries (Tamasy, 2007).
Tamasy (2007) indicates that change brings about unsettled segments within a sector. According to Stevenson, Roberts and Grousbeck (1999), the identification and selection of the right opportunities are the most important capabilities of entrepreneurial companies in unsettled business segments. In this context, the challenges of lowering telecommunications costs, whilst improving service quality, cannot be realised by the provision of services by larger operators alone, but by enabling entrepreneurs to participate in the distribution of business opportunities and activities in the telecommunications sector.

1.2 THE RESEARCH PROBLEM

Sector transformation in South Africa not only poses new opportunities and challenges for entrepreneurial activities in the telecommunications sector but also threatens livelihood and entrepreneurial competitiveness in this industry and ultimately in the entrepreneur’s survival. Transformation in the telecommunications sector in South Africa started in 2007 and is still in process. Transformation factors include legislation, regulation and infrastructural development. Market volatility and uncertainty have also become more evident in the transformation process. In this environment, entrepreneurs face the challenge of identifying and developing new opportunities that arise from the transformation process, by turning them into viable ventures and therefore increasing their competitiveness.

Limited theory and models are available on entrepreneurial competitiveness within technological sectors, but more importantly within the South African telecommunications sector. Therefore, entrepreneurs in the telecommunications sector face a dilemma in identifying the factors that influence their competitiveness in this transforming sector. They need to consider the problems associated with sector transformation, regulation, infrastructural and technological change as well as the problems associated with the re-organisation of competitive strategies in these uncertain conditions. Taking these factors into consideration, the purpose of this research study is to identify and examine the factors which influence entrepreneurs’ abilities to position their businesses more competitively whilst remaining
entrepreneurial in nature in the fast paced technological landscape of the South African telecommunications sector.

Against this background, the research problem is formulated as follows: *Entrepreneurs face the problem of identifying the factors that influence the competitiveness of their businesses in the transforming telecommunications sector in South Africa.*

The research problem can further be categorised into a set of research questions. The main research question can be stated as: *How can entrepreneurs in the telecommunications sector in South Africa position their businesses effectively to remain entrepreneurial in nature and be more competitive in a fast paced technological landscape?*

The main research problem is supported by the research questions listed in Table 1.1.

<table>
<thead>
<tr>
<th>RQ</th>
<th>Secondary research questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1</td>
<td>What factors must be considered to promote continuity of the entrepreneurial nature of businesses in high technology environments?</td>
</tr>
<tr>
<td>RQ2</td>
<td>What is the ranking of these factors that require more attention and focus or have a higher risk of failure to achieve continuity of the entrepreneurial nature of business?</td>
</tr>
<tr>
<td>RQ3</td>
<td>What management methods or processes must be considered that will promote or lower the risk of not achieving competitiveness in the telecommunications sector?</td>
</tr>
<tr>
<td>RQ4</td>
<td>How does the regulatory environment and sector reform affect entrepreneurial activities in the telecommunications sector?</td>
</tr>
<tr>
<td>RQ5</td>
<td>How can the effectiveness and performance of both the entrepreneurial environment and the telecommunications sector in South Africa be measured?</td>
</tr>
<tr>
<td>RQ6</td>
<td>How can a model representation provide a detailed description to understand and reproduce this research study in the future?</td>
</tr>
<tr>
<td>RQ7</td>
<td>How can the proposed model be validated by empirical evaluation in the telecommunications sector in South Africa?</td>
</tr>
<tr>
<td>RQ8</td>
<td>What interpretations and conclusions can be drawn from the empirical findings</td>
</tr>
</tbody>
</table>
1.3 RESEARCH OBJECTIVES

1.3.1 Primary research objective

The primary objective of this study is therefore to ‘investigate what factors have an impact on the entrepreneurial competitiveness in the telecommunications sector in South Africa through the development of a theoretical model’. The various factors (independent and intervening variables) and the dependent variable (Perceived Entrepreneurial Competitiveness) will be identified, investigated and tested empirically. The research study will confirm the existence of relationships between the various independent variables and their influences will be measured. The primary areas of interest in this study relate to (1) Entrepreneurship, (2) Telecommunications and (3) Competitiveness. Figure 1.1 illustrates the research process in terms of the primary and overlapping constructs between Entrepreneurship, Telecommunications and Competitiveness.

In each of the primary areas of interest Entrepreneurship (1), Telecommunications (2) and Competitiveness (3) there is extensive literature. The overlaps between the areas, however, are disproportionate. The Entrepreneurship/Competitiveness (E/C) overlap (5) has gained significant coverage in the literature, but the
Entrepreneurship/Telecommunications (E/T) (4) overlap has not been investigated to any large extent.

The Entrepreneurship/Telecommunications/Competitiveness (E/T/C) nexus (6) is representative of significant literature in the primary areas of interest, but the combination represents new knowledge contribution. “The gap” therefore in this research study is represented at the E/T/C point of intersection (6). The primary objective stated will support an area of research relating to the nexus point of intersection. This supports this study’s contribution to the body of knowledge.

Based on the literature review, a conceptual theoretical model will be proposed depicting the relationships or factors influencing the promotion of entrepreneurial competitiveness in the telecommunications sector in South Africa. These relationships or factors will then be tested by means of an empirical investigation.

The following research design objectives have been identified in order to address the primary objective:

1. To develop a theoretical model comprising the factors that will promote entrepreneurial competitiveness in the telecommunications sector. In addition, to construct a path diagram of relationships between the independent variables (factors identified having influencing entrepreneurial competitiveness) and the dependent variable (Perceived Entrepreneurial Competitiveness);

2. To develop a measuring instrument that will empirically test the relationships described in the conceptual model;

3. To empirically test the proposed model and suggested hypotheses by means of sourcing data from entrepreneurs in the telecommunications sector in South Africa and thereafter by statistically analysing the source data and

4. To propose recommendations based on the results of the statistical analysis.

1.3.2 Secondary research objectives

The primary objective of this study is therefore to investigate what factors have an impact on the entrepreneurial competitiveness in the telecommunications sector in South Africa.
sector in South Africa. The research questions will be supported by the following secondary research objectives listed in Table 1.2:

### Table 1.2 Secondary research objectives

<table>
<thead>
<tr>
<th>RO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RO₁</td>
<td>Identify factors relating to Entrepreneurial Orientation in technological environments</td>
</tr>
<tr>
<td>RO₂</td>
<td>Review the literature in order to establish the factors related to Entrepreneurial Orientation, Opportunity Recognition, Resource Allocation and Strategic Positioning</td>
</tr>
<tr>
<td>RO₃</td>
<td>Review the literature in order to establish the methods and processes and identify key factors in the telecommunications sector in South Africa that influence the competitiveness of the entrepreneurial business</td>
</tr>
<tr>
<td>RO₄</td>
<td>Establish a Benchmarking framework related to entrepreneurship and telecommunications</td>
</tr>
<tr>
<td>RO₅</td>
<td>Represent the factors identified from the literature study in a conceptual model for empirical testing</td>
</tr>
<tr>
<td>RO₆</td>
<td>Explain the research methodology used for this research study in detail, to enable it to be reproduced in future</td>
</tr>
<tr>
<td>RO₇</td>
<td>Conduct an empirical evaluation on the conceptual model to promote entrepreneurial competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>RO₈</td>
<td>Discuss the results and interpretations of the research study</td>
</tr>
</tbody>
</table>

### 1.4 ATTRIBUTES OF THE DESIRED THEORY AND THE PROPOSED MODEL

The key attributes of the theoretical research in this study seek to achieve the following:

- The research proposes creation of a model (a graphical, mathematical or schematic description or analogy of a system of postulates, data and interferences (Buys, 2007) that promotes entrepreneurial competitiveness in the telecommunications sector in South Africa;
The model consists of the following key entries:

- Entrepreneurial Orientation within the telecommunications sector;
- Entrepreneurial process;
- Opportunity recognition factors;
- Effective resource allocation to increase business performance;
- Strategic positioning factors and
- Competitiveness aspects.

The model will include strategic positioning factors influencing competitive advantage;

The model will include external factors including the regulatory environment and legal framework;

The theory and model will create new knowledge and a better understanding of the concept of technological entrepreneurship in sectorial transformation in an emerging economy and

The research will identify scope for further research.

1.5 CONTRIBUTION OF THE STUDY

No similar research study that focuses exclusively on a combined study of Entrepreneurship/Telecommunications/Competitiveness (6) as described in Figure 1.1 has previously been undertaken in South Africa. The scope of the research will focus on the competitiveness of technological entrepreneurial activities within the telecommunications sector in South Africa by taking into consideration the transformation changes in legislation and regulation as well as advancements in technological infrastructural development.

Technological Entrepreneurship (TE) and Entrepreneurial Orientation (EO) are topics of interest to academics, business people and governments around the world (McDougall and Oviatt, 2000). Recent legislative and regulatory changes in the telecommunications sector in South Africa, together with infrastructural and regulatory changes, introduced a new transformation path where entrepreneurs have to build competitive businesses in this sector. The research will therefore contribute to the promotion of entrepreneurial competitiveness within the telecommunications sector in emerging markets.
The research further offers the potential of contributing to entrepreneurial competitiveness in the telecommunications sector through the development of a model. In addition, the research into entrepreneurial competitiveness in this specific field of a technological sector in an emerging market can be used as a base for research in other technological sectors or emerging markets.

1.6 BENEFICIARIES OF THE RESEARCH

The following groups will benefit from the findings of the research project:

- Government - fostering entrepreneurship in sector specific disciplines;
- Technological sectors - encouraging entrepreneurial activities;
- Institutions - tertiary institutions which offer technological or entrepreneurship courses on emerging markets can enhance their subject contents;
- Management in technological entrepreneurial companies;
- Technology companies - seeking competitive advantage strategies and
- Individuals - entrepreneurs in emerging markets seeking ways to become more competitive in technological environments.

1.7 THE RESEARCH FRAMEWORK

The research process consists of an in-depth literature study followed by the research methodology to test the perceived hypotheses. Figure 1.2 presents a graphical representation of the study design. A literature study will be conducted and interrelationship in telecommunications will be tested in context with Technological Entrepreneurship and Entrepreneurial Orientation in the telecommunications sector. The proposed chapter selection Entrepreneurial Orientation includes (Chapter 2), Telecommunications (Chapter 3) and Benchmarking (Chapter 4). A chapter describing the proposed model contents will follow (Chapter 5).

The research framework in Figure 1.2 describes EO as one of the perceived intervening variables and this will form the base to test the hypotheses in order to derive a theoretical model for the promotion of competitive entrepreneurship in the
telecommunications sector in South Africa. A preliminary literature review will follow to support the research framework.

**Figure 1.2 The research framework**

Source: Author's own construction, 2010
1.8 PRELIMINARY LITERATURE REVIEW

1.8.1 Entrepreneurship

Entrepreneurship is a process of organising resources (material, human and financial) (Shane, 2003; Bonnell and Gold, 2002; Schumpeter, 1934). According to the authors, the organisation of resources is crucial in the sense that it brings everything together and leads to the establishment and sustainability of a company (Shane, 2003; Bonnell and Gold, 2002; Schumpeter, 1934).

Entrepreneurship, according to Timmons and Spinelli (2007) can be described as the ability to set up and build something out of virtually nothing; it is therefore an elementary human, creative act. Casson and Wadeson (2007) argue that the entire area of entrepreneurship has always given and continues to give good weight to the innovative and creative aspect of developing an entrepreneurial idea and turning it into a business venture.

Numerous studies have been conducted to identify the traits that distinguish entrepreneurs from the rest of society (Swedburg, 2000; Chell, Haworth and Brearley, 1991; McClelland, 1961). Although the authors describe entrepreneurs as unique in their character make-up, no definitive character profile of entrepreneurs has been found to exist (Baum, 2004). In this regard, Baum (2004) argues that many of the characteristics commonly associated with entrepreneurs, such as ambition, initiative, motivation, optimism, passion, perseverance and tenacity can also be found amongst non-entrepreneurs.

In this perspective, this research will be focused towards a specific set of entrepreneurial qualities. This research will not only present a generalised entrepreneurial profile, but also a more specific emphasis on background experience and technological knowledge as well as on the particular skill of opportunity recognition in conjunction with innovation and creativity in the telecommunications sector.
1.8.2 Entrepreneurial Orientation

Entrepreneurship researchers use the term Entrepreneurial Orientation (EO) to describe a fairly consistent set of related activities or processes (Idar and Mahmood, 2011; Quince and Whittaker, 2003; Smart, 1994; Miles, 1991). Entrepreneurship scholars have attempted to explain performance by investigating the relationship between entrepreneurial orientation and business performance (Wiklund and Shepherd, 2005; Lumpkin and Dess, 2001; Zahra and Garvis, 2000). The term entrepreneurial orientation has also been used to refer to the strategy-making processes and styles of companies that engage in entrepreneurial activities (Quince and Whittaker, 2003).

Entrepreneurial orientation reflects how a business operates strategically rather than what it does (Lumpkin and Dess, 1996). Given the importance of entrepreneurship to business performance, entrepreneurial orientation can be an important measure of how a business is strategically organised to discover and exploit market opportunities (Wiklund and Shepherd, 2005; Ireland, Hitt and Sirmon, 2003; Zahra and Garvis, 2000). Recent studies on EO includes resource-advantage theory (Li, Haung and Tsai, 2009), knowledge creation studies (Nonaka and Toyama, 2005) and a popular model by Lumpkin and Dess (1996), namely the five dimensions of EO. The resource-advantage theory views entrepreneurial orientation as resource that facilitates a business to out-perform other rivals and competitive advantage (Li et al., 2009; Hunt and Morgan, 1997, 1996).

The development of entrepreneurial orientation requires organisational members to engage in intensive knowledge activities. In order to respond to the dynamic and competitive environment, businesses need, consistently, to transfer entrepreneurial orientation into feasible strategic activities to fulfill business-objectives and achieve superior performance by focusing attention on the utilisation of the knowledge creation process (Li, et al., 2009). Both newly established and existing ventures tend to have relatively limited knowledge, managerial and financial resources and these often prevent entrepreneurs from pursuing strategic orientation (Wiklund and Shepherd, 2005).
Studies on EO include knowledge creation processes (Nonaka and Toyama, 2005; Nonaka and Takeuchi, 1995). The knowledge creation process allows businesses to amplify knowledge embedded internally and transfer knowledge into operational activities to improve efficiency and create business value (Nonaka and Toyama, 2005; Nonaka and Takeuchi, 1995). Based on the theory of knowledge creation, knowledge is created through a spiral process of socialisation, externalisation and combination (Nonaka and Toyama, 2005).

A popular model of Entrepreneurial Orientation suggests that there are five dimensions to EO, namely autonomy, innovativeness, risk taking, pro-activeness and competitive aggressiveness (Quince and Whittaker, 2003; Lumpkin and Dess, 2001; Lumpkin and Dess, 1996). Taking into consideration the current telecommunications landscape, this study will investigate a combination of factors that constitute the existence of EO, the processes involved and the application, as an intervening variable, towards competitive entrepreneurial activities in the telecommunications sector.

1.8.3 Opportunity recognition

Opportunity recognition can be defined as a cognitive process through which entrepreneurs conclude that they have identified an opportunity (Ardichvili, 2003; Solso, 1999). “Opportunities emerge from a complex pattern of changing conditions: changes in technology, economic, political, social and demographic conditions. They come into existence at a given point in time because of a contrast or when a series of conditions co-exist, which did not exist previously but are now present” (Baron and Ensley, 2006:1331).

Entrepreneurs engage in activities of business opportunity recognition and exploitation to gain strategic competitive advantage, which can be contextualised as both external and internal exploitation (Schwartz and Teach, 2000; Bhave, 1994). The entrepreneur then recognises how to refine the opportunity, identify the business concept and then the commitment can be brought into reality (Schwartz and Teach, 2000).
1.8.4 Entrepreneurial innovation

Entrepreneurship and innovation have seen considerable attention in the literature. Initially, entrepreneurship studies connected entrepreneurship with a self-employed individual, but the term entrepreneurship today is linked to processes focusing on innovation, performance and uniqueness within a business (Zoltan, 2004). Ward (2004) suggests that entrepreneurs must engage in a creative process of generating valuable ideas for new goods or services that will appeal to an identifiable market. When they have identified those potential opportunities, they must work out how to bring the project to realisation (Ward, 2004). The fact that novelty and usefulness relate to creative ideas, possible connections between creativity and entrepreneurship have been of interest for some time (Ward, 2004; Whiting, 1988; Gilad, 1984).

Novel and useful ideas are the lifeblood of entrepreneurship. Ko and Butler (2007) describe both innovation and creative ideas as a conceptual combination process where previously separated ideas, concepts or other forms are mentally merged. Conceptual combination bears a special relationship to creativity, in the sense that it forms the basis of a person’s creative functioning process (Costello, 2000). Conceptual combination also appears to be directly relevant to the needs of entrepreneurs in search of new ideas to pursue (Ko and Butler, 2007).

Ward (2004) argues that the way in which people conceptualise a problem strongly influences their likelihood of achieving an original or creative solution. This is no less true for entrepreneurial creativity. Transformation in a sector can be associated with new problem definitions and therefore calls for creative problem solving abilities and innovative solutions (ITU, 2009).

1.8.5 Technological Entrepreneurship

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 (Therin, 2007; Venkataraman, 2004; Phan, 2002; Christensen, 1997). The knowledge is extensive for developed countries and
industrialised markets and to a lesser extent for emerging markets. Specific knowledge on technological entrepreneurship in emerging markets is insignificant compared to that on other markets and forms of entrepreneurship (Therin, 2007).

Technological Entrepreneurship is a relatively unexplored topic and is one of the most important factors in regional development (Therin, 2007; Venkataraman, 2004). Schumpeter (1934) describes an entrepreneur as a person who destroys the existing economic order by introducing new products and services, by creating new forms of organisations and by exploiting new raw materials. Building on Schumpeter’s economic theory, Phan (2002) argues that technological innovation poses an alternative perspective in the development of competitive technological markets. Technological entrepreneurs, therefore, pursue business activities in technology based markets.

Christensen (1997) describes technology-based markets as lenient towards the introduction of disruptive technologies. This is likely to be observed in industry specific sectors which are technology driven such as the ICT sector (Phan, 2002). Christensen (1997) also provides anecdotal evidence that shows that large companies which commercialise innovations based on disruptive technologies face enormous internal and market problems; hence the opportunity lies in the hands of the smaller technological companies driven by the founders and in the hands of particular entrepreneurs.

In the new, independent entrepreneurial business, the linkage of technology to markets is the responsibility of everyone concerned, but especially of the founder of the company (Phan, 2002). These technological entrepreneurial companies have low fixed costs, low overheads, a single technology focus and a willingness to risk current income for potential capital gains returns if they are successful (Phan, 2002). In the present day, the high technology companies exist in high velocity environments (Mishra, 2002). In these environments, rapid and discontinuous change in demand is evident (Fildes, 2003). Due to this fast paced rate of change of technology, the life cycle of a product continues to shrink (Mishra, 2002). A typical example in telecommunications is the rapid change in mobile handset technologies and rapid changes in Internet access technologies.
Technological Forecasting (TF) has been acknowledged as an effective tool in setting technology strategies (Fildes, 2003). Evidence shows that technology in telecommunications changes quickly and frequently. In order to forecast the life cycle of a technology, the entrepreneur can use a number of TF techniques. The quality of forecasts would greatly depend on the proper selection and application of appropriate techniques (Fildes, 2003). Market specific forecasting, such as the telecommunications sector in South Africa, will require matching the technique to a technology by mapping both the technology and technique characteristics on a common scale (Lee, Yoon, Lee and Park, 2009).

1.8.6 Telecommunications

Telecommunications link continents electronically and remove physical, geographical barriers and should be researched in a global perspective (ITU, 2009). In the last part of the 20th century, the almost simultaneous arrival of three major innovations, mobile phones, broadband data and the Internet, not only changed the face of communications, but also gave an impetus to dramatic economic growth (Tsai, Chen and Tzeng, 2006). Tsai et al. (2006) state that modern communication technologies have been instrumental in reshaping telecommunications markets worldwide.

Africa, like all other regions of the emerging world markets, is in the midst of a global information revolution that presents an apparent overflow of opportunities (Wilson and Wong, 2003). Technologies such as Internet access and cellular communications grow rapidly, as do traditional media such as radio transmission. In one country after another, the local press serves up lively commentaries and news reports about trends in information and communications technology (ITU, 2009).

The South African telecommunications communications sector comprises industries rendering services, which facilitate the interaction between parties. These include postal services, broadcasting services (television, radio and pay-tv), telecommunications (mobile and fixed-line) and Internet /data service providers (TIPS, 2010). According to Gillwald (2005), the South African telecommunications sector has experienced dramatic transformation in the past 15 years. The transformation includes infrastructure, market composition, legalities and regulation.
changes. Wireless mobile services provide connectivity to millions of people previously excluded from having a phone and when the Internet made entrance into the sectors it fundamentally changed the way businesses and individuals communicate (Gillwald, 2005). The state of the sector’s performance however is described as poor and inefficient due to inefficient regulation, high prices and monopolised behaviour within the sector (Bagdadioglu and Cetinkaya, 2010; ITU, 2010b; Gillwald, 2005).

Despite the poor performance outlook, the South African broadband basket has shown consistently significant growth rates of over 30% between 2007 and 2008 (Frost and Sullivan Institute, 2009). Frost and Sullivan Institute (2009) expected this positive trend to continue for the next two to four years and the statistics confirms the increase in broadband demand (Goldstuck, 2012). Analysis from the Frost and Sullivan Institute (2009) found that the South African broadband market earned revenues of over R 2.2 billion in 2008 and estimates this will reach R 12.15 billion in 2015.

1.8.7 Regulation

Encouraging competition is not always easy, or popular. The innovations driven by data communications and the digital economy it supports can be disruptive to the status quo, sparking political demands to insulate particular segments of the economy (Comin and Hohijn, 2004). Even the most well-intentioned policy makers sometimes protect or introduce laws and regulations that inhibit competition and thereby slow the adoption of broadband technology. Such protection can create impediments to the new opportunities and increased productivity and income provided through data communications (Comin and Hohijn, 2004).

In the midst of the controversies around the regulatory roles, South Africa’s telecommunications sector has been at the forefront of the country’s infrastructural reform process and was the first sector to confront some of the inherent tensions within the country’s core policy objectives, which include:

- Accelerated sector growth and modernisation;
- The achievement of universal access/service;
• Promotion of economic efficiency and
• Broad Based Black economic empowerment (BBBEE) (Gillwald, 2005; Teljeur, Gillwald, Steyn and Storer, 2003).

The stated national strategies to achieve these policy objectives, although slow in implementation, have broadly conformed to international economic reform best practices and include:
• Restructuring and privatisation of state-owned enterprises (SOEs);
• Market reform and liberalisation;
• Economic regulation;
• Universal access;
• Service funding mechanisms and
• Promotion of foreign direct investment (FDI) (Gillwald, 2005; Teljeur et al., 2003).

1.8.8 Benchmarking

The main idea behind benchmarking, in principle, is to compare one organisation with others in terms of competitiveness and performance. Benchmarking institutions have established themselves over the past decade. The development of various indicators and indices mainly measure market participation, performance, competitiveness and trends and draw comparisons with a number of countries in both the emerging and developed markets.

A broad definition of benchmarking can be described as a standard, or a set of standards, used as a point of reference for evaluating performance or level of quality (Maire, Pillet and Bronet, 2008; Kyrö, 2003; Muir, 1994). Benchmarks may be drawn from individual experience, from the experience of others in the category of measurement or from legal requirements. When benchmarked, Africa lags behind developed markets in terms of telecommunications in the areas of regulation, transformation and infrastructure deployment (BMI, 2012; ITU, 2011a). According to the International telecommunications Union (ITU) (2009), Africa has only two telephone lines per 100 people. This is poor compared to Europe's four for every ten people. Growth in Africa's telecommunications sector is yet to be experienced (ITU, 2009). After five years the sector has already seen steady growth figures but
accelerated mobile and Asynchronous Digital Subscriber Lines (ADSL) deployment is expected to stimulate growth (BMI, 2011). The region has showed considerable development, specifically in mobile communications and Internet access (BMI, 2012; ITU, 2011b).

The South African telecommunications market sector is in the midst of transformation and is seen as the main hub of telecommunications growth in Africa (ITU, 2011b; Kechiche, 2010). South Africa is the largest telecommunications market in the Africa and Middle East region in terms of revenue and is one of the most advanced in Africa in terms of penetration rates (Kechiche, 2010). South Africa is seen as the telecommunications leader on the African continent with 4.03 million installed exchange lines, representing around 100 lines for every 1 000 inhabitants (Telkom, 2010).

1.9 RESEARCH DESIGN AND METHODOLOGY

In order to address the research methodology of the study and to test all the hypotheses, the objective will be as follows:

‘To investigate and identify the factors influencing entrepreneurial competitiveness in the telecommunications sector in South Africa’

This research project can be described as a theoretical, model-building study. From literature, as many factors as possible will be identified in order to propose a conceptual model. In order to test the propositions that will be formulated in this study, the proposed model will then be empirically tested. The Structural Equation Modelling (SEM) technique will be used to test the proposed model in a real life situation by means of quantitative data gathering and analysis in a format compatible with the proposed research model (Hair, Black, Babin, Anderson and Tatham, 2006). SEM allows both confirmatory and exploratory modelling. This means they are suited to both model testing and model development (Wothke, 2010).

Structural Equation Modelling is a multivariate technique that combines aspects of multiple regression and factor analysis to estimate a series of interrelated
dependence relationships simultaneously (Adendorff and Boshoff, 2011; Hair et al., 2006). There are usually two main parts to SEM: the structural model showing potential causal dependencies between endogenous and exogenous variables and the measurement model showing the relations between the latent variables and their indicators (Hair et al., 2006; Pearl, 2000).

Structural Equation Modelling, according to Hair et al. (2006), has been widely used and appears in almost every conceivable field of study as an evaluation technique. The reasons for its attractiveness in such diverse areas is twofold: (1) it provides a straightforward method of dealing with multiple relationships simultaneously while providing statistical efficiency and (2) it has the ability to assess the relationships comprehensively and provide a transition from exploratory to confirmatory analysis. This transition corresponds to greater efforts in all fields of study toward developing a more systematic and holistic view of problems (Hair et al., 2006).

Structural Equation Modelling provides the researcher with the ability to accommodate multiple regressions, which can estimate a single relationship (equation), but only SEM can estimate numerous relationships at once (Garson, 2012). They can be interrelated in that the dependent variable in one equation can be an independent variable in another equation(s). This allows the researcher to model complex relationships that are not possible with any of the other multivariate techniques. It is therefore a more advanced and rigorous statistical technique to analyse data (Lee, 2007; Hair et al., 2006).

1.9.1 Secondary research

No similar research study that focuses exclusively on the promotion of entrepreneurial competitiveness in the telecommunications sector in South Africa has been undertaken previously. The factors that have an impact on the competitiveness of the entrepreneurs in this sector will be investigated by means of a comprehensive literature study.

This research included a literature study that identified as many factors as possible that could influence entrepreneurial competitiveness in the telecommunications
sector in South Africa. The proposed conceptual model in this chapter is derived from and based on an analysis of relevant secondary sources.

Secondary sources studied included literature on the telecommunications landscape; both current and future market conditions, benchmarking, Technological Entrepreneurship and Entrepreneurial Orientation within the sector. Both international and national libraries supplied data by means of inter-library loan facilities at the NMMU, which included academic literature consisting of published text books and accredited journal articles extracted online via the NMMU online library from sources such as EMERALD, DIALOGUE, SCIENCE DIRECT and AMI/FORM.

1.9.2 Primary research

Empirical research is a way of gaining knowledge by means of direct and indirect observation or experience (Collis and Hussey, 2009). The primary research of this study involved identifying the most appropriate research paradigm; identifying the sample and collecting the data and an analysis of the data collected. For each of the sub-components, a brief introduction is provided in the paragraphs below. A detailed discussion is presented in Chapter 7.

1.9.2.1 Research paradigm

The research design consisted of a positivistic paradigm, given the nature of the problem statement and the research objectives in question. According to Collis and Hussey (2009), collection of evidence, in a positivistic paradigm by following a quantitative research design, can be done by means of measuring instruments including the use of questionnaires and interviews. Quantitative research is undertaken to answer questions about relationships between variables, with the purpose of explaining, predicting and controlling the phenomena (Leedy and Ormrod, 2005).

Empirical evidence in this study was collected by means of a questionnaire which was designed and developed from the factors identified in the literature study. A large sample was required for the positivistic paradigm for the representative sample
to be considered as relevant to the entire population and to support the statistical analysis method to be considered for action (Collis and Hussey, 2009).

1.9.2.2 Data collection

The sampling unit in this study refers to the entrepreneurial person, who founded, owns or manages an operational business in the telecommunications sector, as the research was concerned with analysing the data collection in order to address the research problem. The sampling method associated with this study is referred to as purposive sampling. Purposive sampling refers to a non-probability sample that confirms to certain criteria and consists of two types of sampling, namely judgment and quota sampling (Blumberg, Cooper and Schindler, 2008). Quota sampling was selected for this study as this method is used to improve representativeness (Blumberg et al., 2008). The rationale behind quota sampling is that certain relevant characteristics describe the dimensions of the population. The population representing the research in question refers to entrepreneurs in the telecommunications sector. The composition of the targeted population proposed for this study included respondents from the following categories:

1. ECNS and iECNS licensees (ICASA, 2012);
2. ISPA members (ISPA, 2012);
3. WAPA Members (WAPA, 2012) and
4. Industry experts.

The population identified for this study was directed to the listed respondents that included 820 entrepreneurs within an existing business environment and were operational in the telecommunications sector in South Africa. Invitations by means of direct interviews, electronic email and direct telephonic calls were made to the targeted population. A database of email addresses was compiled and an electronic mail request to complete the questionnaire was sent to the target respondents.

The research study was made flexible in its approach by making use of a combination of techniques for gathering of data. Techniques employed included:

- Experience Surveys. Discussion of issues and ideas with knowledgeable and experienced people in the telecommunications environment;
• Secondary Data Analysis and
• A discussion guide was drawn up to address topics and questions (Collis and Hussey, 2009).

The study object of this research is the Entrepreneur in the telecommunications Sector is South Africa. The population needs to be defined in order to understand:
• The environment in which the study object functions;
• The influences on their behaviour and
• The circumstances under which they operate.

When a representative group of entrepreneurs is studied, the characteristics of this particular group must first be defined to ensure sufficient focus of the research effort (Collis and Hussey, 2009). Questionnaires were sent to the target sample and conducted in four phases:
1. A preliminary process was conducted to determine if the licensed person/company is an entrepreneur or entrepreneurial business;
2. Demographic questions were included to qualify the population in the survey;
3. A pilot study was performed to test the validity and accuracy of the survey and
4. A final survey was conducted using the identified target population.

1.9.2.3 Data analysis

The data analysis included Exploratory Factor Analysis (EFA) performed on all the items in order to identify unique factors. Bartlett’s Test of Sphericity was performed to establish if the data was factor analysable. A Principal Component Analysis with a Varimax Rotation was specified as the extraction and the rotation method in cases where factors were not expected to be correlated. In cases, however, where factors were expected to be correlated, Principal Axis Factoring with an Oblique (Oblimin with Kaiser Normalisation) Rotation was specified as the extraction and rotation method.

Kaiser’s Eigenvalues greater-than-one rule was used to determine the number of representable factors presented in the conceptual model. Cronbach’s alpha coefficients were calculated for each of the factors to evaluate the internal
consistency between the items measuring each construct in the conceptual model and to confirm the reliability of the measuring instrument. In order to confirm internal consistency the Cronbach’s alpha coefficient value greater than 0.7 was used. The software application SPSS 19.0 for Windows was used to confirm that each item was a measure of the various constructs under consideration and therefore assessed the discriminant validity of the measuring instrument.

Structural Equation Modelling (SEM) was adopted to evaluate the relationships in the set of variables used in the perceived model proposed in the study. Structural Equation Modelling refers to a multivariate technique which combines aspects of Multiple Regression and factor analysis, to estimate a series of interrelated dependence relationships simultaneously (Hair et al., 2006). The computer application LISREL 8.8 (Jöreskog and Sörbom, 2006) was deployed to test the relationships among the factors that influenced entrepreneurial competitiveness in the telecommunications sector in South Africa.

The Goodness-of-fit indices for the model was assessed by using the various fit indices, including the Satorra-Bentler scaled Chi-square (χ2), the normed Chi-square, the Root Mean Square Error of Approximation (RMSEA), as well as the 90% confidence interval for RMSEA. An in-depth explanation of the data analysis will be presented in Chapter 7.

1.9.2.4 Proposed conceptual model

The process of theoretical model building research can be categorised into the following elements (Buys, 2007):

- Data Collection;
- Data Analysis and
- Inference of new hypothesis.

The secondary research was used to present a conceptual theoretical model that influences entrepreneurial competitiveness in the telecommunications sector. The initial literature review highlighted a number of interrelated factors that influence
entrepreneurial activity in the telecommunications sector. Figure 1.3 illustrates the proposed conceptual theoretical model.

A conceptual theoretical model was then tested by means of an extensive empirical study. Structural Equation Modelling (SEM) was adopted to test the model to promote competitive entrepreneurship in the telecommunications sector in South Africa. In Chapter 8 the revised model is presented.

The main objective of the empirical research was to prove the interdependence and to qualify the relationships between the elements of a proposed model (Collis and Hussey, 2003). Figure 1.3 indicates the perceived theoretical model. The perceived hypotheses are indicated. SEM will be conducted to determine what factors significantly affect entrepreneurial competitiveness in the telecommunications sector.

The proposed theoretical model in Figure 1.3 illustrates how the intervening and independent variables are expected to interrelate with the dependent variable: Perceived Entrepreneurial Competitiveness in the telecommunications sector in South Africa. The perceived variables include Infrastructural Change, Sector Transformation, Entrepreneurial Orientation, Regulatory Alignment, Opportunity Recognition, Entrepreneurial Mindset, Entrepreneurial Innovation, Entrepreneurial Experience, Resource Allocation, Entrepreneurial Leadership, Human Capital, Financial Resources, Strategic Positioning, Legal Alignment, Benchmarking and Technological Entrepreneurship.
1.9.3 Research hypotheses

The hypotheses formulated are based on a series of relationships to be tested between the intervening variables, the independent variable (IV) elements as illustrated in Figure 1.3 and the perceived dependent variable (DV), which can be described as follows:

H¹ There is a positive relationship between *Infrastructural Change* and *Entrepreneurial Competitiveness* in the telecommunications sector

H¹a There is a positive relationship between *Infrastructural Change* and *Entrepreneurial Orientation*

H² There is a positive relationship between *Sector Transformation* and
Entrepreneurial Competitiveness in the telecommunications sector in South Africa

H²a There is a positive relationship between Sector Transformation and Entrepreneurial Orientation

H³ There is a positive relationship between Regulatory Alignment and Entrepreneurial Competitiveness in the telecommunications sector

H³a There is a positive relationship between Regulatory Alignment and Entrepreneurial Orientation

H⁴ There is a positive relationship between the Entrepreneurial Mindset and Entrepreneurial Competitiveness in the telecommunications sector

H⁴a There is a positive relationship between the Entrepreneurial Mindset and Opportunity Recognition

H⁵ There is a positive relationship between Entrepreneurial Innovation and Entrepreneurial Competitiveness in the telecommunications sector

H⁵a There is a positive relationship between Entrepreneurial Innovation and Opportunity Recognition

H⁶ There is a positive relationship between Entrepreneurial Experience and Entrepreneurial Competitiveness in the telecommunications sector

H⁶a There is a positive relationship between Entrepreneurial Experience and Opportunity Recognition

H⁷ There is a positive relationship between Entrepreneurial Leadership and Entrepreneurial Competitiveness in the telecommunications sector

H⁷a There is a positive relationship between Entrepreneurial Leadership and Resource Allocation

H⁸ There is a positive relationship between Human Capital and Entrepreneurial Competitiveness in the telecommunications sector

H⁸a There is a positive relationship between Human Capital and Resource Allocation

H⁹ There is a positive relationship between Financial Resources and Entrepreneurial Competitiveness in the telecommunications sector

H⁹a There is a positive relationship between Financial Resources and Resource Allocation

H¹⁰ There is a positive relationship between Legal Alignment and Entrepreneurial
Competitiveness in the telecommunications sector

$H^{10a}$ There is a positive relationship between Legal Alignment and Strategic Positioning

$H^{11}$ There is a positive relationship between the Benchmarking and Entrepreneurial Competitiveness in the telecommunications sector

$H^{11a}$ There is a positive relationship between Benchmarking and Strategic Positioning

$H^{12}$ There is a positive relationship between Technological Entrepreneurship and Entrepreneurial Competitiveness in the telecommunications sector

$H^{12a}$ There is a positive relationship between Technological Entrepreneurship and Strategic Positioning

$H^{13}$ There is a positive relationship between Strategic Positioning and Entrepreneurial Competitiveness in the telecommunications sector

$H^{14}$ There is a positive relationship between Resource Allocation and Entrepreneurial Competitiveness in the telecommunications sector

$H^{15}$ There is a positive relationship between Opportunity Recognition and Entrepreneurial Competitiveness in the telecommunications sector

$H^{16}$ There is a positive relationship between Entrepreneurial Orientation and Entrepreneurial Competitiveness in the telecommunications sector

Results from the theoretical framework were used to build the model for the promotion of entrepreneurial competitiveness in the South African telecommunications sector.

1.10 DELIMITATIONS OF THE RESEARCH/OUTLINE OF THE STUDY

The research study was conducted within the following delimited scope:

- The research fields identified in the study namely Entrepreneurship, telecommunications and Competitiveness are universally similar when studied as individual areas of interest. The field of research for each area of interest was therefore not limited to emerging markets only and therefore cannot be generalised;
- The Geographical Scope of the nexus construct was South Africa;
• Only entrepreneurs or technologically based entrepreneurial businesses operating in the telecommunications sector in South Africa were investigated;
• The research population included management, entrepreneurs or entrepreneurial companies in possession, or those leveraging an Electronic Communications Network Licence (ECN) or an individual Electronic Communications Network Licence (iECN) Licence;
• Entrepreneurs or entrepreneurial companies who form part of the Internet Service Providers’ Association (ISPA) and the Wireless Access Providers’ Association of South Africa (WAPA) members and
• Telecommunications sector services breakdown of data communications including broadband, data, mobile broadband and Internet application platforms.

1.11 STRUCTURE OF THE THESIS

The study comprises eight chapters. The chapters and their links are outlined and set out diagrammatically in Figure 1.4.
The chapters provide the conceptual context of the study. The literature covered moves progressively from the primary areas of interest to the overlapping constructs and ends in the nexus overlap which was identified as the ‘research gap’. The chapters addressing Research Questions and Objectives are presented in Table 1.3 as follows:

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Research Question</th>
<th>Research Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two</td>
<td>RQ₁, RQ₂, RQ₃</td>
<td>RO₁, RO₂</td>
</tr>
<tr>
<td>Three</td>
<td>RQ₃, RQ₄</td>
<td>RO₃</td>
</tr>
<tr>
<td>Four</td>
<td>RQ₂, RQ₃, RQ₅</td>
<td>RO₄</td>
</tr>
<tr>
<td>Five</td>
<td>RQ₆</td>
<td>RO₅</td>
</tr>
<tr>
<td>Six</td>
<td>RQ₇</td>
<td>RO₆</td>
</tr>
<tr>
<td>Seven</td>
<td>RQ₇</td>
<td>RO₇</td>
</tr>
<tr>
<td>Eight</td>
<td>RQ₈</td>
<td>RO₈</td>
</tr>
</tbody>
</table>

Chapter 1: Introduction to the Study. Introduction and general orientation to the study of entrepreneurial orientation in the telecommunications sector in South Africa. It also presents the purpose, objectives and the hypothesis of the study. The methodology is discussed and the study demarcated.

Chapter 2: Entrepreneurial Orientation. Chapter 2 discusses Entrepreneurial Orientation in conjunction with the factors that have an impact on the competitiveness of technological entrepreneurs and addresses Research Questions RQ₁, RQ₂, RQ₃ as well as research Objectives RO₁ and RO₂.

Chapter 3: The telecommunications Sector. Chapter 3 provides a study of the telecommunications sector in South Africa in the context of global sectors and trends. Research Questions RQ₃, RQ₄ and research objective RO₃ are addressed in this chapter.

Chapter 4: Benchmarking. A comparative study is performed in Chapter 4 by means of indicators and indices. The chapter introduces benchmarking criteria for
both entrepreneurship and telecommunications. Performance in South Africa with respect to entrepreneurship and telecommunications is also reported. Research Questions RQ₂, RQ₃, RQ₅ and research objective RO₄ are addressed in this chapter.

Chapter 5: Conceptual model formulation. The proposed model in Chapter 1 is formulated and the hypotheses stated. Supportive literature, collated from Chapters 2 to 4, is discussed to support the hypotheses. The research question RQ₆ and objective RO₅ are addressed in this chapter.

Chapter 6: Research methodology. This chapter focuses on the research design and the research methodology selected to address the main research problem and includes questions identified in Chapters 2 to 4. This Chapter also forms the basis on which the data will be gathered and analysed in Chapter 7. Research Question RQ₇ and research objective RO₆ are addressed in this chapter.

Chapter 7: Data analysis. The findings in chapter two to five and the experiential material collected using the methods in Chapter 6 are reported on in this chapter. This includes the Structural Equation Modelling used to analyse the data. Research Question RQ₇ and research objective RO₇ are addressed in this chapter.

Chapter 8: Summary and recommendations. This chapter focuses on the process of interpreting the findings from chapter seven and attempts to confirm that the research questions and expectations created in Chapters 1 to 5 have been answered and met. The revised model to promote the success of entrepreneurs in the telecommunications sectors, which has been developed through the study, is presented. Possible future avenues of research in this study area are also highlighted. Research Question RQ₈ and research objective RO₈ is addressed in this chapter.

1.12 DEFINITION OF CONCEPTS

3G: Third generation of mobile technology
4G: Fourth generation of mobile technology
ADSL: Asynchronous Digital Subscriber Line
CDMA: Code division multiple access
1.13 ASSUMPTIONS

The following assumptions will prevail during the scope of this study:

- Universal entrepreneurial studies apply to entrepreneurial studies of the telecommunications sector;
- The current Legislation and Regulatory framework will remain current for the duration of the study and
- Market and Economic conditions will be constant for the duration of the research project.
1.14 SUMMARY

This first chapter describes the research intent and background to the problem, as well as an overview on the development of entrepreneurship, modern perceptions and the current state of the telecommunications sector. The research problem and several research questions were stated, followed by the rationale for the research project and key challenges.

The research framework, including the delimitations and definitions, is 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.

Chapters 2 to 5 contain the literature overview and focus on the current available theory concerning the key concepts of entrepreneurial orientation in general and on technological entrepreneurship: specifically, an analysis of the telecommunications sector as a comparative study.

Chapter 2 will discuss Entrepreneurial Orientation in context in conjunction with the factors that have an impact on the competitiveness of technological entrepreneurs and addresses Research Questions RQ\textsubscript{1}, RQ\textsubscript{2}, RQ\textsubscript{3} as well as the Research Objectives RO\textsubscript{1}, RO\textsubscript{2} and RO\textsubscript{3}. 
CHAPTER 2

ENTREPRENEURIAL ORIENTATION

2.1 INTRODUCTION

This chapter addresses the research questions RQ₁, RQ₂ and RQ₃ and the research objectives RO₁ and RO₂. The chapter presents a literature review on Entrepreneurial Orientation (EO). The perspective is contained in the following elements:

- The entrepreneur is defined for this study;
- Standard academic practice, where most recent theories are taken as the foundation upon which the model to promote competitive entrepreneurship is built;
- Research journals and results drawn from the body of knowledge are referenced;
- Traditional literature studies and their relevance are applied to the study;
- The study and review of existing theoretical frameworks and models in the context of this study and
- The identification of a specific set of qualities to represent the profile of the technological entrepreneur and/or entrepreneurial business, which operate in an economical sector where transformation, change in legislation and regulation are evident.

The theoretical base for this chapter is composed of three stand-alone topics that constitute the research study, namely Entrepreneurial Orientation, Entrepreneurial Competitiveness and Technological Entrepreneurship. This necessitates the selection of applicable research frameworks and theoretical models for the three parts of the study. It is against this background that the literature review in this chapter will be conducted.

Common definitions of the entrepreneur or entrepreneurial business are employed in this study. The terms entrepreneur and entrepreneurial business are used interchangeably. Entrepreneurial businesses can be defined as businesses that satisfy one of the following conditions: they are new entrants into a market or are
businesses entering a market at a specific time and they are owner-managed (Van Praag and Versloot, 2007).

Literature suggests that persons can only qualify as entrepreneurs if they introduced new goods, introduced new methods of production, opened a new market, discovered a new source of supply of raw materials or half-manufactured goods and established a new organisation in any sector (Almahdi and Dickson, 2010; Deakins and Freel, 2009; Schumpeter, 1934). This research study is concerned with a specific set of entrepreneurial qualities, which will not only require a generalised entrepreneurial profile, but more specifically, the emphasis will be on background experience, technological knowledge as well as particular skills in opportunity recognition contextualised within the areas of technological innovation and creativity, leadership, mindset and includes management aspects.

Numerous studies have been concerned with identifying the traits that distinguish entrepreneurs from the rest of society. Although authors such as Swedburg (2000), Chell et al. (1991) and McClelland (1961) described, in earlier studies, entrepreneurs as somehow unique in their character composition, no definitive character profile of entrepreneurs has been found (Baum, 2004). In this regard, Baum (2004) also argues that many of the characteristics commonly associated with entrepreneurs, such as ambition, initiative, motivation, optimism, passion, perseverance and tenacity could also be found amongst non-entrepreneurs. Yeung (2009) describes the field of entrepreneurship research to be largely fragmented in academic research.

Authors refer to entrepreneurial activities as a process of organising resources (material, human and financial) (Shane, 2003; Bonnell and Gold, 2002; Schumpeter, 1934). According to these authors, the organisation of resources is crucial in the sense that it brings everything together and leads to the establishment and success of a company (Shane, 2003; Bonnell and Gold, 2002; Schumpeter, 1934). Schumpeter (1934:66) described the function of the entrepreneur as “to serve as a disruptive force with a dynamic approach in an economy that reached a static equilibrium”. In addition, Yeung (2009) refers to entrepreneurship as the ability of
participants whether individuals or businesses, to create and capitalise in different economic spaces.

2.2 GLOBAL PERSPECTIVES ON ENTREPRENEURSHIP

In the past decades, increased attention has been demonstrated in the investigation of factors relating to entrepreneurship and new venture creation in a global economic context (Deakins and Freel, 2009; Nelson, 2004). Much of this work has been done to identify methods of encouraging entrepreneurship as a means of increasing the rate of creating new business, sustaining existing ventures and enhancing regional and national economic development (Minniti and Lévesque, 2008).

The literature under review suggests that the phrase ‘entrepreneur’ has been interpreted in different ways by many researchers. Say (2001) reports that an entrepreneur is the organiser of economic factors of production and the main agent of production in the economy, Kirzner (2001), however, described this role as the ability to spot opportunity.

Knight (2000) views the role of entrepreneurs as that of risk-taker, while Casson and Watson (2007) report entrepreneurs as the organisers of resources. Deakins and Freel (2009) describe entrepreneurs as creative and imaginative. The term ‘entrepreneur’ was absent in ancient, conventional economic theory. Neo-classical economic theory considers an entrepreneur as someone who co-ordinates different factors of production but the role was not very important. In recent years, the role of entrepreneurs has received greater attention through the development of Small and Medium-Sized Enterprises (SME) (Almahdi and Dickson, 2010).

Cantillon (1755) was the first to recognise the crucial role of the entrepreneur in economic development, founded on individual property rights. This role in economic development is supported by Deakins and Freel (2009) who classified the entrepreneurial act as a catalyst for economic change. The entrepreneur, therefore, is described as someone who is alert to profitable opportunities for exchange and acts as a middleman (Almahdi and Dickson, 2010; Deakins and Freel, 2009; Kirzner, 2001).
In more recent literature, entrepreneurship, according to Timmons and Spinelli (2007), is described as the ability to set up and build something out of virtually nothing; it is therefore described as an elementarily human, creative act. Casson and Wadeson (2007) argue that the entire area of entrepreneurship has always given and continues to give good support to the innovative and creative aspect of developing an idea and turning it into a business venture.

Entrepreneurs have a very important and very specific role to play in the economy (van Praag and Versloot, 2007). They create employment, contribute to productivity growth, produce and commercialise innovations and in action they generate positive regional spillovers. Literature shows that entrepreneurs, at the individual level, also appear to be more satisfied than employees (Minniti and Lévesque, 2008). A distinctive function of economic analysis is its ability to analyse the link between entrepreneurship and the aggregate level of economic activity. Within this context, an increasing amount of attention has been recently paid to the specific role of start-up activities in the economic growth of regions and cities (Minniti and Lévesque, 2008; Acs and Armington, 2006; Fritsch, 2004).

There is growing recognition that improving economic conditions alone is not sufficient and that at least part of the solution requires changing of national culture or, more precisely, finding ways to strengthen entrepreneurial values, perceptions and motivations of prospective entrepreneurs (Bosma, Acs, Autio and Levy, 2008; Tomes, 2003). The Global Entrepreneurship Monitor (GEM) (2011) suggests there are marked international differences in entrepreneurial activity and in regional variations within countries. Factors such as differences in local market opportunities, skill levels for new venture creation and management, unemployment levels, availability of grants and loans for start-ups, variations in entrepreneurial culture and the presence of entrepreneurial role models influence sub-national patterns (Reynolds, 2009; Bosma et al., 2008; Levy, 2008).

A more recent addition to entrepreneurship studies is the comparative analysis of entrepreneurship in different national and regional contexts (Fernhaber, McDougall and Oviatt, 2007; Dana, 2004; McDougall and Oviatt, 2000). This group of studies combines a diverse range of theoretical and empirical studies conducted in specific
countries and regions. Research on international entrepreneurship recognises that there are two branches to the study of entrepreneurship; one focusing on the cross-national-border behaviour of entrepreneurial actors and another focusing on the cross-national-border comparison of entrepreneurs, their behaviour and the circumstances in which they are imbedded (Fernhaber et al., 2007).

There are marked international and regional differences in the incidence of entrepreneurial activity within developed and emerging markets (Bosma, Wennekers and Amorós, 2011; Levie, Brown and Galloway, 2004; Reynolds, Carter, Gartner and Greene, 2004). Factors such as differences in local market opportunities, skill levels for new venture creation and management, unemployment levels, availability of grants and loans for startup, variations in entrepreneurial culture and the presence of entrepreneurial role models influence subnational patterns (Anderson, Li, Harrison and Robson, 2003).

2.3 ENTREPRENEURSHIP CONTEXTUALISED IN SOUTH AFRICA

2.3.1 Entrepreneurial activities in South Africa

Entrepreneurship is vitally important to economic and social development in emerging markets, including South Africa (Bosma et al., 2008). Through entrepreneurial activities, new competitive markets and businesses are established which lead to job creation and result in a multiplying effect on a country’s economy (Bosma et al., 2011). Entrepreneurship empowers citizens and is an essential requirement for any emerging market to move forward and successfully integrate into the global economy.

Entrepreneurial activity in South Africa is hindered by a poor skills base as well as by challenging environmental limitations, including poverty, a lack of active markets and poor access to resources. As a result, many South Africans do not regard entrepreneurship as a positive and viable choice (Von Broembsen, Wood and Herrington, 2005). According to Cichello (2005), self-employment is a risky venture and the poor and unemployed, who are already financially strapped and vulnerable, often find it impossible to consider taking on the additional risks associated with unemployment. The hindrances associated with small business formation and the
continuation thereof, remain an important factor in the lack of employment creation. Besides these challenges, 45% of all employed people in South Africa work in companies with fewer than ten employees (SBP, 2011).

Given that South Africa is characterised by a dual economy (Bosma et al., 2008), a formal and an informal economy, the country’s Total Entrepreneurial Activity (TEA) rate should be expected to be in line with other emerging markets such as Argentina, Chile, Brazil and Peru (Reynolds, 2009). Reynolds (2009) indicates, however, that these countries achieved TEA rates that are two to three times higher than the rate achieved by South Africa in 2009 and to date the position has not improved (Bosma et al., 2011). Although the South African government’s intentions to stimulate entrepreneurial activity are theoretically sound, indications are that the initiatives are failing (Reynolds, 2009). Recent indicators support that there has been a decline and that South Africa has lost more ground on its TEA rate (Bosma et al., 2011).

South Africa remains one of the more poorly-performing countries in entrepreneurial activity, despite the fact that the country exhibits the factors which are conducive to entrepreneurial ventures, including government policies and programmes aimed at stimulating entrepreneurship (Bosma et al., 2011). According to the Global Entrepreneurship Monitor Report (GEM, 2012), the TEA index ranks South Africa as 29th out of 54 participating countries (Bosma et al., 2011). South Africa ranked below the average of the participating countries (Reynolds, 2009).

Two further factors exacerbate the concern evoked by South Africa’s low entrepreneurial activity rate. Firstly, South Africa is not a nation with means to provide generous welfare benefits to the unemployed. There are therefore no incentives to choose uninterrupted leisure over attempting to find some form of self-employment. Secondly, South Africa has high levels of unemployment relative to the rest of the GEM sample (GEM, 2011). South Africa’s unemployment rate of 25.2% in the first quarter of 2012 is double the next highest rate than that of Columbia’s rate of 12% (IMD, 2012).

The South African government has prioritised the development of the Small, Medium and Micro Enterprise (SMME) sector in the country (PNC, 2010). The area of
Information and Communications Technology (ICT) has been identified as a major area of need to develop the SMME sector, especially in areas of information provision, access to national and international markets and other areas of business support and development (PNC, 2010). ICT enables entrepreneurs to manage their businesses efficiently and thus enhance their competitiveness in the global market (ITU, 2009). They can increase their geographic reach, improve efficiency in procurement and production and improve customer communications and management (ITU, 2009). For these reasons, the need to encourage and accelerate the uptake and optimal application of ICT by entrepreneurs in different sectors of the economy cannot be overemphasised (ITU, 2010b; PNC, 2010).

The ICT sector has the potential to absorb prospective entrepreneurs, considering the various business opportunities offered by the sector. Some of the business opportunities available within the sector relate to telecommunications, systems integration, application development, database administration, web design and Internet service provision (ITU, 2009). The ICT sector is also seen as an area with major opportunities for the historically disadvantaged sectors of the population. It is therefore imperative for government to provide mechanisms to accelerate the entry of entrepreneurs into the ICT sector (PNC, 2010).

2.3.2 Government initiatives

For the past fifteen years the South African government has invested in a plethora of initiatives aimed at supporting and growing the SMME sector. Broadly speaking, it has focused simultaneously on high-end enterprise development and the encouragement of micro-enterprise activity as a means of reducing the gap between the first economy and the underdeveloped second economy (SBP, 2011). An institutional framework was established which consisted of support agencies including Ntsika, subsequently replaced by SEDA (Small Enterprise Development Agency) and on the financial support side, Khula Enterprise Finance and the Apex Fund that provide micro-finance loans of less than R10 000. On the policy front, the National Small Business Act was passed in 1996 and stipulations pertaining to the sector were built into the BEE Codes of Good Practice (SBP, 2011).
Large amounts of taxpayers' money have been channelled into growth support initiatives. For 2011/12 the adjusted appropriation for SEDA amounted to over R400 million, with an additional R381 million allocated to the Apex Fund and an additional R55 million to Khula (SBP, 2011). Furthermore, government-backed finance is provided to the small business sector by other agencies such as the Industrial Development Corporation and the Msobomvu Fund which was tasked with promoting entrepreneurship, job creation and skills development among young people. This was subsequently absorbed into the newly established National Youth Development Fund (SBP, 2011).

Despite these initiatives by government and agencies, South Africa lags behind other emerging markets in promoting the growth and sustainability of small businesses (Bosma et al., 2011). On start-ups, the Global Entrepreneurship Monitor (GEM) 2011 figures indicate that 8 in 100 adult South Africans own a business that is less than 3.5 years old. This is significantly behind other low-to-middle income countries; where on average 13 out of 100 adults are building new businesses. GEM (2011) also reports that only 2.3% of South Africans own businesses that have been established for over 3.5 years, indicating a high failure rate among start-ups, with South Africa ranking 41st out of 43 countries in the prevailing rate for established business owner-managers (Bosma et al., 2011). This suggests that government support agencies and initiatives have been less successful than intended.

As one of the key initiatives of the Accelerated and Shared Growth Initiative of South Africa, entrepreneurship has been recognised by the South African Government as a critical driver in the economic and social development of South Africa (Mlambo-Ngcuka, 2006). Government acknowledges that innovative entrepreneurs create new, competitive markets and businesses which lead to job creation and have a multiplying effect on the economy. Government therefore established the objective to establish South Africa as an entrepreneurial nation that rewards and recognises entrepreneurship (DTI, 2010).

A further key initiative will be to pursue the recommendations made to Cabinet on the regulatory environment for small businesses. These recommendations include:
The Minister of Labour will lead a review of labour laws, including their impact on small businesses;

The reforms in tax administration affecting small businesses will continue and

The DTI and DPLG will prepare recommendations on how to improve the regulatory environment for small businesses in municipalities and in that sector departments will review the impact of government’s laws and regulations on small businesses (DTI, 2010).

2.4 ENTREPRENEURIAL ORIENTATION

Entrepreneurship researchers use the term Entrepreneurial Orientation (EO) to describe a set of related entrepreneurial activities or processes (Clausen and Korneliussen, 2012; Idar and Mahmood, 2011; Quince and Whittaker, 2003). The term Entrepreneurial Orientation has also been used to refer to the strategy-making processes and the styles of companies that engage in entrepreneurial activities (Quince and Whittaker, 2003).

Entrepreneurial orientation can therefore be defined as the processes, methods, styles, practices and decision-making activities employed by entrepreneurs that lead into the creation of new markets (Lumpkin and Dess, 2001, 1996).

Recognition of the economic significance of small business and high-tech small companies in particular grew during the last years of the 20th century (Quince and Whittaker, 2003). Traditional studies indicate that behaviour which includes willingness to take risk, innovativeness, technological leadership and a proactive stance towards competition is important in both policy and organisational theory (Lumpkin and Dess, 2001). More recent, organisation theory perspectives started to focus on entrepreneurship as an organisational level phenomenon (Boehm, 2008). In particular, increasing attention has been paid to EO to be seen as a process reflected in repetitive organisational behaviour rather than the actions of individuals possessing certain attributes or characteristics (Edelman and Yli-Renko, 2010; Quince and Whittaker, 2003).
A popular model of Entrepreneurial Orientation (Lumpkin and Dess, 1996) suggested that there are five dimensions to Entrepreneurial Orientation, namely: autonomy, innovativeness, risk-taking, pro-activeness and competitive aggressiveness. These five dimensions constitute the basis of this study with relation to Entrepreneurial Orientation. According to Quince and Whittaker (2003), the effective combination of the five dimensions of entrepreneurial orientation can gain competitive advantage or strategic renewal. However, little is known about the antecedents and processes underlying nascent efforts by entrepreneurs to successfully establish a new or to re-organise a current venture (Edelman and Yli-Renko, 2010).

What drives entrepreneurs to start or persevere in conducting and organising business activities? Traditional entrepreneurship studies have adopted structurally deterministic explanations based on opportunity discovery and resource mobilisation (Edelman and Yli-Renko, 2010). Researchers also suggest utilising a contingency theory framework, describing new venture emergence as a bridge between resource profiles of nascent entrepreneurial ventures and the environmental requirements that they have to face (Reynolds et al., 2004; Shane, 2003). In this perspective, entrepreneurial actions and opportunities can further be perceived to exist in the environment as a result of changes in technology, consumer behaviour and preferences or other attributes related to the market or to industry (Venkataraman, 2004).

In contrast with the opportunity discovery view, recent research suggests a shift to a creation theory of entrepreneurship (Alvarez and Barney, 2007; Venkataraman, 2004; Sarasvathy, 2001). Rather than focusing on the characteristics of the entrepreneur and the environment, the creation perspective views opportunities as actively constructed by organisational participants and their mental models (Edelman and Yli-Renko, 2010). According to Edelman and Yli-Renko (2010) the environment composition is not something that is taken as a given but instead is enacted by entrepreneurs. Table 2.1 indicates the comparison of the discovery and creation views of entrepreneurship.

Taking into consideration both the discovery and creation view, opportunities can be seen as social constructions formed through entrepreneurs’ perceptions and
effectuated through interaction between the entrepreneur and his environment (Alvarez and Barney, 2007). In this perspective, entrepreneurial action relates to the interpretation of the equivocal environment and articulates a clear and compelling vision to its organisational stakeholders to secure the necessary support and effort to enact a successful vision (Edelman and Yli-Renko, 2010).

Table 2.1 Comparison of Discovery and Creation views of entrepreneurship

<table>
<thead>
<tr>
<th>Concept</th>
<th>Discover view</th>
<th>Creation view</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunities</td>
<td>Exist in the environment, independent of the individuals who discover them</td>
<td>Are based on entrepreneurs’ subjective perceptions and created through social interactions and learning processes</td>
</tr>
<tr>
<td>Environment</td>
<td>Comprises objective conditions that produce opportunities: entrepreneurs focus on predicting the future environment</td>
<td>Enacted through interactions between entrepreneurs and stakeholders: entrepreneurs focus on constructing the future environment</td>
</tr>
<tr>
<td>Resources</td>
<td>Required in order to meet the resource needs of exploiting a given opportunity</td>
<td>Matched with perceived opportunity in an iterative improvisation process in which both the definition of opportunity and resource requirements evolve</td>
</tr>
<tr>
<td>Cognitions</td>
<td>Affect entrepreneurs’ ability to recognise and exploit opportunities</td>
<td>Underlie the subjective notions of opportunity and environment</td>
</tr>
</tbody>
</table>

Source: Alvarez and Barney, 2007

When the perception of environmental change is acknowledged, a business would respond by changing its structure, strategy and processes (Kathuria, Maheshkumar and Dellande, 2008). The survival of a business is at risk unless it adapts to shifts in the sector-specific environment and therefore Entrepreneurial Orientation has been deemed a crucial organisational process that contributes to business performance and survival when the environment changes (Clausen and Korneliussen, 2012).

Entrepreneurs need both technological and administrative knowledge to establish and successfully run a newly established business (Wiklund and Shepherd, 2005). Factors, such as a rise in global competition, business restructuring and fast-paced
technological progress have forced business owners to consider becoming entrepreneurial in nature (Dess, Lumpkin and McKee, 1999). In the same context, when examining adoption of EO as a strategic response, Zahra (1993) found that business owners tended to embrace EO when the environment was dynamic. However, no specific empirical studies focusing on EO have linked autonomy and performance (Joshi, 2008).

Many studies have shown that other dimensions of EO can improve a company's long-term financial performance (Wiklund and Shepherd, 2005; Zahra and Covin, 1995). In his literature review, Joshi (2008) indicates that, in general, researchers into EO have mainly focused on only certain dimensions of the EO model with opportunity recognition and innovation as the main focus areas. Table 2.2 indicates researched areas of the five dimensions of EO.

<table>
<thead>
<tr>
<th>Author</th>
<th>EO dimension focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumpkin and Dess (2001)</td>
<td>Pro-activeness and competitive aggressiveness</td>
</tr>
<tr>
<td>Hornsby, Kuratko and Zahra (2002)</td>
<td>Innovation and the development and implementation of new ideas in an organisation</td>
</tr>
<tr>
<td>Srivastava and Lee (2005)</td>
<td>Innovation and its relationship to top management team (TMT) characteristics</td>
</tr>
<tr>
<td>Zahra (2007)</td>
<td>Contextualizing theory building in entrepreneurship research</td>
</tr>
</tbody>
</table>

**Source: Researcher's own construction, 2010**

An exception to the above studies is research by Antoncic and Hisrich (2003) where all the five dimensions proposed by Lumpkin and Dess (1996) were used, but they reconstituted EO into four new dimensions. Namely they combine risk taking and competitive aggressiveness and merge them with pro-activeness. Further, they subsume the autonomy dimension into a new dimension labeled as new venturing.
Research by Thornhill and Amit (2001) have examined autonomy in light of new business venturing and similarly Zajac, Golden and Shortell (1991) have studied the autonomy of newly created units from their sponsoring organisations.

The individual level focus on autonomy as a dimension of Entrepreneurial Orientation, defined by Lumpkin and Dess (2001:431) as "... independent action by an individual or team aimed at bringing forth a business concept or vision and carrying it through to completion," is sparsely addressed in the literature. This individual level emphasis is necessary in the context of high technology companies, where it has been argued that autonomy in successful, high technology companies is manifested when key, high-risk decisions are made immediately by people dealing with problems, rather than by being made later by top management (Joshi, 2008).

2.4.1 Autonomy and Entrepreneurial Orientation

The role of autonomy in spurring innovative thinking as well as entrepreneurial behaviour has received interest from many researchers in the social sciences (Joshi, 2008). In the theoretical framework of Entrepreneurial Orientation presented by Lumpkin and Dess (1996), autonomy is considered to be the attribute of the five dimensions that must be present for a business to use the entrepreneurial process to achieve long-term success.

Although autonomy is closely related to both decentralisation and wide spread employee participation in decision making, the concept of autonomy being broader than organisational structure is reflected in the writings of researchers focusing on entrepreneurial behaviour in business (Joshi, 2008; Baum and Wally, 2003). Nadler and Gerstein (1992) postulate that autonomous action in a business is facilitated by leading employees to a clear vision, knowledge of strategy and clarity of goals, skills to upgrade their expertise and by allowing free flow of information throughout the business to facilitate autonomous decision-making to achieve the desired goals. Decision makers will have to be provided with skills, resources and support, as well as access to organisational information to make appropriate decisions, especially since information sharing increases their expertise and overall technological
knowledge of the company's processes, thus making them more capable of making critical decisions (Baum and Wally, 2003).

Autonomy will therefore require individuals who are experts to have a greater say in decision-making and will have to provide them with the information to make better decisions. Further, business-wide autonomy facilitates employee empowerment, which in turn, improves employee productivity and the work unit's performance (Seibert, Silver and Randolph, 2004; Nadler and Gerstein, 1992). Therefore, to improve success and competitiveness in the entrepreneurial business, it becomes important to promote autonomy.

2.4.2 Strategic orientation

Entrepreneurs often create and arrange resources required to exploit market opportunities by organising a company (Alvarez and Barney, 2007; Peteraf and Barney, 2003). In order to organise their businesses, entrepreneurs must make multiple informed choices based on their ability to analyse the information available. Two of the most important choices are: firstly to establish who, in a company, has the right to make what kinds of decisions (Alvarez and Barney, 2007) and secondly to determine the claims of various individuals to the residual cash flows created by exploiting an opportunity (Stam, 2007).

Most businesses face external environments that are highly turbulent, complex and in many cases global which lead to conditions that make interpreting these conditions increasingly difficult (Hitt, Ireland and Hoskisson, 2005). While economic geography has addressed entrepreneurship and entrepreneurial businesses, earlier studies mostly focused on the local and domestic foundation of entrepreneurial activities and their impact on small business formation, technological innovation and industrial clustering (Stam, 2007; Kalantaridis and Bika, 2006; Parthasarathy and Aoyama, 2006).

On review, current literature suggests that two types of strategic orientations seem to be represented, namely market-driven and market-driving approaches, respectively as interaction orientation and entrepreneurial orientation (Chen, Li and Evans, 2012).
The two approaches are distinguished by business capabilities and business performance. The importance of these two orientations on business performance links the two constructs. Interaction orientation along with a market-driven orientation and exploitative learning focuses on developing distinctive customer value in existing market boundaries whereby the business interacts with its individual customers and makes use of information obtained from their mutual interactions to co-create value (Ramani and Kumar, 2008).

Entrepreneurial orientation on the other hand is linked to a market-driving orientation. Exploratory learning emphasises active industry change and the creation of new markets through exploration of new opportunities, thereby contributing to advancements in the value proposition in the marketplace (Chen et al., 2012; Lumpkin and Dess, 1996). Literature that focused on interaction orientation has investigated the effect of interaction orientation on customer-based activities within a business (Ramani and Kumar, 2008). Literature exploring entrepreneurial orientation has emphasised the effects of entrepreneurial orientation on innovative activities and technological development within the business context (Li, Guo, Liu and Li, 2008; Wang, 2008; Avlonitis and Salavou, 2007). Incorporating these research streams contributes to the understanding of a business’ market orientation which contributes to its strategic position and competitive advantage.

Broadly speaking, strategic competitiveness is achieved when a business successfully formulates and implements a value creating strategy and its competitors are unable to duplicate it or find it too costly to imitate; this business then has a sustained competitive advantage (Hitt et al., 2005). However, there is only limited research and understanding on the competitiveness of entrepreneurship and entrepreneurial activity in markets where sector transformation is evident. Cohen and Winn (2007) stress the discovery of opportunity as essential when they posit that entrepreneurial competitiveness research examines how opportunities to bring into existence future goods and services are discovered, created and exploited, by whom and with what economic, psychological, social and environmental consequences (Cohen and Winn, 2007).
When faced with uncertainty (in an environment), the entrepreneur, sometimes with limited capability and experience, tends to refer to historical data or relies on limited information to make decisions. For example, the extent to which he understands his environment directly impacts on entrepreneurial behaviour (Luthans, Stajkovic and Ibrayeva, 2000). When faced with high environment uncertainty, the entrepreneurial business is more autonomous, better able to create innovative products and to respond to the unexpected. Therefore, it will adopt the best entrepreneurial behaviour for improvements throughout the business for better competitiveness.

Alternatively, the management style of the conservative business is risk averse and lacks proactive incentive to innovate (Simsek, Lubatkin and Floyd, 2003). In the face of high environment uncertainty, the conservative business will pursue opportunities within the business network, leverage strategic alliance and collaborate with companies in other industries, thus transferring the risks brought about by the uncertainty. Hence the approach is entrepreneurial behaviour that progresses step-by-step (Simsek et al., 2003).

In business and strategic management, environment uncertainty has always been used as a discussion topic (Hitt et al., 2005). In general it is agreed that uncertainty refers to the environment that affects the performance and competitiveness of a business, the complexity or unpredictable nature of the organisational structure, the dynamic nature and other characteristics (Hitt et al., 2005). Bensaou and Venkataraman (1995) believed that environment uncertainty is the result of the capacity, complexity and level of activity in the market. Environment uncertainty will depict the way entrepreneurs act and behave under the prevailing conditions, and is academically referred to as Strategic Entrepreneurship (Ireland and Webb, 2007).

The term Strategic Entrepreneurship (SE) refers to the value-creating intersection between business strategy and entrepreneurship. The attributes listed in Figure 2.1 describe strategy and entrepreneurship in context with creating newness (Ireland and Webb, 2007). The Figure 2.1 illustrates that SE results from combining attributes of strategy and entrepreneurship. The business combines exploration-oriented attributes with exploitation-oriented attributes to develop consistent streams of innovation and to remain technologically ahead of competitors. SE is therefore
concerned with the actions a business intends to take to exploit the innovations that result from its efforts to continuously explore for innovation-based opportunities (Ireland and Webb, 2007).

The outcomes of the value creating intersection in Figure 2.1 indicates the ability to anticipate and then respond strategically to environmental change which is one of the important outcomes of effective SE. Through SE, the business intends to rely on innovation, on opportunity and its exploitation as the source of sustainable competitive advantage and effective responses to continuous environmental changes. Effective SE practices find businesses realising that adapting to change requires an array of newness in the form of innovations.
2.5 THE ENTREPRENEURIAL PROCESS

Researchers in the early 1980’s emphasised the entrepreneurial person as the dominant player in the process of new venture creation. David McClelland (1961) derived a model describing the entrepreneur’s needs as (1) the need for achievement, (2) the need for affiliation and (3) the need for power. In the 1990’s Bolton and Thompson (2000) described an entrepreneurial model within the dimensions of talent, temperament and technique.

More recently, Timmons and Spinelli (2007) argue that there is no evidence of an ideal entrepreneurial personality and successful entrepreneurs have a wide range of personality types. Great entrepreneurs according to Timmons and Spinelli (2007) can either be gregarious or low key, analytical or intuitive, charismatic or boring, good with details or terrible, delegators or control freaks. Successful entrepreneurs pose not only creative and innovative flair, but also solid management skills, business know-how and sufficient contacts (Harper, 2008; Timmons and Spinelli, 2007). Figure 2.2 illustrates this relationship.

![Figure 2.2 Who is an entrepreneur?](image)

**Source:** Timmons and Spinelli, 2007:15
As seen in Figure 2.2 a person is more distinctively identified as an entrepreneur where higher levels of creativity and innovation as well as high levels of management skills are evident.

The focus subsequently shifted from the entrepreneurial person to the process involved in formulating entrepreneurship. Harper (2008) defines the entrepreneurial process as a profit-seeking, problem-solving process that takes place in real time and under conditions of structural uncertainty. The Timmons and Spinelli (2007) model of the entrepreneurial process, first introduced in 1994 and illustrated in Figure 2.3 as a basis, can be regarded as the standard for the entrepreneurial process. The critical factors relating to the entrepreneurial process can be summarised in three main groups:

- The people (the founders, including the management team);
- The idea (a developed and refined concept in order to exploit market opportunities) and
- The resources (human capital and financial/physical resources) (Timmons and Spinelli, 2007).
With reference to Figure 2.3 all three factors, namely opportunity, team and resources play an equally important role. Successful entrepreneurs have a wide range of personality types. Studies have shown that an entrepreneur does not need specific inherent traits, but rather a set of acquired skills. The skills fall within the illustrated diagram presented by Timmons and Spinelli (2007). The entrepreneur is measured against innovation and creativity as one determinant and general managerial skill, business know-how and networking the others.

On this basis, the factors of success described in Figure 2.3 related to competitive entrepreneurial activity depend substantially on creation and development in the interplay with other factors such as people and resources (Faltin, 1999). In the same context, Gibb (2002) argues that entrepreneurship is often narrowly confined and associated with business administration, which is too narrow a paradigm for entrepreneurship and limits perspective on the process. Faltin (1999) also argues that emphasis on the different factors in the Timmons and Spinelli (2007) model will be placed or prioritised in various ways, depending on the individual factors and the venture taken on by the entrepreneur.

Literature suggests that alertness forms part of the Entrepreneurial process (Tang, Kacmar and Busenitz, 2012). Given the growth and role of entrepreneurship today in current economic markets, it is becoming increasingly important to understand how new entrepreneurial opportunities are developed. Discussions of the emergence of new entrepreneurial opportunities often include “eureka” moments, but understanding of how new opportunities are produced is limited (Tang et al., 2012; McMullen and Shepherd, 2006).

One concept that is starting to gain momentum involves alertness. Entrepreneurs tend to be more alert to possibilities for new entrepreneurial ventures (McMullen and Shepherd, 2006). Alertness in the entrepreneurial context is described as a concept that has the potential to add substantially to our understanding of how new ideas are initiated and pursued (Minniti and Lévesque, 2008).

Alertness enables a person to organise and interpret information in various domains of knowledge related to the development of new opportunities (Minniti and Lévesque,
In this context, Minniti and Lévesque (2008) state that entrepreneurial development generates a continuous process of change, performed by heterogeneous, interdependent individuals who interact in many different ways and thereby evolve and adapt. Their interactions are multi-layered; therefore it is impossible to determine the final amount of entrepreneurial activity that will prevail in a certain area. That amount is, in fact, the outcome of two elements, namely distribution of information and alertness (Minniti and Lévesque, 2008). Factors such as alertness, inherent traits, acquired skills, resource availability and entrepreneurial behaviour all relate to the actions which an entrepreneur will take when an opportunity arises. This can be described as the mindset applied to a particular proposition (Minniti and Lévesque, 2008).

In order to present different perspectives, the entrepreneurial process is discussed in context with the social cognition theory as well as the metacognitive model of the entrepreneurial mindset as part of the composition of the entrepreneurial person. The social cognition theory highlights personal behaviour, individual cognition and the impact of the environment as the three interactive forces (Lin, 2006). In a study of an entrepreneurial person’s personal behaviour and motivation, Shane (2003) categorised previously investigated motivational factors in terms of need for achievement, risk taking, tolerance for ambiguity and locus of control, self-efficacy and goal setting. Shane (2003) suggest that research on how an individual’s motives influence entrepreneurial action is suggestive rather than conclusive, primarily because much research suffers from significant methodological problems.

Lin (2006) referred to the self-efficacy concept as a person’s ability to control his/her actions and the way he/she accomplishes work objectives at three levels:

- **Magnitude**: a person’s belief in the level of difficulty to complete a task;
- **Strength**: the degree of a person’s firm belief in successful accomplishment of a certain task and
- **Generalisability**: if the self-fulfillment of a person is applicable in different situations.
Of late, many management domains have applied these theories to explain the behavioural actions of the individual or of the business itself, or of actual behaviour (Schmidt and Ford, 2003).

Schmidt and Ford (2003) introduced a situated metacognitive model of an entrepreneurial mindset where the inclusion of metacognitive training in entrepreneurship pedagogy will advance adaptable thinking, an attribute that can be regarded of fundamental importance to entrepreneurs. Haynie, Shepherd, Mosakowski and Earley (2010) developed a situated metacognitive model of the entrepreneurial mindset based on the dynamic consideration of cognitive functioning and focused on how decision heuristics and strategies develop, adapt and are employed over the duration of the entrepreneurial process. The model enables the study of the dynamics of sense-making in a context that begins before the identification of the entrepreneurial opportunity and runs through the many stages and steps associated with entrepreneurial action.

Earlier studies have found that metacognitive awareness is positively related to adaptable decision-making (Schraw and Dennison, 1994). Individuals who are metacognitively aware are more likely to formulate and evaluate multiple alternatives to process a given task and are also highly sensitised and receptive to feedback from the environment that can be incorporated into subsequent decision frameworks (Melot, 1998). Metacognitive processes are therefore important in dynamic, uncertain environments such as those which entrepreneurs typically face in high technology sectors (Shepherd et al., 2007). When environmental conditions change, individuals adapt their cognitive responses and develop strategies for responding to the environment (Haynie et al., 2010; Shepherd et al., 2007).

Given the dynamism and uncertainty surrounding entrepreneurial action, metacognition facilitates the study of how entrepreneurs adapt to their evolving and unfolding context and why some adapt successfully while others do not (McMullen and Shepherd, 2006). Metacognition is not a dispositional trait, but instead represents a learned process (Nelson, 2004), which can be enhanced through training (Schmidt and Ford, 2003; Nietfeld and Schraw, 2000).
2.5.1 Opportunity recognition

Without an opportunity, entrepreneurship does not exist (Short, Ketchen, Shook and Ireland, 2010; Shane and Venkataraman, 2000). Research predominantly approaches the concept of entrepreneurial opportunities from two perspectives, namely, opportunities exist as objective phenomena in the environment waiting to be discovered by alertness in entrepreneurs, or opportunities are subjectively perceived and even created by individual entrepreneurs (Renko, Shrader and Simon, 2012).

Opportunity recognition can be defined in this study as a cognitive process through which entrepreneurs conclude that they have identified an opportunity which is built on the conceptual foundations laid by authors of literature (Murphy, 2011; Gaglio, 2004; Ardichvili, 2003; Shane, 2003; Shane and Venkataraman, 2000; Kirzner, 1997).

A potential entrepreneur can be innovative, creative and hardworking but without an opportunity to target with these characteristics, entrepreneurial activities cannot take place (Short et al., 2010). Although entrepreneurship research has tended to centre (focus) on entrepreneurs and their behaviours in creating new ventures, the perception of opportunity recognition has received increased attention in literature (Murphy, 2011; McMullen and Shepherd, 2006; Shane and Venkataraman, 2000; Venkataraman, 1997).

Venkataraman (1997) reasoned that entrepreneurship as a scholarly field seeks to understand: firstly, why, when and how opportunities for the creation of future goods and services arise in the economy and secondly, why, when and how some are able to discover and exploit those opportunities whilst others cannot or do not. More recent studies surrounding opportunity recognition have been theoretically rich, including a base of theories such as the coherence theory, creation theory, discovery theory, organisational learning and research on affect, social cognitive theory and structuration theory (Murphy, 2011; Short, et al., 2010; Baron, 2008; Alvarez and Barney, 2007). The literature suggests that the opportunity construct holds great promise as a basis for theory building.
An opportunity is described by some authors as a discrete phenomenon that is exogenous to the entrepreneur and originates from external circumstances, such as new technology or a social change (Shane, 2003; Kirzner, 2001; Shane and Venkataraman, 2000). Others viewed opportunity as inevitably linked to and stemming from the entrepreneur's own cognition (Edelman and Yli-Renko, 2010; Sarason, Dean and Dillard, 2006; Gartner et al., 2003). Baron (2008) describe how an individual's affect leads to cognitive processes such as judgements and perceptions that, in turn, drive key aspects of the entrepreneurial process, such as opportunity recognition.

Identifying and selecting the right opportunities for new ventures are amongst the most important abilities of successful entrepreneurs (Ardichvili, Cardozo and Ray, 2003). Consequently, explaining the discovery and development of opportunities is a key part of entrepreneurship research (Venkataraman, 2004). Numerous theories of opportunity, recognition and development have been presented by many scholars in recent years (see Table 2.3). Their research is based on different, often conflicting, assumptions borrowed from a range of disciplines.

<table>
<thead>
<tr>
<th>Article</th>
<th>Literature/Theory Base</th>
<th>Contribution to Understanding the “Opportunity” Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shane and Venkataraman (2000)</td>
<td>Various</td>
<td>The entrepreneurship field should be defined by the individuals and processes that lead to the discovery, evaluation and opportunity exploitation</td>
</tr>
<tr>
<td>Aldrich and Cliff (2003)</td>
<td>Research on family business</td>
<td>Transformations in the degree of family embeddedness may lead to the emergence and recognition of new entrepreneurial opportunities</td>
</tr>
<tr>
<td>Ardichvili, Cardozo and Ray (2003)</td>
<td>Dubin’s (1978) theory building framework</td>
<td>Personality traits, social networks and prior knowledge are antecedents to the entrepreneurial alertness needed to recognise, evaluate and develop opportunities</td>
</tr>
<tr>
<td>Article</td>
<td>Literature/Theory Base</td>
<td>Contribution to Understanding the “Opportunity” Concept</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Denrell, Fang and Winter (2003)</td>
<td>Resource-based theory and research in economics</td>
<td>Develops a framework for analysing strategic factor market inefficiencies, which suggests that strategic opportunities represent a situation when prices fail to reflect the value that represents a resource’s best use</td>
</tr>
<tr>
<td>Ireland, Hitt and Sirmon (2003)</td>
<td>Strategic entrepreneurship</td>
<td>Small businesses are generally better at identifying opportunities but less adept at appropriating value by developing competitive advantages</td>
</tr>
<tr>
<td>Gaglio (2004)</td>
<td>Social cognition</td>
<td>The processes of mental simulation and counterfactual thinking provide the mechanisms by which opportunities are identified and developed</td>
</tr>
<tr>
<td>Lumpkin and Lichtenstein (2005)</td>
<td>Organisational learning</td>
<td>Builds on three approaches to organisational learning (behavioural., cognitive and action learning) to develop a creativity-based model of opportunity recognition that includes the discovery and formation phases</td>
</tr>
<tr>
<td>Lee and Venkataraman (2006)</td>
<td>Various</td>
<td>Opportunities are created when disequilibrium exists between an individual’s level of aspiration and her/his appraised value in the labour market</td>
</tr>
<tr>
<td>McMullen and Shepherd (2006)</td>
<td>Various</td>
<td>Opportunities are exploited when individuals are willing to bear the uncertainty needed to take entrepreneurial action</td>
</tr>
<tr>
<td>Sarason, Dean and Dillard (2006)</td>
<td>Various</td>
<td>Opportunities are exploited when individuals are willing to bear the uncertainty needed to take entrepreneurial action</td>
</tr>
<tr>
<td>Alvarez and Barney (2007)</td>
<td>Discovery theory and creation theory</td>
<td>Discovery theory and creation theory provide competing explanations for how entrepreneurial opportunities are formed</td>
</tr>
<tr>
<td>Cohen and Winn (2007)</td>
<td>Sustainable entrepreneurship</td>
<td>Market imperfections lead to opportunities for the creation of new technologies and business models</td>
</tr>
<tr>
<td>Dean and McMullen (2007)</td>
<td>Research on environmental Economics</td>
<td>Environmental market failures represent opportunities for achieving profitability while also reducing environmentally degrading behaviours</td>
</tr>
<tr>
<td>Fernhaber, McDougall and Oviatt (2007)</td>
<td>Research on international Entrepreneurship</td>
<td>Entrepreneurial opportunities are the starting point that drives a model of international entrepreneurship that determines the speed of internationalisation</td>
</tr>
<tr>
<td>Lee, Peng and Barney (2007)</td>
<td>Real options theory</td>
<td>Entrepreneurial-friendly bankruptcy laws encourage the exploitation of opportunities at the societal level</td>
</tr>
<tr>
<td>Article</td>
<td>Literature/Theory Base</td>
<td>Contribution to Understanding the “Opportunity” Concept</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>---------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Miller (2007)</td>
<td>Entrepreneurial risk</td>
<td>Entrepreneurial risk, unique conceptualisations of risk and rationality are associated with opportunity recognition, discovery and creation</td>
</tr>
<tr>
<td>Shepherd, McMullen and Jennings (2007)</td>
<td>Coherence theory</td>
<td>Presents a theoretical framework wherein opportunities evolve from third-person opportunity beliefs that an opportunity exists for someone to become first person (an opportunity exists for me)</td>
</tr>
<tr>
<td>Baron (2008)</td>
<td>Research on affect</td>
<td>Affect (individual’s moods and feelings) influences the entrepreneur’s cognitions and thus, shapes entrepreneurial processes such as opportunity recognition</td>
</tr>
<tr>
<td>Choi, Lévesque and Shepherd (2008)</td>
<td>“Timing of exploitation” Theory</td>
<td>Timing is a critical factor when transitioning between the opportunity exploration and exploitation processes</td>
</tr>
<tr>
<td>Klein (2008)</td>
<td>Work of Austrian economists Knight and Misses</td>
<td>Opportunities as subjective phenomena (judgements) that are imagined, rather than created or discovered</td>
</tr>
<tr>
<td>Schindehutte and Morris (2009)</td>
<td>Complexity science</td>
<td>Strategic entrepreneurship involves both exploration and exploitation of opportunities</td>
</tr>
<tr>
<td>Zahra, Gedajlovic, Neubaum and Shulman (2009)</td>
<td>Various</td>
<td>Certain technology contexts may be more conducive to discovering opportunities, whereas others encourage both creation and discovery</td>
</tr>
<tr>
<td>Short, Ketchen, Shook and Ireland, (2010)</td>
<td>Concept of opportunity recognition</td>
<td>The opportunity concept and the processes surrounding it</td>
</tr>
</tbody>
</table>

Source: Author’s own construction, 2011

Opportunity recognition forms one of the core identifiers of entrepreneurship (Short et al., 2010). The term opportunity recognition is a well-researched topic. Table 2.3 summarises the key features of conceptual and empirical articles with reference to entrepreneurial opportunity discovery. For the entrepreneur to utilise an opportunity, a window must be open and remain open long enough to achieve market-required returns (Timmons and Spinelli, 2007). Whilst elements of opportunities may be recognised, Ardichvili et al. (2003) state that opportunities are made and not found. Careful investigation of and sensitivity to market needs and as well as an ability to spot suboptimal deployment of resources may help an entrepreneur to begin to develop an opportunity (Ardichvili et al., 2003).
Entrepreneurs often engage in activities of business opportunity recognition, development and exploitation to gain strategic competitive advantage, which can be contextualised as both external and internal exploitation (Schwartz and Teach, 2000; Bhave, 1994). They also identify business opportunities in order to create and deliver value for stakeholders in prospective ventures. The entrepreneur follows a cognitive process to refine or develop the opportunity, identify the business concept and then the commitment can be brought into reality (Schwartz and Teach, 2000). Opportunities are therefore one of the key concepts that define the boundary and exchange-conditions of the entrepreneurship field (Busenitz, West, Shepherd, Nelson, Chandler and Zacharakis, 2003).

Opportunities emerge from a complex pattern of changing conditions: changes in technology, economic, political, social and demographic conditions. They come into existence at a given point in time because of a contrast or when a series of conditions co-exist, which did not exist previously but are now present (Baron and Ensley, 2006). Bhave (1994) defined a model for opportunity recognition and exploitation, with two paths to opportunity recognition and exploitation: external and internal. In the former, a business was begun and then an opportunity was found. In the latter case, the opportunity was found and then the business began. In either case, opportunities had to be recognised and refined, the business concept identified, or then a commitment to the idea had to be converted into a reality.

The creation of a successful business follows a successful opportunity development process. This includes recognition of an opportunity, its evaluation and development (Short et al., 2010). Opportunity development involves an entrepreneur’s creative work and is therefore referred to as opportunity development rather than opportunity recognition. The opportunity development process is cyclical and iterative where the entrepreneur is likely to conduct evaluations several times at different stages of development. The process of opportunity evaluation could also lead to the recognition of additional opportunities or adjustments to the initial vision.

Factors that influence this core process of opportunity recognition and development leading to business formation include entrepreneurial alertness, information
asymmetry and prior knowledge, social networks, personality traits (including optimism, self-efficacy and creativity) and the type of opportunity itself (Ardichvili et al., 2003). An opportunity can be described as subjective phenomena (judgements) that are imagined, rather than created or discovered (Klein, 2008). The opportunity development process begins when entrepreneurial alertness exceeds a threshold level where the entrepreneur's judgement leads him to believe that the opportunity is real (Short et al., 2010). Alertness levels towards an opportunity are likely to be heightened when a coincidence of several factors exists, namely, certain personality traits (creativity and optimism), relevant prior knowledge or experience and social networks. The particular activities within the process are also affected by the degree of specificity of knowledge about market needs and resources (Ardichvili et al., 2003).

2.5.2 Innovation and creativity

Novel and useful ideas are described as the lifeblood of entrepreneurship. The fact that novelty and usefulness relate to creative ideas, possible connections between innovation, creativity and entrepreneurship has been of interest for some time (Ward, 2004). Ward (2004) suggests that entrepreneurs must engage in an innovative and creative process of generating valuable ideas for new goods or services that will appeal to an identifiable market. Once the potential opportunities are identified, entrepreneurs must consider and decide how to bring the project to realisation (Ward, 2004).

Today's economy is subjected to ever-changing technology (Marcati, Guidoa and Pelusob, 2008). Continuous technological innovation and creativity play a vital role in ensuring the survival and development of companies. Technological innovation decisions have become a very important decision problem that cannot be ignored in the entrepreneurial decision-making process (Marcati et al., 2008).

Innovation relates to the openness and creativity of individuals (Marcati et al., 2008). Amongst the many drivers of innovation, growing attention to the internal factors leading to innovative behaviour by individuals has been paid. At the heart of the entrepreneurial process is the innovative spirit (Timmons and Spinelli, 2007). Smaller
entrepreneurial businesses do things differently when it comes to research and development actions (Timmons and Spinelli, 2007). These differences are associated with the attributes of innovative individuals and can be viewed as the psychological underpinnings of the human capital existing in an organisation. This is the stock of experience, skills, knowledge accumulated by its members over time (Batjargal, 2007).

Successful innovation can be described as the process whereby new ideas are transformed, through economic activity, into a sustainable value-creating outcome whereby a business gains competitive advantage (Hindle and Yencken, 2004). There are two key concepts in this interpretation; namely, process innovation and competitiveness. Process innovation is only achieved when the idea has been transferred into an outcome, which has value. The second key is competitiveness which requires good integration with those who assign value to the customer and it implies rigour and continuous measurement (Hindle and Yencken, 2004).

Literature further suggests that the need for innovation and creativity results from intensifying competition and risk in a broader sense. This includes social issues so that new trends and tendencies in the market place can be identified in advance (Gagesse, 2012). The relevance of the entrepreneurial process, with particular arguments and emphasis on innovation and creativity in this study relates to the current transformation process in the South African telecommunications sector, which is currently exposed to stringent competition forces; both from the larger corporations as well as small entrepreneurial businesses (TIPS, 2010).

Creativity is what separates humans from other species. When a person is involved in a creative activity, there is a sense of living more fully than during the rest of his/her life (Csikszentmihalyi, 1996). Entrepreneurs have a much more specific interest in creativity because they see it as a link to innovation, which in turn leads to new product development, better products and a stronger competitive position for existing businesses (Ko and Butler, 2007). In addition to being associated with new product development, creativity is also seen as important to entrepreneurial behaviour because it is linked with the identification of opportunities that lead to new business creation and in some cases, even to new industries (Baumol, 2002).
The framework for entrepreneurial creativity, depicted in Figure 2.4 by Ko and Butler (2007) indicates how social networks, alertness and knowledge lead to “connecting the dots” through the association of related information or bi-sociation of unrelated information.

The framework indicates possible outcomes of the creative action that will relate to the entrepreneur’s ability to creatively absorb the possibilities on hand, followed by creative decision abilities to engage in entrepreneurial activity. Ward (2004) acknowledges that although creativity is an essential aspect of entrepreneurship and most managers encourage creativity, very little is known about how the process works, especially with regard to recognising entrepreneurial opportunities. As companies in less developed and newly emerging markets attempt to move from product imitation towards product development and innovation, creativity is likely to become an increasingly important maintenance key to those who already hold a competitive advantage (Ward, 2004).
Ko and Butler (2007) describe both innovation and creative ideas as a conceptual combination process where previously separated ideas, concepts or other forms are mentally merged. Conceptual combination bears a special relationship to creativity, in the sense that it forms the basis of a person’s creative functioning process (Costello, 2000). Conceptual combination also appears to be directly relevant to the needs of entrepreneurs in search of new ideas to pursue (Ko and Butler, 2007).

Ward (2004) argues that the way in which people conceptualise a problem strongly influences their likelihood of achieving an original or innovative solution. This is no less true for entrepreneurial innovation and creativity. For example, transformation in a technological sector can be associated with new problem definitions and therefore calls for creative problem solving abilities and innovative solutions (ITU, 2009).

2.5.3 The entrepreneurial mindset

Entrepreneurship research, engaged in cognitive research seeks to understand how individuals identify entrepreneurial opportunities and act on them (McMullen and Shepherd, 2006). A fundamental assumption of entrepreneurship is that the context is often high in novelty, uncertainty and is a dynamic environment. Researchers postulate that “the successful future strategists will exploit an entrepreneurial mindset” and “the ability to rapidly sense, act and mobilise, even under uncertain conditions” (Ireland et al., 2003:963).

The ability to sense and adapt to uncertainty characterises a critical entrepreneurial resource and extant conceptualisations of the entrepreneurial mindset indicate that this resource is cognitive in nature (Haynie et al., 2010). Haynie et al. (2010) represent the foundation of the entrepreneurial mindset to be cognitive adaptability, which can be defined simply as the ability to be dynamic, flexible and self-regulating over cognitions in dynamic and uncertain task environments.

Adaptable cognitions are important for achieving desirable outcomes from entrepreneurial actions (Krauss, Frese, Friedrich and Unger, 2005). Haynie et al. (2010) developed a five step situated metacognitive model of the entrepreneurial mindset. The model integrates the combined effects of entrepreneurial motivation and context toward the development of metacognitive strategies applied to
information processing in an entrepreneurial environment. The model describes the entrepreneur as a ‘motivated tactician’ and representative of a “fully engaged thinker who has multiple cognitive strategies available” (Fiske and Taylor, 1991:13). The entrepreneur, motivated by goals, motives and needs has to act or not in response to perceived opportunities. He, therefore, chooses from perceived strategies (McMullen and Shepherd, 2006; Schmidt and Ford, 2003).

The situated, metacognitive model of the entrepreneurial mindset is presented in Fig. 2.5 and is explained stepwise based on its five major elements. The elements of the model depicted here represent a set of inter-related processes that together describe metacognitive functioning. The model is described below as follows (Haynie et al., 2010):

- **Step 1** - the conjoint effect of the environmental context and entrepreneurial motivation;
- **Step 2** - the activation of metacognitive awareness;
- **Step 3** - the critical metacognitive resources - metacognitive knowledge and metacognitive experience;
- **Step 4** - metacognitive strategy formulation and
- **Step 5** - metacognitive monitoring and performance feedback mechanisms.

Although the five steps in the situated metacognitive model of the entrepreneurial mindset in Figure 2.5 represents the causal chain of an entrepreneurial mindset, adaptation may not begin with Step 1 as the model is representative of an iterative process.

In the context of entrepreneurship, cognition is defined as the knowledge structures (heuristics and schema) that people use to make assessments, judgements, or decisions involving opportunity recognition and evaluation, new venture creation, or growth (Mitchell, Smith, Morse, Seawright, Peredo and McKenzie, 2002). Alternatively, metacognition, described by Mitchell et al. (2002), is a higher-order process that reflects a person’s awareness and control over the knowledge structures that are employed to make assessments, judgements, or decisions.
When faced with a new decision task, a metacognitively aware individual might engage in self-questioning strategies designed to relate the current task to past experiences, incrementally test alternative solutions and reflect on differing outcomes, or draw upon prior knowledge, experience and intuition to formulate a set of strategic alternatives (Haynie et al., 2010).

The metacognitive model of the entrepreneurial mindset makes three primary contributions. Firstly, a metacognitive lens allows for the dynamic consideration of cognitive functioning focused on how decision heuristics and strategies develop, adapt and are employed over the duration of the entrepreneurial process. The model enables the study of the dynamics of sense-making in a context that begins prior to the identification of the entrepreneurial opportunity and runs through the many stages and steps associated with entrepreneurial action (Haynie et al., 2010).

Secondly, metacognitive processes are important in dynamic, uncertain environments like those that entrepreneurs typically face. When environmental cues
change, individuals adapt their cognitive responses and develop strategies for responding to the environment (Shepherd et al., 2007). Lastly, Schmidt and Ford (2003) posit metacognition not as a dispositional trait, but instead represent a learned process, which can be enhanced through training. The metacognitive model of an entrepreneurial mindset, according to Haynie et al. (2010), will advance adaptable thinking and opportunity recognition which promote an attribute of fundamental importance to successful entrepreneurship.

2.5.4 Entrepreneurial behaviour

Studies pertaining to entrepreneurial behaviour can be categorised into five different perspectives. The first perspective on entrepreneurial behaviour is derived from the angle of process and focus on the entrepreneur’s start-up path experience; to what extent the business and the environment complement each other and the method of application (Lin, 2006; Lumpkin and Dess, 1996). The second perspective looks at entrepreneurial behaviour from the angle of content, focusing on the entrepreneur’s scale of entry into the industry, the characteristics of the business as well as the resource details available (Bruyat and Julian, 2000).

The third perspective is to investigate the factors that impact on entrepreneurial behaviour at the different levels of the organisation. Entrepreneurial behaviour can be categorised into three levels:

- Entrepreneurial behaviour of the individual levels, emphasising the correlation between the entrepreneur’s values, character, professional or environmental background with the performance of the entrepreneurial effort (Lin, 2006; Shook, Priem and McGee, 2003);

- Entrepreneurial behaviour of the organisational levels focuses primarily on the cause impacting on and the effect arising from the orientation of organisational foundation, behaviour in creating a new market and performance of the market creating behaviour. Lumpkin and Dess (1996) believed that entry into new markets is a clear sign of the organisation levels and physical evidence of the entrepreneurial spirit. Shane (2003) expounded the importance of the development and sequence of entrepreneurial opportunities and
• Entrepreneurial behaviour of the industrial levels, potential innovative business activities or the creation of a wide range of environments. Processes for innovation would generate trail blazing improvements in the industry (Knight, 2000).

The fourth perspective relates to behaviour. Entrepreneurial behaviour according to Lin (2006) is a combination of business innovation, risks and strategic renovation. Entrepreneurial behaviour is also referred to as the manifestation of company innovation, taking risks and proactive behaviour (Shane, 2003). In support, Covin and Slevin (1991) suggest that the business must provide a strategic decision model that drives the entrepreneurial direction.

Covin, Green and Slevin (2006) believe that entrepreneurial strategic posture is the integration of management’s attitude when faced with uncertainty and taking risks, innovative products, including the breadth and depth of technological development and the extent to which the business is strategically revolutionised. Focusing on the dimension concept of strategic posture, the company’s strategic posture is affected by financial capability (e.g. external source of financial capital, consumer credit status and other variables), sales capabilities (e.g. advertising, price, product line, product quality and other variables) and production capacity (e.g. effectiveness of the production process, the autonomy of the process and other variables) (Lin, 2006).

Lin (2006) posits a link on the measurement of strategic posture advocated by the social cognition theory on entrepreneurial behaviour, focusing on the following key points:

• The focus of the business on the development of technology for key tasks in the value chain or the sales activities downstream;
• The approach towards the unpredictable competitive environment or industry and
• The cognitive style of senior management’s decision-making in the business (Lin, 2006).
The fifth perspective compares the organisational culture and entrepreneurial spirit of businesses to find out if there are differences in the entrepreneurial behaviour (Bruyat and Julian, 2000). For example an entrepreneurial business is one that has a plan to accept high risks and pursues opportunity with persistence and commitment. It will also be more ready than its competitors to provide an action plan to respond to an opportunity. In contrast, a conservative business tends to be risk averse and does not tend toward innovation (Lin, 2006). An entrepreneurial business pursues flexibility, a wide variety of products and places much emphasis on the speed of innovation and requires skilled, entrepreneurial behaviour and culture to adapt accordingly (Lin, 2006).

2.5.5 Entrepreneurial decision style

Personality and decision style affect a potential entrepreneur’s perceived suitability for tasks required to start a business and this suitability finally also impacts performance in entrepreneurial occupations (Caliendo, Fossen and Kritikos, 2010; Zhao, Seibert and Lumpkin, 2010). Researchers have found that metacognitive awareness is positively related to adaptable decision-making (McMullen and Shepherd, 2006; Krauss et al., 2005; Schraw and Dennison, 1994). Individuals who are metacognitively aware are more likely to formulate and evaluate multiple alternatives to process a given task and are also more highly sensitised and receptive to feedback from the environment that can be incorporated into subsequent decision frameworks (Zhao et al., 2010). Given the dynamism and uncertainty surrounding entrepreneurial action, metacognition facilitates the study of how entrepreneurs adapt to their evolving and unfolding context and why some adapt while others do not (McMullen and Shepherd, 2006).

Early studies on entrepreneurial behaviour were based on Rotter’s (1966) opinion that the personality trait of internal-external control was a key factor affecting entrepreneurship. Subsequent studies on whether an entrepreneur was more inclined to a personality trait of internal control than a non-entrepreneur were inconclusive (Lin, 2006). Nevertheless, in assessing the impact of the individual on entrepreneurial behaviour, decision style as well as the innate characteristics of the individual’s character was often a topic for discussion. Sadler-Smith and Shefy
(2004) indicated that besides categorising decision style into two types: rationality and intuition, emphasis should also be placed on the entrepreneur’s capacity to respond to emergency situations and the importance of the impact of these two types of information processing on the performance of the business.

Sadler-Smith and Shefy (2004) concluded that when considering the individual character, in addition to developing a method of measuring the variables of change during the start-up period of a venture, using decision-cognitive style of decision-making to assess entrepreneurial management was a good approach. Rational decision-making focuses on the process of analysis that consists of features of procedure, logicality and collectivity for achieving a specific objective. Intuitive decision, on the other hand, has the characteristics of being individualistic, emotional and based in real-time. Researchers often use these different categories as a style for decision cognition (Sadler-Smith and Shefy, 2004).

2.5.6 Entrepreneurial leadership

Entrepreneurial leadership in a business gains its description from the business leader’s status, profession and leadership capabilities (Guo, 2009). Whilst the position of the leader legitimises entrepreneurial leadership, this kind of leadership cannot be based solely on power and hierarchy. Entrepreneurial leadership, according to Skodvin and Andresen (2006), is based on individual skills such as achieving business objectives innovatively and collecting the resources required realising new ventures. Hansson and Monsted (2008) describe entrepreneurial leaders as leaders who are able to recognise opportunities and evaluate them through increasing the flow of information. This can manifest itself in the form of entrepreneurial vision, which in return leads to performance and growth when strategy mediates their relationship (Hansson and Monsted, 2008). In this way, through risk taking and initiatives, entrepreneurial leadership aims to create innovations (D'Intino, Goldsby, Houghton and Neck, 2007).

Entrepreneurial leaders are able to work in any business and on any task, by leading individuals and teams entrepreneurially and by managing resources productively (Kansikas, Laakkonen and Sarpo, 2012). Leaders with entrepreneurial skills and characteristics may possess what is required to become an entrepreneurial leader.
Therefore, any individual with an entrepreneurial leadership style in any business can be deemed an entrepreneurial leader. Lumpkin and Dess (2001) states, that risk-taking, proactiveness and innovativeness characterise entrepreneurial leadership when it is defined as an entrepreneur’s way of leading in new ventures. Entrepreneurial leadership is needed to cope with uncertainty. Entrepreneurial leadership is therefore an important prerequisite for any business to obtain in order to operate in uncertain environments.

Entrepreneurs in different contexts, such as industry, business ideas and culture, are able to create a leadership style that enables them to survive in a situation where resources are scarce (Kansikas et al., 2012). Giving encouragement through entrepreneurial vision in daily routines is typical of an entrepreneur’s way of leading an owner-managed business. Encouraging and motivating others and leading by example are typical of the leadership shown by entrepreneurs.

In small businesses, entrepreneurial leadership is often rooted in a single person who makes all the decisions. Entrepreneurs influence the business culture and its characteristics by their own daily operational actions. Gupta, MacMillan and Surie (2004:241) state that “both entrepreneurial leadership and team-oriented leadership require the ability to be effective in bargaining and team building. However, whilst team-oriented leadership focuses on effective coordination and communication, win-win problem solving and intragroup relationships, entrepreneurial leadership emphasises path clearing for opportunity exploitation and value creation”.

Entrepreneurial leadership is based on a straightforward way of leading a unit toward set goals. This means that it is focused on action rather than on communication and monitoring. However, in cases where this leads to lack of consultation with, or lack of harmony between, the business’s employees, then conflicts can arise. Creating value through results achieved makes entrepreneurial leadership a progressive and productive way to lead a team of people.
2.5.7 Human capital

Small company development is by nature different from that of larger business. It has been suggested that entrepreneurs informally and intuitively perceive an opportunity, which they perceive because they have some feel for the market (Schwartz and Teach, 2000). Human capital attributes, including education, experience, knowledge and skills have long been argued to be a critical resource for success in entrepreneurial business (Unger, Rauch, Frese and Rosenbusch, 2009). Researchers postulate that human capital may play an even larger role in the future because of the constantly increasing knowledge-intensive activities in most work environments and even at higher scales in high technological business sectors (Unger et al., 2009; Bosma et al., 2008).

The human capital theory assumes that people attempt to receive compensation for their investments in human capital (Unger et al., 2009). The theory has been adopted by entrepreneurship studies and has stimulated a considerable body of directly related research which led to an even larger number of studies that include human capital into their prediction models of entrepreneurial success (Rauch, Frese and Utsch, 2005; Davidsson and Honig, 2003).

Individuals try to maximise their economic benefits using their human capital (Unger et al., 2009). Highly educated people may not choose to become entrepreneurs because entrepreneurship may very well lead to reduced income compared with other employment opportunities (Cassar, 2006). However, once individuals have entered entrepreneurship, those who have invested more in their human capital are likely to strive for more growth and profits in their business compared to individuals who have invested less in their human capital. This is because they want to receive higher compensation for their human capital investments (Cassar, 2006).

Highly educated entrepreneurs would otherwise choose to dissolve their businesses and seek other, more lucrative employment opportunities (Unger et al., 2009; Gimeno, Folta, Cooper and Woo, 1997). The arguments suggest that according to human capital theory, human capital leads to entrepreneurial success (Unger et al., 2009). Entrepreneurship literature provides several bases of arguments on how
human capital should increase entrepreneurial success. Firstly, human capital increases the capability of owners to perform the generic, entrepreneurial tasks of discovering and exploiting business opportunities (Shane and Venkataraman, 2000). Prior knowledge increases entrepreneurial alertness and prepares the business owner to discover specific opportunities that are not visible to other people (Westhead, Ucbasaran and Wright, 2005; Shane and Venkataraman, 2000; Venkataraman, 1997). In this context, human capital directly affects an entrepreneur’s approach to the exploitation of opportunities (Shane and Venkataraman, 2000).

Secondly, human capital is positively related to planning and venture strategy, which in turn, positively impacts success (Frese, Krauss, Keith, Escher, Grabarkiewicz and Luneng, 2007; Baum, Locke and Smith, 2001). Thirdly, knowledge is useful for acquiring other utilitarian resources such as financial and physical capital (Brush, Greene and Hart, 2001) and can partially compensate for a lack of financial capital which is a constraint for many entrepreneurial businesses (Hanks and Chandler, 1998).

Lastly, human capital is a prerequisite for further learning and assists in the accumulation of new knowledge and skills (Ackerman and Humphreys, 1990). Taking the three bases together, entrepreneurs with a greater amount of human capital should be more effective and efficient in running their business than owners with lower human capital.

Human capital can create competitive advantage if it is sufficiently different from that of competitors (Alvarez and Barney, 2007). Alvarez and Barney (2007) argue that if all owners possess the same human capital, there will be no competitive advantage. In emerging markets, human capital is more heterogeneous and scarcer than in highly developed countries (Unger et al., 2009). Therefore, human capital is more likely to create competitive advantage in the emerging markets. Moreover, emerging markets trigger more necessity-entrepreneurship because people are forced into self-employment as there are no other alternatives available (Reynolds et al., 2004). There is, therefore, a higher variance of human capital in emerging markets (Unger et al., 2009).
2.5.8 Financial resources

In principle, business performance can be measured by its ability to make profits from business ventures (Covin et al., 2006). Literature links the influences of EO on innovation and financial performance (Li et al., 2008; Wang, 2008). Entrepreneurs involved in risk taking are associated with a greater willingness to commit more resources to projects where the cost of failure may be high (Wiklund and Shepherd, 2005). This also commits the risk taker to invest resources in projects where the outcomes are uncertain. It largely reflects that the company is willing to break away from the tried-and-true and venture into uncertain terrain (Wiklund and Shepherd, 2005).

Research has found that to undertake high-risk ventures, entrepreneurial strategies require considerable financial resources to be successful (Muravyev, Talavera and Schäfer, 2009; Wiklund and Shepherd, 2005). Access to financial resources, either internal or external, is a key aspect pertaining to business performance. Economics and finance literature suggest the pervasiveness of financial constraints in both small and large listed businesses (Muravyev et al., 2009; Covin et al., 2006; Wiklund and Shepherd, 2005). For established businesses, the evidence comes from the analysis of the link between internally generated cash flows and investment levels (Hubbard, 1998). For new start-ups, the evidence mostly comes from the studies that focus on the impact of personal wealth on the propensity to become an entrepreneur (Blanchflower and Oswald, 1998).

Access to finance remains a challenge where entrepreneurs have to access resources from institutions or in many cases self-finance their new ventures by means of private venture capital. Considerable attention has been focused on the role of venture capital in financing entrepreneurial activity, in part because many now-prominent businesses relied on venture capital finance during their early development (de Bettignies and Brander, 2007). The decision whether to pursue venture capital or not is typically very important for an entrepreneur. Many entrepreneurs explicitly decide not to seek venture capital, and some who receive offers of venture capital finance ultimately decline those offers (de Bettignies and Brander, 2007).
Smaller businesses, because of inexperienced management, in general face financial resource difficulties (Scarborough and Zimmerer, 2003). This results in higher mortality rates than in larger businesses. These small businesses face particular constraints in the areas of legal and regulatory requirements, market access, access to financial instruments and tax regulations (Malagas, 2003). Research by Wiklund and Shepherd (2005) on EO performance suggests that businesses that face performance constraints, in terms of a stable environment and limited access to capital, can be superior performers if they adopt high levels of EO. This indicates an increase in business performance is associated with higher levels of EO within entrepreneurial businesses.

2.6 THE TECHNOLOGICAL ENTREPRENEUR

The research subject of this study is the entrepreneur who operates in a high technology business, in particular the telecommunications sector and is referred to as a high-tech entrepreneur, technical entrepreneur or technological entrepreneur. Nieman et al. (2003) use the term ‘technopreneurs’, but the term technological entrepreneurs or technological entrepreneurship will be used throughout this study.

Technological entrepreneurship research is about understanding the conditions and factors that lead to the identification and exploitation of opportunity for value creation in the context of technology changes, adoption or opportunities. The process of opportunity search is heavily influenced by the entrepreneur’s background as well as by the task environment in which the entrepreneur operates (Phan and Foo, 2004).

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 orientation, entrepreneurial process and the person, revealed that a substantial body of knowledge has been accumulated over the past decades. This knowledge is extensive for developed countries and industrialised markets and to a lesser extent for emerging markets. Specific knowledge in the field of technological entrepreneurship in emerging markets is insignificant compared to that of other markets and forms of entrepreneurship (Therin, 2007).
Technological Entrepreneurship is a relatively unexplored topic and is one of the most important factors in regional development (Therin, 2007; Venkataraman, 2004). Schumpeter (1934) described an entrepreneur as a person who destroys the existing economic order by introducing new products and services, by creating new forms of organisations and by exploiting new raw materials. Building on Schumpeter's economic theory, Phan (2002) posits that technological innovation poses an alternative perspective in the development of competitive technological markets. Technological entrepreneurs pursue business activities in the technology based market sector.

At the turn of the century, Roberts (1991) proposed a four-factor model for the development of the technological entrepreneur. The model developed by Roberts is presented in Figure 2.6. The four-factor model consists of:

- Family background;
- Personal development (goal orientation, personality and motivation);
- ‘Growing up’ (educational attainment and age) and
- Work experience.

![Figure 2.6 A model of entrepreneur development](image-url)

Source: Roberts, 1991:52
The reaction of elements captured in Roberts’ model depends on the variables and the specific configuration in which these elements are captured. The parameters for the identification of the technological entrepreneurial person in this study are supported by Robert’s (1991) four-factor model. No other suitable model could be found in literature applicable to this study of technological entrepreneurship in emerging markets. The four-factor model by Roberts (1991) includes entrepreneurial development. No prominent environmental factors such as government policies and economic conditions are evident within the model.

Technological entrepreneurship builds upon a body of knowledge that addresses the role of human agency in shaping new technologies (Garud and Karnoe, 2003). Garud and Karnoe (2003) suggest that human agency is distributed among people who are engaged in emerging technological paths, are embedded in emerging technological paths. The development of every technology involves the effort of a multiplicity of participants. The embedding processes in Figure 2.7, represented by the arrows, indicate the complexity of the technological path and distribution of human agency. Four interplaying factors, namely regulation, design and production, evaluation and use, all form micro-processes that determine the possible outcomes of the technological path.

![Figure 2.7 Distributed agents involved in the emergence of a technological path](image)

*Source: Garud and Karnoe, 2003:279*
2.6.1 The technological entrepreneurial environment

In the new, independent entrepreneurial business, the linkage of technology to markets is the responsibility of everyone, especially of the founder of the company (Phan and Foo, 2004). These technological entrepreneurial businesses promote low fixed costs, low overheads, single technology focus and willingness to risk current income for potential returns in capital gains if the investments are successful (Phan and Foo, 2004). In the context of the current telecommunications environment, entrepreneurial businesses can foster technological change while sustaining lower margins better than larger companies can and endure higher risk levels in this uncertain market sector (IMD, 2012). This environment is described in Figure 2.8 where Gnyawali and Fogel (1994) developed a suitable model to describe the environment of technological entrepreneurs.

The model represented in Figure 2.8 identifies the key role players in the Technological, entrepreneurial environment as:
• Government policies and procedures;
• Socio-economic conditions;
• Entrepreneurial and business skills;
• Financial assistance and
• Non-financial assistance.

The integrative model of entrepreneurial environments further describes the opportunity and propensity to enterprise and the ability to enterprise as key elements. In addition, the model indicates the relationships that link the elements and the effect of each related element on the other.

Technology-based markets are considered to be lenient towards the introduction of disruptive technologies (Phan, 2002; Christensen, 1997). This is likely to be observed in industry-specific sectors which are technology-driven, such as the ICT sector (Phan, 2002). Christensen (1997) also provides anecdotal evidence that shows that large companies that commercialise innovations based on disruptive technologies face enormous internal and market problems, hence, opportunity lies in the hands of the smaller technological companies driven by their founders and by particular entrepreneurs.

2.6.2 Regional transformation and Technological Entrepreneurship

There has been significant interest in what would be necessary for productive entrepreneurship to flourish in a country and perhaps even within specific sectors in a country (Venkataraman, 2004). Suggestions from authors (Venkataraman, 2004; Christensen, 1997) to foster successful Technological Entrepreneurship in regional transformation include changes in a country’s legal system, making it more transparent, suggested changes in tax and legislation to change the way corporates operate and proposed changes in a country’s infrastructure, including the telecommunications and transport systems (Venkataraman, 2004).

Favourable law and infrastructure can contribute towards successful entrepreneurship in a region, but that alone cannot create an environment for promoting sustainable entrepreneurship. These factors can be described as tangible
contributions and are necessary for transformation. Venkataraman (2004) suggests that regional transformation also depends on the intangibles of entrepreneurship, which relate to the conditions for Schumpeterian entrepreneurship to thrive in a region. These are sound legal systems, capital markets and other structural workings.

The very notion of transformative entrepreneurial activity is in many cases counter-cultural in many of the emerging markets. Multiple emerging regions are characterised by cultures that celebrate and depend on traditional views, perceptions and the way things are done (Edelman and Yli-Renko, 2010). Very talented people are directed into positions in which they are not rewarded for making good entrepreneurial decisions and for taking the risk. As a result, unconventional ideas, companies, projects and products do not emerge (Edelman and Yli-Renko, 2010).

Technological entrepreneurship plays a central role in regional transformation (Venkataraman, 2004). Schumpeter was the first to position the centrality of the entrepreneur in economic progress. Through the introduction of new methods of production, business composition, supply chain formulation, emerging markets or products, the dislocation caused by such changes leads to new and sustaining sources of entrepreneurial success (Edelman and Yli-Renko, 2010).

Researchers suggest that an entrepreneurial team may prefer to be risk-seeking in start-up ventures to introduce technological innovation in the business (Fenzl and Brudermann, 2009). Compared to a general business, entrepreneurial businesses show higher motivation levels to introduce technological innovation. Decision-making in an entrepreneurial team is thus also perceived to be different from how individuals deal with risks (Wu, Kefan, Hua and Shi, 2010).

Technological Innovation is highly subjected to risk decision-making. In their study, Wu et al. (2010) focused on the problem of technological innovation risk decision-making in an entrepreneurial team for typical business. Traditional technological innovation studies mainly focus on risk decision-making. In their study, Wu et al. (2010) describe two main departures from traditional technological innovation risk decision-making. The first is differences between start-ups and traditional business
risk-taking and the second is the differences between entrepreneurial team decisions and individual decisions.

Human risk behaviour has been researched as an individual cognitive process where individuals collect and process information to determine their actions and decisions (Fenzl and Brudermann, 2009). Technological innovation projects involve decision-making, uncertainty, complexity, multiple objectives and dynamic interactions. Technological innovation activity contains high risk and uncertain factors in each stage and component of the process (Fenzl and Brudermann, 2009).

The probability of a successful technological innovation is often less than the probability of failure (Wu et al., 2010). Technological innovation risk is mainly due to the uncertainties of technology, market, innovation benefits and institutional environment. Entrepreneurial innovation team risk decision-making typically focuses on what action a group should take. Figure 2.9 illustrates the model depicting three possible outcomes in the innovation decision-making process.

![Figure 2.9 Innovation decision-making process](image)

**Source:** Wu et al., 2010:859
As illustrated in Figure 2.9, the entrepreneurial team includes a number of decision-making individuals, where the impact of subject factors/preferences/influence of a single decision-maker has been significantly reduced. Instead, the composition of decision-makers' opinions, the mutual relations among policy-makers and a team's decision-making system have a greater impact on decision outcomes.

2.6.3 Technological forecasting

In the present day, high technology companies exist in high velocity environments (Mishra, 2002). It is an environment in which there is rapid and discontinuous change in demand, competitors and technological change combined with regulations (Fildes, 2003). The rate of change of technology is described as rapid and fast-changing and consequently the life cycle of products continues to shrink (Mishra, 2002). A typical example in telecommunications is the rapid change in mobile handset technologies and rapid changes in Internet access technologies.

Technological Forecasting (TF) has been acknowledged as an effective tool in setting technology strategies (Fildes, 2003). Evidence shows that technology in telecommunications changes rapidly and frequently. In order to forecast the life cycle of a technology, the entrepreneur can use a number of TF techniques. The quality of forecasts would greatly depend on proper selection and application of appropriate techniques (Fildes, 2003). Market sector specific forecasting will require matching the technique to a technology by mapping both technology and technique characteristics on a common scale (Lee et al., 2009).

Changing technology, driven forward by continued innovation and changing market landscapes, affects everybody's business. Technological businesses do not wait for change to happen but actively monitor and take advantage of changing environments and innovations (Veugelers, Bury and Viaene, 2010). This action is referred to as technological intelligence and requires experience in the sector to recognise these opportunities.
Technology intelligence is key to the technological entrepreneur’s daily success and has been defined as “the capture and delivery of technological information as part of the process whereby an organisation develops an awareness of technological threats and opportunities” (Kerr, Mortara, Phaal and Probert, 2006:73). Technological Intelligence refers to the process of analysing and organising large amounts of technology data in order to gain competitive advantage (Veugelers et al., 2010). Technology intelligence also allows for the systematic identification of externally developed disruptive technologies, which are probed for their potential value and suitability within a business strategy (Kerr et al., 2006).

In order to identify as comprehensively as possible all options for introducing new, external technologies or innovations in an economic sector, it becomes necessary to analyse large amounts of technology data, originating from disparate sources outside the business environment (Zhu and Porter, 2002). The use of appropriate ICT tools and extensive data mining analyses, such as text mining can generate actionable technology intelligence. Technology intelligence can, therefore, have many uses, such as business strategy development and human resources allocation towards possible new ventures which result in gaining competitive advantage (Veugelers et al., 2010).

2.7 SUMMARY

In Chapter 1, the introduction to this research study was formulated. This chapter contains a literature study relating to the three main topics, namely Entrepreneurial Orientation, Entrepreneurial competitiveness and Technological Entrepreneurship. The literature review included theoretical models for each of the three main topics as well as literature supporting the hypotheses formulated. A general overview was presented followed by the most appropriate contributions by researchers using the following framework:

Firstly, the literature review and theory are discussed under:

- General Entrepreneurship theory;
- Regional and local literature on Entrepreneurship;
- Entrepreneurial Orientation;
The Entrepreneurial Process with relation to Entrepreneurial competitiveness and
Technological Entrepreneurship including the entrepreneurial environment.

Secondly, current theoretical models applicable to this study and supporting the proposed hypotheses in Chapter 1 are summarised in Table 2.5.

<table>
<thead>
<tr>
<th>Model and/or Theory</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation theory</td>
<td>Alvarez and Barney (2007)</td>
</tr>
<tr>
<td>The Entrepreneurial Process</td>
<td>Timmons and Spinelli (2007)</td>
</tr>
<tr>
<td>Metacognitive model of the entrepreneurial mindset</td>
<td>McMullen and Shepherd (2006)</td>
</tr>
<tr>
<td>EO Model - five dimensions of EO</td>
<td>Lumpkin and Dess (1996)</td>
</tr>
<tr>
<td>Entrepreneurial environment</td>
<td>Gnyawali and Fogel (1994)</td>
</tr>
<tr>
<td>Technological Entrepreneurial process: Four Factor Model</td>
<td>Roberts (1991)</td>
</tr>
</tbody>
</table>

Source: Author’s own construction, 2010

Chapter 2 discussed Entrepreneurial Orientation within the context of the factors that have an impact on the competitiveness of technological entrepreneurs and addressed Research Questions RQ₁, RQ₂, RQ₃ as well as research Objectives RO₁ and RO₂. The chapter also discussed the methods and processes that promote the competitiveness of the technological, entrepreneurial business. Research in Chapter 3 will focus on the telecommunications sector in South Africa in conjunction with entrepreneurial competitiveness factors and sector transformation.
CHAPTER 3

TELECOMMUNICATIONS

3.1 INTRODUCTION

Chapter 2 outlined the importance of entrepreneurship in terms of aspects necessary to build a competitive business. The factors influencing entrepreneurial competitiveness were also investigated. The objectives set in Chapter 3 are to present an overview of telecommunications and this sector in South Africa. This chapter also identifies factors relating to the promotion of competitive entrepreneurial activities in South Africa. Research Questions RQ3, RQ4 and the research objective RO3 will be addressed in this chapter.

Chapter 3 further provides a study of the telecommunications sector in South Africa in the context of global sectors and emerging market trends. The study in this chapter includes research in the following areas:

- Global telecommunications overview and drivers;
- The South African telecommunications sector;
- The nature of the telecommunications industry;
- Legislation in force;
- The regulatory landscape;
- Telecommunications categorised and
- The role of telecommunications in the South African economy.

Communications in the 1980’s was described as an essential human process that enables both individual expression and societal structure (Habermas, 1989; Fisher, 1982). Access to information is a fundamental process and a necessary precondition for personal development and socio-economic participation (Ponelis and Britz, 2008; Benkler, 2006). Benkler (2006) describes access to information and the ability to communicate as an integral part of human freedom and development. This notion supports the United Nations’ declaration on communication as “everyone has the right to freedom of opinion and expression: this right includes freedom to hold
opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontier” (United Nations, 1948).

Telecommunications is referred to as the extension of communication. Technically explained, sound is converted into electronic pulses and carries signals over distance through the air, wires and through space. The term telecommunications covers the conversion of all original communications, including radio, telegraphy, television, telephony, data communication and computer networking regardless of distance to be covered (Linstone, 2002).

Information and telecommunications technologies make it possible to communicate with the entire globe by means of modern inventions including telephones, the Internet, e-mail and social networking platforms far beyond the distance that a voice can carry. In the global information economy, communication and access to information also implies access to different socio-economic and political activities (Ponelis and Britz, 2008). Development of new information and communication technologies paves the way to communicate and assumes new importance since it is almost impossible to participate fully in the globalised world without access to these technologies (Ponelis and Britz, 2008; Tsai et al., 2006). A country’s telecommunications sector consists of these communications activities.

A country’s telecommunications sector refers to all industries rendering services, which facilitate communication and interaction between parties (TIPS, 2010). This interaction includes postal services, broadcasting services (television, radio and pay-tv), telecommunications (mobile and fixed-line) and the Internet, and includes data providers. In the past, telecommunications sectors were administered by the Ministries of Post, Telegraph and telecommunications (MPTTs) in many countries, including South Africa. These departments set the legal and regulatory policies; determined the technical standards; designed and certified equipment; controlled the radio frequency spectrum; allocated number blocks to operators; managed state assets and made investment decisions. The ministries also set prices, operated businesses, granted privileges and regulated largely state-owned communications parastatals (ITU, 2009).
In the 1980s and 1990s, the telecommunications sectors started to reform. The communications landscapes in some countries started to change, in large part due to rapidly changing technological developments and business opportunities interacting with each other. In the same period, there were also institutional developments (ITU, 2009). Telegraph lost its importance, while post and telecommunications generally became structurally separated regulators (ITU, 2009). This resulted in the opening of the sector to innovation and new technological advancements.

The telecommunications industry, by nature, is also highly subjected to the introduction of disruptive technologies (Wymbs, 2004; Linstone, 2002; Christensen, 1997). Linstone (2002) described the vital role of technological innovation in telecommunications in the beginning of the 20th and 21st centuries. During this period, telecommunications players invented and provided disruptive technologies which caused deep structural adjustment throughout society (Linstone, 2002).

3.2 GLOBAL TELECOMMUNICATIONS OVERVIEW AND DRIVERS

Telecommunications, in nature, must be researched in a global perspective as they link continents electronically and remove physical and geographical communications barriers (ITU, 2009). In the last part of the 20th century, the almost simultaneous arrival of three major innovations, mobile phones, broadband data and the Internet changed the face of telecommunications and became the driving force to economic growth (Tsai et al., 2006). Ponelis and Britz (2008) state modern communication technologies have been instrumental in reshaping the world’s telecommunications markets.

Telecommunications have become a primary contributing factor towards the development of increasingly complex, large organisations and the globalisation of different corporations (Nandi, 2002). Telecommunications helps to remove, to a great extent, the physical constraints on organisational communication in all sectors of markets, both local and global (ITU, 2009). Telecommunications trends and growth are globally driven by changes which include infrastructural development, technological change, fixed-line to mobile substitution, mobile communications, broadband Internet, access to broadband and broadband penetration. These
technologies have been in existence for less than 20 years, but their existence reshapes telecommunications sectors globally in the modern era (ITU, 2010a; Tsai et al., 2006).

Global telecommunications trends during the past decade featured regulatory and technological change (ITU, 2012; Ponelis and Britz, 2008; Tsai et al., 2006). Technological drivers include mobile communications, access to the Internet and broadband connectivity. Figure 3.1 indicates Global ICT development trends for the past ten years (ITU, 2012).

Growth in mobile communications accelerated globally while fixed-line communications declined steadily. Adoption of alternative communications such as Internet activities increased at a steady pace at the same time (BMI, 2012). By the end of 2012, an estimated 5.5 billion users would have adopted mobile cellular communications, including 940 million subscriptions to 3G mobile Internet services. Access to mobile networks is now available to 90% of the world population and 80% of the population living in rural areas. People are moving rapidly from 2G to 3G mobile platforms, in both developed and emerging markets. In 2010, 143 countries were offering 3G services commercially, compared 95 countries in 2007 (ITU, 2010b).
Mobile cellular growth has started to slow down worldwide, due to saturation levels. In developed countries, the mobile market reached saturation levels with, on average, 121 subscriptions per 100 inhabitants at the end of 2011 and a marginal growth of 2% from 2010 to 2011. At the same time, the emerging markets increased their share of mobile subscriptions from 53% of total mobile subscriptions at the end of 2005 to 73% at the end of 2011 (ITU, 2012). In emerging markets, mobile cellular penetration rates were estimated at 68% at the end of 2010. The penetration rates were mainly driven by the Asia and Pacific region. India and China alone added over 300 million mobile subscriptions in the same year. In the African region, penetration rates reached an estimated 41% at the end of 2010, compared with 76% globally, which indicates a significant potential for growth in the region (ITU-D, 2012).

The evolution of the Internet and the progress of information and communication technologies have accelerated the transmission of information and knowledge, thereby moving people all over the world toward an information society (Tsai et al., 2006). Tsai et al. (2006) stated that the development of the knowledge economy promotes broadband network construction leading to an information society. Hamelink (2004) expanded the idea that modern technologies in telecommunications cause a shift from information and knowledge societies towards communication societies.

### 3.2.1 Fixed mobile substitution

The need to run a wire-line into every home and business becomes obsolete when mobile communications are available. As mobile communications became the substitution technology to traditional fixed-line telephony in the past decade, incumbent telecommunications operators in high-income countries experienced an annual decline in fixed-line voice revenues (ITU, 2010b).

Since the late 1990’s, the number of mobile lines in low-income countries has been outpacing that of fixed-lines by an increasing margin (Albon, 2006). However, this has occurred while the number of fixed-lines was increasing as well. In contrast, fixed-lines in high-income countries peaked around the turn of the millennium (Albon,
For some time, fixed-line penetration in high-income countries remained above 90%, but mobile penetration increased rapidly to over a 100% (ITU, 2010b).

Use of mobile communications has continued to dominate growth in telecommunications since the turn of the century, followed by Internet user access. Fixed and mobile broadband demand followed a steady growth path, whilst fixed telephone lines faced a declining trend, mainly due to fixed mobile substitution. In 2002, with one billion users worldwide, mobile communications surpassed fixed-line subscribers (Garbacz and Thompson, 2007; ITU, 2003). Currently, there are estimated to be over five billion mobile users against approximately 1.2 billion fixed-line (ITU, 2010b) users in the world.

Most recently, however, fixed-line penetration declined even further (BMI, 2012). The ratio between fixed telephone lines and mobile users is close to 1:5 and for fixed-line to mobile telephone usage almost 1:3 in 2011. Mobile communications are also making definite inroads into the broadband market that was previously dominated by fixed-line access. As a result, fixed network capacity has become under-utilised in low-income countries (BMI, 2012). Figure 3.2 indicates the growth in mobile cellular subscriptions per 100 inhabitants from the turn of the century to 2011.

![Figure 3.2 Mobile subscriptions users per 100 inhabitants, 2001 to 2011](image)

Source: ITU-D, 2012
The growth patterns in emerging markets exceeded those of developed markets due to high saturation levels in the developed world. Capital investment in Mobile communications increased to a point where 90% of the world population could access a mobile cellular signal by 2009 (ITU, 2010b).

3.2.2 Broadband and the Internet

Internet access medium is referred to as a global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide (FNC, 1995). The Internet is also referred to as a network of networks that consists of millions of private, public, academic, business and government networks, of local to global scope, that are linked by a broad array of electronic, wireless and optical networking technologies. The Internet carries a vast range of information resources and services, such as the interlinked hypertext documents of the World Wide Web (WWW) and the infrastructure to support electronic mail (FNC, 1995).

The term broadband refers to a telecommunications signal of greater bandwidth, in some sense, than a standard or usual signal (the broader the band, the greater the capacity for traffic). Its origin is in radio systems engineering, but is used to describe high-speed data access. In principle, the perception of broadband is directly linked to the level of functionality provided by an access connection to the end user (Cordona, Schwartz, Yourtoglu and Zulehner, 2009). The evolution of Internet broadband access has caused the debate on the “Digital Divide” to shift from dialup to broadband technologies (Chaudhuri and Flamma, 2009). According to the ITU (2010), demand, globally, for higher speed access networks and mobility grows daily. The global number of Internet users per 100 inhabitants rose from 10 to 30 from 2000 to 2010 with over 2 billion Internet users in 2012 (ITU, 2012).

Telecommunications industries are continuously looking for value-added services to diversify content and thereby drive innovations to deliver further growth (ITU, 2010b). The emphasis on demand is on ubiquitous broadband and proposals for high-speed city-wide wireless access are increasingly common (Chaudhuri and Flamma, 2009). Internet broadband has therefore become fully integrated into multifaceted, but
consolidated information, communications and entertainment (ICE) marketplace (Tsai et al., 2006).

By the end of 2011 an estimated 2.5 billion Internet users had access to the World Wide Web. Figure 3.3 indicates the number of Internet users per 100 inhabitants and a comparison between developed and emerging markets between 2001 and 2011. During this period, the number of Internet user doubled (ITU, 2012).

![Figure 3.3 Internet users per 100 inhabitants, 2001-2011](image)

**Source:** ITU-D, 2012

User access to the Internet doubled in five years with higher growth levels displayed in emerging markets. Along with the diversification of content applications and the increase in broadband penetration, the Internet has become the foremost tool not only for the exchange and creation of information but also for offering television broadcasting, television on demand and videophone platforms throughout the world (Tsai et al., 2006). Content providers and equipment manufacturers continue to develop new services and products that will allow users to make the most of their broadband connection to facilitate Internet consumer behaviour. All these factors are drivers for Internet access demand.
3.3 LEGAL AND CONSTITUTIONAL MANDATES

Telecommunications industries, like other critical infrastructure industries (electricity, transportation, water, natural gas), have historically attracted sector-specific government intervention, which is described as regulation or sector-specific regulation (Levin and Schmidt, 2010). Such sector-specific regulation has applied in addition to the laws that apply generally to all businesses operating in the economy. Regulatory statutes are formulated to direct and control financial and intellectual resources in the establishment of competitive entry across all services in the telecommunications sector (Levin and Schmidt, 2010).

In an age of convergence, when service offerings are constantly evolving as a result of technological innovation, a country’s licensing authority plays a large role in determining whether the country will reap the benefits of technological innovation or not. A country’s licensing authority establishes the range of technologies and services that may be provided to consumers. The degree of competition in the sector depends on how many service providers are authorised to service customers. Authorisation processes materially affect the ability to attract investments in a telecommunications sector (IRT, 2010).

The growth in the regulatory authority of countries has been exponential since 1990 (IRT, 2010). By the end of 2009, 153 countries and administrative regions had created a national regulatory authority for their ICT and telecommunications sectors (IRT, 2010). Today, 93% of African countries boast a separate sector regulator, which represents the highest percentage for a continent in the world. Eighty nine percent of the countries on the American continent have separate sector regulators, followed by 80% in Europe, 66% in the Arab States and 62% in Asia-Pacific countries (ITU, 2011b).

Newberry (2004) indicates that rapid technological innovations and pressure from international organisations has encouraged and accelerated the transition from direct regulation and public ownership to indirectly regulated and increasingly competitive telecommunications sectors. The share of private ownership among
telecommunications operators was expected to increase from two to 42% in 167 countries by 2010 (ITU, 2010b).

The change of governance regulations structures, the appropriate speed and order of reform in telecommunications sectors have attracted various debates, particularly in the emerging markets (Jayakar and Martin, 2011; Li and Xu, 2004; Makhaya and Roberts, 2003; Nsouli, Mouir and Norbert, 2002). A well-designed framework for authorisation creates a fundamental process for healthy, competitive ICT sectors that are stable enough to provide consistent services to consumers, yet flexible enough to integrate new technologies (Jayakar and Martin, 2011). A well-designed framework includes mechanisms to promote and encourage competition in the telecommunications sector (Li and Xu, 2004).

3.3.1 Global telecommunications liberation

In addition to changes in regulatory functions and jurisdictions of telecommunications, there has been a substantial trend towards liberalisation and change where state-owned operators were partially or wholly transferred to the private sector. Most significantly, telecommunications sectors were liberalised as new entrants were licensed in mobile, fixed and Internet markets (Engman, Onodera and Wilson, 2006). The liberalisation of the sector has stimulated the creation of clusters of innovation and new products. The Internet and other network platforms have exponentially expanded the global market for electronic communications and applications. Traditional telecommunications sectors have been transformed to ICTs. These have become both more significant as an economic sector and as a major contributor to the overall competitiveness of businesses, cities, regions and countries (ITU-D, 2011).

Apart from change in technology, competition has proven to be the most effective agent of adjustment in a telecommunications sector (Engman et al., 2006). An independent and competent regulator, however, is paramount to derive the full benefits from competition. Privatisation without effective regulation has not necessarily improved service levels. The establishment of independent regulatory authorities prior to privatisation has had a positive effect on investment in
infrastructure, telephone penetration and the stock market valuation. To achieve effective regulation and independent regulatory institutions is always a challenge. This is especially the case for emerging markets with limited technical and financial capacity (Engman et al., 2006).

As governments opened their markets, the cost of investment was shared among multiple operators, which mitigated the potentially dangerous risks of misguided decisions by a single operator. The ITU (2009) World telecommunications regulatory database revealed that 171 countries around the world had opened their mobile cellular markets to competition by 2009 (ITU, 2009) and funding had generated very many entrants into the markets. More recently, governments have adopted converging technologies, such as Internet Protocol television (IPTV) and mobile television and content driven video on demand. This is achieved by merging the telecommunications regulator with the broadcasting and content regulator (ITU-D, 2010).

3.3.2 Telecommunications and economic growth

In an emerging global economy, the ability of a telecommunications sector to provide an internationally competitive network for information exchange has significant implications for trade and economic growth (Madden and Savage, 2000). In essence, the efficient delivery of telecommunications services provides direct benefits through lower transaction costs, improved access to information and indirect benefits due to accelerated information diffusion (Madden and Savage, 2000; Greenstein and Spiller, 1996).

Telecommunications services have many attributes that can directly affect the performance of a country’s economy (Engman et al., 2006). For example, telecommunications services are used both for final consumption and as intermediate inputs in manufacturing and services sectors. Also, from a trade perspective, telecommunications forms part of a mode of delivery and also a directly traded service. Entire service industries, business practices and international supply of business services are dependent on their reliable and cost-effective supply (Engman et al., 2006).
In earlier studies, knowledge creation and transmission were described by Bruce (2000) as a major source of growth in more developed countries. As such, telecommunications infrastructure investments must be seen as a priority for many governments and international development agencies (ITU, 2009; Spiller and Tiller, 1997). World growth in network infrastructure and access to these services reflects the important role telecommunications plays in economic growth. By allowing easy acquisition, speedy transfer of information among economic units and by facilitating rapid two-way communications over distance, telecommunications plays a vital role in the coordination of such economic activity (Nandi, 2002).

3.4 THE SOUTH AFRICAN TELECOMMUNICATIONS SECTOR

Telecommunications sectors are highly competitive and advanced technological industry segments (Levin and Schmidt, 2010). Such sectors allow market forces to establish market segmentation and seek competitive industry participation. Businesses in these sectors do so by formulating strategies that create market segments dictated by price, quality, technology or scale of the market (Levin and Schmidt, 2010; Walsh, 2005; Grant, 1998). As a result, competitive industries never reach a static state, but rather exhibit continuous change over time (Levin and Schmidt, 2010; Grant, 1998).

The South African telecommunications sector refers to all industries rendering services, which facilitates the interaction between parties. These include postal services, broadcasting services (television, radio and pay-television), telecommunications (mobile and fixed-line) and Internet Service Providers (TIPS, 2010). According to Gillwald (2005), the South African telecommunications sector has experienced dramatic shifts in the past 15 years. Wireless mobile services provide connectivity to millions of people previously excluded from having a phone and the Internet made an entrance into the sector and fundamentally changed the way businesses and individuals communicate (Gillwald, 2005).

The state of the South African telecommunications sector’s performance however is described as poor and inefficient (Bagdadioglu and Cetinkaya, 2010; ITU, 2010b; Gillwald, 2005). Competition induction therefore is vital for the South African
telecommunications sector to increase performance and competition across the spectrum of telecommunications service delivery (Levin and Schmidt, 2010). Market variables arising from environmental change within a sector may require a change in a company’s competitive advantage strategies in order to respond to the potential opportunities created by these variables (Walsh, 2005). It is not only companies which have to deal with change, but the overall performance of all industry players including the private and public entities across the whole telecommunications sector is affected (Walsh, 2005).

Assessment of the telecommunications sector environment in South Africa provides insight into sector-specific changes. The effect these changes have on business strategies requires the creation of special techniques to understand them. While there are no formulae to guide which choice of environmental factors are to be considered, the specifics of demands on a business will determine what factor is relevant (Levin and Schmidt, 2010).

3.4.1 History of the South African telecommunications sector

The first use of telecommunications in the Republic of South Africa was a single line telegraph connecting Cape Town and Simonstown in 1860. In 1878 the first point-to-point telephones were installed in Cape Town. The first undersea links were introduced in 1879, which connected Durban to Europe and soon after, with the rest of the world. The telecommunications network continued to develop through internal financing in a heavily regulated market as international technology developed.

Telephone services were initially operated by the South African Post Office (Telkom, 2010). Table 3.1 summarises the historical development of the telecommunications sector in South Africa. In the 1960s, South Africa was connected to 72 countries and the annual total of outgoing annual international calls numbered in excess of 28 000. Five million fixed telephone lines were active by 1990. In anticipation of privatisation, the government formed two state-owned companies in 1990, the telecommunications corporation, Telkom and the Post Office.
During the 1990s, South Africa launched mobile operations, underwritten by Telkom in partnership with Vodafone. This subsidiary grew to be Vodacom, which Telkom sold in late 2008 in preference for its own 3G network. Vodacom has a subscriber base of more than 45 million users, with an average return per user (ARPU) of more than R60 across both rural and urban subscribers (Vodacom, 2012). Vodacom, together with the other operators, came under criticism in late 2009 by government and the public for high inter-connect charges. This issue is an on-going debate and a point of discussion by the Parliamentary Committee on telecommunications.

<table>
<thead>
<tr>
<th>Critical Dates</th>
<th>Development in the South African telecommunications Industry</th>
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<tbody>
<tr>
<td>Pre - 1990</td>
<td>Department of Post and telecommunications regulates all nationwide communications networks</td>
</tr>
<tr>
<td>1991</td>
<td>Government formed two state-owned companies, the telecommunications corporation, Telkom and the Post Office</td>
</tr>
<tr>
<td>1994</td>
<td>Government allows the private sector to provide data transmission services, but had to use Telkom's facilities</td>
</tr>
<tr>
<td>1995</td>
<td>Establishment of cellular phone networks</td>
</tr>
<tr>
<td>1996</td>
<td>Government enforces New telecommunications Act No 103 of 1996</td>
</tr>
<tr>
<td>1997</td>
<td>The Department of Post and telecommunications changed its name to the Department of Communications</td>
</tr>
<tr>
<td>1999</td>
<td>Government enforces the Broadcast Act</td>
</tr>
<tr>
<td>2004</td>
<td>Second National Operator Neotel launched</td>
</tr>
<tr>
<td>2006</td>
<td>Electronic Communications Act (Act 36 of 2006)</td>
</tr>
</tbody>
</table>

**Source:** DOC, 2011; Telkom, 2010

The licensing authority in South Africa embarked on reforming the telecommunications sector when the legal and regulatory mandates were redesigned. In 2004, the Department of Communications redefined the Electronics Communications Act (ECA), which consolidated and redefined the landscape of telecommunications licensing in South Africa (both mobile and fixed). The
Independent Communications Authority (ICASA) currently licences more than 450 independent operators with the Electronic Communications Network Licence (with the ability to self-provision) as well as issuing Electronic Communications Service Licences for service deployment over infrastructure in the retail domain (ICASA, 2012).

As a part of the mandate to reform the telecommunications landscape, the monopolistic character of the telecommunications sector was brought to an end by 2005. Telkom had enjoyed a long-term of monopoly since its establishment in 1990. Telkom is no longer the single operator in South Africa and faces competition from the second Fixed Network Operator Licensee, Neotel, as well as the three mobile operators, Vodacom, MTN and Cell-C. However, it still receives criticisms from smaller operators and the Competition Commission for setting South African pricing in its favour (Goldstuck, 2012).

### 3.4.2 Transformation in the South African telecommunications sector

The speedy introduction of technological innovations and pressure by international organisations have encouraged and accelerated the transition from a publicly owned monopoly to an increasingly competitive telecommunications sector (Newbery, 2004). The performance of the South African telecommunications sector, however, during the past decade is described as poor and lagging behind in comparison with other emerging markets (Ayogu and Bayat, 2010; Bagdadioglu and Cetinkaya, 2010). The poor performance of a telecommunications sector under public ownership, accompanied by the lack of public financing for renewal and maintenance investments are the main motives for reform (Bagdadioglu and Cetinkaya, 2010).

Since its new mandate, the Department of Communications has attempted to create a favourable environment that ensures that South Africa has the capacity to advance its socio-economic development goals, support the renewal of Africa and contribute to the building of a better world (DOC, 2011). This new mandate places the Department of Communications at the forefront of government initiatives to bridge the digital divide as well as to provide universal access to ICT for all South Africans.
In an attempt to improve on the bad performance of the sector, the South African Government, like all other African Governments and the African Union Heads of State, developed National ICT Policies and Strategies that would improve the lives of their societies. In January 2010, Government, together with the other African Union Heads of State, declared “the Information and Technology sector as a top priority and adopted a declaration that called on all African countries to prioritise ICTs as a vehicle for driving Africa’s Development Agenda” (DOC, 2010:2). Figure 3.4 illustrates the composition of the South African telecommunications structure as enforced in 2000 (BMI, 2003).

**Figure 3.4 The South African telecommunications sector structure**

The South African Government adopted access and use of ICTs to enable socio-economic development and service delivery. This calls for a necessary alignment of
ICT policies and strategies with the broader strategies of Government to accelerate social and economic development (DOC, 2010). This strategic plan is characterised by what is termed “a new wave of change” which means that the Department has committed itself to working faster, harder and smarter, responding to the call of President Zuma (DOC, 2010). The Department adopted the following six key pillars of transformation strategy for the DOC and its portfolio organisations:

- To stabilise the public entities within the portfolio;
- The reconstruction and development of the Department of Communications;
- Forging partnerships with the private sector, academia, civil society organisations and labour;
- Building an integrated national broadband plan;
- Building a people-centred inclusive Information Society and knowledge-based economy and
- Major projects include:
  - e-skills Institute;
  - ICTs and rural development;
  - Corporatisation of the Postbank;
  - e-Connectivity and the 2010 legacy;
  - Local and digital content development;
  - Strategy and
  - International relations (DOC, 2010; Cull, 2009).

3.4.3 Telecommunications industry reform

One of the mandates a regulator is faced with is to encourage competition which is not always easy, or popular. Innovation driven by data communications and the digital economy it supports can be disruptive to existing technologies and induce political demands to insulate particular segments from the economy (Cull, 2009; Comin and Hohijn, 2004). Even the most well-intentioned policy makers sometimes protect or introduce laws and regulations that inhibit competition and thereby slow the adoption of broadband technology (Gillwald, 2005). However, such protections can create impediments to new opportunities and increased productivity and income.
In the midst of the controversies around the regulatory roles, the South African telecommunications sector has been at the forefront of the country’s infrastructural reform process and thereby is the first sector to confront some of the inherent tensions within the country’s core policy objectives. These include accelerated sector growth and modernisation, the achievement of universal access or service, promotion of economic efficiency and Broad Based Black Economic Empowerment (BBBEE) (Gillwald, 2005; Teljeur et al., 2003).

The stated national strategies to achieve these policy objectives, although slow in implementation, have broadly conformed to international economic reform best practices and include restructuring and privatisation of state-owned enterprises (SOEs), market reform and liberalisation, economic regulation, universal access and service funding mechanisms as well as the promotion of foreign direct investment (FDI) (Gillwald, 2005; Teljeur et al., 2003).

Telephony in South Africa, like broadcasting, started as a monopoly under the direct control of government which was first under the auspices of the Post and telecommunications department and thereafter by Telkom. ICASA was given the mandate to introduce competition in the sector and bring the monopoly to an end. Telkom, the monopoly fixed-line operator, was corporatised in 1991 and later was partially privatised in 1996. Telkom was granted a five-year monopoly under the 1996 telecommunications Act of that year, justified on the basis that this would allow Telkom to meet universal service targets to extend access to the network (Cull, 2009).

Over time, much more slowly than had been anticipated, competitors have entered the telecommunications market. In 1993 licences for two mobile phone operators were awarded, one of which, Vodacom was 50% owned by Telkom. In 2005 a second fixed-line operator was licensed after a 3 year delay. Telkom’s exploitation of its market power and the related lack of competition and high consumer prices has been extensively discussed elsewhere (Horwitz and Currie, 2007). This is largely the result of Ministerial discretion being used in favour of Telkom.
The 2005 Electronic Communications Act changed the framework of regulation with a ‘layering’ approach to licensing with telecommunications service licences being technologically neutral. In 2008, following a court challenge to the Minister of Communications, the regulator agreed to grant network licences to any value-added service licensee, opening up the network infrastructure to far greater competition (Gillwald, 2008).

3.4.4 The Department of Communications’ mandate

The mandate of the Department, derived from relevant legislation, is as follows:
“To create a vibrant ICT Sector that ensures that all South Africans have access to affordable and accessible ICT services in order to advance socio-economic development goals and by giving support to the African Agenda by contributing to building a better world” (DOC, 2010:10).

The core functions of the Department of Communications are:
- To develop ICT policies and legislation that create conditions for an accelerated and shared growth of the South African economy, which positively impacts on the well-being of all our people and is sustainable;
- To ensure the development of robust, reliable and affordable ICT infrastructure that supports and enables the provision of a multiplicity of applications and services to meet the needs of the country and its people;
- To strengthen the ICT Regulator, Independent Communications Authority of South Africa (ICASA), to enable it to regulate the sector in the public interest and ensure growth and stability in the sector;
- To enhance the capacity of and exercise oversight over, State Owned Enterprises (SOE’s) as the delivery arms of government and
- To fulfil South Africa’s continental and international responsibilities in the ICT field.

The mandate of the Department of Communications is embedded in legislation as well as in other policy documents. The legislative framework for the work of the Department is contained mainly in the following (DOC, 2010):
- Broadcasting Act (Act 4 of 1999);
• Electronic Communications and Transactions Act (Act 25 of 2002);
• Electronic Communications Act (Act 36 of 2006);
• Former States Broadcasting Re-organisation Act (Act 91 of 1996);
• Independent Broadcasting Authority Act (Act 153 of 1993);
• Independent Communications Authority of South Africa Act (Act 13 of 2000);
• Sentech Act (Act 63 of 1996);
• Telecommunications Act (Act 103 of 1996);
• Post Office Act (Act 44 of 1958);
• Postal Services Act (Act 124 of 1998 and
• Telegraph Messages Protection Act (Act 44 of 1963).

In executing its role, the Department is also guided by:
• The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996);
• Public Service Act, 1994 (Act 103 of 1994) as amended and
• Public Finance Management Act, 1999 (Act 1 of 1999) as amended.

3.4.5 ICT governance in South Africa

Empirical proof indicates that political accountability is an important determinant of regulatory performance and it is argued that policies aimed at enhancing politically accountable systems should also be given the necessary attention in development programmes (Gasmi and Recuero Virto, 2010; Gasmi, Noumba and Recuero Virto, 2009).

The Independent Communications Authority of South Africa (ICASA) is the South African composite ICT regulator. The mandate of ICASA is to enforce government’s policies and implementation thereof. The regulator is placed under the direct oversight of the Minister of Communications. Under law, ICASA is intended to function without political or commercial interference (DOC, 2010). Regulations and policies formulated by ICASA follow a process of public consultation. After the public consultation process the regulation acquires the force of law.

The Independent Communications Authority of South Africa Act (2000) provided for the merger of the South African telecommunications Regulatory Authority and the
Independent Broadcasting Authority to form the Independent Communications Authority of South Africa (ICASA). ICASA regulates the telecommunications and broadcasting industries in the public interest and assures affordable services of a high quality for all South Africans.

ICASA was established in terms of Independent Communications Authority of South Africa Act of 2000 (Act No. 13 of 2000). The authority makes regulations and issues communications licences in terms of Electronic Communications Act and Postal Services Act. In addition to developing regulations, ICASA issues Licences to telecommunications and broadcasting service providers; enforces compliance with rules and regulations; protects consumers from unfair business practices and poor quality services; hears and decides on disputes and complaints brought against licensees; controls and manages the effective use of Radio Frequency Spectrum (ICASA, 2012).

In line with the licence conversion of the Electronic Communications Act 36 of 2005 (ECA), ICASA converted all Value Added Network (VANs) licences issued in terms of the telecommunications Act (TA) of 1996. The Independent Broadcasting Act (IBA) of 1993 was converted. An estimated 600 class and individual licences were issued. The following regulations were also issued:

- Licence fee regulations. These are designed to lower the regulatory barrier to entry, which consequently results in competition and the lowering of the cost of communication;
- E-rate regulations. These regulations prescribe a minimum of 50% discount of the total charge for the provision of Internet or broadband service to schools and tertiary institutions;
- The review of handset subsidies regulations. These are to enhance the transparency of pricing, so that consumers are able to make informed decisions in terms of price;
- Interconnection regulations. These are the key regulations to facilitate competition. They provide competing services such as premium services, value-added services and Internet access to a competitor’s customers and
- Table of Frequency Allocations and the broadcasting spectrum plan.
The strength of ICASA is defined in terms of its regulatory capacity, compliance monitoring and enforcement. Although the regulator’s mandate proved to be sound, Gillwald (2008) highlights ICASA’s failure to deliver on its mandates. The notion is also supported by Ayogu and Bayat (2010) in a previous study. The regulator’s enforcement mandate has found to be especially crucial in the areas of interconnection, facilities leasing and consumer protection (Ayogu and Bayat, 2010).

Ayogu and Bayat (2010) describe the problem with South Africa’s ICT governance as not the lack of oversight, but the form and purpose that seems to drive the oversight. The expectation, obviously, would be to have a governance regime that is consistent with ICASA’s mandate. However, according to Ayogu and Bayat (2010) this does not appear to have been the case.

ICASA “has a singular challenge to create, through sound regulation, an environment conducive to the growth and development of the communications industry” (Ayogu and Bayat, 2010:244). Ayogu and Bayat (2010) further argue that it is Government’s mandate to use ICASA to achieve the prescribed goals. As a matter of priority, it must nurture ICASA’s capacity to become impartial. Firstly, Government can nurture impartiality through either divesting from Telkom or by acquiring a competing interest in a Second National Operator at the same level as in Telkom. Secondly, industry self-regulation (code of practices) is a poor substitute for consumer protection which evidently is in need of credible enforcement mechanisms (Ayogu and Bayat, 2010; Horwitz, 2001).

3.4.6 The Electronic Communications Act of 2005

The aim of the Department of Communications is to further develop ICT policies and legislation that stimulate and improve the sustainable economic development of the South African first and second economies and positively impact on the social wellbeing of all its citizens. The Department also aims to oversee the performance of state-owned entities within its portfolio (Department of Communications, 2010).

Former President Thabo Mbeki signed the Electronic Communications Act (EC Act), formerly known as the Convergence Bill in 2006. The ECA provides a regulatory
framework for the convergence of broadcasting, broadcasting signal distribution and the telecommunications sector (Telkom, 2012). The Act also repeals the telecommunications Act of 1996, the Independent Broadcasting Authority Act and portions of the Broadcasting Act. However, there are other legal processes that have to take place before it becomes operational law (ICASA, 2012).

The licensing and provision of telecommunications services in South Africa has historically been subject to the telecommunications Act and the regulations made under the telecommunications Act (ICASA, 2012). The establishment of the new Act of 2005 and the ICASA Amendment Act of 2006 intended to promote a reformed landscape and to induce a new era in the ICT sector in South Africa. The two pieces of legislation are part of the new converged regulatory framework for the ICT sector, aimed at lowering costs of access to ICT and increasing the efficiency of telecommunications services provisioning in the country (DOC, 2012).

The promulgation of the ECA is expected to have spin-offs in the social sphere, the ICT market and ICT industry. The Electronic Communications Act seeks to:

- Promotion of convergence in the broadcasting, broadcasting signal distribution and telecommunications sectors;
- Provide the legal framework for convergence of these sectors;
- Make new provisions for the regulation of electronic communications services, electronic communications network services and broadcasting services;
- Provide for the control of the radio frequency spectrum and
- Provide for the continued existence of the Universal Service Fund (DOC, 2010).

### 3.4.7 The ICASA licence framework

The Electronic Communications Act (2005) makes provision for operators in the telecommunications industry to be licensed according to their market position in the landscape. The South African Regulator, ICASA issues ECS and ECNS licences to service providers. The ECS and ECNS licences were formerly known as VANS (Value Added Network Services) licences. Certain licensees supported reseller provider platforms, which are used by providers to deliver telecommunication services. Typically these providers will not own their own licences and the estimated
number of total providers in the country were expected to be over 1,000 by the end of 2011 (Goldstuck, 2012).

By January 2012 the regulator had issued licences to 354 iECNS and 557 iECNS service providers (ICASA, 2012) which is a combined mix total of more than 600 licensed operators. It is possible under the ECA (2005) to be issued with more than one category of service licence. Since 2005, a steady increase in licence applications has been observed. Table 3.2 indicates the licence matrix described in the Electronic Communications Act. The ECA (2005) is therefore divided into three market structure classifications:

- Electronic Communications Network Services (ECNS);
- Electronic Communications Services (ECS) and
- Broadcasting Services.

### Table 3.2 ECA licensing classifications

<table>
<thead>
<tr>
<th></th>
<th>Electronic Communications network Services</th>
<th>Electronic Communications Services</th>
<th>Broadcasting Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual</strong></td>
<td>Individual Electronic Communications Network Services Licence</td>
<td>Individual Electronic Communications Services Licence</td>
<td>Individual Broadcasting Services Licence</td>
</tr>
<tr>
<td><strong>Class</strong></td>
<td>Class Electronic Communications Network Services Licence</td>
<td>Class Electronic Communications Services Licence</td>
<td>Individual Broadcasting Services Licence</td>
</tr>
<tr>
<td><strong>Exempt</strong></td>
<td>Exempt Electronic Communications Network Services</td>
<td>Exempt Class Electronic Communications Services</td>
<td>Exempt Broadcasting Services</td>
</tr>
</tbody>
</table>

Source: Ellipsis, 2012

The classifications in Table 3.2 are summarised as follows:

**Individual Licences:**

- National and Provincial Electronic Communication Services (ECNS);
- Commercial and Public Broadcasting (national and provincial);
- Voice telephony using own numbers;
• ECNS, communications services and broadcasting of which more than 25% is owned by the state and
• Others (determined by ICASA) having significant social or economic impact.

Class Licences:
• Municipal ECNS;
• Community and low power broadcasting and
• Others (determined by ICASA) not having significant social or economic impact.

Licence Exemptions:
• Non-profit electronic communications;
• Services;
• Resellers of electronic communications services;
• PTNs (not selling excess capacity);
• LANs and
• Others (determined by ICASA).

Historically the network provider was also the provider of services. However, unbundling the service from the network is feasible and has been the path of most deregulation processes followed by a licensing framework (Ayogu and Bayat, 2010).

Since the telecommunications sector is regulated, Internet Service Providers (ISP’s) are required be obtain a licence in order to provision the services. The term Internet Service Provider (ISP) refers to an operator who provides the physical component of connectivity and access to the Internet, Voice over Internet Protocol (VOIP) and data connectivity. The ISP connects to its customers by using a data transmission technology appropriate for delivering Internet Protocol datagrams, such as dial-up, Digital Subscriber Line (DSL) and dedicated high-speed interconnects.

The first ISP in South Africa was launched in 1993 as a project filed by the CSIR. After commercial viability was established, the first ISP was launched. The growth of ISP numbers has continued to accelerate where it passed the 700 barrier by 2011 (Goldstuck, 2012).
The ECA stipulates that an ECS or ECNS licence is required in order to be a licensed operator. Internet Service Providers may provide Internet e-mail accounts to users, which allows them to communicate with one another by sending and receiving electronic messages through their ISPs' servers. As part of their e-mail service, ISPs may provide other services, such as remotely storing data files on behalf of their customers, as well as other services unique to each particular ISP. Table 3.3 indicates the composition of the Internet users in South Africa.

<table>
<thead>
<tr>
<th>Internet Access location</th>
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</thead>
<tbody>
<tr>
<td>Work</td>
<td>53%</td>
<td></td>
<td>Education</td>
<td>5%</td>
<td>Other</td>
</tr>
<tr>
<td>Home</td>
<td>39%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Education</td>
<td></td>
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<tr>
<td>5%</td>
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<tr>
<td>Other</td>
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<tr>
<td>3%</td>
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<thead>
<tr>
<th>Internet users by region</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Gauteng</td>
<td>49%</td>
<td>Western Cape</td>
<td>24%</td>
<td>Kwazulu Natal</td>
<td>10%</td>
</tr>
<tr>
<td>Home</td>
<td>39%</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Education</td>
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<td>5%</td>
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<td>Other</td>
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<td>3%</td>
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<table>
<thead>
<tr>
<th>Internet users by age</th>
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</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>10%</td>
<td>24-34</td>
<td>30%</td>
<td>35-54</td>
<td>43%</td>
</tr>
<tr>
<td>Internet users by gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>69%</td>
<td>Female</td>
<td>31%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet users by race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>64%</td>
<td>Black</td>
<td>24%</td>
<td>Coloured</td>
<td>7%</td>
</tr>
<tr>
<td>Black</td>
<td>24%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coloured</td>
<td>7%</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Indian</td>
<td>5%</td>
<td></td>
<td></td>
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<tr>
<td>Internet connection type</td>
<td></td>
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</tr>
<tr>
<td>ADSL</td>
<td>50%</td>
<td>Mobile</td>
<td>20%</td>
<td>Wireless</td>
<td>13%</td>
</tr>
<tr>
<td>Mobile</td>
<td>20%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireless</td>
<td>13%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet user education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>35%</td>
<td>Matric</td>
<td>24%</td>
<td>Technikon</td>
<td>21%</td>
</tr>
<tr>
<td>Matric</td>
<td>24%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technikon</td>
<td>21%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Matric</td>
<td>16%</td>
<td></td>
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</tbody>
</table>

Source: Research ICT Africa, 2012

3.5 THE NATURE OF THE TELECOMMUNICATIONS INDUSTRY

The telecommunications industry in South Africa can be segmented into the following - telephony, data and broadcasting. The telecommunications industry concerns the provision of two-way, one-to-one communications of voice, data and video. It is distinct from the broadcasting market, which is typically a one-way or referred to as one-to-many communications service (Hodge and Theopold, 2001).
Emerging telecommunications technologies enable convergence of telephony, data and video over a single access medium. Telecommunications convergence therefore occurs when infrastructures developed for either market are adapted to provide the other service. Given these economies of scope, operators more often start to provide converged services in the telecommunications industry (Jakopin and Klein, 2012). The various segments of the telecommunications sector exhibit different levels of competition by industry players.

The niche value-added markets serving mainly the business sector generally benefit from the emergence of competition whilst several factors suggest that competition in the market for local calls will be limited (Hodge and Theopold, 2001). These factors include the strategic first-mover advantages of the incumbent, natural monopoly elements in certain segments, abuses of market power and vertical integration (Jakopin and Klein, 2012). For regulatory purposes it is important to understand the vertical stages of industry production and possible horizontal market divisions in telecommunications. Table 3.4 provides the commonly used breakdown for a telecommunications market, noting that the dynamic nature of the industry makes such definitions valid at a point in time only.

<table>
<thead>
<tr>
<th>Production Stage</th>
<th>Description</th>
<th>Sub Stages</th>
<th>Horizontal Divisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of network infrastructure</td>
<td>Provision of switching and transmission infrastructure</td>
<td>• Customer premises equipment</td>
<td>• Fixed vs. mobile</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• PABX vs. phone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Local access</td>
<td>• Fixed vs. Mobile</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Business vs. residential</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Voice and data vs. broadband video</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• National long distance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• International long distance</td>
<td></td>
</tr>
</tbody>
</table>
### Production Stage Description

<table>
<thead>
<tr>
<th>Production Stage</th>
<th>Description</th>
<th>Sub Stages</th>
<th>Horizontal Divisions</th>
</tr>
</thead>
</table>
| Provision of services | Provision of additional infrastructure and technical support to operate services over provisioned infrastructure | • Line lease agreement  
• Content  
• Value-added  
• Infrastructure  
• Technical service provision  
• Customer management (billing customer support) | • Basic voice vs. VANS vs. broadcast  
• Fixed vs. mobile  
• National long distance vs. international  
• Business vs. Residential |

**Source:** Hodge and Theopold, 2001

Telecommunications production can mainly be divided into (1) the provision of network infrastructure and (2) the provision of services on that infrastructure. Typically a public monopoly is vertically integrated and so provides all parts of the production chain and all horizontal markets (Jakopin and Klein, 2012).

In the context of deregulation the focus shifts onto the various stages of production and not what individual businesses do. In this way it is easier to identify essential facilities and anti-competitive behaviour stemming from vertical integration. It is also easier to track where competition can feasibly survive without regulation (Hodge and Theopold, 2001).

#### 3.5.1 Provision of network infrastructure

Within the group of network providers who use fixed-line infrastructure, networks were historically built to focus on one of three different types of transmission - voice, video or data. It becomes more evident that networks are increasingly offering converged types of services over a single medium (Choi, Woo and Shim, 2011). This is feasible due the digital format used in network transmission.

Major Network operators provide the infrastructure on which various telecommunications services are run. Networks are made up of switches and transmission technologies. The switches then provide the routing of voice, data, and video signals through the network infrastructure. The transmission medium can be
Telecommunications industries relate to the original purpose for which their networks were built namely telecommunications (voice), broadcasting (video) and computing (data). There are three different components to the network that can be seen as three different sub-stages of production; namely, local access, long-distance and international. The local access network connects the customer premises to the local Telco exchange switch through the local loop. Customer premises equipment (CPE) is used to terminate local access connections to the end-user and includes fixed-line telephones, mobile handsets and private exchange equipment for business use (Choi et al., 2011).

From the local switch there is an inter-transmission facility to either other local switches or long-distance (national or international) points-of-presence. The long-distance networks then transmit the signal to another long-distance point-of-presence where it is distributed to a local switch and onto the other customer premises. Local access can be provided by a number of different technologies, each with different cost structure and therefore different degrees of substitutability with the traditional public switched telephone network (PSTN).

Local access is handled as one stage of production, but this stage can be broken down further, such as connection of premises to local loop and the local exchange (switch). In the search for increased competition at the local access level, it may be
desirable to further unbundle the production process and find ways to inject competition (Hodge and Theopold, 2001). Unbundling provides entrants with access to the local loop of the incumbent operator so that they do not incur large fixed and sunk costs to build their own infrastructure (Bourreau and Dogan, 2005). Regulator ICASA is mandated to manage the process of unbundling in South Africa with a deadline set for November 2012 (ICASA, 2012). The SA White Paper on telecommunications (1996) suggests allowing community groups and SMMEs to install and utilise local loops which connect to the Telkom PSTN. To date, however Local Loop Unbundling (LLU) has not been realised in South Africa.

Upgrading the networks to provide greater speed does require additional investments in the local access infrastructure (Crandall, 2005). An alternative medium to copper is the use of fibre optic cabling, which delivers far greater network capacity. Due to the higher cost of fibre optic, it is only cost effective with large businesses and not with residential homes in the local access component of the network. As a consequence, broadband infrastructure competition remains low, although this kind of competition has an important and positive impact on broadband development (Höffler, 2009). Fibre optic cables are used extensively in the long-distance and international networks, whilst fixed-lines are still considered the most economical way of connecting to the last mile.

In voice, the traditional PSTN consists mainly of copper transmission equipment at the local access level and switching equipment that allows two-way transmission between two individual points on the network by establishing a dedicated line between two points for the duration of a call. The transmission mediums have low capacity or network speed, which makes it inadequate for video transmission and a slow but adequate medium for data transmission. However, recent technological developments in data compression have substantially increased the speeds available on these wires. These technologies include Asymmetrical Digital Subscriber Line systems (ADSL) and other Digital Subscriber Line (DSL) connectivity media. Alternatively, high-speed transmission connectivity includes wireless transmission.
In addition to fixed-line communications, wireless networks are widely used to provide transmission (Choi et al., 2011). Wireless networks differ from fixed-line in their use of the radio frequency spectrum for transmission. The local access process involves a handset for the subscriber transmitting to and from a base station using a specific spectrum that the network provider is licensed to use. The base stations are usually connected to each other or to another network through a fixed-line infrastructure. In local access there are two types of wireless networks; namely fixed and mobile (Hodge and Theopold, 2001).

The fixed wireless local loop is a recent addition and is being used to provide a last mile access to the consumer for fixed-line voice or data networks. It is similar to two-way radio where the physical coverage is very limited and the receiving device (a telephone) is often fixed in location. The same receiving device as fixed-lines is used. In terms of a market boundary for competition analysis, it is not designed to compete with the cellular networks but rather to provide a lower cost alternative to using fixed wire as the last mile access to the home (Jakopin and Klein, 2012).

Cellular networks provide local access but also have the added advantage of mobility. The subscriber is required to invest in a handset that cannot be used for fixed-line or fixed wireless access (a switching cost). The current mobile networks are constrained in their network speed to offering voice and data services only. The spacing of the base stations is dependent on the traffic volumes. The result is that the initial investment required establishing a local access infrastructure is lower than that of fixed-lines (Hodge and Theopold, 2001). It also indicates that there are lower economies of scale and density, making more network providers viable.

Satellite communications make use of more powerful devices to transmit to one of a number of earth stations, which in turn link to each other via one or more satellites. The greater distances, over which the receiving equipment must transmit, means they are larger and more expensive than cellular. However, the use of satellites enables the network to minimise the number of earth-based transmission stations. Other wireless communications also include the broadcasting group (radio, free-to-air TV and Pay TV) which are one-to-many operations without two-way capacity and so cannot offer telecommunications (Choi et al., 2011).
3.5.2 Provision of telecommunications services

The network infrastructure is the basis on which telecommunications services are provided. The increasing intelligence of telecommunications networks has permitted a proliferation of services that are feasible beyond the basic local, national and international telephony (Choi et al., 2011). Service provision can be split into two basic components - value-added network services (VANS) and basic voice. From this point there can be further separation into wireless, fixed-line, local/long distance/international and business/residential. VANS are described as including electronic data interchange, electronic mail, protocol conversion, database access, managed data network services, voice mail, store and forward fax, video conferencing, telecommunications related to publishing and advertising services and electronic information services, including Internet service provision.

The provision of services occurs at the top of the network infrastructure. Historically the network provider was also the provider of services. However, unbundling the service from the network is feasible and has been the path of most deregulation processes. A service provider who does not own the network offers the service by either leasing part of the network from the network provider and enhancing this with one or more service components, or interconnecting its own network to others in order to provide the service (Jakopin and Klein, 2012).

Typically, licensed service providers, discussed earlier in the chapter, will operate in the provision of services space. The additional components that service providers bring to the network are:

- **Service-specific infrastructure** - this includes additions to the network infrastructure required to provide, technically, a particular advanced service. For example, in Internet services these would include a national points of presence (POPs) network linking to the long-distance data network (Internet backbone), linking to a server farm that would include a router, authentication server, firewall, mail hosts, proxy servers and local content servers;
- **Some form of customer management systems** - this would include customer information, billing and customer support (call centre) and
• Content services - some advanced services may have content that will be received by the customer such as Internet provisioning and video on demand (Jakopin and Klein, 2012).

An example of separation of network and service provider is the cellular industry in South Africa. The network provides wholesale network access to a group of approved service providers and does not necessarily retail to the public. The wholesale providers in turn offer retail outlets to access customers where they typically stock and sell handsets, perform credit checks, link the customer to the network whilst performing all billing and debt collection. Horizontal markets divisions in the service component can be taken from the divisions in the network markets and include standard voice products provided to business or residential customers; data, voice and video products, value added services and fixed or mobile services (Jakopin and Klein, 2012).

Key factors, when examining horizontal market divisions, are product bundling and technological change (Hodge and Theopold, 2001). In terms of product bundling, most voice services offer the more advanced features as part of the service. The additional products can be part of a basic voice service or bundled as an ad hoc service. In terms of technological change, the product boundaries will continually change and so need to be re-assessed periodically (Hodge and Theopold, 2001). Technological change, in return, enables competitors to interconnect their networks in order to access a customer base beyond their network scope (Goldstuck, 2012).

The pricing and competitive behaviour amongst the providers is influenced by a number of factors peculiar to network industries. The value of a network is related to the number of customers connected to that network (Deering and Murphy, 2003). It is therefore in the interest of all competitors to interconnect with each other to gain access to as broad a customer base as possible in order to enhance the value of their respective networks. The ability to interconnect also means that businesses can compete with other network providers on one part of their network without having to duplicate the entire network (Deering and Murphy, 2003). Operators may, for example, compete on long distance telephony by building their own long distance infrastructure and then interconnecting to a local network to reach the final
customers. Interconnection is therefore an important key to achieve competitive advantage for telecommunications businesses.

3.5.3 The role of telecommunications in the South African economy

Telecommunications services play a key role in any economy from being an important intermediate input to business, an enabling medium for a range of content providers, a significant item in household expenditure and a source of demand for numerous manufacturing and service industries (ITU, 2011a). In 2009 the telecommunications industry in South Africa accounted for around 5% of Gross Domestic Product (GDP) (ITU, 2010b). This indicates an upward trend from the sector’s earlier share of GDP, which was between 1 and 2% during the 1970s to the mid-1990s. From 1994, real value added by the communications sector has grown 8% every year on average. Particularly, government provision of postal and telephonic services experienced tremendous growth before 1994. Mobile telephonic services experienced their largest growth in the late 1990’s and early 2000’s.

By 2010, mobile operators’ revenues estimated to grow to R98 billion compared to broadcasting revenues (Multichoice and SABC) of R 12 billion (Frost and Sullivan, 2009). This indicates that mobile telecommunications revenues are eight times larger than broadcasting. According to Frost and Sullivan (2009) the South African broadband market has shown consistently significant growth rates of over 30% between 2007 and 2008. Frost and Sullivan (2009) expect this positive trend to continue for the next two to three years as well. New analysis from Frost and Sullivan also finds that the South African broadband market earned revenues of over R 2.2 billion in 2008 and estimates this to reach R 12.15 billion in 2015 (Frost and Sullivan, 2009).

Despite the expected growth in the industry, the Communication Workers Union (CWU) has described the ICT sector as one of jobless growth, saying it is problematic for the poor and working class in SA. This is in contrast with the Department of Communications’ belief that the sector has the potential to create more than 1.5 million jobs over the medium-to long-term. ICT has become an important catalyst in socio-economic development in South Africa (DOC, 2010).
3.5.4 Fixed-line telephony trends in South Africa

Progress has been slow in the liberalisation of the South African telecoms market, with incumbent operator Telkom, which was publicly listed in March 2003, retaining its dominance in the fixed-line market (BMI, 2012). Although South Africa had a fixed-line penetration rate of 8.3% at the end of 2011, the penetration rate is believed to be below 3% in South Africa's non-white households. Telkom's residential fixed-lines and payphones are expected to decline in number, particularly after strong growth from prepaid mobile and Voice over IP (VoIP) services (BMI, 2012).

In 2011, South Africa ranked third in Africa in fixed-line telephony penetration, with over 4.3 million fixed-line connections (Telkom, 2012). Telkom traditionally supplied the connectivity. Fixed-line telephony is still dominated by Telkom, which is listed on the JSE and majority of shares is owned by the Department of Communications (BMI, 2012). Telkom's monopoly of running fixed-line services came to an end in 2006, when the country's second fixed-line operator, Neotel, commenced its operations. India's Tata Communications own the majority of shares. Neotel offers telephony and data services using CDMA technology. Telkom still retains sole ownership over the last mile fixed-line connectivity in the country (BMI, 2012). ADSL services form part of the last mile fixed-line service. Last mile fixed line is also referred to as the local loop. Although legislation specifies Local Loop Unbundling (LLU) and the process had to be completed by November 2011, constant delays have caused them to be still under Telkom’s control (ICASA, 2012).

Developments in South Africa's telecommunications sector include the announcement in December 2011 that there would be a further one-year delay in the process of implementing LLU (ICASA, 2012). Market analysts believe this delay will pose negative effects on the sector's development (BMI, 2012). ICASA (2011) proposed a phased approach to opening up Telkom's LLU infrastructure, starting with Bitstream access. ICASA's failure to meet the 2011 deadline and a phased introduction of LLU may result in alternative operators having to wait another two to three years to get full access to the LLU infrastructure (Goldstuck, 2012). In light of ICASA's previous failures to maintain its working schedules, and the government's
large direct and indirect interest in the incumbent, industry players remain skeptical about the timeline for recent proposals on LLU (BMI, 2012).

The launch of residential voice services by the second national operator Neotel, in May 2008, has helped to foster competition and choice within the market. Neotel's CDMA-based fixed-wireless service is being sold together with Internet connectivity. The expansion of Neotel's fixed-wireless service offering is believed to have contributed to moderate growth in the number of fixed-line customers in South Africa (BMI, 2012). Mobile operators Vodacom and MTN have also begun to deploy their own fibre-optic networks and intend to offer fixed-line services in competition against Telkom. It should be remembered, however, that traditional fixed-voice services will continue to experience competitive pressures from mobile services, VoIP offerings including number portability.

Number portability was introduced in 2008 (ICASA, 2012). The implementation of number portability means that customers can switch their telephone numbers between operators Telkom and Neotel, as well as porting between mobile networks whilst retaining their existing numbers. The Independent Communications Authority of South Africa has been working to bring down the costs of telephony by regulating mobile termination rates, which refers to the amount that operators have to pay for using another operator's network (ICASA, 2012).

3.5.5 Mobile communication trends in South Africa

South Africa is one of the fastest growing mobile communications markets in the world (BMI, 2012). Five mobile operators namely Telkom owned 8ta, CellC, MTN, Vodacom and virtual network operator Virgin Mobile deliver mobile services in South Africa. As of 2011, there were over 46.4 million mobile users in South Africa, ranking the country 26th in terms of subscriber numbers internationally and third in the region with a penetration rate of 123% (BMI, 2012).

At local level, multinational companies including Vodacom and MTN, with the smaller Cell C coming in third position, dominate the mobile landscape. Telkom entered the mobile market in 2010 with its own offering, 8ta and roams off MTN's network
infrastructure until Telkom rolls out its own base stations. There are also two mobile virtual network operators (MVNOs). These are cell phone companies which operate in partnership with an existing mobile company, whose infrastructure they also use. Both existing MVNOs operate in partnership with Cell C. Virgin Mobile has been in operation since 2006 and has recently secured investment from a Bahamas-based investment company. South African mobile companies are also making inroads internationally, with MTN leading the way. The company has well over 100 million subscribers in more than 20 countries in Africa, Asia and the Middle East (MTN, 2012).

The South African government awarded two GSM 900 cellular licences in September 1993 to Vodacom and MTN. Both operators introduced their services in the following year. By mid-2011, Vodacom and MTN jointly controlled approximately 83% of the country’s cellular customer base (BMI, 2012). Vodacom is 65% owned by the UK’s Vodafone Group while MTN is a homegrown South African company with mobile operators throughout Africa and the Middle East. Vodacom and MTN were early to market the Third Generation (3G) mobile data services and are increasingly deploying extensive and higher-speed 3.75G networks based on HSPA+ technology.

The two mobile market leaders are also testing Fourth Generation (4G) mobile data services based on LTE technology. After a protracted and highly controversial licensing process, the South African government awarded Cell C the country’s third cellular licence in August 2001 (Cell C, 2012). Cell C has since grown to become South Africa’s third-largest mobile operator in subscriber numbers. The company is owned by 3C telecommunications, which is 60%-owned by Oger Telecom South Africa, a division of Saudi Arabia’s Saudi Oger. In 2010 Cell C became the first South African mobile operator to launch a 4G network (Cell C, 2012).

In 2010 Telkom 8ta, which is owned by fixed-line incumbent operator Telkom South Africa and provides voice, launched 8ta and data services over a CDMA platform. By the end of 2011 it was estimated that South Africa had a mobile penetration rate in excess of 123% (BMI, 2012). Despite the introduction of compulsory SIM registration in 2009, the potential for multiple SIM ownership is expected to continue growing and
will result in penetration rising well above 100%. By the end of 2011 over 19% of South African mobile customers had 3G enabled mobile handsets (BMI, 2012).

The high mobile penetration rate in South Africa has a direct impact on subscriber expenditure and process offered by the operators (BMI, 2012). Using the OECD low-user basket (OECD, 2012) as a reference, Vodacom kept its voice call rates at the same level throughout the 2010/2011-year slightly above 8ta’s prices. 8ta adjusted its prices moderately following the termination rate reduction in March 2011 (BMI, 2012). Telkom owned operator, 8ta was the lowest cost operator in the country until August 2011, when Cell C introduced the ‘99c’ tariff and thereby reduced on-net prices from R1.50 and they became the lowest-cost operator in the country (BMI, 2012). Virgin Mobile, which operates virtually on the CellC network, kept its tariffs at the same level as those of Cell C until August 2011 but it did not follow Cell C’s strategy of lowered pricing. MTN was the most expensive operator and the lowest-cost product available from MTN remained at constant level during 2011 (BMI, 2012).

### 3.5.6 International data capacity and undersea cable connectivity trends

An increase in the number of undersea data cables linking South Africa to the rest of the world, as well as market liberalisation, has seen an improvement in local Internet access, with the number of South African Internet users passing 6 million in January 2012, finally breaking through the 10% mark in Internet penetration for the country. The Seacom submarine fibre-optic cable system linking South and East Africa to global networks via India and Europe was commissioned in July 2009, while the East African Submarine Cable System (EASSy), that links countries along the continent’s eastern coast to the rest of the world, started service in August 2010. The West Africa Cable System linking southern and western African countries with Europe is scheduled to be operational by the end of 2011 (Twinomugisha, Martin and Kondoro, 2010).

### 3.5.7 Data connectivity trends in South Africa

With the arrival of several international data cables to the country’s shores, focus has shifted to improving connectivity within the boundaries of South Africa, by building
national and citywide fibre-optic cable networks. Telkom’s historical monopoly in the industry led to high access prices towards long-haul data transmission in the country. Government established an initiative in the form of Broadband Infraco, the state-owned company, which has been given the task of improving Internet access and of bringing down broadband prices in South Africa. Infraco started selling wholesale bandwidth capacity to the country’s telecoms companies and Internet service providers in November 2010 (DOC, 2010). Its Licence does not allow the company to offer products directly to consumers; rather it sells high-capacity long-distance transmission services to telecom operators, Internet service providers and other value-added network service providers.

Operators building infrastructure in South Africa started to form alliances and share access infrastructure (Goldstuck, 2012). These alliance networks are a common structure among telecommunications companies (Deering and Murphy, 2003). Since global strategic alliances are one of the most significant and recent developments in the telecommunications industry, they have also influenced the South African telecommunications Industry. For example MTN, Vodacom and Neotel are jointly building a 5 000km fibre-optic cable network connecting several cities across South Africa. The first phase of the cable, linking Gauteng with KwaZulu-Natal, was commissioned in June 2010 (BMI, 2011).

In November 2010, a new player in South Africa’s telecommunications industry, FibreCo telecommunications, announced plans to develop a national open-access fibre-optic broadband network to improve connectivity and further reduce Internet costs in the country. FibreCo is a partnership between Cell C, ICT company Internet Solutions and investment management and advisory company Convergence Partners (BMI, 2011).

### 3.5.8 Internet access trends

By the end of 2011 South Africa was estimated to have over 7 million Internet users, which gave the country a penetration rate of 14.3%, up from 12.3% at the end of 2010 (BMI, 2012). Although high by regional standards, South Africa had a similar proportion of Internet users to Sudan and Uganda (BMI, 2012). In terms of level
access to Internet facilities, differences exist between major urban cities and the townships and rural parts of the country. Meanwhile, the development of broadband services has been hampered by high prices. At the end of 2011, broadband penetration in South Africa is reported to have been 8.3% (BMI, 2012). Telkom has reported accelerating demand for its ADSL offers. However, one of the biggest factors that are expected to condition future growth in the sector is the ongoing expansion of competition and LLU.

According to surveys conducted by research institution World Wide Worx and Cisco Systems, the number of South Africans making use of broadband connections increased by 50% between 2009 and 2010, with most of the growth coming as small and medium sized businesses upgraded to ADSL connectivity (Goldstuck, 2012; ITU, 2011b). This trend is expected to continue at the same pace for 2011 and 2012. Every business that changes connectivity from traditional analogue dial-up to ADSL is estimated to add an additional 1 to 20 new users to the Internet user base (Goldstuck, 2012). Driving forces in broadband uptake have been driven by ICASA’s granting of Electronic Communications Network Services licences to over 600 organisations (ICASA, 2012). This implies that service providers that were previously required to buy their network access from one of the major providers can now build their own networks or choose where they want to buy access.

3.6 TELECOMMUNICATIONS CATEGORISED

Businesses engage in activities in different categorised sections in telecommunications, which are provisioned over ICT Infrastructure. Some operators provide fixed or mobile telephony, while others are concerned with data services and the larger operators provide network infrastructure and supply services.

3.6.1 The OSI seven layer model for networking

A formal system that network engineers discuss and apply frequently is the Open Systems Interconnection (OSI) Seven Layer Model for Networking, developed by the International Standards Organisation (ISO) to define a standardised method for designing telecommunications networks and the functions that support them (ITU-T, 1993). This model describes seven layers of interaction for an information system.
communicating over a network. It incorporates a stack of layers representing major function areas that are generally required or useful for data communication between nodes in a distributed environment.

The OSI model is also used to distinguish, by means of layer categorisation, between the types of products or services which businesses in the telecommunications sector provide. Starting from a high-level application perspective, data are sent down the stack layer by layer. Each layer adds information around the originally presented data until that original data plus its layers of added content are represented at the bottommost layer as a physical medium. This bottommost layer can be bursts of coloured light or voltage across a wire in order for that data to physically travel from one point to the other in the real world. The model represents the 'lowest layer' in the hierarchy (the physical) and proceeds to the 'highest' (the application). Table 3.5 describes the OSI model and the services associated with each layer.

<table>
<thead>
<tr>
<th>Table 3.5 Seven-layer OSI hierarchy</th>
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<tbody>
<tr>
<td>Levels in the OSI model</td>
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<tr>
<td><strong>Competition</strong></td>
</tr>
<tr>
<td>7. Applications</td>
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<tr>
<td>6. Presentation</td>
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<td>5. Session</td>
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<tr>
<td>Levels in the OSI model</td>
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<td>-------------------------</td>
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<tr>
<td>4. Transport</td>
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<tr>
<td>3. Network</td>
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<td>2. Data link</td>
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<tr>
<td>1. Physical</td>
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</table>

Source: Rogerson, 1997

3.7 SUMMARY

Chapter 3 presented an overview on global telecommunications drivers and the current landscape is South Africa. The literature study in this chapter indicated how telecommunications in South Africa has been transforming itself through ever increasing sophistication in technologies from cables to radio voices, wireless networks, entertainment and video imaging, with many more technological inventions to come. The research indicates evidence of change, transformation and technological progress. Entrepreneurial opportunities identified within the sector include the following:

- Change in the telecommunications landscape;
- Evidence of sector transformation in the South African telecommunications sector;
- Technological advances and change in terms of access medium; and
• ECN and iECNS licences, which were issued by the ECA (2005). More than 600 licences present an opportunity and space for entrepreneurs to operate in the sector.

Research Questions RQ3, RQ4 and research objective RO3 were addressed in chapter 3. The next chapter will present a study on benchmarking techniques and institutions related to entrepreneurship and telecommunications.
CHAPTER 4

BENCHMARKING

4.1 INTRODUCTION

The topic of this research study is “A model to promote Entrepreneurial Competitiveness in the South African telecommunications sector”. Chapter 2 presented a literature review on Entrepreneurial Orientation whilst Chapter 3 portrayed an overview on the telecommunications trends and the sector in South Africa. The main objective of this chapter is to identify the benchmarking factors that influence the effectiveness and performance of entrepreneurial businesses in the telecommunications sector in South Africa. Literature in this chapter will therefore focus on a benchmarking diagram in the two areas of research namely (1) performance of the South African telecommunications sector and (2) a benchmarking on entrepreneurship performance in South Africa.

The main idea behind the principle of benchmarking is to do a comparison in terms of competitiveness and performance (Kyrö, 2003). Benchmarking in this chapter is concerned with (1) Entrepreneurship and (2) Telecommunications in the context of identifying the factors which promote entrepreneurial competitiveness in the telecommunications sector in South Africa. The chapter includes an overview on institutions that periodically report performance in the two disciplines by means of comparative data indicators and indices. Research Questions RQ₂, RQ₃, RQ₅ and research objective RO₄ will be addressed in this chapter.

A broad definition is that benchmarking can be described as a standard, or a set of standards, used as a point of reference for evaluating effectiveness and performance or level of quality (Maire et al., 2008; Kyrö, 2003; Muir, 1994). Benchmarks may be drawn from formal institutions, personal experience, from the experience of others, in the category of measurement or from legal requirements (Kyrö, 2003).
The term benchmarking can be described as a measurement of the quality of business policies, products and services, programmes, strategies, etc. and a comparison with standard or similar measurements (Maire et al., 2008). The objectives of benchmarking can be described as: firstly to determine what improvements are called for and where they are necessary, to analyse how other businesses in the industry achieve their high performance levels and secondly to use this information to improve performance (Maire et al., 2008; Muir, 1994).

Benchmarking application helps to define the best possible indicators for evaluation and also to obtain a picture of the entire operation of a business. For any business, the primary evaluation criterion is efficiency (Ahmad and Hoffman, 2008). It is generally assumed that the more efficiently a business operates the more profit it will generate and the more secure its future will be. Efficiency is more indicative than profitability because it cannot be as easily manipulated to achieve short-term objectives. Ahmad and Hoffman (2008) state that it is expected that an efficient company will withstand market competition, be less sensitive to unfavourable changes in the environment and be more likely to use indicators to link the best of its short and long-term goals.

Benchmarking institutions derive points of reference by means of relative indicators and indices. An index, or a composite indicator, refers to a group of indicators aggregated into a single value (Gudmundsson, 2001). It is common to have more than one level of indicator aggregation within an index. The starting level consists of indicators aggregated into a composite of indicators referred to as sub-indices and as a result of the sub-indices aggregation, the composite indicator is a composite index clustered in multi-levels. An index-based indicator supports the idea of a composite cluster of associated technologies, along with a selection of these technologies and the indicators measuring them (Press, 1999). Press (1999) highlighted that, with a complex concept such as the Internet, indices may be more robust than a single indicator in measuring a qualitative concept.
4.2 MEASURING BUSINESS PERFORMANCE

Research in Chapter 2 indicated the association between business performance and Entrepreneurial Orientation (EO). The term competitiveness is associated by authors in literature as a measure of effectiveness, performance and increased success in both new and existing ventures (Wiklund and Shepherd, 2005; Lumpkin and Dess, 2001; Zahra and Garvis, 2000; Wiklund, 1999; Zahra and Covin, 1995). As this study is concerned with the promotion of entrepreneurial competitiveness in the telecommunications sector in its current uncertain environment, business performance is based on how effective entrepreneurs can position their businesses in order to obtain higher standards of effectiveness and performance and in return higher levels of competitiveness.

The importance of Entrepreneurial Orientation to the survival and performance of businesses has been acknowledged in the entrepreneurship literature presented in Chapter 2 (Wiklund and Shepherd, 2005; Lumpkin and Dess, 2001). Empirical evidence indicated that the positive influence of EO on performance increases over time (Wiklund, 1999; Zahra and Covin, 1995). Based on further research, EO involves a willingness to innovate, to be creative in the thinking process, search for risks, take self-directed actions and be more pro-active and aggressive than competitors toward new marketplace opportunities, but also to have some form of measurement of performance (Lin, 2006; Wiklund and Shepherd, 2005; Lumpkin and Dess, 1996).

The five dimensions of Entrepreneurial Orientation described by Lumpkin and Dess (2001) are considered as the base of departure when entrepreneurial business performance is measured. These include innovativeness, risk-taking, proactivity, competitive aggressiveness and autonomy. Several studies have suggested that the dimensions of EO can lead to market growth increase (Ireland et al., 2003; Shane and Venkataraman, 2000) and business performance (Wiklund and Shepherd, 2005; Zahra and Garvis, 2000; Lumpkin and Dess, 1996). Based on research done by Hunt and Morgan (1996) on resource-advantage theory, EO can be regarded as an organisational resource. Such a resource can differentiate a business from its
competitors and result in economic dynamism and wealth creation in the competitive process (Ireland et al., 2003; Shane and Venkataraman, 2000).

Businesses demonstrating EO characteristics have the capability or capacity to discover and exploit new opportunities (Wiklund and Shepherd, 2005) and they can respond to challenges to increase performance and flourish in a competitive and uncertain environment (Shane and Venkataraman, 2000; Lumpkin and Dess, 1996). The innovative dimension of EO reflects the tendency to engage in and support novelty to create and introduce new products, services, or technology (Lumpkin and Dess, 1996). Innovative companies may have a broader base of skills and knowledge which they can exploit to build distinctive competences (Li et al., 2009; Zahra and Garvis, 2000). Business performance is therefore regarded as closely linked to resource availability (Haber and Reichel, 2005).

Prior research has employed a variety of resource measures such as income, cash flow, return on assets and return on equity to assess business performance (Haber and Reichel, 2005). Although financial measures are used to assess business performance, they are not sufficient criteria to measure overall performance. Research therefore suggests a combination of financial and non-financial measures to offer a more comprehensive evaluation of measurement of business performance (Haber and Reichel, 2005; Daily, McDougall, Covin and Dalton, 2002). Subjective non-financial performance measures include indicators such as strategic position, perceived market share, perceived sales growth, customer satisfaction, loyalty and brand equity (Haber and Reichel, 2005).

In addition to financial and non-financial measures, another approach focuses on internal and external measures (Gupta and Zeithaml, 2006). Internal measures are concerned with the interests of stakeholders inside the business. External measures hinge on customers, suppliers, competitors and other market-related indicators (Gupta and Zeithaml, 2006; Haber and Reichel, 2005). Performance assessment therefore also requires the evaluation of output and input perspectives. Output measures reflect a business’s key goals, with final results and profitability as a focal point, whereas input measures focus on tasks and activities that are instrumental in achieving end results (Gupta and Zeithaml, 2006; Clark, 1999).
In the research field of entrepreneurship, there is a lack of guidance on performance measurement since there is difficulty in defining entrepreneurial performance (Li et al., 2009; Haber and Reichel, 2005). Murphy, Trailer and Hill (1996) examined 51 published entrepreneurship studies using performance as the dependent variable and found that the most commonly considered dimensions of performance were related to efficiency, growth and profit. Measures of efficiency include some financial measures such as return on investment and return on equity. Growth focuses on the increase in sales, employees, or market share. Profit includes return on sales and net profit margin. Following the suggestions of Murphy et al. (1996), efficiency, growth and profit of business performance also need to be considered in a benchmarking framework where competitiveness is measured.

4.3 BENCHMARKING TECHNIQUES

The International Telecommunications Union (ITU, 2009) points out that by making international comparisons it is possible to show measureable comparisons in performance between sectors in the telecommunications sectors of different countries. Therefore, benchmarking was promoted as a support tool for measuring performance at both macro and micro level.

At the macro level, a popular analytical tool, which considers external factors and their impacts, is referred to as the PESTLE analysis. The PESTLE analysis tests the current and potential influences from political pressures; local, national and world economic impact; sociological trends and changes; the impact of new and emerging technological changes; the legal framework and environmental issues. As environmental changes affect the performance of companies within a sector or industry the PESTLE analysis has been employed to analyse the general environment (Gay, 2002; Lynch, 1997; Luffman, Lea, Sanderson and Kenny, 1996).

There are several factors in the macro-environment that can affect the decisions of entrepreneurs (Walsh, 2005; Gay, 2002). Tax changes, new laws, trade barriers, demographic change and government policy changes are all examples of macro change. To help analyse these factors, managers can categorise them using the PESTLE framework (Walsh, 2005). This classification distinguishes between:
• **Political factors** refer to government policy such as the degree of intervention in the economy. What goods and services does a government want to provide? To what extent does government believe in subsidising businesses? What are its priorities in terms of business support? Political decisions can affect many vital areas of business such as the education of the workforce, the health of the nation and the quality of the infrastructure of the economy, such as the road and rail system;

• **Economic factors** include interest rates, tax law changes, economic growth, inflation and exchange rates. Economic change can have a major impact on a business’s behaviour. For example:
  • Higher interest rates may deter investment because it costs more to borrow;
  • A strong currency may make exporting more difficult because it may raise the price in terms of foreign currency;
  • Inflation may provoke higher wage demands from employees and raise costs and
  • Higher national income growth may boost demand for products (Gillespie, 2007).

• **Social factors** refers to changes in social trends can influence the demand for products and the availability and willingness of individuals to work.

• **Technological factors** refer to new technologies, creation of new products and new processes. Technology can reduce costs, improve quality and lead to innovation. These developments can benefit consumers as well as the organisations providing the products.

• **Environmental factors** are associated with change, including weather and climate change and the general move towards more environmentally friendly products and processes. This is affecting demand patterns and in return creating business opportunities.

• **Legal factors** are related to the legal environment in which a business operates in a country. Legal changes can affect a business’s costs as new systems and procedures may have to be developed and demands, in terms of the law, affect the likelihood of customers buying the goods or using the service.

PESTLE factors do not indicate sufficient information when the factors are identified alone. Business owners need to consider the factors and identify the items that have
the greatest impact on their environment. At the micro level the ETPS analysis is used to test the environment at a business level, which includes the entrepreneurial environment. ETPS scans the Economic, Technical, Political and Social environment. When combined with external micro-environmental factors and internal drivers, the ETPS factors can be classified as opportunities and threats in a SWOT analysis. Figure 4.1 indicates the benchmarking diagram associated with this research project which is based on the PESTLE analysis framework.

The PESTLE analysis is used as the framework to analyse the factors related to entrepreneurial benchmarking in the South African telecommunications sector. The challenge with benchmarking in the telecommunications sector is that it has evolved...
into areas of research that consist of technical aspects, social issues, economic and business factors as well as regulation demands (Stiller, 2009; Lam and Shiu, 2008). These factors are a combination of macro and micro analysis.

Although separately analysed, entrepreneurship and telecommunications use the same PESTLE items in the areas of benchmarking but the content of indicators relates to the topic or research. In the following sections, Tables 4.1 and 4.2 respectively, indicate the benchmarking criteria for entrepreneurship and telecommunications. At the macro level, all the PESTLE factors are taken into consideration, whilst at micro-level only four factors are considered, namely, political, economic, social, and technological.

4.4 INSTRUMENTS FOR ENTREPRENEURSHIP BENCHMARKING

Research in Chapter 2 indicated the importance of entrepreneurship to the economic and social development of South Africa. The recognition that entrepreneurship and entrepreneurs are important drivers of economic growth, employment, innovation and productivity has long been understood by analysts and economic academia (Lundström and Stevenson, 2005). Through innovation and creative ideas, entrepreneurs create new, competitive market spaces and businesses which lead to job creation and result in positive spin-offs for the economy. This recognition has accelerated since the mid-1990s, as policy makers in many countries and international organisations started to acknowledge the importance of entrepreneurship, making general statements about their commitment to increasing support by developing policies to improve the entrepreneurial environment (GEM, 2011). This awareness called for a better understanding of entrepreneurship and comparative measurements to be developed (Lundström and Stevenson, 2005).

In the mid 1990’s recognition of entrepreneurship benchmarking gained momentum with policy makers in many countries and international organisations when they began to realise the importance of entrepreneurship. They promised commitments to support increased entrepreneurship activities, or to improve the entrepreneurial environment (GEM, 2011; Lundström and Stevenson, 2005). The main drive towards benchmarking was accelerated by new policy creation to support improved
entrepreneurial environments with targeted actions such as funding, subsidies and support structures to assist entrepreneurs.

In order to better assess environment performance, policy makers make international comparisons of entrepreneurship (Ahmad and Hoffman, 2008). Several indicators and indices have been developed to support entrepreneurship benchmarking by institutions such as the Organisation for Economic Co-operation and Development (OECD) and the Entrepreneurship Index Project. Besides the economic spin-offs, growing awareness of the importance of entrepreneurship prompted the need for a sounder basis for internationally, comparable indicators of entrepreneurship and for an internationally accepted measure of entrepreneurship that facilitates and forms the basis of these measures (Ahmad and Hoffman, 2008). Table 4.1 indicates the benchmarking criteria for entrepreneurship.

### Table 4.1 Benchmarking criteria for entrepreneurship

<table>
<thead>
<tr>
<th>Environment</th>
<th>Customer values, market values, stakeholder/ investor values, management style, staff attitudes, organisational culture, staff engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal and Regulation</td>
<td>Current home market legislation, future legislation European/international legislation, environmental regulations, employment law, consumer protection</td>
</tr>
<tr>
<td>Technological aspects</td>
<td>Transportation, energy uses/sources/fuels, associated/dependent technologies, rates of obsolescence, waste removal/recycling</td>
</tr>
<tr>
<td>Social issues</td>
<td>Entrepreneurial activities, Cultural aspects, lifestyle trends, population growth rate, age distribution, Organisational culture, attitudes to work, management style, staff attitudes, Education, occupations, earning capacity, living standards</td>
</tr>
<tr>
<td>Economic and business factors</td>
<td>Home economy situation, overseas economies and trends, general taxation issues, taxation specific to product/services, specific industry factors, customer/end-user drivers, Stage of a business cycle, Labour costs, Likely changes in the economic environment, Impact of globalisation</td>
</tr>
<tr>
<td>Political</td>
<td>Government type and stability, Environmental and consumer-protection legislation, funding, grants and initiatives</td>
</tr>
</tbody>
</table>

Source: Author’s own construction, 2012
4.4.1 Entrepreneurial performance

Given its experience in international data development, many countries and policy makers turned to the Organisation for Economic Co-operation and Development (OECD) for assistance and guidance in developing a suitable benchmarking framework for Entrepreneurship by taking advantage of its international networks of statisticians, analysts and policy makers (OECD, 2008; Ahmad and Hoffman, 2008). The OECD, in conjunction with the statistical office of the European Union (Eurostat), developed a framework, which consists of indicators to measure entrepreneurship and the activities associated with entrepreneurial performance (OECD, 2005). The framework is illustrated in Figure 4.2.

![Figure 4.2 The OECD/EUROSTAT framework for entrepreneurship indicators](image)

Source: Ahmad and Hoffman, 2008:6

The framework in Figure 4.2 identifies three separate but inter-connected flows, all of which are important in the formulation, assessment and appraisal of policy measures of entrepreneurship, namely: determinants, entrepreneurial performance and impact. Determinants reflect the key factors that affect entrepreneurial performance and entrepreneurial performance reflects the target indicators that policy makers believe have an impact influence on some or many ultimate objectives. And therefore reflect the value or value system created by entrepreneurs and entrepreneurship.

Entrepreneurial performance measures the entrepreneurial actions that are instrumental in delivering results. If there is a multitude of possible outcomes, it follows that there is also a multitude of entrepreneurial indicators. Countries will therefore choose to focus on different indicators of performance depending on their policy objective. The indicators included within entrepreneurial performance and
developed by the OECD and its partners’ area consists of a series of indicators that are generally thought to reflect entrepreneurship and fit within the definitions outlined by the OECD. The framework therefore brings all the indicators together and provides an important and unique rationale for their collection across countries. Many of these indicators will be produced for the first time in many countries in the near future (OECD, 2008).

4.4.2 Social and economic objectives

The social and economic objectives related to entrepreneurship in the context of the OECD framework have been identified as job creation, economic growth and poverty alleviation as illustrated in Figure 4.3. Each of these objectives listed can be more precisely defined in terms of further specific objectives such as company growth or higher numbers of self-employed, which provide indicators for part or all of the more macro impact indicators. Most of these indicators have meanings and uses beyond entrepreneurship studies or policy making and so their availability and international comparability are for many countries unlikely to be limited.

![Figure 4.3: The OECD/EUROSTAT framework for entrepreneurship indicators - categories for entrepreneurial impact](image)

Source: Ahmad and Hoffman, 2008:9

Indicators are currently identified within these sub-categories as GDP growth, Gini coefficients, employment indicators, the average/median salaries and relative
poverty (OECD, 2005). This framework is used by analysts and the links between the performance indicators and specific impacts become clearer, when, on the basis of empirical evidence, it will be easier to provide these sub-categories with indicators.

**4.5 INSTRUMENTS FOR TELECOMMUNICATIONS SECTOR BENCHMARKING**

In benchmarking, a country or sector reports progress by reporting higher values of performance indicators at macro level. Reports also indicate where results are better than those of their peers and indicate improvements in rank order. Two important questions emerge from relative comparative indicators. First is the position of each sector relative to the others. The second concerns the determination of benchmark countries and their telecommunications sectors (Petrović, Gospić, Tarle and Bogojević, 2011). Based on the PESTLE analysis, Table 4.2 indicates the benchmarking criteria related to the telecommunications sector in South Africa.

The last decade marked empirical work in sector performance (Duso and Seldeslachts, 2010; El Khoury and Savvides, 2006; Varoudakis and Rossoto, 2004; Gutierrez, 2003; Li and Xu, 2002). Performance evaluation and benchmarking have become important, continuous improvement tools for sectors in the high-technology world of computers and telecommunications where competition intensity grows (Duso and Seldeslachts, 2010). Indicators arrayed in indices are used in the studies of performance in the examination of the telecommunications sector.

Since the information society was identified as one of the global priorities, many cross-country assessment approaches were developed with the objective of measuring the digital divide (ITU, 2010a). The objectives were supported by the International Telecommunication Development Sector (ITU-D), which led into the process of defining the methodology and indicators for benchmarking which support economic activity and sector performance evaluation. There are two main domains of telecommunications characterised by index-based assessments namely Digital Divide and Regulation (Petrović et al., 2011).
Assessments of sector performance are important for both developed and emerging markets alike, as they ensure sector development in both the short and long-term (ITU, 2010b). The dynamics of the changing landscape in the telecommunications sector requires constant measurement, survey, analysis and comparison of the relevant performance features (Petrović et al., 2011). In addition, telecommunications development generates substantial economy-wide positive externalities and requires continuous measurement in terms of sector performance and policy making (Roller and Waverman, 2001). Petrović et al. (2011) also state that benchmarking is becoming a widely used methodology for improving performance at both the macro and micro level.

### Table 4.2 Benchmarking demarcation for telecommunications

<table>
<thead>
<tr>
<th>Environment</th>
<th>Environmental issues, environmental regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal and Regulation</td>
<td>Regulatory bodies and processes</td>
</tr>
<tr>
<td></td>
<td>industry-specific regulations, competitive regulations</td>
</tr>
<tr>
<td>Technological aspects</td>
<td>Maturity of technology, competing technological developments, research funding, technology legislation, new discoveries</td>
</tr>
<tr>
<td></td>
<td>Information technology, internet, global and local communications</td>
</tr>
<tr>
<td></td>
<td>Technology access, licensing, patents, potential innovation, replacement technology/solutions, inventions, research, intellectual property issues, advances in manufacturing</td>
</tr>
<tr>
<td>Social issues</td>
<td>Ethical issues, diversity, immigration/emigration, ethnic/religious factors, consumer buying patterns, brand, company, technology image, Media views, law changes affecting social factors, trends, advertisements, publicity, Demographics: age, gender, race, family size, lifestyle trends, consumer attitudes and opinions</td>
</tr>
<tr>
<td>Economic and business factors</td>
<td>Current and projected economic growth, inflation and interest rates</td>
</tr>
<tr>
<td></td>
<td>Unemployment and supply of labour</td>
</tr>
<tr>
<td></td>
<td>Likely impact of technological or other changes on the economy</td>
</tr>
<tr>
<td>Political</td>
<td>Government type and stability</td>
</tr>
<tr>
<td></td>
<td>Tax policy and trade and tariff controls</td>
</tr>
<tr>
<td></td>
<td>Environmental and consumer-protection legislation</td>
</tr>
<tr>
<td></td>
<td>Likely changes in the political environment</td>
</tr>
</tbody>
</table>

**Source:** Author’s own construction, 2012
At the macro level, modern telecommunications companies need benchmarking and must be able to adapt to the existing environment by expanding the scope of services and by varying revenue sources (Duso and Seldeslachts, 2010; Tölösi and Lajtha, 2000). Strategic planning, supported by benchmarking, enables any organisation to focus the change in management capability on areas where the best return is yielded through improving quality, productivity and customer satisfaction (Duso and Seldeslachts, 2010).

At the micro level, benchmarking is a tool used to define the best possible indicators for comparison and to obtain a picture of a business’s entire operation. For any business, a primary evaluation criterion is efficiency (Tölösi and, 2000). Efficient benchmarking is a link between the desire to learn from other companies and the need for strategic allocation of organisational resources (Duso and Seldeslachts, 2010). It is generally assumed that the more efficiently a business operates the more profit it will generate and the more secure its future will be (Tölösi and, 2000). Efficiency is therefore more indicative than profitability because it cannot be as easily manipulated to achieve short-term objectives. It is expected that an efficient company will:

- withstand market competition;
- be less sensitive to unfavourable changes in the environment and
- be more likely to use indicators to link the best of its short and long-term goals (Tölösi and Lajtha, 2000).

Performance assessment ranking in the telecommunications sector can be addressed relatively (comparative rankings) and absolutely (growth rates) (Petrović et al., 2011). Several composite indices were developed of which the most recent is the index-based benchmarking by the Information and Communications Technologies Development Index (IDI) first published in 2009 (ITU, 2009). The IDI is also used as a measure of the availability of information and communications technologies for society, in other words, the social aspects of telecommunications development. Several methods including Data envelopment and multi-dimensional approaches have been adopted in order to measure performance in the telecommunications sector.
4.5.1 Data Envelopment Analysis methodology

A widely applied tool for benchmarking in telecommunications is a quantitative technique referred to as Data Envelopment Analysis (DEA). The main idea of DEA is to extend the traditional concept of productivity or efficiency (input to output ratio) and makes it suitable for performance evaluation and benchmarking within the context of multiple performance measurements (Zhu, 2004). This concept supports index-based benchmarking and the application of sub-indices. There are several examples of DEA applications in telecommunications. Research is being conducted both at the micro (operators, divisions) and macro (countries, regions) levels. Table 4.3 indicates studies applied to DEA and what aspects were measured within the context of telecommunications.

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sueyoshi</td>
<td>1994</td>
<td>Performance of public telecommunications in the US</td>
</tr>
<tr>
<td>Majumdar</td>
<td>1997</td>
<td>The impact of incentive regulation on technical efficiency provided by DEA in the U.S. between 1993 and 1997</td>
</tr>
<tr>
<td>Lien and Peng</td>
<td>2001</td>
<td>Production efficiency of telecommunications in 24 OECD countries from 1980 to 2005</td>
</tr>
<tr>
<td>Pentzaropoulos and Giokas</td>
<td>2002</td>
<td>Main European public telecommunications organisations (PTOs) in terms of their operational efficiencies</td>
</tr>
<tr>
<td>Azadeh, Izadbakhsh and Bukhari</td>
<td>2007</td>
<td>Studied 27 developed and developing countries using DEA, principal component analysis (PCA)</td>
</tr>
<tr>
<td>Giokas and Pentzaropoulos</td>
<td>2008</td>
<td>Compared and subsequently ranked 30 OECD member states according to their respective telecommunications efficiencies and went on to underscore policy implications</td>
</tr>
<tr>
<td>Lam and Shiu</td>
<td>2008</td>
<td>Relied on the DEA approach to measure the productivity performance of China’s telecommunications at a provincial level</td>
</tr>
<tr>
<td>Lam and Shiu</td>
<td>2010</td>
<td>Calculate the Malmquist index, in order to measure the total factor productivity (TFP) growth in 105 countries between 1980 and 2006</td>
</tr>
</tbody>
</table>

Source: Adopted from Petrović et al., 2011
DEA uses mathematical programming techniques and models to evaluate the performance of peer units (called Decision Making Units or DMUs) in terms of multiple inputs used and multiple outputs produced (Petrović et al., 2011). Institutions such as ITU and the OECD include DEA in their analysis reports. In the studies recorded in Table 4.1, the authors highlighted DEA as the most suitable technique for exploring telecommunications development and performance, especially in measuring regulatory regimes.

4.5.2 Policy making in telecommunications: A three-dimensional approach

The three-dimensional benchmarking approach for benchmarking follows the idea that only multidimensional, cross-country performance evaluation can be used as a support tool for policy making in telecommunications. Therefore, a three-dimensional benchmarking assessment of information society, regulatory reform and economic efficiency is proposed. It is also proposed that, only a country that is successful in all three dimensions can be regarded as a benchmark country. The benchmarking metrics applied to each dimension are Information and Communications Development Index (IDI) for information in society, efficiency obtained by DEA for sector economic efficiency and EBRD index scores for regulatory framework.

The three-dimensional benchmarking model is also referred to as the ISER approach. The research sample of this study was 20 emerging markets regarded as transition countries by EBRD (2008). Although the transition process ended for some countries in the sample, they were included in the analysis because they could serve as potential benchmarks for countries still in transition (Kitov, 2007). The EBRD transition index was used for the infrastructure reform of telecommunications. This index reflects a country’s progress in the commercialisation and regulation of telecommunications, because the infrastructure owned by an incumbent operator comes first in planning but last in actual deregulation and liberalisation. This index is a good measure of the regulation aspect (Zhu, 2003).

In order to measure the efficiency of the telecommunications sector, data on sector outputs and inputs are a popular method suggested by authors (Giokas and
Pentzaropoulos, 2008; Lam and Shiu, 2008; Lien and Peng, 2001). Total telecommunications services revenue is used as the output measure, while the three inputs taken into consideration to measure efficiency are: (1) total number of subscribers, (2) total full-time staff employed and (3) annual telecommunications. The total number of subscribers is divided between landline users, mobile and internet subscriptions.

4.6 BENCHMARKING INSTITUTIONS

4.6.1 Entrepreneurship benchmarking institutions

Several benchmarking institutions were found to support indices on entrepreneurship, but only those that included South Africa as a participating country are mentioned in this section. For example the Kauffman Index of Entrepreneurial Activity is a well-known comprehensive index that only focuses on the United States as its population target, but has no direct relevance to South Africa. Institutions, such as the Global Entrepreneurship Monitor (GEM) include South Africa as a population target.

4.6.1.1 The Global Entrepreneurship Monitor

The Global Entrepreneurship Monitor (GEM) takes a broad view of entrepreneurship and focuses on the role played by individuals in the entrepreneurial process (GEM, 2011). GEM collects data on attitudes and perceptions such as; perceived opportunities to start businesses, perceived skills and knowledge to start businesses and national support for starting a business as a good career choice. In addition GEM also focuses on entrepreneurs’ intentions to start a business in the near future.

The GEM Adult Population Survey is based on a representative sample of at least 2 000 adults in each country and surveys their attitudes to and their involvement in, entrepreneurship. For many individuals the entrepreneurial process often starts with personal assessments dealing with attitudes and perceptions to entrepreneurship (GEM, 2011). GEM research in South Africa is primarily funded by South Africa
Breweries, The Swiss South Africa Cooperative Initiative and the Small Enterprise Development Agency.

Unlike most entrepreneurship data-sets that measure newer and smaller businesses, GEM studies individuals' activities with respect to starting and managing a business. Furthermore, GEM views entrepreneurship as a process and considers people in entrepreneurial activity in different phases from the very early phase when the business is in gestation to the established phase and possibly discontinuation of the business. Within this context, GEM provides a means by which a wide variety of important entrepreneurial aspirations, such as innovativeness, competitiveness and high-growth aspirations can be systematically and rigorously studied (GEM, 2011).

Participating Countries in the GEM report are as follow (GEM, 2011):

- Factor-Driven Economies
  Angola, Bolivia, Bosnia and Herzegovina*, Colombia*, Ecuador*, Egypt, India, Iran*

- Efficiency-Driven Economies
  Argentina, Brazil, Chile, Croatia**, Dominican Republic, Hungary**, Jamaica, Latvia, Macedonia, Mexico, Peru, Romania, Russia, Serbia, South Africa, Turkey and Uruguay

- Innovation-Driven economies
  Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Republic of Korea, Netherlands, Norway, Slovenia, Spain, United Kingdom, United States

  * Transition country: from factor-driven to efficiency-driven
  ** Transition country: from efficiency-driven to innovation-driven

GEM measures multiple phases of entrepreneurship. This multiple-phase perspective provides opportunities for assessing the state of entrepreneurship across phases in a society. For example, an economy with few established business owners may also see few individuals start new businesses and therefore have a low supply of entrepreneurs that could otherwise become business owners. At the same time, a lot of startup activity accompanied by a relatively low number of established
businesses could point either to a lack of sustainability among those startups or to environmental constraints that make it difficult to stay in business.

The intent to start a business is followed by nascent activity, defined as entrepreneurs who are in the first three months of running a new business. New business owners are former nascent entrepreneurs; they have been in business more than three months, but less than three and a half years. Together, nascent and new entrepreneurs compose total early-stage entrepreneurial activity.

Additional phases include established business ownership as well as business discontinuation, which can supply society with experienced entrepreneurs who may go on to start another business or to use their expertise and resources to benefit entrepreneurs in some way (through financing, advising, or other forms of support).

4.6.2 Telecommunications benchmarking institutions

The intensity of regulation changes in the telecommunications sectors during the last two decades gave rise to the need for alternative and meaningful indicators. The International Telecommunications Union (ITU, 2009) points out that by making relative international comparisons is it possible to show which policies have been more successful than others and for this reason, an approach based on comparative rankings may be more meaningful than one that uses absolute growth rates. Researchers also aimed to construct policy-based, rather than outcome-based, measures (Rodriguez and Rodrik, 2000).

Different composite indicators (indices) were devised as policy-based measures of liberalisation, competition, privatisation, deregulation and of the overall openness of telecommunications markets (Petrović, et al., 2011). For example, the Organisation for Economic Co-operation and Development (OECD) developed indicators of regulation in telecommunications (Conway and Nicoletti, 2006) and the European Bank for Reconstruction and Development (EBRD) developed transition indices for various sectors, including the transition index for infrastructure reform in telecommunications. The next section describes the institutions that embarked on developing and refining measurement tools in the telecommunications sectors.
4.6.2.1 The International Telecommunications Union

The International Telecommunication Union (ITU) is a specialised institution of the United Nations which is responsible for information and communication technologies. ITU coordinates the shared, global use of the radio spectrum, promotes international cooperation in assigning satellite orbits and works to improve the telecommunications infrastructure in emerging markets by establishing worldwide standards.

The ITU hosts worldwide and regional exhibitions and fora and brings together representatives of governments, telecommunications and ICT industry to exchange ideas, knowledge and technology. The institution has a long history of collecting, harmonising and disseminating statistics on telecommunications and ICTs and is recognised as the prime source of internationally comparable data in this field (ITU, 2011a).

The ITU is active in areas including new-generation wireless broadband, Internet access mediums media, new-generation wireless technologies, aeronautical and maritime navigation, radio astronomy, satellite-based meteorology, convergence in fixed-mobile phone, Internet access, data, voice, TV broadcasting and next-generation networks (ITU, 2011a).

4.6.2.2 World Wide Worx

World Wide Worx conducts leading edge and industry-relevant market research on trends in information technology, telecommunications and the strategic business challenges that arise as a result of changes and developments in these areas (Goldstuck, 2012). The organisation’s independent research reports include the following topics:

- Trends in cellular usage in businesses and consumers;
- Online access, online retail, online banking and online media trends and strategies;
- The IT and telecoms markets and
- Factors in the competitiveness of small and medium businesses (Goldstuck, 2012).
The institution conducts independent research, both self-funded and sponsored. Quarterly reports are constructed in the fields of SME activity, Internet and telephony penetration figures and other Internet related studies.

4.6.2.3 The World Bank

The World Bank is an international financial institution that provides loans to emerging markets for capital programmes. The World Bank Group’s mission is to improve the lot of people and keep them out of poverty (World Bank, 2011). Through financial assistance, policy and institutional support and technical knowledge, it helps people across the world build a better future for themselves, their families, and their countries. At the heart of the Bank’s approach to delivering programmes and policy advice is a strong focus on results. The organisation is concerned with statistical data in the countries where the institution is financially connected. South Africa has been a member country since 1945 (World Bank, 2011).

4.6.2.4 Business Monitor International

Business Monitor International (BMI) reports on the South African Telecommunications Market and it contains recent growth forecast for the mobile, fixed-line and internet sectors, as well as an analysis of market data published by the country's telecoms regulator ICASA (BMI, 2012). BMI also reports on the major service providers, including Telkom South Africa, Vodacom and MTN. The growth forecasts for the fixed-line and internet sectors are also measured and reported.

4.7 ENTREPRENEURSHIP BENCHMARKED - SYNOPSIS ON SOUTH AFRICA

According to the GEM, South Africa is classified as an Efficiency-Driven Economy (GEM, 2011). In this category, efficiencies are promoted as the main drivers of growth. As the country’s industrial sector develops, institutions start to emerge to support further industrialisation and the build-up of scale in the pursuit of higher productivity through economies of scale. Typically, national economic policies in scale-intensive economies shape their emerging economic and financial institutions to favour large national businesses (Bosma et al., 2011).
As increasing economic productivity contributes to financial capital formation, niches may open in industrial supply chains that service these national incumbents. This, combined with the opening up of the independent supply of financial capital from the emerging banking sector, would expand opportunities for the development of small-scale and medium-sized manufacturing sectors. Thus, in a scale-intensive economy, it is expected that necessity-driven industrial activity would gradually give way to an emerging small-scale manufacturing sector (Bosma et al., 2011). Table 4.4 displays the National Demographic Summary Sheet for South Africa in 2011.

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>GEM 2011 Entrepreneurship Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population(x1 000):</td>
<td>50 133</td>
</tr>
<tr>
<td>Area(x1 000km2):</td>
<td>1,214</td>
</tr>
<tr>
<td>Density(persons/km2):</td>
<td>41.1</td>
</tr>
<tr>
<td>GDP Per Capita (PPP) (USD):</td>
<td>10 977</td>
</tr>
<tr>
<td>Perceived Opportunities:</td>
<td>41</td>
</tr>
<tr>
<td>Perceived Capabilities:</td>
<td>43</td>
</tr>
<tr>
<td>Fear of Failure:</td>
<td>29</td>
</tr>
<tr>
<td>Nascent Entrepreneurship Rate:</td>
<td>5.2</td>
</tr>
<tr>
<td>Owner / Managers in New Businesses Rate:</td>
<td>4.0</td>
</tr>
<tr>
<td>Owner / Managers in Established Businesses Rate:</td>
<td>2.4</td>
</tr>
<tr>
<td>Total early - stage Entrepreneurial Activity Rate (TEA):</td>
<td>9.1</td>
</tr>
<tr>
<td>Necessity-Driven TEA Rate:</td>
<td>3.2</td>
</tr>
<tr>
<td>Medium - High Job Expectation Rate: (MHEA):</td>
<td>3.0</td>
</tr>
<tr>
<td>Entrepreneurial Employee Activity Rate (EEA):</td>
<td>0.3</td>
</tr>
<tr>
<td>Private Sector EEA Rate (PEEA):</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**Source: Bosma et al., 2011**

Entrepreneurship in South Africa, after holding steady at low levels, jumped 62% from 5.9% in 2009 to 8.9% in 2010 (GEM, 2011). The upward trend continued in the early-stage entrepreneurial activity 2011 with a reported research rate of 9.1%. The 2011 figures, from the GEM (2011) report, are statistically not different from the level of 8.9% in 2010, but the country has slipped back below the median of entrepreneurship rates of all countries participating in the survey (GEM, 2011). GEM (2011) also reported that South Africa has slipped below the median of all 54 countries that participated in the 2011 study.
The South African Government has prioritised entrepreneurship and the advancement of small businesses as the catalyst of achieving economic growth and development. While legislation provides evidence of this commitment, more needs to be done in order to create an environment conducive to entrepreneurship. The quality of the country's commercial infrastructure, particularly its financial markets, sets it apart from comparable economies. Figure 4.4 illustrates the Entrepreneurship Institution profile in South Africa.

![Figure 4.4 Entrepreneurship institution profile in South Africa](image)

**Source:** GEM, 2011:175

Although the country has a high rate of unemployment which is estimated at 25% of the population and aged 15 to 64 years, it is not noted that 35% of TEA is driven by Necessity. Though a significant proportion of the population exhibits positive attitudes regarding entrepreneurship, the TEA remains dismally low as fear of failure and the desirability of formal employment have a moderating effect. Figure 4.5 indicates the entrepreneurial person’s profile in South Africa.

The GEM (2011) research points to several factors that inhibit entrepreneurship in South Africa. The major challenges remain; top-down corruption, high levels of crime, low standards of education - particularly at primary school level - and poor health among South Africa’s labour force. Significantly, South Africa performed poorly on all the metrics in the Global Competitiveness Index. Historically, South
Africa’s Total Entrepreneurial Activity (TEA) level has always been below the median, and only managed to get above it in 2010. This indicates that the country is still not performing as well as it should be on the global stage (GEM, 2011). When compared with similar economies like Brazil and China, South Africa should be performing at levels of 14 to 15%.

![Figure 4.5 Entrepreneurial profile in South Africa](image)

In 2011 the GEM research focused specifically on BRIC countries by weighing up how South Africa performs relative to this group. The result that emerged indicated that South Africa ended slightly higher than Russia on many key metrics. Brazil and China achieved the highest levels of TEA at 14.9% and 24% respectively (GEM, 2011).

In Brazil, the TEA rate has increased by 28% since 2006, indicating an improvement attributed to well-managed government programmes to stimulate and support small businesses, as well as numerous legislative reforms that make it easier to start businesses. Surveys amongst citizens also showed a significant decrease in their fear of failure (GEM, 2011). Media support for entrepreneurship is also a significant factor, argues the report: in Brazil the media supports entrepreneurial initiative with free advertising and coverage and by publicizing issues affecting entrepreneurs (GEM, 2011).
National experts, participating in the study, rated South Africa’s physical infrastructure highest in terms of stimulating entrepreneurial activity, while government entrepreneurship programmes scored lowest. There was strong criticism levelled at the fact that government agencies with significant funding were often still not addressing the needs of entrepreneurs adequately. Overall, South Africa as a country under performs in terms of TEA (GEM, 2011).

4.8 TELECOMMUNICATIONS BENCHMARKED - SYNOPSIS ON SOUTH AFRICA

Although price comparison is the key indicator of the competitiveness of markets, in South Africa there is very little pricing transparency to allow for any meaningful assessment by consumers or even by the Regulator of communication prices (Research ICT Africa, 2012). Operator tariffs are filed with the regulator, ICASA, without any process of assessment or objection. Lowest price tariff calculators, set up by regulators and consumer groups in countries such as in the United Kingdom, do not yet exist in South Africa. With more than 100 voice products currently on offer in the market, no South African consumer can readily determine the best-priced package (Research ICT Africa, 2012).

4.8.1 South Africa’s ICT basket

The South African ICT basket consists of a broad spectrum of services. Leased lines and managed leased lines, that are independent of service provision, produce revenues and create technical challenges for many businesses in the industry. Creation of intelligent networks enables the offering of numerous, customised comfort services such as call-forwarding and calling number identification. The emergence of information technology and content services also forms part of the ICT basket.

For the seven-layer OSI hierarchy earlier discussed in Chapter 3 (Table 3.5), the situation develops where telecoms companies not only implement and operate the lower three transport layers, but also want to have a share in the upper tele-services and applications layers. Most of the companies have the knowledge needed to implement these layers and thus could generate additional revenues. The following section discusses the ICT basket indicators in South Africa.
4.8.1.1 Fixed line telephony

The South African fixed line services declined in numbers over the past years. Telkom serviced 4.073 million active fixed lines in service at the end of September 2011 (Telkom Report, 2010). This figure was down by 2.8% year on year. This decline is expected to continue in the coming years (BMI, 2012). According to Telkom’s report on fixed line penetration, South Africa had 4.265 million lines in service at the end of 2010 (Telkom, 2012). This was equivalent to a penetration rate of 8.6%. South Africa’s fixed-line market declined by an estimated 3% in 2010, similar to the rate of decline in 2009 (BMI, 2012). This estimate includes the assumption that Neotel serviced approximately 70 000 fixed line customers at the end of 2010. The downward trend in fixed line access is expected to continue at a similar pace (BMI, 2012).

South Africa’s fixed-line market will continue to face the combined effects of mobile substitution and the proliferation of IP telephony. The growing popularity of mobile and VoIP services will have a negative effect on fixed-line growth, including the growth of fixed-wireless services. The extended fixed-line forecast for South Africa predicts a market of approximately 3.8 million connections at the end of 2016, with penetration of 7.2% (BMI, 2012).

4.8.1.2 Mobile Communications

Based on the strong performance of Vodacom and MTN, which account for almost 83% of the South African mobile market, BMI (2012) estimated that South Africa’s mobile customer base grew to 65.1 million subscribers by the end of 2011. Penetration levels are therefore reported at an estimated 123%. The five-year growth forecast envisages that the number of customers will rise to over 83 million by the end of 2016 (BMI, 2012). This indicates a mobile penetration rate of almost 158% in South Africa by 2016. Mobile prices are more competitively priced in over 30 African countries than they are in South Africa. Prices in Kenya, Mauritius, Egypt and Namibia are only a fraction of the price of even the lowest priced services in South Africa (Research ICT Africa, 2012).
4.8.1.3 South Africa’s broadband value

According to the Goldstuck (2012) report, the South African Internet user base grew at a 25% rate to a number of 8.5 million Internet users at the end of 2011. This follows a growth of 28% in 2010. A total of 7.9 million South Africans accesses the Internet on their cell phones, whereas the study found, 6.02 million use a computer, laptop, or tablet. Of these PC and tablet PC users, 90% also use their mobile phones to access the Internet. An estimated 2.48 million South Africans use only their cellphones to access the Internet. The report also indicates that there were 5.5 million 3G users and 8.5 million smartphone owners in South Africa at the end of 2011. Goldstuck (2012) stated that the number of smartphones is expected to increase to over 11 million in 2012. At a growth rate of 16% in 2011, ADSL user numbers was lower than the overall increase in Internet users in SA during 2011 (Telkom, 2012).

South Africa is connected via multiple submarine fibre cables. Undersea cable capacity to South Africa at end of 2011 was 2.69 Terabits per second (Tbps). By the end of 2012 the undersea cable capacity is expected to increase to 11.9 Tbps, while the country is projected to activate 24.6Tbps of undersea capacity by the end of 2013 (Goldstuck, 2012). The increase is expected to increase Internet user numbers beyond 10 million by the end of 2014 (BMI, 2012; Goldstuck, 2012).

South Africa was recently added to Ookla’s House Value Index and is currently ranked at number 57 (out of 62 countries) when the relative cost of broadband is compared. This ranking is an improvement over the July 2011 ranking where South Africa was last (number 62 out of 62 countries). South Africa’s relative improvement, however, is based on a poorer performance of other countries rather than an improvement in local performance (Ookla, 2012).

The average price of R262 per Mbps in South Africa has remained virtually unchanged since July 2011 and is still much higher than the international average of R74 per Mbps. South Africa’s global broadband value rank, which looks at broadband subscription cost divided by the Gross Domestic Product per Capita,
forfeited one place (from 56 to 57). South Africa has an average broadband basket cost of R574 per month, which contributes to 16% of the average monthly GDP per capita (Ookla, 2012).

4.9 SUMMARY

In Chapter 4, benchmarking, with reference to Entrepreneurship and Telecommunications was discussed. Methods to benchmark both Entrepreneurship and Telecommunications were identified. Institutions and techniques to benchmark entrepreneurial activities in various countries as well as telecommunications indicators were discussed. Research Questions RQ2, RQ3, RQ5 and research objective RO4 were addressed in this chapter.

The literature study in Chapters 2 to 4 was conducted to identify the factors that influence entrepreneurial competitiveness in the telecommunications sector in South Africa. This literature study will form the base on which the conceptual model will be constructed. Chapter 5 formulates the theoretical model and discusses the selected variables, which are hypothesised to influence entrepreneurial competitiveness in the telecommunications sector.
CHAPTER 5

THE CONCEPTUAL MODEL TO PROMOTE ENTREPRENEURIAL COMPETITIVENESS IN THE SOUTH AFRICAN TELECOMMUNICATIONS SECTOR

5.1 INTRODUCTION

The research questions RQ₆ and objective RO₅ are addressed in this chapter. The factors from the literature study that influence entrepreneurial competitiveness in the telecommunications sector in South Africa were discussed in Chapters 2 to 4. These factors includes Entrepreneurial Orientation, Infrastructural Change, Sector Transformation, Regulatory Alignment, Opportunity Recognition, Entrepreneurial Mindset, Entrepreneurial Innovation, Entrepreneurial Experience, Resource Allocation, Entrepreneurial Leadership, Human Capital, Financial Resources, Strategic Positioning, Legal Alignment, Benchmarking and Technological Entrepreneurship.

This chapter formulates the conceptual, theoretical model and discusses the identified variables, which are hypothesised to influence the promotion of entrepreneurial competitiveness in the telecommunications sector. The variable relationships are based on the discussion of the factors that influence entrepreneurial competitiveness, as presented in the previous chapters.

5.2 THE CONCEPTUAL MODEL

The research problem in chapter one was stated as: Entrepreneurs face the challenge of identifying the factors that influence the competitiveness of their businesses in the transforming telecommunications sector in South Africa. The dependent variable in the proposed model is identified as Perceived Entrepreneurial Competitiveness in the telecommunications sector in South Africa. The proposed conceptual model is presented in Figure 5.1.
The conceptual model proposes 12 independent variables namely *Infrastructural Change*, *Sector Transformation*, *Regulatory Alignment*, *Entrepreneurial Mindset*, *Entrepreneurial Innovation*, *Entrepreneurial Experience*, *Entrepreneurial Leadership*, *Human Capital*, *Financial Resources*, *Legal Alignment*, *Benchmarking* and *Technological Entrepreneurship*. Four intervening variables are proposed to group the independent variables namely *Entrepreneurial Orientation*, *Opportunity Recognition*, *Resource Allocation* and *Strategic Positioning*. Each of these components is hypothesised to relate to measures of effectiveness and performance in entrepreneurial competitiveness. The independent variables, with the intervening variables and the hypotheses, are grouped and numbered in the proposed model.
and presented in Figure 5.1. Effectiveness and performance in this study, discussed in Chapter 4 are measured using the dependent variable *Perceived Entrepreneurial Competitiveness*.

In this study, the attempt to categorise the factors influencing the perceived entrepreneurial competitiveness in the telecommunications sector in South Africa reflects a judgement of best fit. Some factors could, however, be categorised under a different intervening variable. The grouping of the factors is justified by the sufficiency of theory derived from Chapters 2 to 4. No claim is made of exhaustive coverage of every possible factor that influences perceived entrepreneurial competitiveness in the telecommunications sector in South Africa. Similarly, although other factors might impact the context of entrepreneurship in South Africa, the focus of this study is on the factors influencing effectiveness of businesses in the country’s telecommunications sector, with specific attention to sector transformation, regulatory, infrastructural and technological change.

A researcher needs to be careful not to include additional elements when constructing a model (Cooper and Schindler, 2007; Hair et al., 2006). By adding additional elements, a study can become diluted with trivial concerns that do not answer the basic questions posed by the research problem (Cooper and Schindler, 2007). A number of hypotheses can be formulated with regard to the relationships between the independent, intervening and the dependent variable. This study identifies the relationships presented in the conceptual model and accordingly, hypotheses are formulated to address these relationships only.

### 5.3 Summarised Description of Each Variable

In this section the variables are discussed individually and the hypotheses are aligned with the literature study.

#### 5.3.1 Dependent variable: Perceived Entrepreneurial Competitiveness

Entrepreneurs in the telecommunications sector seek competitive advantage in the three areas of concern described in Chapter 1, namely regulatory change, infrastructural change and sector transformation. The primary research objective
stated in Chapter 1 is ‘to investigate what factors have an impact on the entrepreneurial competitiveness in the telecommunications sector in South Africa through the development of a model.’ Entrepreneurship, Telecommunications and Competitiveness in the primary areas of study are represented by significant literature, but the combination of the three factors is poorly represented in the literature.

In Chapter 2, the association between EO and business performance was discussed. The discussion that followed in Chapter 4 on business performance and competitiveness described a measure of effectiveness, performance and increased success in both new and existing ventures (Wiklund and Shepherd, 2005; Lumpkin and Dess, 2001; Zahra and Garvis, 2000; Wiklund, 1999; Zahra and Covin, 1995). The various factors influencing entrepreneurial competitiveness have been identified in the literature and the conceptual model describes the relationships. In total, 12 independent variables have been identified, together with 4 intervening variables.

The variables Entrepreneurial Orientation, Opportunity Recognition, Resource Allocation and Strategic Positioning will be accounted for as the intervening variables for this study. The independent variables accounted for are the factors identified as Infrastructural Change, Sector Transformation, Regulatory Alignment, Entrepreneurial Mindset, Entrepreneurial Innovation, Entrepreneurial Experience, Entrepreneurial Leadership, Human Capital, Financial Resources, Legal Alignment, Benchmarking and Technological Entrepreneurship.

According to the literature, entrepreneurs seeking competitive advantage, seek higher levels of effectiveness and better business performance. In order to support this, the independent variables are grouped with the intervening variables as proposed in the conceptual model. Each variable is discussed individually in the next section.

5.3.2 Intervening variable: Entrepreneurial Orientation

The literature review in Chapter 2 suggests that Entrepreneurial Orientation is described as a fairly consistent set of related activities or processes (Idar and
Mahmood, 2011; Quince and Whittaker, 2003; Smart, 1994; Miles, 1991). The term entrepreneurial orientation has also been contextualised with strategy-making processes and styles of companies that engage in entrepreneurial activities (Quince and Whittaker, 2003).

The five dimensions of EO described by Lumpkin and Dess (1996) refer to autonomy, innovativeness, risk taking, proactivity and competitive aggressiveness as the main activities in which entrepreneurs engage. Traditional studies also indicate that behaviour is important in both the policy and organisational theory contexts, as are the willingness to take risk, innovativeness, technological leadership and a proactive stance toward competition (Lumpkin and Dess, 1996; Covin and Slevin, 1991).

Researchers further suggest that within EO lies the contingency theory framework, describing new venture emergence as a bridge between resource profiles of nascent entrepreneurial ventures and the environmental requirements that they have to face (Shane, 2003). In this perspective entrepreneurial actions and opportunities exist in the environment as a result of changes in technology, consumer behaviour and preferences or other attributes related to the market or industry context (Venkataraman, 2004).

Taking into consideration both the discovery and creation view, opportunities can therefore be seen as social constructions formed through an entrepreneur’s perceptions and effectuated through the interactions between the entrepreneur and his environment (Alvarez and Barney, 2007). When a business senses that change is occurring, it will be acknowledged and respond by changing its structure, strategy and processes (Kathuria et al., 2008).

It is therefore hypothesised that:

\[ H^{16} \quad \text{There is a positive relationship between EO and Entrepreneurial Competitiveness in the telecommunications sector.} \]
5.3.3 Independent variable 1: Infrastructural Change

There has been significant interest in what would be necessary for productive entrepreneurship to flourish in a country and within specific sectors in a country (Venkataraman, 2004). With reference to telecommunications sectors, technological drivers included mobile communications, access to the Internet and broadband connectivity (ITU, 2010b).

Telecommunications trends and growth are globally driven by most recent developments which include infrastructural and technological development, fixed line to mobile substitution, mobile communications, broadband Internet, access to broadband data and broadband penetration. These technologies have existed for less than 20 years, but their existence reshaped telecommunications sectors globally (ITU, 2010a; Tsai et al., 2006).

Entrepreneurs need to recognise both infrastructural and technological changes in the industry in order to remain competitive. Increased Internet activity, online software applications and the progress of ICT overall have accelerated the transmission of information and knowledge, thereby moving people all over the world toward an information society (Tsai et al., 2006). The demand for Internet access grows daily in the form of basic access and for speed of access. According to the ITU (2010b) global demand for higher-speed access networks and mobility grows daily.

Tsai et al. (2006) postulate that the development of the knowledge economy promotes broadband network construction which leads to the information society, which leads to high technology infrastructure being deployed to accommodate expansion and to create new platforms for communication. These new platforms create opportunities for entrepreneurs to establish new ventures and increase levels of competitiveness.

It is therefore hypothesised that:

\[ H^1 \quad \text{There is a positive relationship between Infrastructural change and Entrepreneurial Competitiveness in the telecommunications sector.} \]
There is a positive relationship between Infrastructural change and Entrepreneurial Orientation.

5.3.4 Independent variable 2: Sector Transformation

Telecommunications sectors are composed of highly competitive and advanced technological markets (Levin and Schmidt, 2010). Such sectors intend to allow market forces to establish market segmentation and to seek competitive industry participation. Businesses in these sectors do so by formulating strategies which create market segments dictated by regulation, price, quality, technology or scale of economy (Levin and Schmidt, 2010; Walsh, 2005; Grant, 1998). As a result, competitive industries never reach a static state, but rather exhibit continuous change over time (Levin and Schmidt, 2010; Grant, 1998).

Fast-paced technological innovations and pressure from international organisations have encouraged and accelerated the transition from a publicly owned, but monopolistic type of company to an increasingly competitive telecommunications sector with many participants (Newbery, 2004). Transformation in the telecommunications sector in South Africa offers new opportunities, challenges and threats to entrepreneurial activities in the industry. The country’s telecommunications sector is in the process of transformation due to changes in legislation, regulation and infrastructural development.

Market volatility and uncertainty are evident in the transformation process of the sector. Introduction of competition is therefore vital for a sector to increase performance and competition across the spectrum of telecommunications service delivery (Levin and Schmidt, 2010). Market variables arising from environmental change within a sector may require a change in a company’s competitive advantage strategies in order to respond to the potential opportunities created by these variables (Walsh, 2005). It is not only companies which have to deal with transformation but performance across the whole telecommunications sector affects the overall performance of people in the industry. This includes those in the private and public enterprises.
Policy makers protect or introduce laws and regulations that inhibit competition. These in turn, can be impediments to new opportunities and increased productivity and income provided through data communications (Comin and Hohijn, 2004). The sector-specific laws and regulations brought to an end a monopolised telecommunications sector and new players entered the market. Regulatory laws were established to facilitate increased competition and to encourage more players in the telecommunications sector.

It is therefore hypothesised that:

\[ H^2 \text{ There is a positive relationship between Sector Transformation and Entrepreneurial Competitiveness in the telecommunications sector.} \]

\[ H^{2a} \text{ There is a positive relationship between Sector Transformation and Entrepreneurial Orientation.} \]

5.3.5 Independent variable 3: Regulatory Alignment

Telecommunications industries, like other critical infrastructure industries (electricity, transportation, water, natural gas), have historically attracted sector-specific government intervention, which is described as regulation or sector-specific regulation (Levin and Schmidt, 2010). Such sector-specific regulation has applied in addition to the laws that apply generally to all businesses operating in the economy. Legislative and regulatory changes in the telecommunications sector in South Africa, together with infrastructural changes, introduced a new transformation path where entrepreneurs have to build competitive businesses in this sector.

The licensing and provision of telecommunications services in South Africa are intended to promote a reformed landscape and a new era in the ICT sector in South Africa. Two pieces of legislation are part of the new, converged regulatory framework for the ICT sector, aimed at lowering costs of access to ICT and increasing the efficiency and competition in telecommunications services in the country (DOC, 2010).
The Electronic Communications Act (2005) makes provision for operators in the telecommunications industry to be licensed according to their market position. Businesses in the telecommunications sector are to obtain licences and comply with the regulatory framework as prescribed in the ECA of 2005.

It is therefore hypothesised that:

\[ H^3 \quad \text{There is a positive relationship between Regulatory Alignment and Entrepreneurial Competitiveness in the telecommunications sector.} \]

\[ H^{3a} \quad \text{There is a positive relationship between the Regulatory Alignment and Entrepreneurial Orientation in the telecommunications sector in South Africa.} \]

**5.3.6 Intervening variable: Opportunity Recognition**

Reference was made in Chapter 2 to the term opportunity recognition. It was defined as a cognitive process by which entrepreneurs conclude that they have identified an opportunity (Ardichvili, 2003; Solso, 1999). Without an opportunity, entrepreneurship does not exist (Short et al., 2010). Opportunities emerge from a complex pattern of changing conditions: changes in technology, economic, political, social and demographic conditions. They come into existence at a given point in time when a series of conditions co-exist, which did not exist previously (Baron and Ensley, 2006).

An entrepreneur can be innovative, creative and hardworking, but without opportunities to exploit these characteristics, entrepreneurial activities cannot take place (Short et al., 2010). Entrepreneurs therefore engage in activities of business opportunity recognition and exploitation to gain strategic competitive advantage. This can be described as both external and internal exploitation (Schwartz and Teach, 2000; Bhave, 1994). The entrepreneur then recognises how to refine the opportunity, identify the business concept and then the commitment can be brought to reality (Schwartz and Teach, 2000).

The entrepreneurship field can therefore be defined by individuals and by processes that lead to the discovery, evaluation and exploitation of opportunities (Shane and
Personality traits, social networks and prior knowledge are identified as antecedents to the entrepreneurial alertness needed to recognise, evaluate and develop opportunities (Alvarez and Barney, 2007; Ardichvili et al., 2003).

It is therefore hypothesised that:

\[ H^{15} \quad \text{There is a positive relationship between Opportunity Recognition and Entrepreneurial Competitiveness in the telecommunications sector.} \]

### 5.3.7 Independent variable 4: Entrepreneurial Mindset

Entrepreneurial behaviour was categorised into five different perspectives in Chapter 2. Three of these apply to an Entrepreneurial Mindset and two are perspectives of the field of strategic entrepreneurship. The first perspective is derived from the angle of process and focuses on the entrepreneur’s start-up path, experience, and to what extent the business and the environment complement each other and the method of application (Lin, 2006; Lumpkin and Dess, 1996). The second perspective refers to entrepreneurial behaviour from the angle of content, focusing on the entrepreneur’s scale of entry into the industry, the characteristics of the business as well as the resources available (Bruyat and Julia, 2000). The third perspective is to investigate the factors that impact on entrepreneurial behaviour at the different levels of the organisation. Lin (2006) categorised entrepreneurial behaviour into three levels:

- **Entrepreneurial behaviour at individual levels**, emphasising the correlation between the entrepreneur’s values, character, professional or environmental background with the performance of the entrepreneurial effort (Shook et al., 2003);

- **Entrepreneurial behaviour at the organisational levels** focuses primarily on the causes of and effects arising from the orientation of an organisational foundation, behaviour in creating a new markets and performance of the market creating behaviour. Lumpkin and Dess (1996) believed that entry into new markets is a clear sign of business performance levels and is physical evidence of the entrepreneurial spirit. Shane (2003) expounded the importance of the development and sequence of entrepreneurial opportunities and
• The entrepreneurial behaviour of the industrial levels is referred to by Knight (2000) where he indicated that innovative business activities or the creation of a wide range of environments and processes for innovation would generate trailblazing improvements in the industry.

The literature discussed Schmidt and Ford’s (2003) introduction of the situated metacognitive model of an entrepreneurial mindset where the inclusion of metacognitive training in entrepreneurship pedagogy will advance adaptable thinking, an attribute that can be regarded of fundamental importance to entrepreneurs. Haynie et al. (2010) developed a situated metacognitive model of the entrepreneurial mindset based on dynamic consideration of cognitive functioning. This focused on how decision heuristics and strategies develop, adapt and are employed throughout the duration of the entrepreneurial process. The model enables the study of the dynamics of sense-making in a context which begins prior to the identification of the entrepreneurial opportunity and runs through the many stages and steps associated with entrepreneurial action. Therefore, the processes of mental stimulation and counterfactual thinking provide the mechanisms by which opportunities are identified, developed and turned into valued business ventures (Gaglio, 2004).

Literature further suggests that the metacognitive model proposed by Haynie et al. (2010), forms the basis for an entrepreneur to function optimally, which includes the conjoint effect of the environmental context and entrepreneurial motivation, the activation of metacognitive awareness, critical metacognitive resources, metacognitive strategy formulation and metacognitive monitoring and performance feedback mechanisms. Therefore, the processes of mental stimulation and counterfactual thinking provide the mechanisms by which opportunities are identified, developed and turned into valued business ventures (Gaglio, 2004).

It is therefore hypothesised that:

\[ H^4 \quad \text{There is a positive relationship between the Entrepreneurial Mindset and Entrepreneurial Competitiveness in the telecommunications sector.} \]
There is a positive relationship between the Entrepreneurial Mindset and Opportunity Recognition.

5.3.8 Independent variable 5: Entrepreneurial Innovation

Novel and useful ideas are described as the lifeblood of entrepreneurship. Because novelty and usefulness relate to creative ideas, possible connections between innovation, creativity and entrepreneurship have been of interest for some time (Ward, 2004). Ward (2004) suggests that entrepreneurs must engage in an innovative and creative process of generating valuable ideas for new goods or services that will appeal to an identifiable market. Once the potential opportunities are identified, entrepreneurs must investigate how to bring the project to realisation.

Today's economy is subjected to ever-changing technology (Marcati et al., 2008). Continuous technological creativity and innovation have played a vital role in ensuring the survival and development of companies. Decisions about technological innovation have become a very important problem that cannot be ignored in the entrepreneurial opportunity recognition and decision-making process (Marcati et al., 2008).

The need for innovation and creativity result from intensifying competition and in a broader sense includes social issues to identify new trends and tendencies in the market place in advance (Veugelers et al., 2010; Goleman, Kaufman and Ray, 1993; Vesper, 1993). The relevance of the entrepreneurial process to this study, with particular arguments and emphasis on innovation and creativity, relates to the current transformation process in the South African telecommunications sector, which is currently exposed to stringent competition forces; both from the larger corporations as well as from entrepreneurial businesses (TIPS, 2010).

It is therefore hypothesised that:

\[ H^5 \quad \text{There is a positive relationship between Entrepreneurial Innovation and Entrepreneurial Competitiveness in the telecommunications sector.} \]
There is a positive relationship between Entrepreneurial Innovation and Opportunity Recognition.

5.3.9 Independent variable 6: Entrepreneurial Experience

The attributes of innovative individuals can be viewed as the psychological underpinnings of human capital existing in an organisation, as they refer to the stock of experience, skills and knowledge accumulated by its members over time (Batzargal, 2007). The internal factors leading to innovative behaviour by individuals have been studied. At the heart of the entrepreneurial process is the innovative and creative spirit (Timmons and Spinelli, 2007).

Smaller entrepreneurial businesses do things differently when it comes to research and development (Timmons and Spinelli, 2007). The literature study indicates that behaviour which includes willingness to take risks, innovativeness, entrepreneurial leadership and a proactive stance against opposition is important in both policy and organisational theory contexts (Lumpkin and Dess, 1996; Covin and Slevin, 1991).

Changes in technology which are driven by continuous innovation and changing market landscapes, affects all businesses within the telecommunications sector (Veugelers et al., 2010). Technological businesses do not wait for change to happen but actively monitor and take advantage of changing environments and new developments (Veugelers et al., 2010). This action is referred to as technological intelligence and it requires experience in the sector to recognise opportunities.

It is therefore hypothesised that:

\[ H^6 \quad \text{There is a positive relationship between Entrepreneurial Experience and Entrepreneurial Competitiveness in the telecommunications sector.} \]

\[ H^{6a} \quad \text{There is a positive relationship between Entrepreneurial Experience and Opportunity Recognition.} \]
5.3.10 Intervening variable: Resource Allocation

Certain aspects of entrepreneurship in this study can be described as a process of organising resources (material, human and financial) (Shane, 2003; Bonnell and Gold, 2002; Schumpeter, 1934). According to the authors, the organisation of resources is crucial in the sense that it is what brings everything together and leads to the establishment and competitiveness of a business (Shane, 2003; Bonnell and Gold, 2002; Schumpeter, 1934).

In the literature, the independent variables associated with Resource Allocation are referred to as Entrepreneurial Leadership, Human Capital and Financial Resource allocation. Entrepreneurs are to manage resources effectively in these areas to increase business competitive levels.

It is therefore hypothesised that:

\[ H^{14} \quad \text{There is a positive relationship between Resource Allocation and Entrepreneurial Competitiveness in the telecommunications sector.} \]

5.3.11 Independent variable 7: Entrepreneurial Leadership

Entrepreneurial leadership is based on a straightforward way of leading a unit toward predefined and set goals. Creating value, through results achieved, makes entrepreneurial leadership a progressive and productive way to lead a unit of people. As a result, entrepreneurial leaders are able to recognise opportunities and evaluate them from the increasing flow of information (Hansson and Monsted, 2007). This can manifest itself in the form of entrepreneurial vision, which leads to performance and growth when strategy mediates their relationship. In this way, through risk taking and initiatives, entrepreneurial leadership aims to create innovations and formulate competitive strategies (D'Intino et al., 2007).

Entrepreneurial leaders are able to work in any business and at any task, by leading individuals and teams entrepreneurially and by managing resources productively (Kansikas et al., 2012). Leaders with entrepreneurial skills and characteristics may possess what is required to become an entrepreneurial leader. Therefore, any
individual with an entrepreneurial leadership style in any business can be deemed an entrepreneurial leader. Chen, Su and Tsai (2007) state that risk-taking, proactiveness and innovativeness characterise entrepreneurial leadership when such leadership is defined as the entrepreneurs’ way of leading in new ventures. Entrepreneurial leadership is needed to cope with uncertainty. Entrepreneurial leadership is therefore an important prerequisite for any business to obtain in order to operate in uncertain environments.

In small businesses, entrepreneurial leadership is often rooted in a single person making all the decisions. Entrepreneurs influence the business culture and its characteristics by their own daily operational actions. Imposing encouragement through an individual’s entrepreneurial vision in daily routines is typical of an entrepreneur’s way of leading an owner-managed business. Encouraging and motivating others and leading by example are typical of the leadership shown by entrepreneurs.

It is therefore hypothesised that:

$$H^7 \quad \text{There is a positive relationship between Entrepreneurial Leadership and Entrepreneurial Competitiveness in the telecommunications sector.}$$

$$H^{7a} \quad \text{There is a positive relationship between Entrepreneurial Leadership and effective Resource Allocation.}$$

5.3.12 Independent variable 8: Human Capital

Human capital attributes, including education, experience, knowledge and skills have long been argued to be a critical resource for success in entrepreneurial business (Unger et al., 2009). Researchers postulated that human capital may play an even larger role in the future because of the constantly increasing knowledge-intensive activities in most work environments and even at higher scales in high-technological business sectors (Unger et al., 2009; Bosma et al., 2008).

Chapter 2 revealed that human capital is positively related to planning and venture strategy, which in turn, positively impacts success (Frese et al., 2007; Baum et al.,
The literature provides several bases of arguments on how human capital should increase entrepreneurial success. Firstly, human capital increases the capability of owners to perform the generic, entrepreneurial tasks of discovering and exploiting business opportunities (Shane and Venkataraman, 2000). Prior knowledge increases entrepreneurial alertness and prepares the business owner to discover specific opportunities that are not visible to other people (Westhead et al., 2005; Shane, 2000; Venkataraman, 1997). In this context, human capital directly affects an entrepreneur's approach to the exploitation of opportunities (Shane, 2000; Chandler and Hanks, 1998).

Secondly, human capital is positively related to planning and venture strategy, which in turn, positively impacts success (Baum, Locke and Smith, 2001) Thirdly, knowledge is helpful for acquiring other utilitarian resources such as financial and physical capital and can partially compensate for a lack of financial capital which is a constraint for many entrepreneurial businesses (Brush et al., 2001). Finally, human capital is a prerequisite for further learning and assists in the accumulation of new knowledge and skills (Frese et al., 2007). Taking the three bases together, entrepreneurs with more advanced human capital should be more effective and efficient in running their business.

Entrepreneurs therefore informally and intuitively perceive an opportunity on which they base some feel for the market and then try to maximise their economic benefits with their human capital available (Schwartz and Teach, 2000).

It is therefore hypothesised that:

\[ H^8 \quad \text{There is a positive relationship between Human Capital and Entrepreneurial Competitiveness in the telecommunications sector.} \]

\[ H^{8a} \quad \text{There is a positive relationship between Human Capital and Resource Allocation.} \]
5.3.13 Independent variable 9: Financial Resources

Knowledge is helpful for acquiring other utilitarian resources such as financial and physical capital (Brush et al., 2001) and can partially compensate for a lack of financial capital, which is a constraint for many entrepreneurial businesses (Chandler and Hanks, 1998).

Access to financial resources, either internal or external, is a key aspect pertaining to business performance. The literature of Economics and Finance describe the pervasiveness of financial constraints in both small and large listed businesses (Muravyev et al., 2009). For established businesses, the evidence comes from the analysis of the link between internally generated cash flows and investment levels (Hubbard, 1998). For new start-ups, the evidence mostly comes from the studies that focus on the impact of personal wealth on the propensity to become an entrepreneur (Blanchflower and Oswald, 1998).

Research by Wiklund and Shepherd (2005) based on EO performance suggests that businesses that face performance constraints, in terms of a stable environment and limited access to capital, can be superior performers if they adopt high levels of EO. This indicates an increase in the advantages of business performance if associated with higher levels of EO within entrepreneurial businesses.

It is therefore hypothesised that:

\[ H^9 \quad \text{There is a positive relationship between Financial Resources and Entrepreneurial Competitiveness in the telecommunications sector.} \]

\[ H^{9a} \quad \text{There is a positive relationship between Financial Resources and Resource Allocation.} \]

5.3.14 Intervening variable: Strategic Positioning

Most businesses face external environments that are highly turbulent, complex and in many cases global which lead to conditions that make interpreting their performance increasingly difficult (Hitt et al., 2005). While economic geography has addressed entrepreneurship and entrepreneurial businesses, studies have mostly
focused on the local and domestic foundation of entrepreneurial activities and their impact on small business formation, technological innovation and industrial clustering (Stam, 2007; Kalantaridis and Bika, 2006; Parthasarathy and Aoyama, 2006).

On review, current literature suggests two types of strategic orientations that seem to be represented; namely, market-driven and market-driving approaches, respectively, as interaction orientation and entrepreneurial orientation (Chen et al., 2012). The two approaches are distinguished by business capabilities and business performance. The importance of these two orientations on business performance links the two constructs. Interaction orientation along with a market driven orientation and exploitative learning focuses on developing distinctive customer value in existing market boundaries whereby the business interacts with its individual customers and makes use of information obtained from their mutual interactions to co-create value (Kumar and Ramani, 2003). Entrepreneurial orientation on the other hand is linked with a market driving orientation and exploratory learning emphasises active industry change and the creation of new markets through the exploration of new opportunities, thereby contributing to advancements in the value proposition in the marketplace (Chen et al., 2012; Lumpkin and Dess, 1996; Covin and Slevin, 1991).

Literature focusing on interaction orientation has investigated the effect of interaction orientation on customer-based activities in business (Kumar and Ramani, 2008). Literature exploring entrepreneurial orientation has emphasised the effects of entrepreneurial orientation on innovative activities and technological development in business (Li et al., 2008; Wang, 2008; Avlonitis and Salavou, 2007). These research streams contribute to the understanding of the orientation of the business market and contribute to strategic and competitive advantage. Entrepreneurs engage in business opportunity recognition and exploitation to gain strategic competitive advantage, which can be contextualised as both external and internal exploitation (Schwartz and Teach, 2000). The entrepreneur then recognises how to refine the opportunity, identify the business concept and then the commitment can be brought into reality (Schwartz and Teach, 2000).
Entrepreneurial behaviour according to Lin (2006) is a combination of business innovation, risks and strategic renovation. Lin (2006) described entrepreneurial behaviour as the manifestation of company innovation, taking risks and proactive behaviour. Covin and Slevin (2001) suggested that a business must provide a strategic decision model that drives the entrepreneurial direction.

Entrepreneurs need both technological and administrative knowledge to establish and successfully run a newly established business (Chen et al., 2012). Factors such as a rise in global competition, business restructuring and fast paced technological progress have forced business owners to consider becoming entrepreneurial in nature. In the same context, when examining adoption of EO as a strategic response, Zahra (1993) found that business owners tended to embrace EO when the environment was dynamic. Taking into consideration the dynamic landscape in the South African telecommunications sector, environmental changes are evident in the areas of regulation, legislation and technological change. These factors positively attract the role players to adopt EO.

Covin et al. (2006) postulate that Entrepreneurial Strategic Posture is the integration of senior management’s attitude when faced with uncertainty and taking risks and innovative products: including the stage of technological development and the extent to which the business is strategically revolutionised. Covin and Slevin (2006) further states that business strategic posture is affected by the financial capability, sales capabilities and production capacity. Lin (2006) posits a link between the measurement of strategic posture advocated by the social cognition theory and entrepreneurial behaviour. Lin (2006) focuses on the following key points:

- The focus of the business on the development of technology for key tasks in the value chain or the sales activities downstream;
- Approach towards unpredictable competitive environment or industry and
- The cognitive style of decision-making of senior management in the business.

In order to remain strategically positioned, a business has to rely on innovation, opportunity and exploitation as the source of sustainable competitive advantage and effective response to continuous environmental changes.
It is therefore hypothesised that:

\[ H^{13} \quad \text{There is a positive relationship between Strategic Positioning and Entrepreneurial Competitiveness in the telecommunications sector.} \]

### 5.3.15 Independent variable 10: Legal Alignment

Regulatory and technological change featured largely in global telecommunication trends in the past decade (ITU, 2010a; Ponelis and Britz, 2008; Tsai et al., 2006; Nandi, 2002). Earlier suggestions from authors (Christensen, 1997; Venkataraman, 1997) to foster successful technological entrepreneurship in regional transformation include changes in a country’s legal system, to make it more transparent. They suggested changes in tax and legislation to change the way corporates operate and proposed changes in the country’s infrastructure, including the telecommunications and transport systems (Venkataraman, 2004).

Telecommunications industries have historically attracted sector-specific government intervention, which is described as regulation or sector-specific regulation (Levin and Schmidt, 2010). Such sector-specific regulation has been applied in addition to the laws that apply generally to all businesses operating in the economy. Regulatory statutes are formulated to direct financial and intellectual resources to the establishment of competitive entry across all services in the telecommunications sector (Levin and Schmidt, 2010).

Telecommunications businesses are expected to comply with regulations in South Africa. The Independent Communications Authority of South Africa (ICASA) is the South African composite ICT regulator. Compliance with regulations ensures a stable environment in which to conduct business. The Electronic Communications Act (2005) makes provision for operators in the telecommunications industry to be licensed according to their market position.

It is therefore hypothesised that:

\[ H^{10} \quad \text{There is a positive relationship between the Legal Alignment and Entrepreneurial Competitiveness in the telecommunications sector.} \]
There is a positive relationship between the Legal Alignment and Strategic Positioning.

5.3.16 Independent variable 11: Benchmarking

The main idea behind benchmarking, in principle, is to make comparisons with others in terms of competitiveness and performance. Benchmarking helps to define the best possible indicators for comparison and to obtain a picture of a company's entire operation (Ahmad and Hoffman, 2008).

In the literature, competitiveness is regarded by authors as a measure of effectiveness, performance and increased success in both new and existing ventures (Wiklund and Shepherd, 2005; Lumpkin and Dess, 2001; Zahra and Garvis, 2000; Wiklund, 1999; Zahra and Covin, 1995). This study is concerned with the promotion of entrepreneurial competitiveness in the telecommunications sector in an uncertain environment, with particular reference to infrastructural and technological change, sector transformation and regulatory changes. Business performance, therefore, is based on how effectively entrepreneurs can position their businesses in order to gain a greater degree of effectiveness and in return, higher competitiveness.

The importance of entrepreneurial orientation to the survival and performance of businesses has been acknowledged in the entrepreneurship literature (Wiklund and Shepherd, 2005; Lumpkin and Dess, 2001). The empirical evidence from Zahra and Covin (1995) and Wiklund (1999) showed that the positive influence of entrepreneurial orientation on performance increases over time. Based on the literature, entrepreneurial orientation involves a willingness to innovate, be creative in the thinking process, search for risks, take self-directed actions and be more proactive and aggressive than competitors toward new marketplace opportunities (Lin, 2006; Wiklund and Shepherd, 2005; Lumpkin and Dess, 1996).

When measuring business performance the five dimensions of entrepreneurial orientation are considered as the departure point. The dimensions include innovativeness, risk-taking, proactiveness, competitive aggressiveness and autonomy as suggested by Lumpkin and Dess (2001).
It is therefore hypothesised that:

\[ H^{11} \quad \text{There is a positive relationship between the Benchmarking and Entrepreneurial Competitiveness in the telecommunications sector.} \]

\[ H^{11a} \quad \text{There is a positive relationship between Benchmarking and Strategic Positioning.} \]

5.3.17 Independent variable 12: Technological Entrepreneurship

In the present day, high-technology companies exist in high velocity environments (Mishra, 2002). It is an environment in which there is rapid and discontinuous change in demand. Competitors and technology change combined as do regulations (Fildes, 2003). Technological entrepreneurship plays a central role in regional transformation (Venkataraman, 2004). Schumpeter was the first to place the entrepreneur at the centre of economic progress. Through the introduction of new methods of production, business composition, supply chain formulation, emerging markets or products, the dislocation caused by their changes leads to new and sustaining sources of entrepreneurial success (Edelman and Yli-Renko, 2010).

In the new, independent entrepreneurial business, the connection between technology and markets is the responsibility of everyone, but especially of the founder of the company (Phan, 2002). These technological entrepreneurial companies have low fixed costs, low overheads, single technology focus and are willing to risk current income for potential capital gains returns if they are successful (Phan, 2002). In the context of the current telecommunications environment, entrepreneurial companies can foster technological change whilst sustaining lower margins better than larger companies and they can endure higher risk levels in this uncertain market sector.

At the individual level, the focus is on autonomy as a dimension of EO, defined by Lumpkin and Dess (1996:140) as “independent action by an individual or team aimed at bringing forth a business concept or vision and carrying it through to completion.” This emphasis at the individual level is necessary in high technology companies, where it has been argued that autonomy in successful high technology
companies is manifested when key, high-risk decisions are made immediately by people dealing with problems, rather than being made later by top management (Joshi, 2008).

It is therefore hypothesised that:

\[ H^{12} \quad \text{There is a positive relationship between Technological Entrepreneurship and Entrepreneurial Competitiveness in the telecommunications sector.} \]

\[ H^{12a} \quad \text{There is a positive relationship between Technological Entrepreneurship and Strategic Positioning.} \]

5.4 SUMMARY

This chapter presented the development of the theoretical model to be empirically tested. The research question RQs and objective ROs were addressed in this chapter. This model is presented in Figure 5.1. The factors that influence entrepreneurial competitiveness in the telecommunications sector have been found to be 16 major determinants, namely Entrepreneurial Orientation, Infrastructural Change, Sector Transformation, Regulatory and Regulatory Alignment, Opportunity Recognition, Entrepreneurial Mindset, Entrepreneurial Innovation, Entrepreneurial Experience, Resource Allocation, Entrepreneurial Leadership, Human Capital, Financial Resources, Strategic Positioning, Legal Alignment, Benchmarking and Technological Entrepreneurship. A total of 29 hypotheses have been discussed and proposed.

In Chapter 6, the research design will be discussed and the instruments used to measure the proposed theoretical model will be defined.
CHAPTER 6

RESEARCH METHODOLOGY

6.1 INTRODUCTION

In this chapter the research methodology for the study is discussed. Research Question RQ7 and research objective RO6 are addressed in this chapter. In order to obtain the results and findings presented in Chapter 7, the methods and techniques to be deployed are discussed in this chapter.

This study, as stated in Chapter 1 can be described as a theoretical, model-building study followed by an empirical assessment of the proposed model. The research design base is to address the primary objective stated in Chapter 1 as:

‘To investigate what factors have an impact on the entrepreneurial competitiveness in the telecommunications sector in South Africa through the development of a theoretical model’.

Upon completion of the literature study, a theoretical model of factors that influence entrepreneurial competitiveness in the telecommunications sector was constructed. It is this proposed conceptual model and the factors from which it is built that constitute the focus of the empirical investigation.

Research is purposeful since it is conducted with a view to achieving outcome (Collis and Hussey, 2009; Blumberg et al., 2008). Good research generates dependable data, which are derived through practices that are conducted professionally and that can be used and relied upon (Blumberg et al., 2008). The outcomes and findings of good research are directly related to the validity of the research methodology employed (Blumberg et al., 2008).

Research is seen as valid when dependable data are derived by professionally conducted practices and according to standards of scientific method (Cooper and
Schindler, 2007). Collis and Hussey (2003) conclude that the purpose of research relates to a process of enquiry and investigation which is systematic and methodical and which results in an attempt to increase research knowledge.

Research methodology starts with a design described as the “science and art of planning procedures for conducting studies to get the most valid findings” which provides the process and structure that holds the research study together (Vogt, 1993:196). The research design provides a framework for the research process to be undertaken and illustrates how all the main parts of the study (samples or groups, measures, treatments or programmes and methods of assignment) function together to address the fundamental research questions (Trochim, 2009).

The research process involves the application of various methods and techniques in order to create knowledge by using objective methods and procedures (Welman and Kruger, 2001). The research process can also be described as a sequential process to discover answers to questions through the application of scientific procedures (Blumberg et al., 2008). The main aim of a research project is, therefore, to find out the truth which is hidden and which has not yet been discovered. Though each research study has its own specific purpose, research objectives fall into the following broad groupings:

- To gain knowledge of, or to achieve new insights into a phenomenon (exploratory or formulative research studies);
- To portray accurately the characteristics of a particular individual, situation or a group (descriptive research studies);
- To determine the frequency with which an event occurs or with what other event it is associated (diagnostic research studies) and
- To test a hypothesis of a causal relationship between variables (hypothesis-testing research studies) (Blumberg et al., 2008).

Aspects of the research process to be covered in this chapter include the type of research design, a definition of the population, the measurement instrument, the data collection methods used and the statistical techniques applied to analyse the data.
In order to test the propositions that will be formulated in this study, the proposed theoretical model will be tested using the Structural Equation Modelling (SEM) technique in real life situation by means of quantitative data collection and analysis in a format compatible with the proposed research model. SEM allows both confirmatory and exploratory modelling, meaning they are suited to both model testing and model development (Wothke, 2010).

6.2 QUANTITATIVE TESTING AND ANALYSIS

The process of a theoretical model building study can be categorised into the following elements:

- Data Collection;
- Data Analysis and
- Inference of new hypothesis (Buys, 2007).

Data Collection, the first stage of the process is described in more detail in this chapter while the analysis of the data is discussed in Chapter 7.

A positivistic research paradigm is proposed for the study. The positivistic paradigm is described by authors as a quantitative, objectivist, scientific, experimentalist or traditionalist research paradigm (Collis and Hussey, 2003). Quantitative research refers to the quantifying of relationships between variables and the aim is to assess the relationship between the independent variable and the dependent or outcome variable in a population (Collis and Hussey, 2009; Leedy and Ormrod, 2005).

Quantitative research designs are either descriptive or experimental. A descriptive study establishes only associations between variables. An experiment investigates causality. For an accurate estimate of the relationship between variables, a descriptive study usually requires a sample collection of hundreds or even thousands of subjects; an experiment, especially a crossover, may need only tens of subjects (Collis and Hussey, 2009). The quantitative research design associated with this study can be classified as an explanatory study as the sample collection amounted to 301 respondents.
6.2.1 The study population

The term ‘population’ refers to a body of participants carefully selected to represent the population required for a study (Collis and Hussey, 2009; Blumberg et al., 2008). The population can therefore be defined as a collection of all the observations of a random variable under study and about which one is trying to draw conclusions in practice (Collis and Hussey, 2009). A population must be defined in very specific terms to include only those units with characteristics that are relevant to the problem (Wegner, 2003). The estimation of the study population was influenced by the following considerations:

- Research hypotheses;
- The variance within the population and
- The sampling technique.

For this study, the population refers entrepreneurs in the telecommunication sector in South Africa.

6.2.2 Sampling and sampling unit

A sample is defined as a subset of a population chosen to represent a target population (Collis and Hussey, 2009; Cooper and Schindler, 2007). The accuracy of a sample design is described as how well it represents the characteristics of the population it purports to represent (Blumberg et al., 2008).

The representativity of a sample depends on two considerations, namely, accuracy and precision (Blumberg et al., 2008). Accuracy in sample design refers to the degree to which bias is absent from the sample. A criterion for good sample design is that it lies within precision of estimate (Blumberg et al., 2008). No sample will fully represent its population in all respects and therefore the sampling technique should be representative of the population studied. Choosing a sampling method entails the following:

- Define the target population;
- Obtain or construct a sampling frame;
- Determine how to select sample members and
• Decide how to convert sample estimates into population estimates (Collis and Hussey, 2009).

The level of precision, or in other words described as the level of sampling error that is acceptable in a research exercise, influences sample size (Leedy and Ormrod, 2005). In reality the sample statistic is known but the population statistic is unknown, so the difference between the sample and the population value can be assessed in that a sample value differs by a certain value from the population value (Leedy and Ormrod, 2005). Precision is directly related to sample size when establishing a confidence sample level. For example, a range in which it is fairly certain that the population value lies, does this (Leedy and Ormrod, 2005). Larger samples are more precise than smaller ones. Probability theory enables the calculation of the sample size that would be required to achieve a given level of precision (Collis and Hussey, 2009).

The sampling unit in this study refers to the entrepreneurial person, who founded, owns or manages an operational business in the telecommunications sector in South Africa. The research is concerned with analysing the data from this sample collection to address the research problem. The sampling method associated with this study is referred to as purposive sampling. Purposive sampling refers to a non-probability sample that conforms to certain criteria and consists of two types, namely judgement and quota sampling (Blumberg et al., 2008). Quota sampling was selected for this study as this method is used to improve representativeness (Blumberg et al., 2008). The rationale behind quota sampling is that certain relevant characteristics describe the dimensions of the population (Blumberg et al., 2008). The population sample representing the research in question refers to entrepreneurs in the telecommunications sector who are members of three industry organisations and also industry experts.

The proposed population sample does not represent the total population size associated with this study, namely, active participant entrepreneurs in the telecommunications sector in South Africa, but it does represent a clearly definable quota of the population concerned within this study, namely entrepreneurs who
founded, owns or manages a business in this sector. The sample is drawn from the following sampling frame:

1. ECNS and iECNS licensees (ICASA, 2012);
2. ISPA members (ISPA, 2012);
3. WAPA Members (WAPA, 2012) and
4. Industry experts.

6.2.3 The sample size

Sample size provides the basis for the estimation of sample error and affects the ability of the model to be correctly estimated (Hair et al., 2006). As with any statistical method, the critical question is how large a sample is needed. Bentler and Chou (1987) suggest that in SEM the sample size requirements vary for measurement and structural models. In an ideal case, the Bentler and Chou (1987) suggested a sample size for SEM to a ratio of 5 responses per free parameter. Hair et al. (2006) suggest that a generally accepted ratio of respondents to parameters to minimize problems with deviations from normality is 15 respondents for each parameter estimated in a proposed model.

Structural Equation Modelling relies on tests that are sensitive to the sample size and the magnitude of differences in covariance matrices. The process of structural equation analysis requires a sample size that should not be small. There are five considerations that affect the required sample size for SEM, namely, the multivariate distribution of data, the estimation technique, the model complexity, the amount of missing data and the amount of average error variance among the reflective indicators (Hair et al., 2006). Literature suggests that sample sizes commonly vary from 200 to 400 for models with 10 to 15 indicators. Authors’ views on sample sizes vary for SEM, but in general, an average number of the minimum sample size can be assumed, based on literature as higher than 200. The following authors suggest a minimum sample size to be as follows:

- Kline (2005) - samples under 100 too small;
- Fan, Thompson and Wang (1999) - sample size less than 200 represents a good fit for RMSEA and CFI, but too sensitive for Chi-square($X^2$) measurement;
• Loehlin (1998) - at least 100 cases, preferably 200;
• Hair et al. (2006) - although there is no correct sample size, recommendations are for a size ranging from 100 to 200, with 200 being the proposed critical sample size and
• Garson (2008) - Sample size under 200 represents unstable parameter estimates.

The sample collection for this study amounted to 301 respondents and is reported in Table 6.2.

6.2.4 The population

The composition of the targeted population proposed for this study includes a sample of entrepreneurs from the following categories:

1. ECNS and iECNS licensees (ICASA, 2012);
2. ISPA members (ISPA, 2012);
3. WAPA Members (WAPA, 2012) and
4. Industry experts.

In Chapter 4, the legal and regulatory framework in the telecommunications sector in South Africa was discussed and the population composition included those entrepreneurs who conform to the ICASA licensing regulations in their businesses. In addition, businesses in the industry are registered as members of either the Internet Service Providers’ Association (ISPA) and/or the Wireless Access Providers’ Association of South Africa (WAPA). Operators including those who are listed members of the Internet Service Providers Association in South Africa (ISPA) as well as the Wireless Access Providers’ Association of South Africa (WAPA) were surveyed.

Members of ISPA adhere to the regulatory framework and associate themselves with the Code of conduct that both ISPA and WAPA promulgate. ISPA and WAPA members also represent active companies within the telecommunications sector of which the majority of these companies are managed or owned by entrepreneurs. In addition, industry experts were directly targeted to complete the survey. This study is
therefore focused on the sample discussed above as it fits the profile of the person investigated or the type of entrepreneurial business. The target sample is categorised in Table 6.1.

The sample selected for this study was directed to a target sample which included 820 entrepreneurs within an existing businesses environment and operational in the telecommunications sector. Invitations to participate were directed at the sample by means of direct interviews, electronic e-mail and direct telephonic calls. A database of e-mail addresses was compiled and requests to complete the questionnaire were sent to the target respondents.

Table 6.1 Target sample

<table>
<thead>
<tr>
<th>Source</th>
<th>Population Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICASA Licensees - database obtained (ICASA, 2012)</td>
<td>467</td>
</tr>
<tr>
<td>Internet Service Providers’ association database obtained (ISPA, 2012)</td>
<td>155</td>
</tr>
<tr>
<td>Wireless Access Providers’ Association of South Africa (WAPA) -</td>
<td>122</td>
</tr>
<tr>
<td>database obtained (WAPA, 2012)</td>
<td></td>
</tr>
<tr>
<td>Industry experts - electronic mail</td>
<td>76</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>820</strong></td>
</tr>
</tbody>
</table>

The questionnaire was made available on the Internet for online submission at http://www.rius.co.za. The number of responses is listed below in Table 6.2. A total of 820 requests were sent via e-mail to the target population, of which a total of 335 respondents completed the survey. A total of 34 incomplete questionnaires was identified and excluded from the data set. Table 6.2 indicates a response of 301 accepted questionnaires, which represents a response rate of 37%.

Table 6.2 Questionnaire completions

<table>
<thead>
<tr>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number distributed</td>
<td>820</td>
</tr>
<tr>
<td>Number completed</td>
<td>335</td>
</tr>
<tr>
<td>Number analysed</td>
<td>301</td>
</tr>
<tr>
<td>Number rejected</td>
<td>34</td>
</tr>
<tr>
<td><strong>Percentage of total analysed</strong></td>
<td><strong>37%</strong></td>
</tr>
</tbody>
</table>
6.3 THE EMPIRICAL STUDY

6.3.1 Data collection

Empirical research is a way of acquiring knowledge by means of direct and indirect observation or experience (Collis and Hussey, 2009). The data-collection approach determined by the researcher depends largely on identifying the types of information needed. This is achieved by posing investigative questions in order to address a problem or answer specific questions related to the research in question (Blumberg et al., 2008). Empirical data in this study was collected by means of a questionnaire which was designed and developed based on the literature study presented in Chapters 2 to 4. The data generated by the questionnaire were then statistically analysed by means of Structural Equation Modelling (SEM). In addition, the following techniques were used to improve the quality of the questionnaires (Collis and Hussey, 2009):

- Experience Surveys - Discussion of issues and ideas with knowledgeable and experienced entrepreneurs in the telecommunication environment;
- Secondary Data Analysis and
- Electronic Interviews - Closed questions were e-mailed to respondents.

The Internet is increasingly considered as an access medium to survey the public (Couper, 2000). E-mail questionnaires have become popular, as manifested in the growing research on e-mail survey methodology (Shih and Fan, 2009; Akl, Maroun, Klocke, Montori and Schünemann, 2005; Ranchhod and Zhou, 2001). E-mail surveying have also been used by researchers in a variety of fields, such as management (Donohue and Fox, 2000), policy research (Enicott, 2002), education (Fraze, Hardin, Brashears, Smith and Lockaby, 2002), market research (Ranchhod and Zhou, 2001; Smee and Brenna, 2000) and telecommunications (Shermis and Lombard, 1999). The emergence of Internet and e-mail survey methodologies have led to several studies comparing e-mail and mail surveys, especially about the response rates of these two survey modes. These comparative studies provide opportunities to understand the strengths and weaknesses of different survey modes, and to explore factors that may affect their response rates (Shi and Fan, 2009).
The advantages of using the Internet include cost savings associated with the elimination of printing and mailing of survey instruments as well as time and cost savings of having returned survey data already in an electronic format (Cobanoglu, Warae and Moreo, 2001). Respondent survey entries can be controlled and missing data can be prevented when online surveys are completed. Most online software tools are programmed to prompt a respondent to enter a missing or skipped question prior to continuing to the next section (Cobanoglu et al., 2001). Online applications therefore cater for this facility where the survey process cannot continue when data is not entered and concern about missing data is therefore minimised.

For special populations that regularly use the Internet, online surveys have been found to be a useful means of collecting data (Sills and Song, 2002; Couper, Traugott and Lamias, 2001). The questionnaire used in this study was published online as electronic submissions were selected as the medium of data collection. Electronic submissions resulted in more accurate response recordings as respondents were obliged to submit an answer before they could proceed to the next sub-section in the survey.

A total of 820 requests were sent via e-mail to the targeted population of which a final number of 335 online responses were completed (see Table 6.2). This represents a response rate of 37% usable responses. The average time to complete the usable questionnaires was 8 minutes and 20 seconds. The number of rejected responses amounted to 34 and successful questionnaires from a population of 301 respondents' were deemed valid. The 34 unusable questionnaires were deleted based on the following criteria:

- Persons indicated they are not entrepreneurs or their businesses are not entrepreneurial in nature;
- Time to complete less than five minutes - indicating the respondent completed the survey in a rush and significantly lower in time than the average completion time. The results were omitted as they might implicate the validity and reliability of the questionnaire and
- Acquiescence bias - Users tended to populate most items with a single scale item selection, indicating they did not thoroughly read the questions. The same
users also formed part of the population who completed the survey in less than 5 minutes.

6.3.2 The research instrument

The purpose of the measuring instrument in the present study was to source primary data to test the hypothesised relationships depicted in the conceptual model and to identify the factors influencing entrepreneurial competitiveness in the telecommunications sector in South Africa.

The published online questionnaire referring to the present study (see Appendix B) consisted of a cover page and 2 sections. The cover page provided details pertaining to the purpose of the study and the type of information being solicited. Questions posed to respondents should be neutral as to the intended outcome. A biased question or questionnaire encourages respondents to answer one way rather than another (Graeff, 2005). Questions were coded according to the variables identified in the conceptual model. Prior to publishing, questions were scrambled in order to avoid answers being order biased. Questions were then published on the online website.

The questionnaire was divided into 10 sub-sections, consisting of 10 randomised questions. The questions were grouped into 10 sections in order to facilitate easier online page flow and answering. Readability tests were performed on the questions by using the Coleman Liau index, Flesch Kincaid Grade Level, ARI (Automated Readability Index) as well as the SMOG index (Online: Online-Utility.org).

The first section of the questionnaire consisted of 92 closed-ended statements based on the factors influencing entrepreneurial competitiveness in the telecommunications sector in South Africa. Items were constructed specifically around assessing the factors represented as variables in the proposed conceptual model as perceived by the respondent. The second section consisted of 10 demographical questions and was placed towards the end of the questionnaire. This section included requesting information on gender, age, language, ethnic grouping, ownership composition, method of entering into the business, industry experience and licence compliance.
As mentioned earlier in this chapter, all questions were worded statements and respondents had to indicate if their degree of agreement or disagreement by means of a 7-point Likert-type scale. The 7-point Likert-type interval scale was interpreted to be 1 as strongly disagree and 7 as strongly agree. Adopting Interval measurement scales, such as a 7-point Likert-type interval allows for the use of more advanced statistical procedures in data analysis such as product moment correlation, t-tests, F-tests and other parametric tests (Blumberg et al., 2008). The use of the interval scale chosen was a strong motivation to use the chosen statistical SEM method.

Questionnaires and interviews were conducted with the target sample in three phases:
- Interviews with a selective sample from the identified population;
- A pilot study conducted to test the validity and accuracy of the survey and
- A final survey sent to the identified target population.

### 6.3.3 Questionnaire design

A questionnaire is described as a list of carefully structured questions, chosen after considerable testing, with the purpose of eliciting reliable responses from a chosen sample (Collis and Hussey, 2009). According to Leedy (1997) a questionnaire is a common instrument for observing data that are beyond the physical reach of the observers. Types of questions used in a questionnaire may be open or closed (Collis and Hussey, 2003). A closed question is where responses are restricted to a small set of responses that generate precise answers. On the other hand open-ended questions do not impose restrictions on the possible answer but are difficult to aggregate and computerise. Leedy (1997) postulates that a structured questionnaire must provide questions that have an element of steering information for the respondent without any prompting from the researcher. The author adopted this approach when the questionnaire was designed.

The questionnaire used in this study was developed using information obtained from the literature study. The questions were carefully selected to address each of the factors that have an impact on entrepreneurial competitiveness in the telecommunications sector in South Africa. The formulation of the questions also
sought to address the hypotheses proposed in this study. Appendix A and B lists the questionnaires used in this study. The questionnaire included 102 designed questions and the construction tested the entrepreneur’s perceptions on issues relating to entrepreneurial competitiveness in the telecommunications sector.

Questions were further carefully constructed to ensure that the research objectives could be met. The wording of the questions was based on Leedy’s (1997) methodology of design. Leedy (1997) states that there are key issues pertaining to questionnaire design that need to be taken into consideration. These are as follows:

- Concise language;
- Unrealistic demands must not be made on to those who will fill in the questionnaire;
- Each question should ask about only one topic;
- Each question should have no escape route, that is no answers ‘don't know’ or ‘no comment’;
- Each question should be polite;
- The questions should be straight forward and be safeguarded against double meanings;
- The question order must be correct;
- The layout must be easy to follow;
- Clear instruction must be given and
- The questionnaire must be tested first.

The questionnaire should not be too long and complicated (Collis and Hussey, 2009). A short and user-friendly layout is important to encourage the respondents to complete the questionnaire. The questions chosen in this study were closed and worded concisely. Suitable words had to be used in the questionnaire to suit the vocabulary level of the respondents. The questionnaire items were worded statements and respondents had to indicate, on a 7-point Likert-type scale, if they agreed or disagreed. Questions were constructed specifically around the factors represented as variables in the proposed conceptual model.
6.3.4 Qualifying questions

For the purpose of the study, the sample was identified as entrepreneurs in the telecommunications sector in South Africa and described as a single element or group of elements subject to selection in the sample (Zikmund, 1993). Entrepreneurial competitiveness refers to a person and a business as two separate sample units. The entrepreneurial person represents the primary sampling unit and the entrepreneurial business the secondary sampling unit.

In order to ensure that the respondents met the criteria to participate in this study, qualifying questions were constructed to confirm valid participation. Respondents were asked to respond to the entrepreneurial nature of the persons under study as well as the entrepreneurial nature of the business in which they are currently engaged. Section 2 included specific demographical questions directed at determining the nature of the entrepreneurial activities of the respondents and therefore qualifying them as valid participants. The qualification questions contributed to minimising errors in responses.

6.3.5 Pilot study

A pilot survey was initially completed to test the questionnaire amongst a sample of directly targeted people involved in the industry players. Thirty questionnaires were distributed by email and 23 respondents completed the pilot study. The results were subjected to a preliminary reliability assessment. On receipt, the responses of the pilot study were reviewed where vague and ambiguously worded questions were revised. Minor changes had to be made to the final questionnaire. The final items were coded sequentially and then randomly positioned in the online questionnaire.

6.3.6 Administration of questionnaires

Completion of the questionnaire design was done in the beginning of February 2012. The pilot survey was published and the targeted respondents were invited to complete the questionnaire. All questions were asked in English to the target group. As mentioned, lists compiled from the ICASA licensee database, ISPA members list and the WAPA members list. In addition, the author compiled an e-mail list of
industry experts who are currently actively participating in business activities in the telecommunication sector. The final e-mail list of 820-targeted respondents was used to request participation in completing the questionnaire. Although the geographical location of the respondents was not requested in the questionnaire, the respondents’ business addresses and telephone numbers were obtained from the databases and indicated from where they operate. This address list revealed that their geographical location represents all provinces in South Africa.

The final questionnaire was published electronically and the start page referred to the covering letter the respondents received by electronic mail. The covering letter included the NMMU letterhead details as well as the author’s contact details. The respondents commenced completion of surveys by mid-March 2012 and the last response was received in the beginning of May 2012. Some studies suggest that in populations with access to the Internet, response rates for e-mail and Web surveys are expected not to match those of other survey methods (Cook, Heath and Thompson, 2000; Couper, 2000). Apparent differences in response rates for online surveys and mail surveys have several causes or explanations. One explanation for these differences in response rates may be the fact that less time and attention have been devoted to developing and testing motivating tools to increase online survey response, compared to the time spent studying tools employed in conventional hard copy questions (Couper, 2000).

Special attention was given to prevent a low response rate. Weekly reminders were sent to respondents by means of electronic mail in order to motivate higher response rates. The online survey tool SurveyGold was used to publish and retrieve results. A record of completed surveys was kept electronically within the software application database and the survey was closed after no responses were received for a period of two weeks. The minimum target of 300 completed surveys for SEM analysis was met.

Upon completion of the questionnaire, participants were required to supply their names, surnames and e-mail addresses. In addition to this information, the software also logged the time a respondent spent to complete the survey and the application
allocated a unique web session to each completed session. The time spent to complete the questionnaire was found to be useful in identifying unqualified surveys.

6.4 OPERATIONALISATION OF VARIABLES

The measuring instrument was defined earlier in this chapter. Questions were formulated in such a way as to ensure that every latent variable in the structural model was measured by at least five items. In order to remove ambiguity in written work and research, all relevant variables for this study were accurately and clearly defined. This process is known as operationalising variables. To operationalise a variable, means to define it so that it can be measured and/or expressed quantitatively or qualitatively (Babbie and Mouton, 2001).

Questionnaires represent a common and concrete illustration of the variable operationalisation process and the questions themselves serve as the operationalisation process (Babbie and Mouton, 2001). A generalised procedure for operationalisation involves:

- Identify the concept to measure;
- Determine one or more quantitative measures of the concept and
- Determine the method for obtaining this measure.

6.4.1 Operationalisation of intervening and independent variables

a) Intervening variable: Entrepreneurial Orientation (coded EO)

In this study Entrepreneurial Orientation refers to the participation of entrepreneurs in the telecommunications sector in South Africa. The term EO in the literature has been referred to the strategy-making processes and the styles of companies that engage in entrepreneurial activities (Quince and Whittaker, 2003). In this context, owners are to ensure that their businesses remain entrepreneurial in nature by means of the elements to be discussed in this section. Businesses demonstrating Entrepreneurial Orientation characteristics have the capabilities to discover and exploit new opportunities (Wiklund and Shepherd, 2005) and they can respond to challenges to increase performance and flourish in a competitive and uncertain environment (Shane and Venkataraman, 2000; Lumpkin and Dess, 1996).
Entrepreneurial actions and opportunities can be perceived to exist in the environment as a result of changes in technology, consumer behaviour and preferences, or to other attributes related to the market or industry context (Venkataraman, 2004). Therefore, to be entrepreneurially orientated in an industry, a business has to offer innovative products, embrace a creative culture and be proactive in identifying industry trends. The entrepreneur must also ensure that his business is competitively positioned in the industry. The entrepreneur must therefore be able to be aggressive in making decisions that involve change of strategy and in adopting new technologies.

A six-item scale was constructed to measure Entrepreneurial Orientation (coded EO). The scale was developed based on work by Clausen and Korneliussen (2012), Short et al. (2010), Idar and Mahmood (2011), Venkataraman (2004), Quince and Whittaker (2003), Shane and Venkataraman (2000) and Lumpkin and Dess (1996).

b) Independent variable: Infrastructural Change (coded IC)

Infrastructural Change in this study refers to entrepreneurial responses to changes in the telecommunications sector in the context of technological advances in the deployment of new infrastructure. Telecommunications advancement globally is driven by infrastructural change. According to the International Telecommunications Union (ITU, 2010b) global demand for higher speed access networks and mobility grows daily. The literature study indicated that factors such as fixed mobile substitution, broadband data and Internet access demand are the catalysts for infrastructural deployment.

New telecommunication infrastructure deployment in South Africa accelerated in recent years due to high consumer demand and inadequate infrastructure development. Driving forces in infrastructure demand have been the granting of Electronic Communications Network Services licenses to over 600 organisations by Icasa (ICASA, 2012). The effect of this decision was that service providers who were previously required to buy their network access from one of the major providers could now build their own networks or choose where they want to buy their access and in return benefit by gaining a competitive advantage.
Entrepreneurs must be able to recognise the opportunities associated with infrastructural change in the telecommunications sector in order to position their businesses more competitively.

Based on work by Tsai et al. (2006) and Venkataraman (2004) a five-item scale was constructed to measure the variable *Infrastructural Change* (coded IC).

c) Independent variable: Sector Transformation (coded SR)

*Sector Transformation* in this study refers to entrepreneurial responses to changes relating to the transformation factors observed in the telecommunications sector, in both the global and South African context. Fast-pace technological innovations and pressure from international organisations have encouraged and accelerated the transition from a publicly-owned incumbent to an increasingly competitive telecommunications sector (Newbery, 2004). Although the South African telecommunications sector lagged in reform, initiatives by the DOC stimulated a faster pace of transformation.

The major benefits associated with sector transformation relate to diminishing monopolies and increase of opportunities for competitors to compete in the industry. The telecommunications sector has been at the forefront of the country’s regulatory and infrastructural reform process and was the first sector to confront some of the inherent tensions within the country’s core policy objectives. These included accelerated sector growth and modernisation, the achievement of universal access/service and the promotion of economic efficiency (Gillwald, 2005; Teljeur et al., 2003). These are all factors which entrepreneurs have to acknowledge identifying new opportunities within the sector that can lead to new business ventures and revenue growth.

Telecommunications sector transformation is a catalyst for new business opportunities. The new Electronic Communications Act, 2005 (ECA) brought about changes in the telecommunications sector and further paved the way for entrepreneurial diffusion in the industry. When entrepreneurial activities increase in
the telecommunications industry the direct result is evident stimulation of competition.

A five-item scale was developed to measure the variable *Sector Transformation* (coded SR) based on the work by Levin and Schmidt (2010), Walsh (2005), Comin and Hohijn (2004), Newbery (2004) and Grant (1998).

d) Independent variable: Regulatory Alignment (coded RL)

In this study *Regulatory Alignment* refers to entrepreneurial responses to the legal aspects of conducting business in the telecommunications sector in South Africa. Entrepreneurial businesses in the telecommunications sector are regulated in terms of the Electronic Communications Act of 2005. The act was formulated by the DOC with the objective of promulgating an effective regulatory environment and to create an environment for more industry players to enter the market. This, in return, will produce more competition. Businesses are expected to remain compliant with the regulations s enforced by the regulatory body, ICASA.

The nature of a technological sector, such as the telecommunications sector in South Africa, requires effective regulation to ensure a stable environment in which to operate. The objectives set by the DOC are to create an environment where competition is stimulated and increased. In return, this objective stimulates and encourages entrepreneurial activity in the telecommunications sector.

Based on the regulatory conditions in South Africa in studies presented by Levin and Schmidt (2010), DOC (2010), Ayogy and Bayat (2010) and Gillwald (2008), a five-item scale was constructed to measure the variable *Regulatory Alignment* (coded RL).

e) Intervening variable: Opportunity Recognition (coded OR)

*Opportunity Recognition* is the second intervening variable used in this study and refers to the ability entrepreneurs possess to identify new opportunities. From the literature, the Entrepreneurial mindset, innovation and experience were identified as the independent variables associated with Opportunity recognition.
Opportunity recognition is a fundamental research issue in entrepreneurship research (Gaglio and Katz, 2001; Shane and Venkataraman, 2000) and is viewed as both an important entrepreneurial capability as well as a source of competitive advantage (Ardichvili et al., 2003). For a business to survive, the owners or management need to be able to identify new opportunities and turn them into profitable, sustainable ventures.

Opportunity recognition is defined in the literature as a cognitive process through which entrepreneurs conclude that they have identified an opportunity (Ardichvili, 2003; Solso, 1999). Entrepreneurs engage in the activities of business opportunity recognition and exploitation to gain strategic competitive advantage, which can be contextualised as both external and internal exploitation (Schwartz and Teach, 2000; Bhave, 1994). The entrepreneur recognises how to refine the opportunity, identify the business concept and then bring the commitment into reality (Schwartz and Teach, 2000).

The ability to spot new opportunities is of the basic nature of an entrepreneur. This ability to recognise new opportunities and turn them into business ventures is mainly dependent on the entrepreneur’s drive to position his business effectively in the industry whilst remaining competitive in his environment. Opportunity recognition is also directly related to first-mover advantage. If an entrepreneur succeeds in turning an opportunity into a business venture, at a faster pace than competitors then increased competitive advantage is achieved.

A five-item scale was developed to measure the intervening variable Opportunity Recognition (coded OR) in the present study based on the work of Ardichvili et al. (2003), Baron and Ensley (2006) and Schwartz and Teach (2000).

f) Independent variable: Entrepreneurial Mindset (coded EM)

For the purpose of this study Entrepreneurial Mindset therefore refers to the ability to identify new opportunities by demonstrating dynamic, flexible and self-regulating attributes when faced with high-technology and uncertain task environments. Haynie et al. (2010) describe the foundation of the entrepreneurial mindset as cognitive
adaptability, which can be described as the ability to be dynamic, flexible and self-regulating in cognitions although task environments are dynamic and uncertain. Entrepreneurs, in general, find it easy to spot new opportunities, based on their mindset and ability to change in uncertain times.

Entrepreneurs find it easy to identify a business opportunity if they apply their minds to the opportunity under consideration and entrepreneurs should be adaptable in their thinking processes. When the rewards are perceived to be high, the entrepreneur should be prepared to take high risks in the business. This stimulates the need for achievement as well as the right mindset to organise resources to achieve competitive advantage. When it comes to organising business, the entrepreneur can set goals and achieve them.


g) Independent variable: Entrepreneurial Innovation (coded EI)

In this study *Entrepreneurial Innovation* refers to entrepreneurial behaviour and approaches towards transforming innovation and creative ideas into successful business ventures. The innovativeness dimension of EO reflects the tendency to engage in and support novelty to create and introduce new products, services, or technology (Lumpkin and Dess, 1996).

The innovative attributes within a business may consist of a broader base of skills and knowledge that can be exploited in building distinctive competences (Li et al., 2009; Zahra and Garvis, 2000). The way in which people conceptualise a problem strongly influences their likelihood of achieving an original or creative solution.

A seven-item scale was constructed to measure the variable *Entrepreneurial Innovation* (coded EI) for use based on the work of Li et al. (2009), Zahra and Garvis (2000) and Lumpkin and Dess (1996).
h) Independent variable: Entrepreneurial Experience (coded EE)

In this study **Entrepreneurial Experience** refers to the ability to take advantage of personal experience in order to improve competitiveness. Entrepreneurs often make business decisions based on their experience in their industries. Based on this experience, the business is better positioned to run effectively and stay abreast with technology.

The telecommunications sector in the literature study is described as a high technology sector. To be technically experienced in the telecommunications industry is an advantage to active entrepreneurs who operate in the sector. The entrepreneur can take advantage of this experience in order to be innovative and identify new opportunities.

Based on the work from Timmons and Spinelli (2007) and Baron and Ensley (2006) a five-item scale was constructed to measure the variable **Entrepreneurial Experience** (coded EE).

i) Intervening variable: Resource Allocation (coded RA)

**Resource Allocation** is the third intervening variable used in this study and refers to the effective deployment of various resources by entrepreneurs in order to be more competitive in the sector. The literature describes Entrepreneurial Leadership, Human Capital and Financial resource allocation as the preceding factors influencing the variable Resource Allocation.

A five-item scale was developed to measure the variable **Resource Allocation** (coded RA) based on the work of Kansikas et al. (2012), Unger et al. (2009), Covin et al. (2006), Wiklund and Shepherd (2005) and Scarborough and Zimmerer (2003).

j) Independent variable: Entrepreneurial Leadership (coded EL)

**Entrepreneurial Leadership**, in this study, refers to entrepreneurial ability to deploy leadership capabilities effectively to gain a competitive advantage. Effective leadership is a critical resource in the entrepreneurial business. Leadership capabilities are tested when market volatility is evident and uncertain conditions
prevail. It is therefore important for the entrepreneur readily to adapt to the
environment. Constructive communication between management and employees is
important and employees in the business must gain confidence in the entrepreneur’s
leadership abilities to follow the vision proposed.

An eight-item scale was developed to measure the intervenient variable
*Entrepreneurial Leadership* (coded EL) in the present study based on the work of

k) Independent variable: Human Capital (coded HC)

In this study *Human Capital* refers to entrepreneurial responses to deploy effectively
human capital in the areas where new opportunities are identified and call for
deployment of human resources to organise skills to take advantage of the
opportunity on hand. Human capital attributes, including education, experience,
knowledge and skills, are a critical resource for success in entrepreneurial business
(Unger et al., 2009).

The literature study indicates that as knowledge-intensive activities in most work
environments constantly increase, the critical role human capital plays in the
entrepreneurial business, at higher levels, in high technological business sectors
becomes more evident (Unger et al., 2009; Bosma et al., 2008). The employees in
the entrepreneurial business contribute effectively to the competitive advantage of a
business. Effective contribution refers to the ability to perform functions best to
increase competitiveness. Entrepreneurs often re-organise their businesses because
effective use of human resources is positively related to a business's successful
implementation of a new venture strategy.

A five-item scale was developed to measure the variable *Human Capital* (coded HC)
in the present study based on the work of Unger et al. (2009), Cassar (2006) and
Shane and Venkataraman (2000).
l) Independent variable: Financial Resources (coded FR)

*Financial Resources*, in this study, refers to the ability of entrepreneurs to effectively deploy financial resources (operational or capital) in order to remain competitive. Access to financial resources, either internal or external, is a key aspect pertaining to business performance. Access to financial resources in order to finance new ventures is beneficial to the entrepreneurial business. Effective use and allocation of financial resources further contributes to the success of the business.

Entrepreneurs involved in risk taking are associated with a willingness to commit more financial resources to projects where the cost of failure may be high (Wiklund and Shepherd, 2005). It also implies committing financially to projects where the outcomes are uncertain. Entrepreneurship largely reflects that the business is willing to break away from the tried-and-true and venture onto uncertain terrain.

A five-item scale for the variable *Financial Resources* (coded FR) was developed based on the work of Muravyev et al. (2009), Covin et al. (2006) and Wiklund and Shepherd (2005).

m) Intervening variable: Strategic Positioning (coded SP)

*Strategic Positioning* is the fourth intervening variable used in this study and refers to the ability by entrepreneurs to arrange resources required to exploit market opportunities by reorganising their businesses (Peteraf and Barney, 2003). In order to reorganise their businesses, entrepreneurs must make multiple, informed choices based on their ability to analyse the information available. Two of the most important choices are: firstly to establish who in a company has the right to make what kind of decisions and secondly to determine the claims of various individuals to the residual cash flows created by exploiting an opportunity (Coff, 1999).

A strategy in this study refers to the decision how to manage the scope of a business and develop competitive advantage through advantage-seeking behaviours. Advantage-seeking behaviour includes balancing resources between exploration and exploitation, seeking continuous streams of innovation and continuous search for opportunities.
When faced with an environment uncertainty, the entrepreneur, sometimes, with limited capability and experience, tends to refer to historical data or relies on limited information to make decisions. For example, the extent to which he understands his environment directly affects entrepreneurial behaviour (Luthans et al., 2000). When faced with environment uncertainty, the entrepreneurial business reacts with more autonomy than non-entrepreneurial businesses and is therefore better able to create innovative products and respond to the unexpected. Therefore, it needs to adopt the best entrepreneurial behaviour for improvements throughout the business for better competitiveness.

The ability to anticipate and then respond strategically to environmental change is one of the important outcomes of effective Strategic Entrepreneurship. Through Strategic Entrepreneurship, the business intends to rely on innovation opportunity and its exploitation as the source of sustainable competitive advantage and effective response to continuous environmental changes. Effective Strategic Entrepreneurial practices allow businesses to adapt to change in an array of newness in the form of innovations.

The telecommunications sector in South Africa is highly regulated and therefore the entrepreneur must explore opportunities how to scan and analyse the legal environment and formulate strategies to gain a competitive advantage. The factors identified in the literature that influence Strategic Positioning include the Legal Alignment, Benchmarking as well as Technological Entrepreneurship aspects.

A five-items scale measured the variable Strategic Positioning (coded SP). The scale was constructed based on the work of Schindehutte and Morris (2009), Ireland et al. (2003), Peteraf and Barney (2003) and Luthans et al. (2000).

n) Independent variable: Legal Alignment (coded LA)

In this study Legal Alignment refers to entrepreneurial responses to align their businesses effectively with legislation in the telecommunications sector in South Africa. Newbery (2004) indicates that rapid technological innovations and pressure from international organisations have encouraged and accelerated the transition
from directly-regulated and publicly-owned incumbents to indirectly regulated and increasingly competitive telecommunications sectors. The share of private ownership among telecommunication operators was expected to continue to increase due to direct legislation (Li and Xu, 2004).

The regulatory body in the telecommunications sector, namely ICASA, regulates and enforces legal mandates as posed by the ECA and the DOC. ICASA’s mandate is spelled out in the Electronic Communications Act for the licensing and regulation of electronic communications and broadcasting services and by the Postal Services Act for the regulation of the postal sector (ICASA, 2012).

The Regulatory Authority’s goal is to ensure that all South Africans have access to a wide range of high quality communication services at affordable prices. Legislation in force therefore empowers ICASA to monitor licensee compliance in respect of licence terms and conditions, develop regulations for the telecommunications sector, plan and manage the radio frequency spectrum as well as protect consumers of these services. Those involved in the Telecommunications Industry in South Africa are expected to obtain and maintain a valid network licence. In order to benefit from infrastructural development, data carrier networks and transmission of signal, a valid licence must be obtained from ICASA. Associated with a licence, an operator is expected to fulfill licensing criteria as stipulated in the ECA of 2005. Inclusion fees are payable to the regulator.

One of the main objectives of legislation in force is to ensure a stable business sector where effective and sufficient competition is introduced. Alignment with the licensing framework, as well as holding a valid network license is therefore beneficial to businesses in the sector.

Based on the legislation framework in South Africa in studies by Ayogy and Bayat (2010), Gillwald (2008), Newbery (2004) and the DOC Report (2010), a five-item scale was constructed to measure the variable *Legal Alignment* (coded LA).
o) Independent variable: Benchmarking (coded BM)

*Benchmarking*, in this study, refers to the abilities entrepreneurs demonstrate to effectively deploy benchmarking techniques in order to adapt to the existing environment by means of expanding the scope of services and various revenue sources (Tölösi and Lajtha, 2000). Financial measures are not sufficient criteria to measure business performance and therefore a combination of financial and non-financial measures to offer a more comprehensive evaluation of business performance measurement is required (Haber and Reichel, 2005; Daily et al., 2002). Subjective non-financial performance measures include indicators such as strategic position, perceived market share, perceived sales growth, customer satisfaction, loyalty and brand equity (Haber and Reichel, 2005).

Benchmarking helps to define the best possible indicators for comparison and to obtain a picture of the company's entire operation (Ahmad and Hoffman, 2008). It is generally assumed that the more efficiently a company operates the more profit it will generate and the more secure its future will be (Ahmad and Hoffman, 2008). Efficiency is therefore more indicative than profitability because it cannot be as easily manipulated to realise short-term objectives. It is expected that an efficient company will:

- Withstand market competition;
- Be less sensitive to unfavourable changes in the environment and
- Be more likely to use indicators to link the best of its short and long-term goals (Tölösi and Lajtha, 2000).

The variable *Benchmarking* (coded BM) item scale was constructed based on the work of Ahmad and Hoffman (2008), Maire et al. (2008), Haber and Reichel (2005), Kyrö (2003), Tölösi and Lajtha (2000). A five-item scale was developed.

p) Independent variable: Technological Entrepreneurship (coded TE)

*Technological Entrepreneurship*, in this study, refers to entrepreneurial responses to operating in a high-technological business environment, in particular the telecommunications sector and is commonly referred to as high-tech entrepreneurs, technical entrepreneurs or technological entrepreneurs. Successful entrepreneurs,
according to Timmons and Spinelli (2007) show not only creative and innovative flair, but also solid management skills, business know-how and sufficient contacts.

Technological entrepreneurship research is about understanding the conditions and factors that lead to the identification and exploitation of opportunity for value creation in the context of technology changes, adoption or opportunities. The process of opportunity search is strongly influenced by the entrepreneur’s background and the environment in which the entrepreneur operates (Phan and Foo, 2004). In the telecommunications sector, the technological entrepreneur is concerned with the technological aspects of the industry. Fast-paced changes in technology require experience and know-how in order to create value.

A five-item scale was developed to measure the variable Technological Entrepreneurship (coded TE) in the present study based on the work of Phan and Foo (2004), Nieman et al. (2003), Phan (2002) and Roberts (1991).

6.4.2 Operationalisation of the dependent variable: Perceived Entrepreneurial Competitiveness (coded EC)

The dependent variable in the theoretical model was identified in this study as Perceived Entrepreneurial Competitiveness in the Telecommunication Sector in South Africa. In this study, Entrepreneurial Competitiveness refers to the ability of entrepreneurs to organise their businesses to be more competitive in the fast-paced telecommunications sector is South Africa, with specific reference to infrastructural development, regulations and sector change. In the new, independent entrepreneurial business, the linkage of technology to markets is the responsibility of everyone, especially of the founder of the company (Phan, 2002). These technological entrepreneurial businesses promote low fixed costs, low overheads, single technology focus and willingness to risk current income for potential returns in capital gains if the investments are successful (Phan, 2002).

The telecommunications sector in South Africa is reshaping at a rapid pace in terms of new infrastructural development, regulations and technological change. The sector is highly competitive and constitutes advanced technological industry
segments (Levin and Schmidt, 2010). The sector further allows for market forces to establish market segmentation and seek competitive industry participation. In the context of the current telecommunications environment in South Africa, entrepreneurial businesses can foster technological change while sustaining lower margins better than larger companies can and endure higher risk levels in this uncertain market sector (IMD, 2012).

The increase in data and infrastructure capacity results in lower telecommunications prices to the consumer (Jackson and Crandall, 2001). Lower prices in return create higher demand for services. The lower price baskets spend per user added pressure to businesses in the industry to be more effective in their strategy so that they can remain competitive. This price basket, together with change in regulations and legislation (Jackson and Crandall, 2001), created an environment where entrepreneurs are forced to rethink their approach in strategy how the changes should be approached (Ireland and Webb, 2009).

The national regulator in South Africa, ICASA, issued electronic network licences during 2009. This enabled licensees to align business activities in order to comply with the Electronic Communications Act of 2005. Incumbent operators, including Telkom, Vodacom, MTN, Neotel and others, commenced with aggressive infrastructure rollout countrywide. The expansion of infrastructure then enabled entrepreneurs who are licence holders to use the opportunity and build their own data networks using wireless and fixed line technologies to become more competitive. Apart from change in technology, competition has also proven to be the most effective agent of adjustment in a telecommunications sector (Engman, Onodera and Wilson, 2006). An independent and competent regulator, however, is regarded paramount to derive the full benefits from competition.

A six-item scale was developed to measure the variable Perceived Entrepreneurial Competitiveness (coded EC) in the present study which was based on based on the various academic resources used to develop the independent and intervening variables and related to competitiveness factors.
6.5 METHOD OF DATA ANALYSIS

Three major criteria for evaluating a measurement tool are: validity, reliability, and practicality. Validity is the extent to which a test measures what it actually intends to measure. Reliability has to do with the accuracy and precision of a measurement procedure. Practicality is concerned with a wide range of factors of economy, convenience and interpretability (Cooper and Schindler, 2007). The validity and reliability of the measuring instrument proposed need to be assessed before proceeding to evaluating the strength of relationships in an empirical model. The statistical techniques, used to test the validity and reliability in this study, are discussed next.

6.5.1 Validity and reliability of the data

According to Cooper and Schindler (2007), validity and reliability are terms used in connection with measuring instruments. The integrity of research is based on the validity and reliability of the study as such and it is important that the study and its subsequent results conform to the requirements of validity and reliability.

6.5.1.2 Validity of the data

The validity of a measuring device refers to whether it measures what it is intended to measure. Collis and Hussey (2009) pose the following questions in terms of questionnaire validity:

- Does the questionnaire measure what it was intended to measure? and
- Did the study reveal accuracy because the requirements of valid research were satisfied?

The researcher, to a considerable extent, determines the validity of the data, as the original definition of the construct is proposed by the researcher and therefore also must be matched to the selected indicators of measures (Hair et al., 2006).

6.5.1.3 Exploratory Factor Analysis (EFA)

In this study, Exploratory Factor Analysis (EFA) was used to assess the discriminant validity of the measuring instrument. EFA is a statistical method used to uncover the
underlying structure of a relatively large set of variables (Hair et al., 2006). EFA is also referred to as a technique whose overarching goal is to identify the underlying relationships between measured variables. EFA is commonly used by researchers when developing a measurement scale to identify a set of latent constructs underlying a battery of measured variables (Blumberg et al., 2008).

The multivariate technique procedures are more accurate when each factor is represented by multiple measured variables in the analysis. There should be at least 3 to 5 measured variables per factor (Garson, 2012). The software application IBM SPSS Version 19.0 for Windows was used to factor analyse the data. The data were pre-examined in order to confirm if they were suitable for factor analysis. The critical assumptions underlying factor analysis were more conceptual than statistical. From a statistical standpoint, the researcher has to ensure that the data matrix has sufficient inter-item correlation to justify the application of factor analysis (Hair et al., 2006).

6.5.1.4 Reliability of the data

The reliability of data refers to the degree of consistency to which the measuring instrument performs (Hair et al., 2006). Apart from producing valid, accurate results the measuring instrument must deliver similar results consistently (Singleton, Straits and Straits, 1993). In this study measurable questions were formulated based on the literature study reported in the previous chapters, which were relevant in the formulation of the theoretical model to promote entrepreneurial competitiveness in the telecommunications sector in South Africa.

The Cronbach-alpha coefficient was calculated to assess the degree of reliability of the variables proposed in the conceptual model. Cronbach’s alpha is a well-known technique to test reliability in a measurement instrument (Garson, 2012). More specifically, alpha is a lower limit for the true reliability of a questionnaire (Garson, 2012). Mathematically, reliability is defined as the proportion of variability in the responses to a survey that is the result of differences in the respondents (Cooper and Schindler, 2007).
Cronbach’s alpha is defined as an objective measure of reliability (Garson, 2012; Hair et al., 2006). Alpha was developed by Lee Cronbach (1951) to provide a measure of the internal consistency of a test or scale and is expressed as a number between 0 and 1. Cronbach’s alpha measures internal consistency in terms of how closely related a set of items is as a group. Internal consistency is concerned with the interrelatedness of a sample of test items (Tavakol and Dennick, 2011). A high value of alpha is often used as evidence that the items measure an underlying or latent construct (Tavakol and Dennick, 2011).

A reliability coefficient result of 0.7 or higher is considered as acceptable by most social science researchers (Garson, 2012; Hair et al., 2006; Cortina, 1993). The computation of Cronbach’s alpha is based on the number of items on the questionnaire measuring a specific construct and the ratio of the average inter-item covariance to the average item variance. Under the assumption that the item variances are all equal, this ratio simplifies to the average inter-item correlation and the result is known as the standardised item alpha (or Spearman-Brown stepped-up reliability coefficient) (Garson, 2012).

In the present study, Cronbach-alpha coefficients were used to measure the degree of reliability of the measuring instrument and were also used to determine which items would be included as measures of specific constructs. For this purpose, the software application SPSS 19.0 for Windows was used to calculate the Cronbach-alpha coefficients of each construct in the theoretical model. After the reliability of the measuring instrument is confirmed, the conceptual model can be subjected to statistical testing.

6.5.2 The technique of Structural Equation Modelling

Chapter 1 discussed the research methodology approach and referred to Structural Equation Modelling (SEM) as the appropriate method to be used in this study for the assessment of the hypothesised relationships in the conceptual theoretical model discussed in Chapter 5. This section describes SEM and the process to assess empirically the proposed theoretical model of Perceived Entrepreneurial Competitiveness in the telecommunications sector in South Africa.
Structural Equation Modelling has been widely used in management literature and appears in many disciplinary fields of study as an evaluation technique (Hooper, Coughlan and Mullen, 2008; Hair et al., 2006). The reasons for using this evaluation technique are twofold: (1) it provides a straight-forward method of dealing with multiple relationships simultaneously, while providing statistical efficiency and (2) it has the ability to assess the relationships comprehensively and provide a transition from exploratory to confirmatory analysis. This transition corresponds to greater efforts in all fields of study toward developing a more systematic and holistic view of problems (Wothke, 2010).

Structural Equation Modelling provides the researcher with the ability to accommodate multiple, interrelated, dependence relationships in a single model. Its closest analogy is multiple regressions, which can estimate only a single relationship at one time (equation), but SEM can be deployed to estimate several relationships simultaneously. The relationships between variables can be interrelated in that the dependent variable in one equation can be an independent variable in other equations. As a result, this technique allows the researcher to model complex relationships that are not possible with any of the other multivariate techniques. SEM is therefore a more advanced and rigorous statistical technique to analyse data compared to multiple regression (Hair et al., 2006).

Structural Equation Modelling is thus a multivariate technique that combines aspects of multiple regression and factor analysis to estimate a series of interrelated dependence relationships (Garson, 2012; Hair et al., 2006). In general, there are two main parts to SEM: the structural model showing potential causal dependencies between endogenous and exogenous variables; and the measurement model showing the relations between the latent variables and their indicators (Garson, 2012; Lee, 2007).

Structural Equation Modelling allows for the examination of a set of relationships between one or more independent variables (IVs), either continuous or discrete and of one or more dependent variables (DVs), either continuous or discrete. Both IV's and DV's can be either measured variables (directly observed) or latent variables (unobserved, not directly observed) (Hair et al., 2006). In conclusion, SEM can be
used as a causal modelling, causal analysis, simultaneous equation modelling, analysis of covariance structures, path analysis, or a confirmatory factor analysis modelling tool (Garson, 2012).

6.5.3 Stages in Structural Equation Modelling

In SEM, the evaluation of model fit is done in two stages consisting of the validation of the measurement model and the validation of the structural model.

The authors (Hair et al., 1998) proposed a 7-stage process to be followed in SEM, namely:

1. Develop a theoretical model;
2. Construct a path-diagram of causal relationships;
3. Convert a path-diagram into a set of structural equations and measurement equations;
4. Choose the input matrix and estimate the proposed model;
5. Assess the identification of model equations;
6. Evaluate the results for goodness of fit and
7. Make the indicated modifications to the model, if theoretically justified (Hair et al., 1998).

The research design in Chapter 6 addressed stage 1 to 3 of the 7-stage process. The dependent variable (*Perceived Entrepreneurial Competitiveness*) as well as the intervening and independent variables were defined earlier in this chapter (see section 6.4.1). The scale development and the operationalisation of each variable were described. Section 6.2 discussed the quantitative testing and analysis which included the population sample (section 6.2.1), the sample size (section 6.2.2) and reflected some of the aspects in stage 3. The above-mentioned 7 stages will be discussed individually before illustrating on how they were implemented in this study.

**Stage 1: Developing a theoretical model**

The process of developing a theoretical model in this study commenced by identifying the factors influencing the dependent variable, by using the literature review and then by using Structural Equation Modelling to test the propositions. Each
variable in the model is conceptualised as a latent variable and then measured by multiple indicators (Garson, 2008). SEM is “based on causal relationships in which the change in one variable is assumed to result in a change in another variable” (Hair, Anderson, Tatham and Black, 1998:592).

The conceptual model presented in Chapter 5 was subjected to empirical testing. The numerous factors influencing the dependent variable, namely Perceived Entrepreneurial Competitiveness were presented and hypothesised influences suggested.

Stage 2: Constructing a path diagram of causal relationships

A path diagram is a method described as portraying relationships which are helpful to depict a series of relationships (Hair et al., 1998). In constructing a path diagram of dependence relationships, the hypothesised relationships, among the constructs included in the theoretical models under investigation, can be portrayed with such a path diagram (Hair et al., 2006). Hair et al. (2006) indicate that constructing path diagrams is a convenient way of portraying a model in visual form.

A path diagram allows the researcher not only to present the predictive relationships amongst constructs (i.e. the independent-dependent variable relationships), but also the associative relationships (correlations) amongst constructs and even indicators (Hair et al., 1998). Latent variables are also referred to as constructs in SEM. Constructs are also known as unobserved variables or factors (the independent-dependent variable relationships). Latent variables are measured by their respective observed indicators (questionnaire items) and may include independent, intervening and dependent variables (Garson, 2008). When portrayed in a model, an ellipsis form represents constructs and rectangles represent observed variables (Cooper and Schindler, 2007).

In a path diagram, a straight arrow denotes a relationship between one construct and another, while a curved arrow denotes a correlation between latent constructs. A straight arrow with two head ends indicates a reciprocal relationship between constructs. A variable that is not predicted or “caused” by another variable in the
model is referred to as an exogenous construct, also known as source; independent or predictor variables and no arrows will point to these constructs from other constructs (Lee, 2007). A variable that is predicted or caused by any other construct in the model is called an endogenous or dependent construct where one or more arrows will point to these constructs (Hair et al., 2006).

Intervening variables are described as variables which are both effects of other exogenous or intervening variables and are causes of other intervening and dependent variables. Endogenous variables can be both intervening variables and pure dependent variables (Garson, 2008). The path diagrams proposed for this study will be presented in Chapter 7.

Stage 3: Converting a path diagram into a set of structural equations and measurement equations

Stage 2 described the construction of the path diagram. Once completed, it becomes necessary to specify the model in more formal terms by means of sets of equations. The equations define the structural, linking constructs, the measurement model and a set of matrices that indicate the hypothesised relationships between the constructs or variables. The objective is to link operational definitions of constructs mathematically to theory to precede the appropriate empirical test (Hair et al., 1998).

Two models are commonly associated with SEM, namely, the measurement model and the structural model (Hair et al., 2006). A measurement model specifies which variables measure which latent constructs. A structural model, however, involves assigning relationships between latent variables based on the proposed theoretical model (Wothke, 2010; Hair et al., 2006). The process is then followed by specifying a set of matrices indicating any hypothesised correlations amongst constructs/variables. Figures 6.1 and 6.2 are examples of path diagrams to be converted into structural equations.

Hair et al. (2006) further indicate that the objective is to link the operational definitions of the variables to theory, in order to apply to appropriate empirical tests. In the structural model, each hypothesised, correlations effect of an exogenous
construct on an endogenous construct, or an endogenous construct on another endogenous construct is expressed as an equation.

For each equation a structural coefficient (b) is estimated and an error term (€) is included to provide for the sum of the effects of specification and random selection error. This equation formulation is illustrated in Figure 6.2.

Source: Hair et al. 1998:595

\[
\begin{align*}
Y_1 &= b_1X_1 + b_2X_2 + \epsilon_1 \\
Y_2 &= b_3X_2 + b_4X_3 + b_5Y_1 + \epsilon_2 \\
Y_3 &= b_6Y_1 + b_7Y_2 + \epsilon_3
\end{align*}
\]

Source: Hair et al. 1998:597
It can be seen from Figures 6.1 and 6.2 that the exogenous variables \(X_1\) and \(X_2\) have an effect on the endogenous variable \(Y_1\). This provision is made for the measurement and specification error \(E_1\) of the magnitude \(b_1\) and \(b_2\). The endogenous variable \(Y_2\) in turn is influenced (coefficients, \(b_3\) and \(b_4\)) by the exogenous variables \(X_2\) and \(X_3\) and the endogenous variable \(Y_1\) whilst provision is made for the measurement and specification error \(E_2\). The endogenous variable \(Y_3\) is influenced by endogenous variables \(Y_1\) and \(Y_2\), to the extent of \(B_6\) and \(B_7\), with a measurement and specification error term \(E_3\) (Hair et al., 1998).

Stage 4: Choosing the input matrix and estimating the proposed model

SEM can use either a covariance- or a correlation matrix as its input matrix (Hair et al., 2006). In the case of confirmatory factor analysis, either type of input matrix can be used; but as the objective is an exploration of the pattern of relationships across respondents, correlations are the preferred input data type which then activates the correlation of the covariance matrix of all the indicators in the model (Hair et al., 2006). The measurement model then determines the strength of the measurement between manifest and latent variables. In doing so, the structural coefficients will then quantify the relationships between the latent variables (Wothke, 2010).

When the structural and measurement models have been specified and the input data decided upon, the computer software application for estimation is then chosen. The software application LISREL (Linear Structural Relations) version 8.80 (Jöreskog and Sörbom, 2006) was used in the current study. Hair et al. (1998) state that, because of the estimation procedure, constructs must be made scale-invariant in order that the indicators be standardised to compare the constructs. Two approaches are used for this procedure, firstly, to set one of the loadings in each construct to the fixed value of 1.0 and secondly to estimate the construct variance directly. This approach results in the same estimates, but for theory testing purposes, the second approach is recommended (Hair et al., 1998).

Stage 5: Assessing the identification of model equations

During stage 5, the research analyst assesses whether the software application could have possibly produced any meaningless or illogical results in the identification
of the structural model (Hair et al., 1998). Hair et al. (2006) postulate that if such identification problems occur, researchers should first look at the three areas of possible causes:

- There could be a large number of estimated coefficients relative to the number of variances or correlations which are indicated by a small number of degrees of freedom;
- The use of reciprocal effects (two-way causal arrows between two constructs) and
- Failure to fix the scale of a construct.

The solution to an identification problem is to eliminate some of the estimated coefficients by subjecting the model to more constraints. In doing so, a structured process should be followed by adding more constraints and by deleting paths from the path diagram until the problem is rectified. The objectives are to achieve an over-identified model that has degrees of freedom available to provide a better estimation of the true relationships (Hair et al., 1998).

Stage 6: Evaluating the results for goodness of fit

Evaluating the empirical results is the first action required in order to identify offending estimates (Hair et al., 1998). Once it has been established that the model provides acceptable estimates, the goodness-of-fit results can be evaluated for the overall model and thereafter separately inspected for the measurement and the structural models. The evaluation of the goodness-of-fit results is an assessment of the extent to which the data and the theoretical models meet the assumptions of SEM. These assumptions includes that the observations were independent. A random sampling of respondents was conducted and all relationships were linear (Hair et al., 2006).

There are three types of goodness-of-fit measures, namely: (1) absolute fit measures, (2) incremental fit measures and (3) parsimonious fit measures (Hair et al., 2006). The absolute fit measures assess the overall model fit (both structural and measurement models collectively) with no adjustment for the degree of over-fitting that might occur. Incremental fit measures compare the proposed model to another
model specified by the researcher. In order to determine the amount of fit by the estimated coefficients, parsimonious fit measures adjust the measures of fit to provide comparisons between models with differing numbers of estimated coefficients (Hair et al., 2006).

During this evaluation stage, an assessment is made of the overall fit of the proposed model of factors that influence perceived entrepreneurial competitiveness in the telecommunications sector in South Africa. Chapter 7 provides an assessment for this purpose and will reflect the results of the absolute fit measures based on the Robust Maximum Likelihood estimation method. This choice implies that the purpose of the statistical analyses was focused on assessing relationships rather than to obtain good model fit.

One way to establish both measurement and structural model validity is goodness of fit. There are several fit measures assessing different aspects of model fit, categorised as absolute fit indices and incremental fit indices. Hair et al. (2006) recommend the following goodness of fit indices to be reported for both measurement model and structural model fit: Chi square, Degrees of freedom, one absolute fit (goodness of fit index (GFI)), one incremental fit index (normed fit index (NFI) and a badness of fit index (root mean square error of approximation (RMSEA)).

**Stage 7: Making modifications to the model**

During this final stage, results should be examined for their correspondence to the proposed theory (Hair et al., 1998). This includes modifying the proposed conceptual model to find a better fit and interpretation of the results. The objective should be to maximise the fit and estimate the most likely relationships between variables (Cooper and Schindler, 2007). Modifications to the model also include a process of adding or removing estimated parameters from the original conceptual model.

When modifications to the model is considered, the researcher must ensure is that the principal relationships in the theory are still supported even if the modifications should be found statistically significant. Modifications should be theoretically justified and deemed empirically significant (Hair, et al., 2006). Hair et al. (2006) suggest that
individual parameter estimates representing each hypothesis must also be examined in order to support a proposed structural theory as goodness of fit alone is not sufficient to support a proposed structural theory. A theoretical model is supported and considered valid to the extent in which the parameter estimates are statistically significant and also in the predicted direction (Hair et al., 2006).

6.6 SOFTWARE PACKAGES

Even though SEM, as a method for measuring relationships among unobserved variables, has been around since early in the 20th century, it was not until Bagozzi published his monograph in 1980 that researchers acknowledged SEM as a reliable statistical tool (Shah and Goldstein, 2006). Today, it has become a well-known technique. Several textbooks (Garson, 2012; Hair et al., 2006; Kline, 2005) have been published and different software applications for computers have been developed (example Amos, MPIUS, LISREL and EQS). This has made SEM a more user-friendly and accessible analytic method for use by non-statisticians (Shah and Goldstein, 2006).

Although the software is user-friendly and computes all the complex calculations for the user, it also requires that the user knows the assumptions underlying the application of the method as well as how to apply and report it correctly. The path diagrams in this study (as discussed in Figures 7.1, 7.2 and 7.3) will be converted to structural equations and measurement models by using the software application LISREL version 8.80 (Jöreskog and Sörbom, 2006).

6.7 SUMMARY

Chapter 6 provided a detailed description of the processes to pre-test the proposed conceptual model. Research Question RQ7 and research objective RO6 were addressed in this chapter. The population studied was described, as well as the sampling unit and sampling technique. The variables were operationalised with clear and concise definitions and an explanation was also provided of how the measuring instrument was developed and administered.
The demographic information pertaining to respondents was summarised. The statistical analysis, performed to ensure the validity and reliability of the results, was explained. The statistical techniques used to measure the influence of demographic variables on the intervening and dependent variables were also identified and outlined.

Finally, a description of the Structural Equation Modelling (SEM) technique, used to verify the proposed conceptual model, was given. Chapter 7 will discuss the results of the various statistical analysis results.
CHAPTER 7

EMPIRICAL RESULTS

7.1 INTRODUCTION

In Chapters 2 to 4, the literature study discussed the identified factors believed to influence the dependent variable. In Chapter 5, a conceptual model was proposed and the hypotheses discussed. Chapter 6 discussed the research design and methodology used to investigate the factors influencing entrepreneurial competitiveness in the telecommunications sector in South Africa. Chapter 7 now reports the empirical results. Research Question RQ7 and research objective RO7 are addressed in this chapter.

The research problem in Chapter 1 was stated as: **Entrepreneurs face the problem of identifying the factors that influence competitiveness in the telecommunications sector in South Africa.** The dependent variable in the proposed model was proposed as **Perceived Entrepreneurial Competitiveness.**

The factors influencing entrepreneurial competitiveness were discussed in Chapter 5 and defined as **Entrepreneurial Orientation, Infrastructural Change, Sector Transformation, Regulatory Alignment, Opportunity Recognition, Entrepreneurial Mindset, Entrepreneurial Innovation, Entrepreneurial Experience, Resource Allocation, Entrepreneurial Leadership, Human Capital, Financial Resources, Strategic Positioning, Regulatory Alignment, Benchmarking and Technological Entrepreneurship.** The interrelationships hypothesised are shown as the proposed model and were presented in Chapter 5 (see Figure 5.1).

This chapter will report the empirical results and will start with demographic information. A discussion on exploratory factor analysis (EFA) will follow.
## 7.2 DEMOGRAPHIC INFORMATION

Demographic information was obtained from the last section of the questionnaire and was summarised. The reported data in Table 7.1 indicates that the demographic data represents the realised sample as well as the population identified for this study.

<table>
<thead>
<tr>
<th>Question</th>
<th>FREQUENCY</th>
<th>PERCENT</th>
<th>CUMULATIVE FREQUENCY</th>
<th>CUMULATIVE PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is your gender?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>273</td>
<td>90.7%</td>
<td>273</td>
<td>90.7%</td>
</tr>
<tr>
<td>Female</td>
<td>28</td>
<td>9.3%</td>
<td>301</td>
<td>100</td>
</tr>
<tr>
<td>What is your Age?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>17</td>
<td>5.64</td>
<td>17</td>
<td>5.65</td>
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<tr>
<td>26-35</td>
<td>90</td>
<td>29.90</td>
<td>107</td>
<td>35.55</td>
</tr>
<tr>
<td>36-45</td>
<td>122</td>
<td>40.53</td>
<td>229</td>
<td>76.08</td>
</tr>
<tr>
<td>46-55</td>
<td>61</td>
<td>20.27</td>
<td>290</td>
<td>96.35</td>
</tr>
<tr>
<td>55+</td>
<td>11</td>
<td>3.65</td>
<td>301</td>
<td>100.00</td>
</tr>
<tr>
<td>What is your home language?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>209</td>
<td>69.44</td>
<td>209</td>
<td>69.44</td>
</tr>
<tr>
<td>Afrikaans</td>
<td>78</td>
<td>25.91</td>
<td>287</td>
<td>95.35</td>
</tr>
<tr>
<td>Zulu</td>
<td>3</td>
<td>1.00</td>
<td>290</td>
<td>96.35</td>
</tr>
<tr>
<td>Xhosa</td>
<td>3</td>
<td>1.00</td>
<td>293</td>
<td>97.35</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>2.65</td>
<td>301</td>
<td>100</td>
</tr>
<tr>
<td>To what ethnic group do you belong?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>11</td>
<td>3.65</td>
<td>11</td>
<td>3.65</td>
</tr>
<tr>
<td>Indian</td>
<td>29</td>
<td>9.63</td>
<td>40</td>
<td>13.28</td>
</tr>
<tr>
<td>White</td>
<td>253</td>
<td>84.05</td>
<td>293</td>
<td>97.33</td>
</tr>
<tr>
<td>Coloured</td>
<td>5</td>
<td>1.66</td>
<td>298</td>
<td>99.00</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>1</td>
<td>301</td>
<td>100.00</td>
</tr>
<tr>
<td>I own the business where I presently work</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>209</td>
<td>69.44</td>
<td>209</td>
<td>69.44</td>
</tr>
<tr>
<td>No</td>
<td>92</td>
<td>30.56</td>
<td>301</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Currently, the telecommunications sector is based on dominantly male occupancy. The majority of the completed and usable questionnaires were completed by males (273), representing 90.7% of the population. The age group varied from 18 years to over 55 years in age, with the majority of respondents represented between the ages 26 to 55. The age group 36-45 represented the highest figure of respondents at 40.53%. From the results, it is observed that 76.08% of the respondents are younger
than 45 years. It is noted that 81.73% of the respondents started new businesses whilst 18.27% bought into existing ventures.

The majority of respondents started a business as a result of greater potential, financial benefits or the challenge they perceived in starting a business. This represents 71% of the respondents. Technological knowledge is a major driver in the telecommunications sector (Baum and Wally, 2003). From the demographic report it can be seen that 70% of the respondents indicated that existing technology (i.e. processes, service methodology etc.) was transferred from their previous employer to their new business. From the demographic information, it was accepted that the respondents are representative of the population for this study.

7.3 DISCRIMINANT VALIDITY OF THE RESEARCH INSTRUMENT

Exploratory factor analysis was conducted to identify the potential, underlying dimensions or factors in the data and to assess the discriminant validity of the instruments used to measure these factors. The discriminant validity of the constructs in the theoretical model was confirmed and where necessary redefined.

After the reliability of these constructs has been confirmed by means of a Cronbach-alpha coefficient analysis, the theoretical model proposed in Chapter 5 will be revised to reflect only those constructs that demonstrate sufficient discriminate validity and reliability. The relationships between these factors will be presented in a path diagram and converted into a structural model for which the path coefficients of the relations will be estimated. An assessment of the goodness-of-fit of the theoretical model to the empirical data will then be undertaken. The relationships between various input and process constructs will then be assessed.

The correlations between variables were also analysed by computing the partial correlations between variables, therefore, the correlations between variables were taken into account. The small partial correlations indicated that valid factors existed in the data because the variables were explained by the factors (variates with loadings for each variable).
When a large set of variables is factored, the method first extracts the combinations of variables explaining the greatest amount of variance and then proceeds to combinations that account for smaller amounts of variance (Hair et al., 2006). In order to determine how many factors to extract, a combination of several criteria were used, namely, the Eigenvalues, the Percentage of Variance criterion and the Screen Test Criterion (Hair et al., 2006, 1998).

The first step, to assess the degree of reliability and validity in the data, was taken by performing factor analysis on the data. The EFA process also included the identification of sub-model constructs. It was decided to divide the conceptual theoretical model presented in Chapter 5 in two sub-models. In the sections below, the measures of factor-analysability as well as the discriminant validity and reliability will be reported for the sub-models. From the results, subsequent factors will be identified. The factor structures for each sub-model will also be tabled. Two sub-models (Sub-Model A and Sub-Model B) were identified from the factor analysis and will be discussed in the next section. The sub-models are represented in Figures 7.1 and 7.2 respectively.
The purpose of EFA conducted was to confirm whether the data contained different underlying dimensions of entrepreneurial competitiveness. The method of factor extraction is based on whether there is an expectation that the underlying constructs can be correlated or not. It was expected that the constructs would be correlated in both sub-models and therefore Principal Axis Factoring with an Oblimin (Oblique) Rotation was specified as the extraction and rotation method. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett’s test of Sphericity was used to assess the factor-analysability of the data. On initial analysis, visual inspection of the correlations revealed a substantial number of correlations greater than 0.40, indicating that factor analysis was appropriate (Hair et al., 2006).

In determining the number of factors (constructs) to extract for each sub-model, Eigenvalues, the Percentage of Variance explained, and the individual factor loading were considered. Initially the number of factors to be extracted was not specified, but the Eigenvalues (> 1.0) suggested a total of five factors for Sub-Model A whilst six factors for Sub-Model B should be used as the intervening variables. This solution was reached through an iterative process of deleting items that did not demonstrate sufficient discriminant validity and by repeating the factor analysis process until all the remaining items loaded to a significant extent (p > 0.4) with no cross-loadings (i.e. loaded on only one factor). All items with loadings < 0.4 were deleted. The most
interpretable factor structure is presented in Table 7.1 for Sub-Model A and Table 7.2 for Sub-Model B in section 7.5.

7.4 RELIABILITY OF THE RESEARCH INSTRUMENT

Reliability of the research instrument refers to the assessment of the degree of consistency between multiple measurements of a variable. The aim is to ensure that responses are not too varied at different points in time (Hair et al., 2006). In Chapter 6 Cronbach’s alpha was defined as a type of reliability estimate or coefficient of internal consistency and was used to assess the internal consistency of the measuring instrument in the present study. A Cronbach-alpha coefficient of greater than 0.70 was used in this study to indicate a reliable factor confirmed to be the acceptable norm in various other studies (Hair et al., 2006, 1998). The results are tabled in the section 7.5.

7.5 DISCRIMINANT VALIDITY AND RELIABILITY

7.5.1 Sub-Model A: Entrepreneurial Orientation / Opportunity Recognition

The intervening variables in the first sub-model, namely Entrepreneurial Orientation/Opportunity Recognition were assessed for discriminant validity by using the Principal Axis Factoring extraction method with a direct Quantimin Oblique Rotation. The results of the factor analysis for this sub-model are reported in Table 7.2 and followed by the individual factor analysis results.

Five factors were extracted from the sub-model presented in Table 7.2, namely Entrepreneurial Mindset (coded EMINDSET), Regulatory Alignment (coded REGULATE), Sector Transformation (coded SREFORM), Infrastructural Change (coded INFRASTR) and Entrepreneurial Experience (coded EXPERIEN).

All items from the extracted five factors loaded significantly (> 0.4) on only one factor for the Sub-Model A. The five factors explained 61% of the variance in the data. Bartlett’s Test of Sphericity was significant and a Kaiser-Meyer-Olkin (KMO) value of 0.748 (p < 0.001) indicates that the data are factor-analysable.
Table 7.2 Rotated factor loadings: Intervening variables - Sub-Model A

<table>
<thead>
<tr>
<th>ITEM</th>
<th>FACTOR</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EMINDSET</td>
<td>REGULATE</td>
<td>SREFORM</td>
<td>INFRAS</td>
<td>EXPERIEN</td>
<td></td>
</tr>
<tr>
<td>EE43</td>
<td>0.785</td>
<td>-0.013</td>
<td>-0.044</td>
<td>-0.089</td>
<td>0.140</td>
<td></td>
</tr>
<tr>
<td>EM27</td>
<td>0.733</td>
<td>0.024</td>
<td>-0.003</td>
<td>-0.013</td>
<td>-0.053</td>
<td></td>
</tr>
<tr>
<td>EM31</td>
<td>0.662</td>
<td>-0.011</td>
<td>0.018</td>
<td>0.077</td>
<td>-0.079</td>
<td></td>
</tr>
<tr>
<td>EM28</td>
<td>0.533</td>
<td>-0.006</td>
<td>0.036</td>
<td>0.043</td>
<td>0.114</td>
<td></td>
</tr>
<tr>
<td>RL21</td>
<td>0.046</td>
<td>0.765</td>
<td>-0.056</td>
<td>-0.039</td>
<td>-0.036</td>
<td></td>
</tr>
<tr>
<td>RL20</td>
<td>0.055</td>
<td>0.707</td>
<td>0.041</td>
<td>-0.044</td>
<td>0.023</td>
<td></td>
</tr>
<tr>
<td>RL18</td>
<td>-0.038</td>
<td>0.662</td>
<td>-0.009</td>
<td>0.077</td>
<td>0.004</td>
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<tr>
<td>RL17</td>
<td>-0.054</td>
<td>0.545</td>
<td>-0.053</td>
<td>0.039</td>
<td>-0.037</td>
<td></td>
</tr>
<tr>
<td>RL19</td>
<td>0.011</td>
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<td>0.091</td>
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<td>0.050</td>
<td></td>
</tr>
<tr>
<td>SR16</td>
<td>0.043</td>
<td>-0.002</td>
<td>0.747</td>
<td>0.030</td>
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<td></td>
</tr>
<tr>
<td>SR13</td>
<td>-0.068</td>
<td>-0.037</td>
<td>0.686</td>
<td>-0.012</td>
<td>0.043</td>
<td></td>
</tr>
<tr>
<td>SR15</td>
<td>-0.006</td>
<td>0.049</td>
<td>0.680</td>
<td>0.050</td>
<td>0.011</td>
<td></td>
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<td>SR12</td>
<td>0.000</td>
<td>0.019</td>
<td>0.665</td>
<td>0.008</td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>SR14</td>
<td>0.028</td>
<td>-0.010</td>
<td>0.467</td>
<td>-0.036</td>
<td>-0.035</td>
<td></td>
</tr>
<tr>
<td>IC10</td>
<td>-0.071</td>
<td>0.011</td>
<td>-0.014</td>
<td>0.834</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>IC11</td>
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<td>IC09</td>
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<td>-0.079</td>
<td>0.026</td>
<td>0.768</td>
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<tr>
<td>EE39</td>
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<td>-0.003</td>
<td>0.075</td>
<td>-0.008</td>
<td>0.740</td>
<td></td>
</tr>
<tr>
<td>EE42</td>
<td>-0.076</td>
<td>-0.057</td>
<td>0.000</td>
<td>-0.006</td>
<td>0.652</td>
<td></td>
</tr>
<tr>
<td>EE41</td>
<td>0.067</td>
<td>0.096</td>
<td>-0.065</td>
<td>0.056</td>
<td>0.586</td>
<td></td>
</tr>
</tbody>
</table>

Table 7.2 indicates that a total of 20 items was loaded on five distinct factors and this explains a variance of 61% in the data. Underlined loadings represent significant loadings (p ≥ 0.4). Sufficient evidence of discriminant validity of the construct Sub-Model A is therefore provided. The next step is to describe each of the factors.

**Factor 1: Entrepreneurial Mindset (coded EMINDSET)**

The factor *Entrepreneurial Mindset* was measured by 3 out of the initial 5 items. The item EE43 intended to measure the factor EMINDSET, unexpectedly loaded on the factor EMINDSET and was thus regarded as an additional measure of EMINDSET. The factor EMINDSET explains 18.2% of the variance in data and the 4 items expected to measure the construct *Entrepreneurial Mindset* loaded together on one
factor. *Entrepreneurial Mindset* returned an Eigenvalue of 3.635 as reported in Table 7.2.1.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM27</td>
<td>I find it easy to identify a business opportunity</td>
<td>.733</td>
<td>.598</td>
<td>.716</td>
</tr>
<tr>
<td>EM28</td>
<td>When it comes to business I am adaptable in my thinking</td>
<td>.533</td>
<td>.520</td>
<td>.757</td>
</tr>
<tr>
<td>EM31</td>
<td>When it comes to business, I can set goals and achieve them</td>
<td>.662</td>
<td>.562</td>
<td>.738</td>
</tr>
<tr>
<td>EE43</td>
<td>I can identify new business opportunities based on my experience</td>
<td>.785</td>
<td>.670</td>
<td>.679</td>
</tr>
</tbody>
</table>

The four items returned an acceptable Cronbach-alpha coefficient of 0.778 and therefore indicate that the instrument used to measure this construct is reliable. The item EE43 was also regarded as a measure of *Entrepreneurial Mindset*. It was decided to leave the operationalisation (definition) of *Entrepreneurial Mindset*, as per Chapter 5, unchanged. For the purpose of this study *Entrepreneurial Mindset* refers to the ability to identify new opportunities, be dynamic, flexible and self-regulating in cognitions when given dynamic and uncertain task environments. The items EM29, EM30 and EM32 did not demonstrate sufficient discriminant validity as expected and were excluded from further analysis.

**Factor 2: Regulatory Alignment (coded REGULATE)**

All the initial 5 items, expected to measure *Regulatory Alignment*, loaded as expected. The factor REGULATE explains 13.2% of the variance in data and the six items expected to measure the construct *Regulatory Alignment* loaded together on one factor. *Regulatory Alignment* returned an Eigenvalue of 2.630 as displayed in Table 7.2.2. The Cronbach-alpha coefficient returned a value 0.774 and therefore indicates that the instrument used to measure this construct is reliable.
Table 7.2.2 Factor 2 - Regulatory Alignment (REGULATE)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>RL17</td>
<td>The South African telecommunications sector is properly regulated</td>
<td>.545</td>
<td>.465</td>
<td>.759</td>
</tr>
<tr>
<td>RL18</td>
<td>Compliance with the Electronic Communications Act of 2005 results in a more competitive business environment</td>
<td>.662</td>
<td>.577</td>
<td>.724</td>
</tr>
<tr>
<td>RL19</td>
<td>Strict regulation in the telecommunications sector is necessary</td>
<td>.531</td>
<td>.471</td>
<td>.761</td>
</tr>
<tr>
<td>RL20</td>
<td>Telecommunications regulations in South Africa stimulates competition</td>
<td>.707</td>
<td>.599</td>
<td>.714</td>
</tr>
<tr>
<td>RL21</td>
<td>The telecommunications sector in South Africa is highly competitive because of effective regulation</td>
<td>.765</td>
<td>.633</td>
<td>.703</td>
</tr>
</tbody>
</table>

As all the items loaded on the factor REGULATE as expected, it was decided to leave the operationalisation (definition) of Regulatory Alignment, as stated Chapter 5, unchanged. For the purpose of this study Regulatory Alignment refers to entrepreneurial responses to align their businesses effectively with the regulatory environment in the telecommunications sector in South Africa.

Factor 3: Sector Transformation (coded SREFORM)

All the items expected to measure the factor loaded onto Sector Transformation as expected. The factor SREFORM explains 12.3% of the variance in data. Sector Transformation returned an Eigenvalue of 2.467 as displayed in Table 7.2.3. The instrument used to measure this construct is reliable because the five items returned an acceptable Cronbach alpha coefficient of 0.785.

All five items loaded on the factor Sector Transformation as expected; therefore the operationalisation (definition) of Sector Transformation, as in Chapter 5, remains unchanged. For the purpose of this study, Sector Transformation refers to
entrepreneurial responses to changes related to the transformation factors observed in the telecommunications sector in South Africa.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR12</td>
<td>The telecommunications sector has changed in the past 5 years</td>
<td>.665</td>
<td>.578</td>
<td>.740</td>
</tr>
<tr>
<td>SR13</td>
<td>Telecommunications sector reform is a catalyst for new business opportunities</td>
<td>.686</td>
<td>.588</td>
<td>.735</td>
</tr>
<tr>
<td>SR14</td>
<td>The new Electronic Communications Act of 2005 (ECA) brought about changes in the telecommunications sector</td>
<td>.467</td>
<td>.415</td>
<td>.788</td>
</tr>
<tr>
<td>SR15</td>
<td>Sector reform stimulates competition in the telecommunications industry</td>
<td>.680</td>
<td>.589</td>
<td>.735</td>
</tr>
<tr>
<td>SR16</td>
<td>Reform in the telecommunications sector opened new opportunities for my business in the past 5 years</td>
<td>.747</td>
<td>.637</td>
<td>.717</td>
</tr>
</tbody>
</table>

**Factor 4: Infrastructural Change (coded INFRASTR)**

The factor *Infrastructural Change* was measured by 3 out of the original 5 items. The factor INFRASTR explains 10.137% of the variance in data and the 3 items expected to measure *Infrastructural Change* loaded together on one factor. *Infrastructural Change* returned an Eigenvalue of 2.273 as reported in Table 7.2.4. The three items returned an acceptable Cronbach-alpha coefficient of 0.848 and therefore indicate that the instrument used to measure this construct is reliable.

As 3 out of 5 the items loaded onto *Infrastructural Change*, it was decided to leave the operationalisation (definition) of *Infrastructural Change*, as in Chapter 5, unchanged. For the purpose of this study, *Infrastructural Change* refers to entrepreneurial responses to changes in the telecommunications sector in context of
technological advances in deployment of new infrastructure. The items IC7 and IC8 did not load as expected and were excluded from further analysis due to poor discriminant validity.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC9</td>
<td>Telecommunications infrastructural changes have an effect on my business</td>
<td>.768</td>
<td>.702</td>
<td>.800</td>
</tr>
<tr>
<td>IC10</td>
<td>My business adapted to new infrastructural technologies in this past year</td>
<td>.834</td>
<td>.722</td>
<td>.784</td>
</tr>
<tr>
<td>IC11</td>
<td>The adoption of new infrastructure technologies makes my business more competitive</td>
<td>.812</td>
<td>.727</td>
<td>.779</td>
</tr>
</tbody>
</table>

Table 7.2.4 Factor 4- Infrastructural Change (INFRASTR)

| Eigenvalue : 2.273 | % of Variance: 10.137 | Cronbach-alpha : 0.848 |

Factor 5: Entrepreneurial Experience (coded EXPERIEN)

The factor **Entrepreneurial Experience** was measured by 3 out of the initial 5 items. The Factor EXPERIEN explains 7.019% of the variance in data and the 3 items expected to measure the construct *Entrepreneurial Experience* loaded together on one factor. *Entrepreneurial Experience* returned an Eigenvalue of 1.404 as displayed in Table 7.2.5. The three items returned an acceptable Cronbach-alpha coefficient of 0.710 and therefore indicate that the instrument used to measure this construct is reliable.

Although only 3 out of 5 items loaded on the factor *Entrepreneurial Experience*, it was decided that the operationalisation (definition) of *Entrepreneurial Experience*, as in Chapter 5, will remain unchanged. For the purpose of this study *Entrepreneurial Experience* refers to the ability to take advantage of personal experience in order to improve competitiveness. The items EE40 and EE43 did not load as expected and were excluded from further analysis.
When the outcomes of the factor analysis are taken into consideration, there is sufficient evidence supporting both the discriminant validity and reliability for the Sub-Model A.

### 7.5.2 Sub-Model B: Resource Allocation / Strategic Positioning

The variables in the second Sub-Model B, namely *Resource Allocation/Strategic Positioning* were assessed for discriminant validity by means of an exploratory factor analysis, using the Principal Axis Factoring extraction method with a direct Quantumin Oblique Rotation. The results of the factor analysis for this sub-model are reported in Table 7.3 and are followed by an individual factor analysis results.

Seven factors were extracted for Sub-Model B which implies that one latent variable namely *Human Capital* had to be deleted from the structural model. The items used to measure the factor *Human Capital* reported a Cronbach-alpha lower than 0.7 (see Table 7.3.6). Although reported in this section, the factor HUMANC will be excluded from the SEM model formulation.

As illustrated in Table 7.3, a newly identified factor emerged, namely *Entrepreneurial Management*. The factors extracted in Sub-Model B are *Financial Resources* (coded FINANCE), *Legal Alignment* (coded LEGAL), *Technological Entrepreneurship*...
(coded TECHNO), Benchmarking (coded BENCHMARK), Entrepreneurial Leadership (coded LEADERS), Human Capital (coded HUMANC) and Entrepreneurial Management (coded MANAGE).

Table 7.3 Rotated factor loadings: Intervening variables - Sub-Model B

<table>
<thead>
<tr>
<th>ITEM</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FINANCE</td>
<td>LEGAL</td>
<td>TECHNO</td>
<td>BENCHMARK</td>
<td>LEADERS</td>
<td>HUMANC</td>
<td>MANAGE</td>
</tr>
<tr>
<td>FR65</td>
<td>.863</td>
<td>-.041</td>
<td>.036</td>
<td>-.013</td>
<td>.105</td>
<td>-.013</td>
<td>.059</td>
</tr>
<tr>
<td>FR66</td>
<td>.787</td>
<td>.014</td>
<td>.011</td>
<td>-.018</td>
<td>.105</td>
<td>.114</td>
<td>-.084</td>
</tr>
<tr>
<td>FR64</td>
<td>.567</td>
<td>.002</td>
<td>.038</td>
<td>.045</td>
<td>-.060</td>
<td>-.129</td>
<td>.193</td>
</tr>
<tr>
<td>LA76</td>
<td>-.017</td>
<td>.698</td>
<td>.129</td>
<td>.005</td>
<td>-.142</td>
<td>-.103</td>
<td>.037</td>
</tr>
<tr>
<td>LA75</td>
<td>-.051</td>
<td>.636</td>
<td>.018</td>
<td>.084</td>
<td>-.025</td>
<td>-.052</td>
<td>.117</td>
</tr>
<tr>
<td>LA73</td>
<td>.109</td>
<td>.630</td>
<td>-.160</td>
<td>-.011</td>
<td>.110</td>
<td>.070</td>
<td>-.082</td>
</tr>
<tr>
<td>LA74</td>
<td>-.100</td>
<td>.588</td>
<td>.035</td>
<td>-.035</td>
<td>-.045</td>
<td>-.055</td>
<td>-.020</td>
</tr>
<tr>
<td>LA72</td>
<td>.079</td>
<td>.476</td>
<td>-.066</td>
<td>-.019</td>
<td>.080</td>
<td>.157</td>
<td>-.063</td>
</tr>
<tr>
<td>TE84</td>
<td>-.071</td>
<td>-.002</td>
<td>.817</td>
<td>-.019</td>
<td>.083</td>
<td>.119</td>
<td>.098</td>
</tr>
<tr>
<td>TE82</td>
<td>-.032</td>
<td>-.009</td>
<td>.631</td>
<td>.004</td>
<td>-.034</td>
<td>.031</td>
<td>-.046</td>
</tr>
<tr>
<td>TE85</td>
<td>.087</td>
<td>.047</td>
<td>.587</td>
<td>.034</td>
<td>.089</td>
<td>-.068</td>
<td>.029</td>
</tr>
<tr>
<td>TE83</td>
<td>.053</td>
<td>-.065</td>
<td>.523</td>
<td>-.023</td>
<td>-.120</td>
<td>.033</td>
<td>-.113</td>
</tr>
<tr>
<td>BM70</td>
<td>.026</td>
<td>-.045</td>
<td>-.047</td>
<td>.670</td>
<td>-.056</td>
<td>-.025</td>
<td>.036</td>
</tr>
<tr>
<td>BM81</td>
<td>.038</td>
<td>.058</td>
<td>.031</td>
<td>.587</td>
<td>-.028</td>
<td>.029</td>
<td>-.048</td>
</tr>
<tr>
<td>BM77</td>
<td>-.019</td>
<td>.024</td>
<td>.039</td>
<td>.545</td>
<td>.059</td>
<td>.066</td>
<td>-.026</td>
</tr>
<tr>
<td>BM79</td>
<td>-.035</td>
<td>.019</td>
<td>.038</td>
<td>.541</td>
<td>-.005</td>
<td>.017</td>
<td>.011</td>
</tr>
<tr>
<td>BM78</td>
<td>.004</td>
<td>-.051</td>
<td>-.054</td>
<td>.504</td>
<td>.006</td>
<td>-.042</td>
<td>-.004</td>
</tr>
<tr>
<td>EL56</td>
<td>-.137</td>
<td>.012</td>
<td>.016</td>
<td>.027</td>
<td>-.933</td>
<td>.008</td>
<td>.057</td>
</tr>
<tr>
<td>EL50</td>
<td>.098</td>
<td>.054</td>
<td>.008</td>
<td>-.004</td>
<td>-.601</td>
<td>-.098</td>
<td>.125</td>
</tr>
<tr>
<td>EL53</td>
<td>.081</td>
<td>-.019</td>
<td>-.045</td>
<td>.006</td>
<td>-.589</td>
<td>.182</td>
<td>-.049</td>
</tr>
<tr>
<td>HC57</td>
<td>-.066</td>
<td>-.021</td>
<td>.002</td>
<td>.059</td>
<td>.022</td>
<td>.761</td>
<td>.073</td>
</tr>
<tr>
<td>HC60</td>
<td>.154</td>
<td>.035</td>
<td>.021</td>
<td>.046</td>
<td>-.023</td>
<td>.512</td>
<td>.175</td>
</tr>
<tr>
<td>FR63</td>
<td>.007</td>
<td>-.003</td>
<td>.127</td>
<td>-.037</td>
<td>-.158</td>
<td>.464</td>
<td>.032</td>
</tr>
<tr>
<td>EL51</td>
<td>.027</td>
<td>-.005</td>
<td>-.065</td>
<td>-.009</td>
<td>-.024</td>
<td>.006</td>
<td>.822</td>
</tr>
<tr>
<td>EL54</td>
<td>.048</td>
<td>.005</td>
<td>-.010</td>
<td>.006</td>
<td>-.056</td>
<td>.091</td>
<td>.688</td>
</tr>
<tr>
<td>HC58</td>
<td>-.110</td>
<td>-.018</td>
<td>.057</td>
<td>-.116</td>
<td>-.051</td>
<td>.230</td>
<td>.527</td>
</tr>
</tbody>
</table>

EIGENVALUE | 4.245 | 2.588 | 2.338 | 2.115 | 1.771 | 1.459 | 1.138 |

The seven factors illustrated in Table 7.2 explained 64% of the variance in the data. Bartlett’s Test of Sphericity was significant and a Kaiser-Meyer-Olkin (KMO) value of 0.689 (p < 0.001) indicates that the data are factor-analysable. All items loaded to a significant extent (> 0.4) on only one factor and there was no evidence of cross
loadings. Sufficient evidence of discriminant validity of the construct Sub-Model B is therefore provided. The results of the factor analysis for this sub-model are reported in Table 7.3 followed by the individual factor analysis results.

**Factor 6 - Financial Resources (coded FINANCE)**

The factor *Financial Resources* was measured by 3 out of the initial 5 items. The factor FINANCE explains 16.33% of the variance in data and the three items, expected to measure the construct *Financial Resources*, loaded together on one factor. *Financial Resources* returned an Eigenvalue of 4.245 as displayed in Table 7.3.1. The acceptable Cronbach-alpha coefficient of 0.80 for the 3 items suggests that the instrument used to measure this construct is reliable.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR64</td>
<td>My business is financially sound</td>
<td>.567</td>
<td>.556</td>
<td>.812</td>
</tr>
<tr>
<td>FR65</td>
<td>I have access to finances to convert new ideas into products</td>
<td>.787</td>
<td>.724</td>
<td>.635</td>
</tr>
<tr>
<td>FR66</td>
<td>My business has access to financial resources for capital expenditure</td>
<td>.863</td>
<td>.665</td>
<td>.703</td>
</tr>
</tbody>
</table>

Although only 3 items loaded on the factor *Financial Resources* the operationalisation (definition) of *Financial Resources*, as in Chapter 5, will remain unchanged. For the purpose of this study *Financial Resources* refers to entrepreneurial responses to effectively deploy financial resources (operational or capital) in order to remain competitive. The items FR62 and FR63 did not load as expected and were excluded from further analysis for reasons of poor discriminant validity.

**Factor 7 - Legal Alignment (coded LEGAL)**

Table 7.3.2 displays the results for the factor LEGAL. All the initial 5 items measured *Legal Alignment* and loaded to a significant extent as expected. The factor LEGAL explains 9.96% of the variance in data and the five items expected to measure the
construct Legal Alignment loaded together on one factor. Legal Alignment returned an Eigenvalue of 2.588.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA72</td>
<td>The competitiveness of my business is aligned to the regulatory environment in South Africa</td>
<td>.476</td>
<td>.415</td>
<td>.719</td>
</tr>
<tr>
<td>LA73</td>
<td>The Electronic Communications Act (ECA) creates a stable environment in which my business can operate</td>
<td>.630</td>
<td>.533</td>
<td>.674</td>
</tr>
<tr>
<td>LA74</td>
<td>It is an advantage to my business to comply with the Electronic Communications Act of 2005</td>
<td>.588</td>
<td>.477</td>
<td>.696</td>
</tr>
<tr>
<td>LA75</td>
<td>It can benefit my business to be an ECNS and iECNS licensee</td>
<td>.636</td>
<td>.520</td>
<td>.680</td>
</tr>
<tr>
<td>LA76</td>
<td>Legislation in the telecommunications sector is necessary to ensure a stable business environment</td>
<td>.698</td>
<td>.541</td>
<td>.672</td>
</tr>
</tbody>
</table>

Table 7.3.2 Factor 7 - Legal Alignment (LEGAL)

The acceptable Cronbach-alpha coefficient of 0.74 for the factor LEGAL suggests that the instrument used to measure this construct is reliable as reported in Table 7.3.2. As expected, all 5 items loaded onto Legal Alignment and therefore the operationalisation (definition) of Legal Alignment, as in Chapter 5, remains unchanged. For the purpose of this study Legal Alignment refers to entrepreneurial responses to the legal aspects of conducting business in the telecommunications sector in South Africa.

Factor 8 - Technological Entrepreneurship (coded TECHNO)

Table 7.3.3 reports the results for factor TECHNO. Of the initial 5 items, only 4 loaded on the factor Technological Entrepreneurship. The factor TECHNO explains 8.99% of the variance in data. The factor Technological Entrepreneurship returned
an Eigenvalue of 2.338. The 4 items returned an acceptable Cronbach-alpha coefficient of 0.725 and therefore indicate that the instrument used to measure this construct is reliable.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE82</td>
<td>My business operates in a hi-tech environment</td>
<td>.631</td>
<td>.523</td>
<td>.661</td>
</tr>
<tr>
<td>TE83</td>
<td>It is my responsibility to identify technological changes in the telecommunications market</td>
<td>.523</td>
<td>.465</td>
<td>.695</td>
</tr>
<tr>
<td>TE84</td>
<td>My business is likely to adapt to technological changes in the future</td>
<td>.817</td>
<td>.642</td>
<td>.595</td>
</tr>
<tr>
<td>TE85</td>
<td>I can foster technological change and sustain lower margins at the same time in the changing telecommunications sector</td>
<td>.587</td>
<td>.453</td>
<td>.706</td>
</tr>
</tbody>
</table>

Although only 4 out of 5 items loaded onto Technological Entrepreneurship it was decided that the operationalisation (definition) of Technological Entrepreneurship, as in Chapter 5, will remain unchanged. For the purpose of this study Technological Entrepreneurship refers to entrepreneurial responses to operating in a high-technology business environment, in particular the telecommunications sector and is commonly referred to as high-tech entrepreneurs, technical entrepreneurs or technological entrepreneurs.

**Factor 9 - Benchmarking (coded BENCHMARK)**

The factor Benchmarking was measured by all five items. The factor BENCHMARK explains 8.14% of the variance in data and the five items expected to measure the construct Benchmarking loaded together on one factor. Benchmarking returned an Eigenvalue of 2.115. The 5 items returned an acceptable Cronbach-alpha coefficient
of 0.701 and therefore indicate that the instrument used to measure this construct is reliable as displayed in Table 7.3.4.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM77</td>
<td>My business analyses the telecommunications industry</td>
<td>.545</td>
<td>.447</td>
<td>.657</td>
</tr>
<tr>
<td>BM78</td>
<td>I know what my competitors do</td>
<td>.504</td>
<td>.396</td>
<td>.676</td>
</tr>
<tr>
<td>BM79</td>
<td>The business offers competitively-priced products and/or services</td>
<td>.541</td>
<td>.447</td>
<td>.661</td>
</tr>
<tr>
<td>BM80</td>
<td>I use external benchmarking indicators to analyse the industry</td>
<td>.670</td>
<td>.532</td>
<td>.619</td>
</tr>
<tr>
<td>BM81</td>
<td>My business performance is measured and compared against industry norms</td>
<td>.587</td>
<td>.483</td>
<td>.642</td>
</tr>
</tbody>
</table>

Table 7.3.4 Factor 9 - Benchmarking (BENCHMARK)

As all 5 items loaded onto Benchmarking as expected, the operationalisation (definition) of Benchmarking, as in Chapter 5, therefore will remain unchanged. For the purpose of this study Benchmarking refers to entrepreneurial responses to effectively deploy benchmarking techniques which adapt to the current changing environment by expanding the scope of services and by varying revenue sources and by increasing competitiveness (Tölösi and Lajtha, 2000).

**Factor 10 - Entrepreneurial Leadership (coded LEADERS)**

Only three items, expected to measure the variable Entrepreneurial Leadership, loaded as expected. The factor LEADERS explains 6.81% of the variance in data and the three items expected to measure the construct Entrepreneurial Leadership loaded together on one factor. Entrepreneurial Leadership returned an Eigenvalue of 1.771 as displayed in Table 7.3.5. The 3 items returned an acceptable Cronbach-alpha coefficient of 0.744 and therefore indicate that the instrument used to measure this construct is reliable.
Although only 3 out of the initial 5 items loaded on the factor Entrepreneurial Leadership, the operationalisation (definition) of Entrepreneurial Leadership, as in Chapter 5, will remain unchanged. For the purpose of this study Entrepreneurial Leadership refers to entrepreneurial ability to effectively deploy leadership capabilities in order to gain competitive advantage. The items EL51, EL52, EL54 and EL55 did not load as expected and were excluded from further analysis.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL50</td>
<td>I adapt easily to an uncertain situation</td>
<td>.601</td>
<td>.552</td>
<td>.692</td>
</tr>
<tr>
<td>EL53</td>
<td>The employees in the business have confidence in my leadership abilities</td>
<td>.589</td>
<td>.512</td>
<td>.732</td>
</tr>
<tr>
<td>EL56</td>
<td>I have the ability to lead the business in uncertain times</td>
<td>.933</td>
<td>.689</td>
<td>.567</td>
</tr>
</tbody>
</table>

**Factor 11 - Human Capital (coded HUMANC)**

The factor Human Capital was measured by only 2 out of the initial 5 items. The item FR63 unexpectedly loaded with the factor Human Capital. Item F63 was thus regarded as a third item measure of the latent variable Human Capital. Factor HUMANC explains 4.37% of the variance in data and the four items are expected to measure the construct Human Capital loaded together on one factor. Human Capital returned an Eigenvalue of 1.459 as reported in Table 7.3.6.

The Cronbach-alpha coefficient for Human Capital of 0.663 is below the accepted 0.7 reliability level. The factor HUMANC is therefore removed. The item FR643 correlated with Human Capital and does not represent significant proof of the reliability of the factor. The operationalisation (definition) of Human Capital in context with this study as reported in Chapter 5 will therefore be excluded from further analysis.
Table 7.3.6 Factor 11 - Human Capital (HUMANC)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC57</td>
<td>Employees are a critical resource to ensure the business' success</td>
<td>.761</td>
<td>.492</td>
<td>.551</td>
</tr>
<tr>
<td>HC60</td>
<td>Human capital directly affects my approach to the utilisation of opportunities</td>
<td>.512</td>
<td>.487</td>
<td>.555</td>
</tr>
<tr>
<td>FR63</td>
<td>Access to financial capital is beneficial to my business</td>
<td>.464</td>
<td>.453</td>
<td>.594</td>
</tr>
</tbody>
</table>

Factor 12 - Entrepreneurial Management (coded MANAGE)

Although not initially expected, the items EL51, EL54 and HC58 loaded as a separate factor. The question items loading on this factor were revisited and Entrepreneurial Management was identified as a new factor. The factor MANAGE explains 4.16% of the variance in data and the four items expected to measure the construct Entrepreneurial Management loaded together on one factor. Entrepreneurial Management returned an Eigenvalue of 1.138 as displayed in Table 7.3.7

Table 7.3.7 Factor 12 - Entrepreneurial Management (MANAGE)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL51</td>
<td>My business deploys human resources effectively</td>
<td>.822</td>
<td>.666</td>
<td>.684</td>
</tr>
<tr>
<td>HC58</td>
<td>The employees contributes effectively to the business' competitive advantage</td>
<td>.688</td>
<td>.574</td>
<td>.781</td>
</tr>
<tr>
<td>EL54</td>
<td>Constructive communication between management and employees is important in my business</td>
<td>.527</td>
<td>.667</td>
<td>.683</td>
</tr>
</tbody>
</table>
The 3 items returned an acceptable Cronbach-alpha coefficient of 0.793 and therefore indicate that the instrument used to measure this construct is reliable. The items EL51, EL54 and HC58 loaded with the new factor MANAGE and were thus regarded as a measure of the latent variable *Entrepreneurial Management*. Three items loaded on the factor *Entrepreneurial Management* and the operationalisation (definition) of *Entrepreneurial Management* refer to the managerial skills used to effectively manage and deploy resources where required, to achieve competitive advantage.

When the outcomes of the factor analysis are taken into consideration, there is sufficient evidence supporting both the discriminant validity and reliability for the Sub-Model B.

**7.5.3 Rotated factor loadings: Intervening variables**

The intervening variables were assessed for discriminant validity by using the Principal Axis Factoring extraction method with a direct Quantumin Oblique Rotation. The results of the factor analysis for the intervening variables are reported in Table 7.4 and followed by the individual factor analysis results.

The factors are reported in Table 7.4 *Entrepreneurial Orientation* (coded ORIENT), *Opportunity Recognition* (coded RECOGNISE), *Resource Allocation* (coded RESOURCE) and *Strategic Positioning* (coded STRATEGIC).

The four factors representing the Intervening variables explained 58% of the variance in the data. Bartlett's Test of Sphericity returned, was significant and a Kaiser-Meyer-Olkin (KMO) value of 0.741 (p < 0.001) indicated that the data are factor-anlysable.
Table 7.4 Rotated factor loadings: Intervening variables

<table>
<thead>
<tr>
<th>ITEM</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ORIENT</td>
<td>RECOGNISE</td>
<td>RESOURCE</td>
<td>STRATEGIC</td>
</tr>
<tr>
<td>EO3</td>
<td>.724</td>
<td>-.050</td>
<td>-.019</td>
<td>-.062</td>
</tr>
<tr>
<td>EO5</td>
<td>.659</td>
<td>.042</td>
<td>.001</td>
<td>.021</td>
</tr>
<tr>
<td>EO4</td>
<td>.620</td>
<td>.007</td>
<td>.012</td>
<td>-.010</td>
</tr>
<tr>
<td>EO6</td>
<td>.545</td>
<td>.003</td>
<td>.039</td>
<td>.062</td>
</tr>
<tr>
<td>EO1</td>
<td>.487</td>
<td>.002</td>
<td>-.004</td>
<td>-.007</td>
</tr>
<tr>
<td>OR22</td>
<td>.058</td>
<td>.740</td>
<td>.018</td>
<td>-.004</td>
</tr>
<tr>
<td>OR23</td>
<td>-.021</td>
<td>.739</td>
<td>-.026</td>
<td>-.034</td>
</tr>
<tr>
<td>OR26</td>
<td>-.054</td>
<td>.538</td>
<td>-.036</td>
<td>.065</td>
</tr>
<tr>
<td>OR24</td>
<td>.062</td>
<td>.451</td>
<td>.034</td>
<td>-.115</td>
</tr>
<tr>
<td>RA46</td>
<td>-.044</td>
<td>-.050</td>
<td>.699</td>
<td>.047</td>
</tr>
<tr>
<td>RA48</td>
<td>.007</td>
<td>-.054</td>
<td>.599</td>
<td>.009</td>
</tr>
<tr>
<td>RA44</td>
<td>-.054</td>
<td>-.032</td>
<td>.547</td>
<td>-.033</td>
</tr>
<tr>
<td>RA45</td>
<td>.050</td>
<td>.112</td>
<td>.542</td>
<td>.034</td>
</tr>
<tr>
<td>RA47</td>
<td>.135</td>
<td>.025</td>
<td>.422</td>
<td>-.060</td>
</tr>
<tr>
<td>SP67</td>
<td>-.027</td>
<td>-.016</td>
<td>-.032</td>
<td>-.892</td>
</tr>
<tr>
<td>SP68</td>
<td>-.111</td>
<td>.127</td>
<td>.114</td>
<td>-.556</td>
</tr>
<tr>
<td>SP69</td>
<td>.009</td>
<td>.050</td>
<td>-.015</td>
<td>-.548</td>
</tr>
<tr>
<td>SP70</td>
<td>.047</td>
<td>-.054</td>
<td>-.024</td>
<td>-.431</td>
</tr>
</tbody>
</table>

**EIGENVALUE** 2.232 2.612 1.808 1.546

**Factor 13 - Entrepreneurial Orientation (coded ORIENT)**

Only 5 of the 6 items expected to measure the construct *Entrepreneurial Orientation* loaded together on this factor. The factor ORIENT explains 17.95 % of the variance in data. *Entrepreneurial Orientation* returned an Eigenvalue of 2.232 as displayed in Table 7.4.1. The 5 items returned an acceptable Cronbach-alpha coefficient of 0.740 and therefore suggest that the instrument used to measure this construct is reliable.

Although only 5 out of the initial 6 items loaded onto *Entrepreneurial Orientation* as expected, the operationalisation (definition) of *Entrepreneurial Orientation* per Chapter 5, remains unchanged. For the purpose of this study *Entrepreneurial Orientation* refers to the overall participation of entrepreneurs in the telecommunications sector in South Africa. The item EO2 did not load as expected and was excluded from further analysis.
Factor 14 - Opportunity Recognition (coded RECOGNIS)

Opportunity Recognition was measured by 4 out of the initial 5 items. The factor RECOGNISE explains 14.51% of the variance in data and the four items expected to measure the construct Opportunity Recognition loaded together on one factor. Opportunity Recognition returned an Eigenvalue of 2.612 as displayed in Table 7.4.2. The acceptable Cronbach-alpha coefficient of 0.711 for the factor RECOGNISE suggests that the instrument used to measure this construct is reliable.

Table 7.4.1 Factor 13 - Entrepreneurial Orientation (ORIENT)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EO1</td>
<td>My business is entrepreneurial in nature</td>
<td>.724</td>
<td>.420</td>
<td>.727</td>
</tr>
<tr>
<td>EO3</td>
<td>My business is proactive in identifying industry trends</td>
<td>.659</td>
<td>.597</td>
<td>.666</td>
</tr>
<tr>
<td>EO4</td>
<td>My business is competitively positioned in the industry</td>
<td>.620</td>
<td>.514</td>
<td>.694</td>
</tr>
<tr>
<td>EO5</td>
<td>My business is aggressive in making decisions that involve change of strategy</td>
<td>.545</td>
<td>.540</td>
<td>.684</td>
</tr>
<tr>
<td>EO6</td>
<td>My business is aggressive in adopting new technologies</td>
<td>.487</td>
<td>.470</td>
<td>.713</td>
</tr>
</tbody>
</table>

Table 7.4.2 Factor 14 - Opportunity Recognition (RECOGNISE)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR22</td>
<td>I often spot new business opportunities</td>
<td>.740</td>
<td>.600</td>
<td>.534</td>
</tr>
<tr>
<td>OR23</td>
<td>My ability to identify new opportunities leads to new business initiatives</td>
<td>.739</td>
<td>.588</td>
<td>.552</td>
</tr>
<tr>
<td>OR24</td>
<td>For my business to survive I must be able to identify new opportunities</td>
<td>.538</td>
<td>.362</td>
<td>.673</td>
</tr>
<tr>
<td>OR26</td>
<td>I have a systematic process that is used to identify new opportunities</td>
<td>.451</td>
<td>.403</td>
<td>.706</td>
</tr>
</tbody>
</table>
Although only 4 out of 5 items loaded on the factor *Opportunity Recognition*, it was decided that the operationalisation (definition) *Opportunity Recognition*, as in Chapter 5, remains unchanged. For the purpose of this study *Opportunity Recognition* refers to the cognitive process through which entrepreneurs conclude that they have identified an opportunity (Ardichvili, 2003; Solso, 1999). The item OR25 did not load as expected and was excluded from further analysis.

**Factor 15 - Resource Allocation (coded RESOURCE)**

All five items used to measure the latent variable *Resource Allocation* loaded as expected. The factor RESOURCE explains 10.04% of the variance in data. *Resource Allocation* returned an Eigenvalue of 1.808 as reported in Table 7.4.3.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA44</td>
<td>When I spot new business opportunities then my business resources need to be re-arranged in order to turn them into business ventures</td>
<td>.547</td>
<td>.435</td>
<td>.663</td>
</tr>
<tr>
<td>RA45</td>
<td>My business allows the employees to recognise new opportunities and turn them into new business ventures</td>
<td>.542</td>
<td>.461</td>
<td>.653</td>
</tr>
<tr>
<td>RA46</td>
<td>My business continually rearranges resources (material, human and financial) in order to remain competitive</td>
<td>.699</td>
<td>.527</td>
<td>.623</td>
</tr>
<tr>
<td>RA47</td>
<td>My business can attract the resources required to be competitive</td>
<td>.422</td>
<td>.395</td>
<td>.678</td>
</tr>
<tr>
<td>RA48</td>
<td>The re-arrangement of my business resources have to accommodate changes in the telecommunications sector</td>
<td>.599</td>
<td>.476</td>
<td>.646</td>
</tr>
</tbody>
</table>
As all 5 items loaded onto Resource Allocation as expected, the operationalisation (definition) of Resource Allocation, as in Chapter 5, therefore will remain unchanged. For the purpose of this study Resource Allocation refers to the process of organising resources (material, human and financial) (Shane, 2003; Bonnell and Gold, 2002; Schumpeter, 1934). The organisation of resources is crucial in the sense that it is what brings everything together and leads to the establishment and competitiveness of a business (Shane, 2003; Bonnell and Gold, 2002; Schumpeter, 1934).

**Factor 16 - Strategic Positioning (coded STRATEGIC)**

Only four of the six items measured Strategic Positioning. The factor STRATEGIC explains 8.59% of the variance in data. Strategic Positioning returned an Eigenvalue of 1.546 as reported in Table 7.4.4.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP67</td>
<td>I actively pursue business opportunities to gain a strategic competitive advantage</td>
<td>-.892</td>
<td>.465</td>
<td>.625</td>
</tr>
<tr>
<td>SP68</td>
<td>My business benefits from new opportunities I identify</td>
<td>-.556</td>
<td>.332</td>
<td>.701</td>
</tr>
<tr>
<td>SP69</td>
<td>My business follows a strategic plan to gain competitive advantage</td>
<td>-.548</td>
<td>.647</td>
<td>.506</td>
</tr>
<tr>
<td>SP70</td>
<td>My business develops partnerships with other companies</td>
<td>-.431</td>
<td>.467</td>
<td>.619</td>
</tr>
</tbody>
</table>

The four items returned an acceptable Cronbach-alpha coefficient of 0.7 which indicates that the instrument used to measure this construct is reliable. The four items loaded on the factor STRATEGIC as expected and the operationalisation (definition) of Strategic Positioning, as in Chapter 5, remains unchanged. For the purpose of this study, Strategic Positioning refers to the ability which entrepreneurs demonstrate to create, manage and arrange resources required to exploit market opportunities by re-organising their businesses (Alvarez, 2005; Peteraf and Barney, 2003).
All the latent variables in this section of the model were measured with instruments that demonstrated sufficient evidence of discriminant validity and reliability. When the outcomes of the factor analysis are taken into consideration, there is sufficient evidence supporting both the discriminant validity and reliability for the independent variables.

7.5.4 Rotated factor loadings: Dependent variable (coded COMPETE)

The dependent variable *Perceived Entrepreneurial Competitiveness* was tested for uni-dimensionality by means of EFA. The number of factors to be extracted was not specified. The factor therefore is reported in Table 7.5 as *Perceived Entrepreneurial Competitiveness* (coded as COMPETE).

<table>
<thead>
<tr>
<th>ITEM</th>
<th>FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COMPETE</td>
</tr>
<tr>
<td>EC89</td>
<td>.539</td>
</tr>
<tr>
<td>EC90</td>
<td>.495</td>
</tr>
<tr>
<td>EC91</td>
<td>.449</td>
</tr>
<tr>
<td>EC87</td>
<td>.747</td>
</tr>
<tr>
<td>EC88</td>
<td>.699</td>
</tr>
</tbody>
</table>

A single factor was extracted as expected, which confirmed the uni-dimensionality of the dependent variable. Bartlett’s Test of was significant and a Kaiser-Meyer-Olkin (KMO) value of 0.738 (p < 0.001) confirmed that the data are factor-analysable.

**Factor 17 - Perceived Entrepreneurial Competitiveness (coded COMPETE)**

One item expected to measure the latent variable *Perceived Entrepreneurial Competitiveness* did not load to a significant extent and was deleted. The factor COMPETE explains 47.66% of the variance in data. *Perceived Entrepreneurial Competitiveness* returned an Eigenvalue of 2.383 as shown in Table 7.5.1.

The operationalisation (definition) of *Perceived Entrepreneurial Competitiveness*, as stated in Chapter 5, remains unchanged. For the purpose of this study *Perceived Entrepreneurial Competitiveness* refers to the ability which entrepreneurs
demonstrate to align their businesses and remain competitive in the fast-paced telecommunications sector in South Africa, with specific reference to infrastructural development, regulations and technological change. The 5 items returned an acceptable Cronbach-alpha coefficient of 0.720 which indicates that the instrument used to measure this construct is reliable.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Question</th>
<th>Factor Loading</th>
<th>Item-total correlation</th>
<th>Cronbach-alpha after deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC87</td>
<td>The effective adoption of new infrastructural technologies makes my business more competitive</td>
<td>.747</td>
<td>.588</td>
<td>.625</td>
</tr>
<tr>
<td>EC88</td>
<td>Effective adoption to change in the telecommunications sector enhances the competitiveness of my business</td>
<td>.699</td>
<td>.566</td>
<td>.636</td>
</tr>
<tr>
<td>EC89</td>
<td>The effective adaptation to new telecommunications regulations allows my business to compete more effectively</td>
<td>.449</td>
<td>.452</td>
<td>.684</td>
</tr>
<tr>
<td>EC90</td>
<td>My business is more competitive because we identify new opportunities and turn them into new ventures</td>
<td>.495</td>
<td>.408</td>
<td>.698</td>
</tr>
<tr>
<td>EC91</td>
<td>Deployment of skilled workers gives my business a competitive advantage</td>
<td>.449</td>
<td>.391</td>
<td>.707</td>
</tr>
</tbody>
</table>

When the outcomes of the factor analysis are taken into consideration, there is sufficient evidence supporting both the discriminant validity and reliability for the factor COMPETE.

### 7.6 Revised Theoretical Models

The proposed theoretical model as developed from the literature was presented in Figure 5.1. As a result of the factor analyses, the original theoretical model depicted
in Figure 5.1 and the hypotheses defined in Chapter 5 had to be revised. Figure 7.3 portrays the revised theoretical model. This revised theoretical model and subsequent hypotheses are subjected to further testing in the remainder of the study.

The exploratory factor analyses performed in this chapter were unable to confirm all the latent variables as originally intended in the theoretical model. The original latent variable *Entrepreneurial Leadership* split into two factors, which were subsequently named *Entrepreneurial Leadership* and *Entrepreneurial Management*. Some items from the deleted variables did, however, load on other factors in the exploratory factor analysis.
Items from the latent variable *Human Capital* loaded on the factor *Entrepreneurial Management*. The latent variable *Human Capital* was removed from the model after the assessment of the discriminant validity and reliability of the items used to measure the various constructs in the model. The latent variable *Entrepreneurial Innovation* was removed as the discriminant validity could not be confirmed by the exploratory factor analysis.

The hypotheses originally formulated in Chapter 5 are revised and summarised in the next section.

**7.7 REFORMULATION OF THE HYPOTHESES**

This section discusses the revised hypotheses that will be discussed in the remainder of this study. Table 7.6 describes the revised hypothesis to be tested in the structural model.

<table>
<thead>
<tr>
<th>Table 7.6 Revised hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H^1$</td>
</tr>
<tr>
<td>$H^{1a}$</td>
</tr>
<tr>
<td>$H^2$</td>
</tr>
<tr>
<td>$H^{2a}$</td>
</tr>
<tr>
<td>$H^3$</td>
</tr>
<tr>
<td>$H^{3a}$</td>
</tr>
<tr>
<td>$H^4$</td>
</tr>
<tr>
<td>$H^{4a}$</td>
</tr>
<tr>
<td>$H^5$</td>
</tr>
<tr>
<td>$H^{5a}$</td>
</tr>
<tr>
<td>$H^6$</td>
</tr>
<tr>
<td>$H^{6a}$</td>
</tr>
</tbody>
</table>
Table 7.6 Revised hypotheses (continued)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H^7</td>
<td>There is a positive relationship between Entrepreneurial Management and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H^7a</td>
<td>There is a positive relationship between Entrepreneurial Management and Resource Allocation</td>
</tr>
<tr>
<td>H^8</td>
<td>There is a positive relationship between Financial Resources and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H^8a</td>
<td>There is a positive relationship between Financial and Resource Allocation</td>
</tr>
<tr>
<td>H^9</td>
<td>There is a positive relationship between Legal Alignment and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H^9a</td>
<td>There is a positive relationship between Legal Alignment and Strategic Positioning</td>
</tr>
<tr>
<td>H^10</td>
<td>There is a positive relationship between Benchmarking and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H^10a</td>
<td>There is a positive relationship between Benchmarking and Strategic Positioning</td>
</tr>
<tr>
<td>H^11</td>
<td>There is a positive relationship between Technological Entrepreneurship and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H^11a</td>
<td>There is a positive relationship between Technological Entrepreneurship and Strategic Positioning</td>
</tr>
<tr>
<td>H^12</td>
<td>There is a positive relationship between Strategic Positioning and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H^13</td>
<td>There is a positive relationship between Resource Allocation and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H^14</td>
<td>There is a positive relationship between Opportunity Recognition and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H^15</td>
<td>There is a positive relationship between Entrepreneurial Orientation and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
</tbody>
</table>

After the reliability and discriminant validity of all the variables remaining in the empirical model had been confirmed, the statistical technique Structural Equation Modelling was used to test the series of relationships of the revised model of Figure 7.3.

7.7.1 Assessment of the normality of the data

The distributional nature of the data influences the estimation procedure when implementing SEM (Hair et al., 2006). If the data report sufficient evidence of normality then Maximum Likelihood Estimation method (MLE) should be used. Should the data not demonstrate sufficient evidence of normality, then Robust Maximum Likelihood (RML) is recommended to be used for estimation of the parameters. Robust Maximum Likelihood compensates for the non-normality of the data (Boomsma, 2000; Satorra and Bentler, 1994).
The normality of the data was assessed by means of a test of multivariate normality in the present study. The software application LISREL 8.8 (Jöreskog and Sörbom, 2006) was used for this purpose. Figure 7.2 describes the Structural Model Estimation for this study.

7.7.2 Assessment of multivariate normality

To assess the multivariate normality of the data the following null hypothesis was considered:

$H^0$: The data distribution is a multivariate normal distribution
$H^1$: The data distribution is not a multivariate normal distribution

The results of the Chi-Square test are shown as follow:

<table>
<thead>
<tr>
<th>Sub-Model A</th>
<th>Chi-Square=902.79, df=442, P-value=0.00000, RMSEA=0.059</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sub-Model B</th>
<th>Chi-Square=945.394, df=558, P-value=0.00000, RMSEA=0.048</th>
</tr>
</thead>
</table>

The value for the Satorra-Bentler Scaled Chi-Square test statistic was 902.79 and 945.394 respectively for both Sub-Models A and B. The associated p-value is smaller than 0.01 and therefore the null hypothesis was rejected at the 0.1% level of significance and the alternative hypothesis accepted. The data reported, consequently, did not meet the requirement of multivariate normality. As a result the Robust Maximum Likelihood method available in LISREL 8.8 was used for estimating both the measurement model and the structural equation model.
The model was further divided in two sections as described in Figures 7.2 and 7.3, labeled ‘Sub-Model A’ and ‘Sub-Model B’ and then analysed separately. The combined results for the structural model estimation are presented in Figure 7.9 and each factor’s relationship is discussed thereafter.

7.8 EMPIRICAL RESULTS AND INTERPRETATIONS OF THE STRUCTURAL EQUATION MODELLING ANALYSIS

In Chapter 6 the research process was described as the application of various methods and techniques in order to create scientifically obtained knowledge by using objective methods and procedures (Welman and Kruger, 2001). The first of the seven stages of SEM, namely the development of a theoretical model from literature was presented in Chapter 5 (see Figure 5.1). The remainder of the stages 2 to 7 will be discussed further in this chapter and includes:

2. Constructing the path diagram of causal relationships;
3. Converting the path diagram into measurement and structural models;
4. Choosing the input matrix type and estimating the proposed model;
5. Assessing the identification of the structural model;
6. Evaluating the goodness-of-fit results and
7. Making theoretically justified modifications to the model (Hair et al., 1998).

7.9 CONSTRUCTING THE PATH DIAGRAM

A path diagram is a method of presenting causal relationships among constructs where each theoretically proposed relationship is described by means of a hypothesis (Hair et al., 2006). Figure 7.4 describes the path diagram of relationships on the revised model.

Several methods were used in Figure 7.4 to make the path diagram easily interpretable and easy to read. All the constructs are depicted as elliptical symbols and colour was added to indicate the intervening variables (light orange), the intervening variables (light green) and the dependent variable (green). The single-headed arrows indicate the dependence relationships. The constructs with no arrows
pointing to them are called the exogenous variables (independent variables) and are not caused by any other variable in the model.

The constructs with arrows pointed to them are called endogenous variables (dependent variables). Endogenous constructs can predict other endogenous constructs, but an exogenous construct can only be causally related to endogenous constructs. The factor *Infrastructural Change* is an example of an exogenous variable in the path diagram as it is causally related to the endogenous variable *Entrepreneurial Orientation*.

**Figure 7.4 Path diagram of relationships: Revised theoretical model**

**Sub-Model A**

1. $H^1$: Infrastructural Change
2. $H^2$: Sector Transformation
3. $H^3$: Regulatory Alignment
4. $H^4$: Entrepreneurial Mindset
5. $H^5$: Entrepreneurial Experience
6. $H^{1a}$: Entrepreneurial Orientation
7. $H^{2a}$: Opportunity Recognition
8. $H^{3a}$: Perceived Entrepreneurial Competitiveness

**Sub-Model B**

1. $H^7$: Entrepreneurial Leadership
2. $H^8$: Entrepreneurial Management
3. $H^9$: Financial Resources
4. $H^{10}$: Legal Alignment
5. $H^{11}$: Benchmarking
6. $H^{12}$: Technological Entrepreneurship
7. $H^{13}$: Strategic Positioning
Structural Equation Modelling, in general, requires a larger sample relative to other multivariate approaches. Hair et al. (2006) suggest that a generally accepted ratio of respondents to parameters to minimize problems with deviations from normality is 15 respondents for each parameter estimated in the model. Although no theoretical limit to the number of variables in the models exists, practical concerns occur even before the limits of most computer software applications are met.

Most often, the interpretation of the results, particularly statistical significance, becomes quite difficult as the number of concepts becomes large (exceeding 20 concepts) (Hair et al., 2006). The researcher should never omit a concept solely because the number of variables is becoming too large, but should recognise the benefits of parsimonious and concise theoretical models (Hair et al., 1998).

The path diagram of the relationships from the revised theoretical model in Figure 7.4 proved to be too complex (the number of parameters to be estimated relative to the sample size) for SEM and therefore separate sub-models and path diagrams were therefore constructed because the desire to include all variables must be balanced against the practical limitations of SEM (Hair et al., 1998). The theoretical model is therefore divided into 2 sub-models (Sub-Model A and Sub-Model B) in order to achieve a more appropriate ratio percentage of sample size to the number of indicators. The sub-models are represented in Figures 7.5 and 7.6 respectively.

Figure 7.5 Path diagram of relationships: Revised theoretical model (Sub-Model A)
7.10 CONVERTING THE PATH DIAGRAM INTO MEASUREMENT AND STRUCTURAL MODELS

In the first 2 steps the theoretical sub-models were revised and the redefined hypothesised relationships portrayed in path diagrams. Each theoretically proposed relationship is represented by means of a hypothesis. These hypotheses were reformulated after exploratory factor analysis was performed. The next step that was applied to each sub-model was to specify the measurement and the structural models.

The process of converting the path diagram into measurement and structural models starts by specifying the revised theoretical model in Figure 7.3 in more formal terms through a series of structural equations linking constructs of the measurement model and then by indicating which item measured which construct (Hair et al., 2006). The objective is to link operational definitions of constructs to theory for the appropriate empirical test (Hair et al., 1998).

A conventional model in SEM terminology consists of two models, the measurement model and the structural model (Hair et al., 2006). Specifying the measurement
model involves assigning indicator variables to the constructs they represent, whereas specifying the structural model involves assigning relationships between constructs based on the proposed theoretical model (Hair et al., 2006). After a theory has been proposed, the SEM model is developed. This involves firstly, specifying the measurement theory and validating it by means of confirmatory factor analysis. Secondly, once the measurement model is deemed sufficiently valid, the researcher can test the structural model (Hair et al., 2006).

The relationships depicted in Figure 7.4 in the path diagram had to be converted into structural equations. This was done so that each endogenous construct was the dependent variable in a separate equation. Furthermore, for each hypothesised effect, a structural coefficient ($b$) would be estimated and an error term ($E_1$) included. An example of a structural equation is provided below for the endogenous construct Entrepreneurial Orientation.

$$\text{ORIENT} = b_1 \times \text{INFRASTR} + b_2 \times \text{SREFORM} + b_3 \times \text{REGULAT} + E_1$$

When developing the specifications for the structural model, the researcher must make the transition from factor analysis (where the researcher had no control over which item defines a factor) to a more confirmatory mode in which the researcher specifies which items define each construct or factor (Hair et al., 2006). The researcher has to specify the manifest variables (questionnaire items) that measure each latent construct. These manifest variables, collected from the respondents, are termed indicators in the measurement model, as they are used to measure or indicate the latent constructs.

Once the specifications are developed and variables are defined, the reliability of all the indicators has to be confirmed. All the specifications of the structural model are identified in Table 7.7 for Sub-Model A and Table 7.9 for Sub-Model B and consist of the constructs identified during the exploratory factor analysis. Figures 7.7 and 7.8 present the structural models as constructed from Table 7.7 and Table 7.9 respectively. The constructs are represented in their various indicative colours (i.e.
intervening is light orange, intervening constructs are light green and the dependent constructs light green). Manifest variables are indicated in the light grey rectangular boxes and the numerical results in-line with the arrowed paths are used to present the measurement errors. The arrows (the directions of which denote the causal effect) indicate the dependence relationship of the constructs.

For this study a covariance matrix was used as the input matrix for each sub-model. The software application LISREL 8.8 (Jöreskog and Sörbom, 2006) was used to obtain the estimates of free parameters from the observed data, for both the measurement and the structural model. As the data in the present study showed evidence of non-normality Robust Maximum Likelihood, which compensates for non-normality of the data, was used for obtaining estimates of the free parameters for all the sub-models (Satorra and Bentler, 1994).

The measurement model was used to assess the measurement properties of the scale, and provides evidence of construct validity. Thereafter the relationships between the constructs in the structural model for each sub-model were identified. The extent to which the proposed models represent an acceptable approximation of the data was established. When estimating the structural model, the estimation of the SEM requires that the measurement specifications are to be included. In this way the path diagram represents both the measurement and structural part of SEM in one overall model (Hair et al., 2006). The measurement and the structural models were assessed for significance in indicator loadings by ensuring that the p-value associated with each loading exceeded the critical value at the 5% (critical value 1.96) significance level, as well as the 1% (critical value 2.58) significance level.

Various fit indices were considered to assess the extent to which the proposed sub-models represent an acceptable approximation of the data. When deciding what indices to report, adopting what are most frequently used statistics is not necessarily good practice as some of these statistics are often quoted purely for historical reasons, rather than for their sophistication (Hooper et al., 2008).

While the golden rule exists for assessment of model fit, reporting a variety of indices is necessary because different indices reflect a different aspect of model fit (Hooper
et al., 2008). Against this background it was decided to use the Satorra-Bentler scaled Chi-Square ($\chi^2$), the normed Chi-Square, i.e. the ratio of Chi-Square to degrees of freedom ($\chi^2/df$), the Root Mean Square Error of Approximation (RMSEA), as well as the 90% confidence internal for RMSEA for this study.

7.10.1 Chi-Square ($\chi^2$)

The Chi-Square value is the measure used for evaluating overall model fit and “assesses the magnitude of discrepancy between the sample and fitted covariance matrices” (Hu and Bentler, 1999: 2). A good model fit would provide an insignificant result at a threshold of 0.05 (Hooper et al., 2008), thus the Chi-Square statistic is often referred to as either a badness of fit or a lack of fit measure (Kline, 2005).

While the Chi-Squared test retains its popularity as a fit statistic, a number of limitations in its use exist. Firstly, this test assumes multivariate normality and severe deviations from normality may result in model rejections even when the model is properly specified (McIntosh, 2006). Secondly, because the Chi-Square statistic is in essence a statistical significance test it is sensitive to sample size which means that the Chi-Square statistic nearly always rejects the model when large samples are used (Hooper et al., 2008; Jöreskog and Sörbom, 2006). The Chi-Square remains, however, a key test statistic that must be reported.

7.10.2 Root Mean Square Error of Approximation (RMSEA)

In recent years the Root Mean Square Error of Approximation (RMSEA) has become regarded as one of the most informative fit indices due to its sensitivity to the number of estimated parameters in the model (Diamantopoulos and Siguaw, 2000). The RMSEA favours parsimony in that it will choose the model with the lesser number of parameters (Hooper et al., 2008). The RMSEA indicates how well the model, with unknown but optimally chosen parameter estimates would fit the population’s covariance matrix (Byrne, 1998). Recommendations for RMSEA cut-off points have been reduced (from 0.08 to 0.05) considerably in recent years (Hooper et al., 2008).

Although the Model Chi-Square has many problems associated with it, it is still essential that this statistic, along with its degrees of freedom and associated p-value,
should at all times be reported (Hayduk, Cummings, Boadu, Pazderka-Robinson, and Boulianne, 2007; Kline, 2005). Threshold levels were assessed by Hu and Bentler (1999), who suggested a two-index presentation format be used. This includes the RMSEA or the CFI. Kline (2005) advocates the use of the Chi-Square test, the RMSEA, the CFI and SRMR. Boomsma (2000) offers similar recommendations and in addition suggests that the squared multiple correlations of each equation be reported.

Based on these authors’ guidelines and the above review, inclusion of the Chi-Square statistic is recommended, its degrees of freedom and p-value, the RMSEA and its associated confidence interval, the SRMR, the CFI and one parsimony fit index such as the PNFI. These indices have been considered as they have been found to be the most insensitive to sample size, model misspecification and parameter estimates (Hooper et al., 2008). In the next section, the goodness-of-fit indices are reported.

7.10.3 Assessment of goodness-of-fit

In order to assess the extent to which the proposed measurement and structural model represent an acceptable approximation of the data, the goodness-of-fit indices of each of the two sub-models (both measurement and structural models) were examined. The following hypotheses were formulated for this purpose:

\(H^0: \text{The data does not fit the model perfectly.}\)
\(H^1: \text{The data fits the model perfectly.}\)

The goodness-of-fit indices of the measurement model and the structural model are identical in all the sub-models subjected to SEM in this study. According to Hair et al. (2006) identical goodness-of-fit indices occur because a single direct relationship between constructs has been estimated in all cases. The goodness-of-fit indices of only the structural models and not the measurement models have been reported and interpreted in the present study. The goodness-of-fit indices of the measurement models can be ascertained from those of the structural model.
The focus of the present study is based on testing relationships and potentially confirming theory (confirmatory analysis), and not on scale development, therefore steps 5 and 7 of SEM, namely assessing the identification of model equations and making modifications to the models, were not undertaken in this study. In addition, model re-specification usually follows the estimation of a model with indications of poor fit (Cooper and Schindler, 2007). The modification indices were inspected for both the sub-models in the present study and they showed evidence of acceptable or close fit, therefore it was deemed unnecessary to make any modification to the measurement model.

7.11 STRUCTURAL AND MEASUREMENT SUB-MODEL A

Table 7.7 displays a summary of all the Sub-Model A endogenous and predictor variables (structural equations) used as inputs for the LISREL program.

<table>
<thead>
<tr>
<th>Structural model</th>
<th>Endogenous variables</th>
<th>Predictor variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurial Orientation</td>
<td>Infrastructural Change, Sector Transformation, Regulatory Alignment</td>
<td></td>
</tr>
<tr>
<td>Opportunity Recognition</td>
<td>Entrepreneurial Mindset, Entrepreneurial Experience</td>
<td></td>
</tr>
<tr>
<td>Perceived Entrepreneurial Competitiveness</td>
<td>Entrepreneurial Orientation, Opportunity Recognition, Infrastructural Change, Sector Transformation, Regulatory Alignment, Entrepreneurial Mindset, Entrepreneurial Experience</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial Orientation</td>
<td>E01, EO3, EO4, EO5</td>
<td></td>
</tr>
<tr>
<td>Infrastructural Change</td>
<td>IC09, IC10, IC11</td>
<td></td>
</tr>
<tr>
<td>Sector Transformation</td>
<td>SR12, SR13, SR14, SR15, SR16</td>
<td></td>
</tr>
<tr>
<td>Regulatory Alignment</td>
<td>RL17, RL18, RL19, RL21</td>
<td></td>
</tr>
<tr>
<td>Opportunity Recognition</td>
<td>OR22, OR23, OR24, OR26</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial Mindset</td>
<td>EM27, EM28, EM31</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial Experience</td>
<td>EE39, EE41, EE42, EE43</td>
<td></td>
</tr>
<tr>
<td>Perceived Entrepreneurial Competitiveness</td>
<td>EC87, EC88, EC89, EC91, EC92</td>
<td></td>
</tr>
</tbody>
</table>

The goodness-of-fit indices for the Sub-Model A are reported in Table 7.8. The RMSEA (0.0589) falls within the reasonable fit range of 0.05 and 0.08 (almost a
close fit), while the upper limit of the 90% confidence interval for RMSEA (0.0644) is less than 0.08. These indices all provide evidence of a model with a reasonable fit. Therefore the null hypothesis, that the data fits the model perfectly, must be accepted. However, although the data does not fit the model perfectly, it can be described as having a reasonable fit.

Table 7.8 Goodness-of-fit indices for the structural model (Sub-Model A)

<table>
<thead>
<tr>
<th>Sample size</th>
<th>301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degrees of freedom</td>
<td>442</td>
</tr>
<tr>
<td>Minimum Fit Function Chi-Square</td>
<td>1066.301 (P=0.00)</td>
</tr>
<tr>
<td>Normal theory weighted least square Chi-Square</td>
<td>967.318 (P=0.00)</td>
</tr>
<tr>
<td>Satorra-Bentler scaled Chi-Square</td>
<td>902.788 (P=0.00)</td>
</tr>
<tr>
<td>Root Mean Square Error of Approximation (RMSEA)</td>
<td>0.0589</td>
</tr>
<tr>
<td>90 percent confidence interval for RMSEA</td>
<td>(0.0534 ; 0.0644)</td>
</tr>
<tr>
<td>P-Value for test of close fit (RMSEA 0.05)</td>
<td>0.00414</td>
</tr>
<tr>
<td>Expected cross-validation index (ECVI)</td>
<td>3.583</td>
</tr>
<tr>
<td>90 percent confidence interval for ECVI</td>
<td>(3.309 ; 3.882)</td>
</tr>
<tr>
<td>ECVI for saturated model</td>
<td>3.520</td>
</tr>
<tr>
<td>ECVI for independence model</td>
<td>18.671</td>
</tr>
</tbody>
</table>

Figure 7.7 describes the Structural Model estimation for Sub-Model A and the results produced from LISREL.
When the relationships in the Sub-Model B are calculated, the path coefficients will indicate the loading of the manifest variable on the construct. The modification indices were inspected and no changes were made to the measurement model.

7.12 STRUCTURAL AND MEASUREMENT SUB-MODEL B

Table 7.9 displays a summary of all the Sub-Model B endogenous and predictor variables (structural equations) used as inputs for the LISREL program. After the relationships in the Sub-Model B are calculated, the path coefficients will indicate the loading of the manifest variable on the construct. The modification indices were inspected and no changes were made to the measurement model.

<table>
<thead>
<tr>
<th>Table 7.9 Structural and measurement Sub-Model B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structural model</strong></td>
</tr>
<tr>
<td><strong>Endogenous variables</strong></td>
</tr>
<tr>
<td>Resource Allocation</td>
</tr>
<tr>
<td>Strategic Positioning</td>
</tr>
<tr>
<td>Perceived Entrepreneurial Competitiveness</td>
</tr>
<tr>
<td>Resource Allocation</td>
</tr>
<tr>
<td>Entrepreneurial Leadership</td>
</tr>
<tr>
<td>Entrepreneurial Management</td>
</tr>
<tr>
<td>Strategic Positioning</td>
</tr>
<tr>
<td>Benchmarking</td>
</tr>
<tr>
<td>Legal Alignment</td>
</tr>
<tr>
<td>Technological Entrepreneurship</td>
</tr>
<tr>
<td>Perceived Entrepreneurial Competitiveness</td>
</tr>
<tr>
<td><strong>Predictor variables</strong></td>
</tr>
<tr>
<td>Entrepreneurial Leadership, Entrepreneurial Management</td>
</tr>
<tr>
<td>Benchmarking, Legal Alignment, Technological Entrepreneurship</td>
</tr>
<tr>
<td>Resource Allocation, Strategic Positioning, Entrepreneurial Leadership, Entrepreneurial Management, Benchmarking, Legal Alignment, Technological Entrepreneurship</td>
</tr>
<tr>
<td>RA44, RA45, RA46, RA47, RA48</td>
</tr>
<tr>
<td>E50, E51, E53, E54, E56</td>
</tr>
<tr>
<td>E51, E54</td>
</tr>
<tr>
<td>SP67, SP68, SP69, SP70</td>
</tr>
<tr>
<td>BM77, BM78, BM79, BM80, BM81</td>
</tr>
<tr>
<td>RE72, RE73, RE74, RE75, RE76</td>
</tr>
<tr>
<td>TE82, TE83, TE84, TE85</td>
</tr>
<tr>
<td>EC87, EC88, EC89, EC91, EC92</td>
</tr>
</tbody>
</table>

The goodness-of-fit indices for the Sub-Model B are reported in Table 7.10. For the Sub-Model B, the RMSEA (0.0481) falls within the good fit range of < 0.5 (a close fit), while the upper limit of the 90% confidence interval for RMSEA (0.0533) is less than 0.08. The reported indices provide evidence of a model with a good fit although the
hypothesis, that the data fits the model perfectly, still has to be rejected and the null hypothesis accepted.

### Table 7.10 Goodness-of-fit indices for the structural model (Sub-Model B)

<table>
<thead>
<tr>
<th>Sample size</th>
<th>301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degrees of freedom</td>
<td>558</td>
</tr>
<tr>
<td>Minimum Fit Function</td>
<td>1062.309 (P=0.0)</td>
</tr>
<tr>
<td>Chi-Square</td>
<td></td>
</tr>
<tr>
<td>Normal theory weighted least square Chi-Square</td>
<td>991.487 (P=0.0)</td>
</tr>
<tr>
<td>Satorra-Bentler scaled Chi-Square</td>
<td>945.394 (P=0.0)</td>
</tr>
<tr>
<td>Root Mean Square Error of Approximation (RMSEA)</td>
<td>0.0481</td>
</tr>
<tr>
<td>90 percent confidence interval for RMSEA</td>
<td>(0.0428 ; 0.0533)</td>
</tr>
<tr>
<td>P-Value for test of close fit (RMSEA 0.05)</td>
<td>0.718</td>
</tr>
<tr>
<td>Expected cross-validation index (ECVI)</td>
<td>3.871</td>
</tr>
<tr>
<td>90 percent confidence interval for ECVI</td>
<td>(3.601 ; 4.168)</td>
</tr>
<tr>
<td>ECVI for saturated model</td>
<td>4.440</td>
</tr>
<tr>
<td>ECVI for independence model</td>
<td>17.193</td>
</tr>
</tbody>
</table>

Figure 7.8 describes the Structural Model estimation for Sub-Model B and the results produced from LISREL.
7.13 ESTIMATION OF THE STRUCTURAL MODEL

The process of model estimation includes a t-value, which is referred to as a statistical hypothesis test in which the test statistic follows the ‘t distribution’ when the null hypothesis is supported (Zikmund, 2003). It is most commonly applied when the test statistic would follow a normal distribution if the value of a scaling term in the test statistic was known. A minimum t-value of 1.96 will represent a p < 0.05 value and indicates the minimum acceptable value for hypothesis acceptance (Zikmund, 2003). In addition to the model estimation, the hypotheses acceptance is also reported in this section. The Structural Model estimation is presented in Figure 7.9.
In the structural model presented in Figure 7.9 it can be seen that 5 independent variables significantly ($p < 0.05$) influence the dependent variable in this model. The path coefficients for each of these relationships proved significant as the $p$-value for these coefficients exceeded the critical values of 1.96 ($p < 0.05$). The independent variables *Regulatory Alignment, Entrepreneurial Mindset, Entrepreneurial Management, Financial Resources* and *Technological Entrepreneurship* positively influence the dependent variable *Perceived Entrepreneurial Competitiveness*. Against this background the hypotheses $H^3$, $H^4$, $H^7$, $H^8$ and $H^{11}$ are supported, whereas $H^1$, $H^2$, $H^6$, $H^9$ and $H^{10}$ are not supported.

The independent variables *Infrastructural Change* and *Regulatory Alignment* positively influence the intervening variable *Entrepreneurial Orientation* and therefore the hypotheses $H^{1a}$ and $H^{3a}$ are supported, whereas $H^{2a}$, $H^{4a}$ and $H^{5a}$ are not supported. The independent variable *Entrepreneurial Management* positively influences the intervening variable *Resource Allocation* and therefore the hypothesis $H^{7a}$ is supported, whereas $H^{6a}$ and $H^{8a}$ are not supported. The independent variable *Benchmarking* positively influences the intervening variable *Strategic Position* and therefore the hypothesis $H^{10a}$ is supported, whereas $H^{9a}$ and $H^{11a}$ are not supported.

The Intervening variable *Entrepreneurial Orientation* positively influences the dependent variable *Perceived Entrepreneurial Competitiveness* and therefore $H^{15}$ is supported. The intervening variables *Opportunity Recognition, Resource Allocation* and *Strategic positioning* did not demonstrate significant influence on the dependent variable *Perceived Entrepreneurial Competitiveness*. Against this background the hypotheses $H^{12}$, $H^{13}$ and $H^{14}$ are not supported.

In addition to $t$-values, the goodness-of-fit indices of the measurement model all provided evidence of a model with a reasonable or good fit. Consequently, the structural equation model was subjected to empirical testing.

**7.14 DISCUSSION OF SIGNIFICANT RELATIONSHIPS IDENTIFIED BY SEM**

In the discussions and models depicted in Sections 7.10 and 7.11, 10 significant relationships were identified between the various independent, intervening and
dependent variables. The significant relationships in both the models are summarised in Figure 7.9. The model illustrated in Figure 7.9 was not tested as a single model, but as two sub-models. The sub-models were subjected as stand-alone to SEM. This approach was implemented because the sample size of the present study was too small to subject the model as a whole to SEM. The 10 significant relationships depicted in Figure 7.9 identify the factors that influence entrepreneurial competitiveness in the telecommunications sector in South Africa. The significant findings will be discussed in the next section. Thereafter, the statistical relationships, hypotheses and the decision on the hypotheses will then be stated.

7.14.1 Infrastructural Change

Hypothesis: $H^1a$ There is a positive relationship between Infrastructural Change and Entrepreneurial Orientation

As seen from the results in Figure 7.9, there is a positive relationship (point estimate = 0.26, $t = 3.15, p < 0.01$) between the factors Infrastructural Change and Entrepreneurial Orientation (Hypothesis $H^1a$). This result suggests that entrepreneurs use the new infrastructure as part of their entrepreneurial activities to be more competitive. Hypothesis $H^1a$ is therefore accepted.

7.14.2 Regulatory Alignment

Hypothesis: $H^3a$ There is a positive relationship between Regulatory Alignment and Entrepreneurial Orientation;

The factors Regulatory Alignment and Entrepreneurial Orientation are positively related (point estimate = 0.17, $t = 2.15, p < 0.05$). Hypothesis $H^3a$ suggests that there is a positive relationship between Regulatory Alignment and Entrepreneurial Orientation. The Hypothesis $H^3a$ is therefore accepted.

Hypothesis: $H^3$ There is a positive relationship between Regulatory Alignment and Entrepreneurial Competitiveness in the telecommunications sector
Regulatory Alignment is positively related (point estimate = 0.51, t = 6.06, p < 0.001) to Entrepreneurial Competitiveness (The Hypothesis H³). The result indicates that entrepreneurs should continually interpret and understand the regulatory environment and align their businesses in order to comply with the regulations in force to increase competitiveness in the telecommunications sector in South Africa. The Hypothesis H³ is therefore accepted.

7.14.3 Entrepreneurial Mindset

Hypothesis: $H^4$ There is a positive relationship between the Entrepreneurial Mindset and Entrepreneurial Competitiveness in the telecommunications sector

Results in Figure 7.9 indicates that the factors Entrepreneurial Mindset and Entrepreneurial Competitiveness are positively related (point estimate = 0.33, t = 2.04, p < 0.05). Hypothesis $H^4$ suggests that there is a positive relationship between Entrepreneurial Mindset and Entrepreneurial Competitiveness. The Hypothesis $H^4$ is therefore accepted.

7.14.4 Entrepreneurial Management

Hypothesis: $H^7$ There is a positive relationship between the Entrepreneurial Management and Entrepreneurial Competitiveness in the telecommunications sector

It can be seen from Figure 7.9 that the factors Entrepreneurial Management and Perceived Entrepreneurial Competitiveness are positively related (point estimate = 0.20 p < 0.001, t = 4.92). Hypothesis $H^7$ suggests that there is a positive relationship between Entrepreneurial Management and Perceived Entrepreneurial Competitiveness. The Hypothesis $H^7$ is therefore accepted.

Hypothesis: $H^{7a}$ There is a positive relationship between the Entrepreneurial Management and Resource Allocation
As indicated in Figure 7.9, the factors *Entrepreneurial Management* and *Resource Allocation* are positively related (point estimate = 0.48, $t = 1.98$, $p < 0.1$). Hypothesis $H^{7a}$ suggests that there is a positive relationship between *Entrepreneurial Management* and *Resource Allocation*. The Hypothesis $H^{7a}$ is therefore accepted.

### 7.14.5 Financial Resources

Hypothesis: $H^8$  
*There is a positive relationship between Financial Resources and Entrepreneurial Competitiveness in the telecommunications sector*

The factors *Financial Resources* and *Perceived Entrepreneurial Competitiveness* are positively related (point estimate = 0.36, $t = 4.75$, $p < 0.001$) as reported in Figure 7.9. Hypothesis $H^8$ suggests that there is a positive relationship between *Financial Resources* and *Perceived Entrepreneurial Competitiveness*. The Hypothesis $H^8$ is therefore accepted.

### 7.14.6 Benchmarking

Hypothesis: $H^{10a}$  
*There is a positive relationship between Benchmarking and Strategic Positioning*

Figure 7.9 indicates that the factors *Benchmarking* and *Strategic Positioning* are positively related (point estimate = 0.27, $t = 3.33$, $p < 0.001$). Hypothesis $H^{10a}$ suggests that there is a positive relationship between *Benchmarking* and *Strategic Positioning*. The Hypothesis $H^{10a}$ is therefore accepted.

### 7.14.7 Technological Entrepreneurship

Hypothesis: $H^{11}$  
*There is a positive relationship between Technological Entrepreneurship and Entrepreneurial Competitiveness in the telecommunications sector*

It can be seen from Figure 7.9 that the factors *Technological Entrepreneurship* and *Perceived Entrepreneurial Competitiveness* are positively related (point estimate = -
0.04, t = 2.09, p < 0.05). Hypothesis H\(^{11}\) suggests that there is a positive relationship between *Benchmarking* and *Perceived Entrepreneurial Competitiveness*. The Hypothesis H\(^{11}\) is therefore accepted.

### 7.14.8 Entrepreneurial Orientation

**Hypothesis:** \(H^{16}\) *There is a positive relationship between Entrepreneurial Orientation and Perceived Entrepreneurial Competitiveness in the telecommunications sector*

Figure 7.9 indicates *Entrepreneurial Orientation* and *Perceived Entrepreneurial Competitiveness* are positively related (point estimate = 0.24, t=3.10, p < 0.001). Hypothesis H\(^{15}\) suggests that there is a positive relationship between *Entrepreneurial Orientation* and *Perceived Entrepreneurial Competitiveness* in the telecommunications sector. The Hypothesis H\(^{16}\) is therefore accepted.

### 7.15 ASSESSING THE IDENTIFICATION OF THE STRUCTURAL MODEL

As discussed in Chapter 6, the research analyst assesses whether the software application has produced any meaningless or illogical results in the identification of the structural model (Hair et al., 1998). The symptoms of the identification problems are: (1) very large standard errors for one or more coefficients; (2) the inability of the software application to invert the information matrix; (3) unreasonable and impossible estimates such as negative error variances and (4) high correlations approximately 0.90 or greater amongst estimated coefficients.

The solution to an identification problem is to impose more constraints on the model in order to eliminate some of the estimated coefficients. A structured process should be followed by adding more constraints and by deleting paths from the path diagram until the problem is rectified. Attempts are therefore made to achieve an over-identified model that has degrees of freedom available to provide a better estimation of the true correlation relationships (Hair et al., 1998).

For the revised empirical models, the degrees of freedom were reported as 442 for Sub-Model A and 558 for Sub-Model B. These results are all significantly greater
than zero and the indicators prove that there is no danger that the proposed theoretical model would produce illogical or meaningless results when generating unique estimates. An inspection of the Completely Standardised Solution confirmed this conclusion. Hair et al. (1998) states that the rank condition must be met by the proposed theoretical model, in which the researcher must use certain existing heuristics to test it. The simplest of these is the three-measure rule, which specifies that any constructs with three or more indicators will always be identified (Hair et al., 1998). In the present research, no single construct has less than three indicators, indicating a reduced risk of model identification problems.

7.16 MAKING THEORETICALLY JUSTIFIED MODIFICATIONS TO THE MODEL

The final phase in the data analysis was to test and report on all the hypotheses. Based on the empirical results of the path coefficients, all the hypotheses defined can be interpreted as being supported or not. Table 7.11 has been constructed to summarise all the hypotheses, to improve the readability of this section.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₁</td>
<td>There is a positive relationship between Infrastructural Change and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H₁a</td>
<td>There is a positive relationship between Infrastructural Change and Entrepreneurial Orientation</td>
</tr>
<tr>
<td>H²</td>
<td>There is a positive relationship between Sector Transformation and Entrepreneurial Competitiveness in the telecommunications sector in South Africa</td>
</tr>
<tr>
<td>H²a</td>
<td>There is a positive relationship between Sector Transformation and Entrepreneurial Orientation</td>
</tr>
<tr>
<td>H³</td>
<td>There is a positive relationship between Regulatory Alignment and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>H³a</td>
<td>There is a positive relationship between Regulatory Alignment and Entrepreneurial Orientation</td>
</tr>
<tr>
<td>H⁴</td>
<td>There is a positive relationship between the Entrepreneurial Mindset and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>Hypothesis</td>
<td>Decision</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td>$H^4_a$</td>
<td>There is a positive relationship between the Entrepreneurial Mindset and Opportunity Recognition</td>
</tr>
<tr>
<td>$H^5$</td>
<td>There is a positive relationship between Entrepreneurial Experience and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>$H^6_a$</td>
<td>There is a positive relationship between Entrepreneurial Experience and Opportunity Recognition</td>
</tr>
<tr>
<td>$H^6$</td>
<td>There is a positive relationship between Entrepreneurial Leadership and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>$H^6_a$</td>
<td>There is a positive relationship between Entrepreneurial Leadership and Resource allocation</td>
</tr>
<tr>
<td>$H^7$</td>
<td>There is a positive relationship between Entrepreneurial Management and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>$H^7_a$</td>
<td>There is a positive relationship between Management and Resource Allocation</td>
</tr>
<tr>
<td>$H^8$</td>
<td>There is a positive relationship between Financial Resources and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>$H^8_a$</td>
<td>There is a positive relationship between Financial Resources and Resource Allocation</td>
</tr>
<tr>
<td>$H^9$</td>
<td>There is a positive relationship between Legal Alignment and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>$H^9_a$</td>
<td>There is a positive relationship between Legal Alignment and Strategic Positioning</td>
</tr>
<tr>
<td>$H^{10}$</td>
<td>There is a positive relationship between the Benchmarking and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>$H^{10}_a$</td>
<td>There is a positive relationship between Benchmarking and Strategic Positioning</td>
</tr>
<tr>
<td>$H^{11}$</td>
<td>There is a positive relationship between Technological Entrepreneurship and Entrepreneurial Competitiveness in the telecommunications sector</td>
</tr>
<tr>
<td>$H^{11}_a$</td>
<td>There is a positive relationship between Technological Entrepreneurship and Strategic Positioning</td>
</tr>
</tbody>
</table>
### Hypothesis

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H^{12}$ There is a positive relationship between Strategic Positioning and Entrepreneurial Competitiveness in the telecommunications sector</td>
<td>Not Supported</td>
</tr>
<tr>
<td>$H^{13}$ There is a positive relationship between Resource Allocation and Entrepreneurial Competitiveness in the telecommunications sector</td>
<td>Not Supported</td>
</tr>
<tr>
<td>$H^{14}$ There is a positive relationship between Opportunity Recognition and Entrepreneurial Competitiveness in the telecommunications sector</td>
<td>Not Supported</td>
</tr>
<tr>
<td>$H^{15}$ There is a positive relationship between Entrepreneurial Orientation and Entrepreneurial Competitiveness in the telecommunications sector</td>
<td>Supported</td>
</tr>
</tbody>
</table>

#### 7.17 SUMMARY

In this chapter the empirical results for the present study were presented. Research Question RQ$_7$ and research objective RO$_7$ were addressed. The proposed theoretical model, the promotion of Entrepreneurial competitiveness in the telecommunications sector, was empirically tested by means of the SEM technique. The validity and reliability instrument was assessed and reported on. This resulted in 8 factors that potentially influence the dependent variable namely *Perceived Entrepreneurial Competitiveness* in the telecommunications sector in South Africa. These factors are:

- Infrastructural Change;
- Regulatory Alignment;
- Entrepreneurial Orientation;
- Entrepreneurial Mindset;
- Entrepreneurial Management;
- Financial Resources;
- Benchmarking and
- Technological Entrepreneurship.

After testing for the normality of the data, the proposed theoretical model of factors influencing the entrepreneurial competitiveness was empirically tested by means of applying SEM. Two sub-models were tested separately and the empirical analysis
indicated that the data was both valid and reliable. To conclude, the empirical results were assessed against the formulated hypotheses.

In conclusion, Chapter 8 will set out the interpretations of the above-mentioned findings with emphasis on the implications and recommendations for entrepreneurs in the telecommunications sector. The chapter will include the contributions and limitations of the present study and recommendations for future research will be discussed.
CHAPTER 8

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 INTRODUCTION

This final chapter presents an overview of the study and discusses the interpretations made from the empirical results. Research Question RQs and research objective ROs are addressed in this chapter. In Chapter 1 an overview of the study was presented, including the structure of the thesis. The relationships between the chapters are set out in Figure 8.1. From the literature reviewed, the research gap was identified, namely entrepreneurial competitiveness in the telecommunications sector in South Africa.

![Figure 8.1 Relationship between the chapters](image)

Source: Author’s own construction, 2012

Chapters 2 to 4 comprised literature reviewed in the areas of Entrepreneurship, Telecommunications and Benchmarking. From the literature the factors influencing
entrepreneurial competitiveness were identified and thereafter structured into a conceptual model. In Chapter 5, a discussion on the perceived factors influencing entrepreneurial competitiveness and the perceived conceptual model was presented. In Chapter 6 the methods and techniques used to obtain the results and findings were discussed. The chapter also provided a detailed description of the processes used to pretest the proposed conceptual model. In Chapter 7 the results of the various statistical analysis results are reported.

Based on both the empirical results and with the insights gained during the research process, the findings are interpreted and evaluated. The implications of each set of findings are discussed with recommendations made. Lastly, the contributions of the study are highlighted, the limitations discussed, whereafter recommendations for future research are suggested. Therefore, all the intended outcomes stated in Chapter 1 are confirmed in this final chapter.

8.2 OVERVIEW ON THE RESEARCH CONDUCTED

This research study was concerned with continued entrepreneurial competitiveness in the telecommunications sector in South Africa. The main research problem in this study was stated as:

‘Entrepreneurs face the problem of identifying the factors that influence the competitiveness of their businesses in the transforming telecommunications sector in South Africa’.

The conditions required to help entrepreneurs competing in the telecommunications sector were investigated. From the literature, factors influencing entrepreneurial competitiveness in this sector were identified and empirically tested through the application of a conceptual model.

Given the notable regulatory, technological and infrastructural changes in this sector, this study aimed to:

1. Identify those factors associated with the sector changes;
2. Develop recommendations for entrepreneurs in this sector which may enhance the likelihood of more competitive strategies;
3. Contribute to more effective functioning of entrepreneurial businesses in this sector and
4. Contribute to the body of knowledge on entrepreneurial activity and competitiveness in the telecommunications sector in South Africa.

Given the scope of deliverables stated above, the primary objective was to investigate what factors have an impact on entrepreneurial competitiveness in the telecommunications sector in South Africa by means of the development of a conceptual model.

The primary objective stated in Section 1.3 was supported by the following research design objectives:

1. To develop a conceptual theoretical model consisting of the factors that will promote entrepreneurial competitiveness in the telecommunications sector and construct a path diagram of relationships between the independent variables and the dependent variable;
2. To develop a measuring instrument that will empirically test the relationships described in the conceptual model;
3. To empirically test the proposed model and suggested hypotheses by means of sourcing data from entrepreneurs in the telecommunications sector in South Africa and thereafter by statistically analysing the source data and
4. To propose recommendations based on the results of the statistical analysis and findings.

The primary objective in this study was supported by a number of secondary objectives. Table 8.1 describes the secondary research objectives that were achieved.
Table 8.1 Secondary Research Objectives achieved

<table>
<thead>
<tr>
<th>RO</th>
<th>The factors relating to Entrepreneurial Orientation in technological environments were identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>RO₂</td>
<td>The literature reviewed and the factors related to Entrepreneurial Orientation, Opportunity Recognition, Resource Allocation and Strategic Positioning were identified</td>
</tr>
<tr>
<td>RO₃</td>
<td>The literature was reviewed to establish methods and processes and to identify key factors in the telecommunications sector in South Africa that influence the competitiveness of the entrepreneurial business</td>
</tr>
<tr>
<td>RO₄</td>
<td>A benchmarking framework was established relating to entrepreneurship and telecommunications</td>
</tr>
<tr>
<td>RO₅</td>
<td>The research methodology used for this research study was explained in detail, to allow it to be reproduced in future</td>
</tr>
<tr>
<td>RO₆</td>
<td>An empirical evaluation was conducted on the conceptual model to promote entrepreneurial competitiveness in the telecommunications sector</td>
</tr>
</tbody>
</table>

The literature study conducted was to identify as many factors as possible that could influence entrepreneurial competitiveness in the telecommunications sector. The study comprised the following literature chapters:

- Chapter 2: Entrepreneurial Orientation;
- Chapter 3: Telecommunications and
- Chapter 4: Benchmarking.

The dependent variable in this study was identified as *Perceived Entrepreneurial Competitiveness*. The factors identified in the literature resulted in 16 primary variables which could potentially influence the dependent variable. In Chapter 5 the conceptual model depicting the perceived factors associated with the dependent variable was proposed.

From the literature, each factor was defined and operationalised as part of a reliable measuring instrument. Positive relationships between these factors and the
dependent variable were hypothesised. Hypotheses were then formulated for the interrelationships between the variables.

The conceptual model consisted of 16 variables, of which 12 were independent variables and four intervening variables. The independent variables were identified as: *Infrastructural Change, Sector Transformation, Regulatory Alignment, Entrepreneurial Mindset, Entrepreneurial Innovation, Entrepreneurial Experience, Entrepreneurial Leadership, Human Capital, Financial Resources, Legal Alignment, Benchmarking and Technological Entrepreneurship.*

Four intervening variables were proposed to group the independent variables, namely *Entrepreneurial Orientation, Opportunity Recognition, Resource Allocation and Strategic Positioning.* Each of these factors was hypothesised to relate to measures of performance and effectiveness in entrepreneurial competitiveness. Each factor was defined and then operationalised. These factors were then used to empirically test the relationships illustrated in the conceptual model. As a result the primary and secondary objectives in this study were achieved.

**8.3 CONCLUSIONS FROM THE RESEARCH METHODOLOGY**

A positivistic research paradigm was adopted for this study and a quantitative research design applied. The proposed theoretical model was subjected to a pilot test by means of an online questionnaire to a demarcated target respondent list. After the pilot study was performed, minor alterations were made and the final questionnaire was distributed among the target population of operational entrepreneurs in the South African telecommunications sector. The questionnaires were made available online and managed by a survey software application system.

A number of statistical tests were performed on the data collected. The first exploratory factor analysis test was performed to confirm the discriminant validity of the measuring instrument. Of the factors identified, two factors were removed, while the title of one of the two factors was altered to reflect more accurately the collection of items that loaded together. This implementation was required as they were identified by the exploratory factor analysis.
Some items from the deleted variables did, however, load jointly or severally on other factors in the exploratory factor analysis. Two variables namely *Entrepreneurial Leadership* and *Human Capital*, loaded together to form a new factor called *Entrepreneurial Management*. Figure 8.2 presents the significant relationships identified in the study.

Figure 8.2 Factors influencing entrepreneurial competitiveness in the South African telecommunications sector

The second analysis test performed, confirmed the reliability of the measuring instruments. The Cronbach-alpha coefficients for each of the identified factors were calculated. Cronbach-alpha values of more than 0.70 suggested that all the scores are reliable. Fourteen factors representing the independent variables and four factors representing the intervening variables were identified during the exploratory factor analysis.
The factor *Human Capital* was omitted from further analysis as it did not demonstrate sufficient proof of reliability. Although not initially expected, three items measured a separate construct in the factor analysis. The new factor, namely *Entrepreneurial Management* was included for further analysis. The third analysis, Structural Equation Modelling was the main statistical procedure used to test the significance of the relationships hypothesised between the various variables. The complete model was not subjected to tests, but divided in two sub-models for empirical evaluation.

### 8.4 Interpretations and Conclusions about the Research Problem and Research Questions

This study, as stated in Chapter 1, can be described as a theoretical model-building study with the main objective being ‘*To investigate what factors have an impact on entrepreneurial competitiveness in the Telecommunications sector in South Africa*’ in order to address the research problem ‘*Entrepreneurs face the problem of identifying the factors that influence the competitiveness of their businesses in the transforming telecommunications sector in South Africa*’.

In order to identify these factors, the primary areas of interest in this study were identified in Section 1.3 and presented as (1) Entrepreneurship, (2) Telecommunications and (3) Competitiveness. Figure 1.1 illustrated the research process in terms of the primary and overlapping constructs between Entrepreneurship, Telecommunications and Competitiveness. These three areas of interest were investigated in Chapters 2 to 4.

As described in Figure 1.1, the Entrepreneurship/Telecommunications/Competitiveness (E/T/C) nexus represents an area of new research and forms the basis of the “research gap” in this study. The primary objective for the study therefore is supported by the nexus point of research conducted. A contribution to the body of knowledge is therefore evident in this study.

In Chapter 7, various factors which have significant influence on the dependent variable were reported and the relationships were summarised in Figure 8.2. The relationships perceived to have an influence on entrepreneurial competitiveness in
the telecommunications sector in South Africa are presented graphically by an illustrative diagram in Figure 8.3.

**Figure 8.3 Illustrative diagram: A model to promote entrepreneurial competitiveness in the South African telecommunications sector**

The illustrative diagram presented in Figure 8.3 indicates the significant relationships between both the macro and micro environmental factors and entrepreneurial competitiveness in the telecommunications sector. The factor entrepreneurial orientation is located in its own box as it represents an intervening variable. The
macro environment factors consist of Infrastructural Change and Regulatory Alignment. The micro environment consists of three main business performance drivers and includes Entrepreneurial Management, Entrepreneurial Mindset and Technological Entrepreneurship.

The next section discusses each of the statistically significant relationships portrayed in Figure 8.3, followed by a discussion on the non-significant factors. The interpretations and recommendations for each relationship will be stated. The hypotheses are also reworded in order to make them more appropriate for managerial use.

### 8.4.1 Entrepreneurial Orientation

For the purpose of this study Entrepreneurial Orientation was described as the positioning of entrepreneurial businesses in the telecommunications sector in South Africa. Entrepreneurial businesses possessing EO characteristics demonstrate the ability to discover and exploit new opportunities whilst they respond to challenges to increase performance and efficiency in the telecommunications sector. These findings are supported by previous research findings (Wiklund and Shepherd, 2005; Shane and Venkataraman, 2000; Lumpkin and Dess, 1996). To be entrepreneurially orientated in the telecommunications industry, an entrepreneur must be able to launch innovative products, embrace a creative culture and be proactive in identifying industry trends. The entrepreneur must also ensure his business is competitively positioned in the industry. The entrepreneur should also be able to make decisions aggressively which involve changes of strategy and adopt new technologies.

The hypothesis $H^{15}$ from the study refers to:

*There is a positive relationship between Entrepreneurial Orientation and Entrepreneurial Competitiveness in the telecommunications sector.*

The hypothesis $H^{15}$ can be presented in management terms as:

*Businesses in the telecommunications sector can be more competitively positioned if they increase the levels of EO as part of their business strategy.*
8.4.2 Infrastructural Change

Entrepreneurs must be able to acknowledge the opportunities associated with infrastructural change in the telecommunications sector in order to position their businesses more competitively. Telecommunications advancement in South Africa is currently driven by infrastructural change. Rapid deployment of local, country-wide and International telecommunications infrastructure has a significant, positive influence on EO in the telecommunications sector in South Africa. These findings are supported by previous research findings by Tsai et al. (2006) and Venkataraman (2004).

Factors such as Fixed Mobile Substitution, Broadband data growth and lower price baskets drive the demand for high technological, infrastructural deployments. The granting of Electronic Communications Network Services licences to over 600 organisations by ICASA also opened doors for entrepreneurs to deliver services over the new infrastructure.

The hypothesis H\textsuperscript{1a} from the study refers to:

*There is a positive relationship between Infrastructural Change and Entrepreneurial Orientation.*

The hypothesis H\textsuperscript{1a} is therefore presented in management terms as:

*The more Entrepreneurs in the telecommunications sector in South Africa acknowledge and benefit from Infrastructural change, the more competitive their businesses will be.*

8.4.3 Regulatory Alignment

When entrepreneurial activities increase in the telecommunications industry the stimulation of competition becomes evident. The telecommunications sector in South Africa is regulated and therefore it is important to obtain an Electronic Network License. Business owners are required to obtain a licence from ICASA to operate in the sector. In order to better understand the regulated environment, entrepreneurs are expected to familiarise themselves with the Electronic Communications Act of 2005.
One of the main objectives of regulation is to ensure a stable business sector where effective and sufficient competition is introduced. Alignment with the licensing framework, as well as owning a valid network licence is therefore an advantage to businesses operating in this sector.

The hypothesis $H^3_a$ from the study refers to:
*There is a positive relationship between Regulatory Alignment and Entrepreneurial Orientation.*

The hypothesis $H^3$ from the study refers to:
*There is a positive relationship between Regulatory Alignment and Entrepreneurial Competitiveness in the Telecommunications sector.*

The hypotheses $H^3$ and $H^3_a$ are therefore presented in management terms as:
*There is a more positive result when entrepreneurs engage in business within the regulatory framework in the telecommunications sector in South Africa.*

**8.4.4 Entrepreneurial Mindset**

Entrepreneurs, in general, find it easy to identify new opportunities, based on their mindset and ability to adjust rapidly in uncertain times. The foundation of the entrepreneurial mindset in the study refers to cognitive adaptability. This mindset can be described as the ability to be dynamic, flexible and self-regulating in cognitions given dynamic and uncertain task environments. When the rewards are perceived to be high, the entrepreneur should be prepared to seek solutions and take high, calculated risks in the business. This stimulates the need for achievement as well as the right mindset to organise resources in order to achieve competitive advantage. When it comes to business organisation, the entrepreneur can set goals and achieve them. These findings are supported by previous research findings (Haynie et al., 2010; Gaglio, 2004).

The hypothesis $H^4$ from the study refers to:
There is a positive relationship between the Entrepreneurial Mindset and Entrepreneurial Competitiveness in the Telecommunications sector.

The hypothesis $H^4$ is therefore presented in management terms as: When Entrepreneurs in the telecommunications sector focus on organising resources and are willing to take high risks, they will be able to position their businesses more competitively.

### 8.4.5 Entrepreneurial Management

Entrepreneurial Management was identified in the study as a new factor. The items that loaded with this factor in the factor analysis included those from Human Capital and Entrepreneurial leadership. Entrepreneurial management in this study therefore relates specifically but not exclusively to both leadership and human resources.

Entrepreneurial Management can thus be referred to as the entrepreneurial ability to effectively demonstrate leadership attributes to gain competitive advantage. Entrepreneurial Management further refers to the managerial skills used to manage and deploy human resources effectively where required to achieve competitive advantage.

The responsibilities many entrepreneurs in the telecommunications sector have to face are both managerial and hands-on in nature. In many of these businesses, the entrepreneur is the most highly skilled person and has to manage the business both technically and administratively. These roles pose challenges to the entrepreneur where he has to focus more on the daily tasks of the business rather than focus on management and resource deployment strategies.

The hypothesis $H^7$ from the study refers to: There is a positive relationship between the Entrepreneurial Management and Entrepreneurial Competitiveness in the Telecommunications sector.

The hypothesis $H^7_a$ from the study refers to:
There is a positive relationship between the Entrepreneurial Management and Resource Allocation.

The hypotheses H\(^7\) and H\(^{7a}\) are therefore presented in management terms as: Entrepreneurs should associate themselves more with managerially orientated tasks and effective resource management in order to gain competitive advantage in the telecommunications sector in South Africa.

### 8.4.5 Financial Resources

Access to finance for capital ventures in South Africa remains difficult to obtain. Entrepreneurs in the telecommunications sector are involved in high risk taking and must face the challenges of being willing to commit more financial resources to projects where the cost of failure may be high. This willingness to take risk also includes committing financially to projects where the outcomes are uncertain. This attitude clearly reflects that the business is prepared to break away from the tried-and-tested by venturing into uncertain terrains which can produce high returns. This is an important aspect in the changing telecommunications sector where price is currently the dominant differentiator as the returns on investments are not high, unless the envisaged venture can be competitively positioned.

The hypothesis H\(^8\) from the study refers to: There is a positive relationship between Financial Resources and Entrepreneurial Competitiveness in the Telecommunications sector.

The hypothesis H\(^8\) is therefore presented in management terms as: Entrepreneurs can position their businesses more competitively when they allocate financial resources effectively to ventures that will enhance their competitiveness in the telecommunications sector in South Africa.

### 8.4.6 Benchmarking

The main objective of benchmarking in the context of this study is to compare a business with other similar businesses. It also implies evaluating internal structures and how efficiently the business is run. Entrepreneurs demonstrate abilities which
effectively deploy measurement techniques to adapt to the existing environment by expanding the scope of services and by varying the sources of revenue. Strategic planning, supported by benchmarking, enables a business to focus on changes in management capability in areas where, by improving quality, productivity and customer satisfaction, the best returns are yielded.

It can be assumed that the more efficiently a business operates the more profit it will generate and the more competitive it will be. Efficiency is therefore more indicative than profitability because it cannot be as easily manipulated to realise short-term objectives. It is expected that an efficient company will withstand market competition, be less sensitive to unfavourable changes in the environment and be more likely to use benchmarking to link the best of its short- and long-term goals.

The hypothesis $H^{10a}$ from the study refers to:

*There is a positive relationship between Benchmarking and Strategic Positioning*

The hypothesis $H^{10a}$ is therefore presented in management terms as:

*The more Entrepreneurs apply internal and external benchmarking techniques, the better they will be able to re-position their businesses in a fast changing sector.*

**8.4.7 Technological Entrepreneurship**

Telecommunications sectors function in a technologically intensive environment. Fast-paced changes in technology require technical experience and know-how to create value. In the telecommunications sector, the technological entrepreneur is concerned with the technological aspects of the industry. In order to be more competitive, entrepreneurial responses to operating in a technological business environment, in particular the telecommunications sector is necessary.

The attributes of a technological entrepreneur include the understanding of conditions that lead to the identification and exploitation of opportunity to create profit in the midst of technological changes and adoption of new policies or opportunities. The process of searching for opportunity is strongly influenced by the entrepreneur’s
technical background and the operational environment in which the entrepreneur operates.

The hypothesis $H_{11}$ from the study refers to:

*There is a positive relationship between Technological Entrepreneurship and Entrepreneurial Competitiveness in the Telecommunications sector*

The hypothesis $H_{11}$ is therefore presented in management terms as:

*Technological entrepreneurs are positively disposed to technological change and they are likely to introduce disruptive technologies into the telecommunications sector.*

8.5 THE ROLE OF THE NON-SIGNIFICANT RELATIONSHIPS

Figure 8.2 portrays both the statistically significant and non-significant factors identified in this study. In order to discuss the non-significant factors, discussions were held with 76 industry experts, who formed part of the study population in the empirical tests and are known to the author. The discussions were conducted at regular intervals and perceptions related to the industry were shared at informal meetings. Based on this qualitative information, conclusions can be drawn relating to several statistically non-significant relationships in the empirical model. These non-significant factors are discussed.

8.5.1 Sector transformation

Sector transformation in this study refers to entrepreneurial responses to changes relating to the transformation factors observed in the telecommunications sector. These changes were identified as infrastructural and regulatory changes observed in the sector. Although these individual factors are reported to have significance in their relationships with the dependent variable, entrepreneurs in the telecommunications sector have not yet fully realised the positive effects of the full extent of sector transformation in South Africa.

The perception of sector transformation at macro level is that the telecommunications industry is still monopolised. The most obvious reason for this is
that Telkom still owns the monopoly in the last mile infrastructure. Major operators, such as Vodacom, MTN and Neotel currently leverage their own backbone infrastructure and have not yet managed to compete directly with Telkom’s last-mile fixed line infrastructure. The entrepreneur who uses the service has not yet realised that there are initiatives to build infrastructure in South Africa. and therefore the perception of oligopolies persists within the entrepreneurs’ minds.

Some entrepreneurial businesses started with small scale last-mile deployment, for example Gated Community infrastructure rollouts. These small scale ventures have the potential to be expanded to large scale roll-outs where true scale sector transformation can be acknowledged at the micro level. This perception of market conditions may have contributed to the relationship reported between the intervening and dependent variable and the factor Sector Transformation as non-significant.

8.5.2 Entrepreneurial experience

From the literature, entrepreneurial experience referred to the ability to take advantage of personal experience to improve competitiveness. Entrepreneurs often make business decisions based on their experience in their industries. In the literature study, the telecommunications sector was described as a fast-changing technological sector. Although the factor Entrepreneurial Experience produced a non-significant result, the factor Technological Entrepreneurship produced a significant relationship. It can be concluded that entrepreneurs in this sector realise that their technical experience, rather than entrepreneurial experience is an important factor in their industry. This perception may have contributed to the report that the relationship between the intervening and dependent variable and the factor Entrepreneurial Experience is non-significant.

8.5.3 Entrepreneurial leadership

The new factor namely Entrepreneurial Management was discussed earlier in this chapter. Two items from the omitted factor Entrepreneurial Leadership namely EL51 and EL54 loaded together with HC58 to form the new factor Entrepreneurial Management. The factor Entrepreneurial Leadership is therefore represented in the model, but the factor relates more to management than to leadership. Entrepreneurs
in the telecommunications sector are usually hands-on individuals who are involved in all aspects of their businesses. For example an entrepreneur will be involved in sales, administration, technical aspects and perform financial management tasks. The role of the individual therefore relates more to a managerial role that that of a leader in his business.

8.5.4 Legal alignment

The literature on government's performance in the telecommunications sector indicates that the perceived viewpoint of the industry relates to poor performance and lack of responsibility. The failure to induce an effective competitive landscape, lack of ability to deploy spectrum space hinders competitive activities within the sector. Entrepreneurs perceive that the government intervention and activities are non-existent in their business models. This negative perception may have contributed to the poor relationships between Legal Alignment and both the intervening and dependent variables.

8.6 THE DEPENDENT VARIABLE: PERCEIVED ENTREPRENEURIAL COMPETITIVENESS

Perceived Entrepreneurial Competitiveness refers to the ability of entrepreneurs to reposition their businesses more competitively in the fast-paced telecommunications sector in South Africa. In Chapter 1, sector transformation, infrastructural and technological changes were postulated as the main reasons why entrepreneurs face a challenge to remain competitive in the industry. Changes brought about continuous pressure on the pricing models which in turn added pressure to the competitiveness of entrepreneurial businesses in the sector.

The telecommunications sector in South Africa is continuing to change at a rapid pace in terms of new infrastructural development and technological advancements and therefore the challenges of remaining competitive will also be influenced. In addition, telecommunication service prices continue a downward spiral. The lower price baskets spend per user requires businesses in the industry to be more effective in their strategy so that they can remain competitive. This price basket, together with
change in regulations and legislation, has created an environment where entrepreneurs are forced to rethink their approach in strategy as to how the changes should be approached.

Incumbent operators, including Telkom, Vodacom, MTN, Neotel and others commenced with aggressive infrastructure rollout countrywide. The expansion of infrastructure enables entrepreneurs who are licence holders to use the opportunity to build their own data networks using wireless and fixed line technologies.

8.7 IMPLICATIONS OF THE STUDY ON THEORY AND THE BODY OF KNOWLEDGE

In Chapter 1 the primary objective was discussed and the three primary areas of research were identified as Entrepreneurship, Telecommunications and Competitiveness. The contribution of this study to the body of knowledge relates to the research performed in the area of Entrepreneurship, Telecommunications and Competitiveness. The nexus of the three primary areas of research represents limited research in the combined construct and research in this field has remained unexplored until now.

The factors influencing entrepreneurial competitiveness were identified and the theoretical model was constructed. This model was then empirically tested. This study added knowledge to the research method of entrepreneurial research by focusing on this interpretation of the literature.

This study further added to the study field of Entrepreneurial Orientation (within a specific sector) research by investigating an area which has dearth of literature, namely entrepreneurial competitiveness in the telecommunications sector in South Africa.

The use of an advanced statistical technique such as Structural Equation Modelling (SEM), as well as the use of a relatively large empirical sample size in this study, also adds knowledge to the field of entrepreneurship in the telecommunications sector which had not previously been investigated in the changed political and economic situation.
The study provided insight into entrepreneurial studies in an area where specific environmental factors affect the levels of competitiveness in a business. This study identified specific changes in the technological sector. The current landscape consists of sector transformation, infrastructural and technological change which contributes new knowledge about how entrepreneurs reposition their businesses in a specific environment, but at the same time they are able to increase the levels of competition.

The study included identifying and developing conceptual models that outline the most significant factors that influence entrepreneurial competitiveness in the telecommunications sector. As a result, a contribution has been made towards understanding the implications of certain factors of competitiveness in entrepreneurial businesses in the telecommunications sector in South Africa. The results of the study therefore offer specific recommendations on how to improve business competitiveness in the telecommunications sector.

A further contribution of this study is the development of a measuring instrument that measures the factors influencing entrepreneurial competitiveness in the telecommunications sector in South Africa. With minor adjustments to the wording and some contextual additions, this measuring instrument could be used to measure the factors influencing the competitiveness of entrepreneurial businesses in other similar sectors. The sectors can be situated in other emerging market segments outside the boundaries of South Africa.

The purposive sampling technique was used in the study. The population sample was extracted from three representative bodies in the telecommunications sector. The homogeneous nature of the demographic characteristics of the respondents in this study contributed to the reliability in the study and can be observed by the high Cronbach-alpha coefficients returned by the measured factors. The sampling technique in similar studies can therefore be adopted.
8.8 RECOMMENDATIONS FOR FURTHER RESEARCH

The main research problem in this study was stated as ‘Entrepreneurs face the problem of identifying the factors that influence the competitiveness of their businesses in the transforming telecommunications sector in South Africa’. The problem was addressed by proposing a theoretical model depicting the factors influencing entrepreneurial competitiveness in the telecommunications sector. The research paradigm was positivistic and a quantitative research design was adopted. Further research can be conducted by using a qualitative research design approach to measure the factors in a narrower paradigm.

This study was concerned with the development of a measuring instrument that measures the factors influencing entrepreneurial competitiveness in the telecommunications sector in South Africa. Similar studies can be conducted in other sectors or in emerging markets with specific environmental conditions.

The assumption was made that universal studies in entrepreneurship apply to entrepreneurial studies in the telecommunications sector. In addition to universal entrepreneurial studies, the findings in this research study provide a foundation and introduction and thereby provide a base of departure for future research in the field of entrepreneurial competitiveness in similar sectors overseas and in particular entrepreneurial businesses in telecommunications sectors.

The research paradigm for the study was positivistic and a quantitative research design adopted. Specific factors including Entrepreneurial Leadership, Opportunity Recognition and Entrepreneurial Innovation could be further researched by means of a qualitative study to profile the entrepreneur in more detail.

Specific scales were developed for each of the variables in this study. The variables in the theoretical model were reported to be reliable and valid based on their high Cronbach-alpha coefficients. This fact, together with the significance of the variables within the model, makes the scales suitable for use in future studies.
SEM requires a large sample size as precision of the estimates is limited by sample size. The sample size can be increased or the number of factors can be decreased to overcome the problem in future studies so that the full benefit of subjecting the model to SEM can be realised. Also, in future studies, models constructed differently can possibly better fit the data collected.

The study provided insight and an entrance into entrepreneurial studies in an area where specific environmental factors affect the competitiveness levels of a business. The theoretical model has application in other industries with unique environmental conditions where entrepreneurs face the same challenge of identifying competitiveness factors. The theoretical model can therefore serve as a foundation to identify other factors related to the environmental conditions of a specific sector.

8.9 LIMITATIONS OF THE STUDY

This study attempted to make a contribution to the body of knowledge concerning entrepreneurial competitiveness in the telecommunication sector in South Africa. However, as in all empirical studies, certain limitations were discovered which should be considered when drawing conclusions with regard to the findings of this study. Many areas of competitiveness have been explored and greater understanding attained and new avenues for research have also been revealed. The limitations are mentioned in consideration for future research of this nature into entrepreneurial competitiveness.

The following assumptions prevailed during the scope of this study:

- Universal entrepreneurial studies apply to entrepreneurial studies of the telecommunication sector;
- The current legislation and regulatory framework will remain current for the duration of the study and
- Market and economic conditions will be constant for the duration of the research project.

The present study was conducted in a time frame where sector transformation is prevalent in South Africa. Factors including sector transformation, regulatory reform
and infrastructural change might not always prevail. The theoretical model therefore is limited to the conditions in a specific sector in a specific time cycle.

The completion of the questionnaire in this study was dependent on the self-report of respondents. The questionnaire consisted of a set of question in a highly structured written form. The factors were measured by one-time individual self-report questions. Respondents might have exaggerated answers to make their situation seem worse or better and therefore the findings of this study are open to question as a result of method bias.

It is recognised that the relationships between the factors under investigation could be influenced by variables other than those accounted for in this study, such as levels of experience, time in business and personal perceptions based on industry experience.

8.10 CONCLUDING REMARKS

Research Question RQ₈ and research objective RO₈ were addressed in this chapter. Telecommunications has a significant social, cultural and economic impact on modern society. At micro-level, companies use telecommunications to build global business empires, whilst at macro-level countries link telecommunications infrastructure to economic growth. Telecommunications has played a significant role in social relationships, the most prevalent technology in engagement by people in every day communications. People talk, share, extract, socialise and communicate electronically mainly by means of computers and mobile devices such as tablets and smart phones. The communications information highway opens the world to academic, career, social and various other sources of knowledge. This is all made possible by inter-networks linked by data lines, wireless access media and clustered servers. These inter-networks all interconnect at concentration points which are operated and managed by people in industry in the telecommunications sectors, both globally and local in South Africa.

New ground has been broken by this study as it provides a foundation from which entrepreneurs can identify the more competitive factors in the telecommunications
sector in South Africa. The study focused on a specific sector with unique market forces that reshape the industry landscape and at a fast pace. In the current uncertain economic circumstances, both globally and locally, it becomes daily routine to reposition business activities in order to be more competitive. The theoretical model constructed in this study can act as a guideline to entrepreneurs in order to focus on the factors influencing the competitiveness of their businesses.

The research highlighted the importance of entrepreneurial activities in the South African telecommunications sector. The study also confirmed a positive response in regulatory alignment by entrepreneurs as they associate themselves with licensing and the legal environment in the telecommunications sector in South Africa.

In conclusion, entrepreneurial activities will continue to make inroads into the telecommunications sector in South Africa and should not be underestimated in terms of their contribution to enhancing the quality of the working and professional lives of South Africans in terms of the potential of entrepreneurs by stimulating economic growth and to create jobs.
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Lansdowne: Juta.


APPENDIX A : GLOSSARY OF RESEARCH TERMS

Abstract: a brief summary of the research study

Analysis: the process of synthesizing data to answer the research question

Alpha: in tests of statistical significance, the alpha level indicates the probability of committing a Type I error; in estimates of internal consistency, a reliability coefficient, as in Cronbach alpha.

Analysis of variance: a statistical test for comparing mean scores among 3 or more groups

Beta: in statistical testing, the beta is the probability of a type II error; in multiple regressions, the standardised coefficients indicating the relative weights of the independent variables

Bias: any influence that can change the results of a study

Causal relationship: a relationship between 2 variables in which the presence or absence of one variable determines the presence or absence of the other

Chi-square test: a nonparametric statistical test used to determine relationships between two nominal level variables

Coefficient alpha (Cronbach alpha): a reliability index that estimates the internal consistency of a measure with several items of subparts

Concurrent validity: the degree to which scores on an instrument are correlated with some external criterion, measured at the same time

Confidence interval: a range of values that a parameter is estimated to fall within

Construct validity: the degree to which an instrument measures the construct intended
**Correlation coefficient**: an index that reflects the degree of relationship between 2 variables. A perfect positive relationship + 1, no relationship is 0, and -1 is a perfect negative relationship.

**Criterion validity**: the degree to which scores on an instrument are correlated with some external criterion.

**Cronbach alpha**: a reliability index that reflects the internal consistency of a measure.

**Degrees of freedom**: a concept used with statistical tests that refers to the number of sample values that are free to vary. In a sample, all but one value is free to vary, and the degrees of freedom is often N-1.

**Descriptive study**: a study that defines or describes a population or phenomenon.

**Descriptive statistics**: methods used to describe or summarise the characteristics of data in a sample.

**Dependent variable**: the outcome variable of interest.

**Exploratory study**: a type of study design used to explore or gain insights into a phenomenon.

**External validity**: refers to how representative the results of the study are (generalisability).

**Face validity**: the degree to which a test appears to measure a concept based on the judgment by experts.

**Factor analysis**: a statistical procedure for reducing a large set of variables into smaller sets of related variables.

**Frequency distribution**: a display of data values from the lowest of the highest, along with a count of the number of times each value occurred.

**Hypothesis**: a statement of the relationship between 2 or more study variables.
**Independent variable**: the conditions or factors that are explored in relationship to their influence on the dependent variable

**Indirect (inverse) relationship**: a negative correlation between 2 variables

**Internal consistency reliability**: the degree to which all items in a scale are measuring the same dimension of a concept

**Internal validity**: a measure of the independent variable being responsible for an observed effect

**Interval scale**: measures data that rank orders a variable with equal distance between measurement points (eg, temperature data)

**Instruments**: devices or techniques used to collect data

**Likert scale**: a scale of measurement in which respondents are asked to respond to statements based on how much they agree or disagree

**Literature review**: the process of searching published work to find out what is known about a research topic

**Mean**: the average value or measure of central tendency. The mean is obtained by dividing the sum of values by the total number of values

**Median**: the middle score

**Mode**: the value that occurs most frequently

**Multiple regression**: a statistical procedure for understanding the effects of 2 or more independent variables on a dependent variable

**N**: used to designate the total sample size

**n**: used to designate the number of subjects in a subgroup

**Nominal scale**: a scale that measures data by assignment of characteristics into categories (eg, male=1, female=2)
**Null hypothesis**: a statement that no relationship exists between study variables

**Ordinal scale**: a scale that measures data that rank order values

**Path diagram**: a diagram representing the relationship of variables

**Pilot study**: a small scale study conducted to test the plan and method of a research study

**R**: the symbol that indicates the squared multiple correlation coefficient which indicates the amount of variance in the dependent variable accounted for or explained by the independent variable

**Range**: represents the dispersion of data or the difference between the smallest and largest values

**Ratio scale**: a scale that has a zero point and equal distances between scores

**Regression**: a statistical procedure for predicting values of a dependent variable based on the values of one or more independent variables

**Reliability**: refers to the consistency of the measures and means that an instrument produces consistent results or data with repeated use

**Respond rate**: the rate of participation in a study

**Significance level**: the probability that an observed relationship could be caused by chance. A significance level of 0.5 indicates the probability that a relationship would be found by chance only 5 times out of 100

**Standard deviation**: a measure of variability of data. The standard deviation is the average of the deviations from the mean

**Standard score (z-score)**: refers to how many standard deviations away from the mean a particular score is located

**T-test**: a statistical test used to determine if the means of 2 groups are significantly different
**Type I error (alpha error):** occurs when it is concluded that a difference between is not due to chance when in fact it is (reject a true null hypothesis)

**Type II error (beta error):** occurs when it is concluded that differences between groups were due to chance when in fact they were due to the effects of the independent variable (accepts a false null hypothesis)

**Variable:** a characteristic, attribute, or outcome

**Validity:** refers to the ability of the instrument to measure what it proposes to measure

**Variance:** a descriptive statistic that examines how scores are distributed

**Z-score:** a standard score, express in terms of standard deviations from the mean
Dear Respondent

Research Project: Entrepreneurial competitiveness in the telecommunications sector is South Africa.

In conjunction with the Nelson Mandela Metropolitan University, I am currently conducting a research project in: The promotion of Entrepreneurial Competitiveness in the telecommunications Sector in South Africa.

The purpose of the research is to establish the factors that influence the competitiveness of their businesses in the transforming telecommunications sector in South Africa and approaches that will promote higher levels of competitiveness of entrepreneurial businesses in the telecommunications sector.

To obtain meaningful results, your co-operation is of particular importance. Completing the questionnaire should not take more than ten minutes of your time.

Kindly note that no attempt is made to identify you, your anonymity is assured and all responses will be treated in the strictest confidence.

We would be grateful if you can complete the questionnaire before 8 May 2012.

You will receive a copy of the results and we trust this will provide you with useful information for your own business environment.

Thank you for your willingness to contribute to the success of this important research project.

Yours faithfully

Towards the fulfillment of a Doctoral Thesis presented by:

Marius Oberholzer
**ENTREPRENEURIAL COMPETITIVENESS IN THE TELECOMMUNICATIONS SECTOR IN SOUTH AFRICA SURVEY**

**Instructions**

Dear Survey Participant

Thank you for your willingness to contribute to the success of this important research project.

To ensure full accuracy of the survey results we would like you to answer the questionnaire carefully and complete all questions. Only one answer is required per question.

There are two sections and the completion of the survey will not take more than 10 minutes to complete.

<table>
<thead>
<tr>
<th>Statements relating Entrepreneurial Competitiveness in the telecommunications sector in South Africa</th>
<th>Extend of Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only One Answer required per statement</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>EO1 My business is entrepreneurial in nature</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>EO2 My business has a creative culture</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>EO3 My business is proactive in identifying industry trends</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>EO4 My business is competitively positioned in the industry</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>EO5 My business is aggressive in making decisions that involve change of strategy</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>EO6 My business is aggressive in adopting new technologies</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>IC7 New telecommunications Infrastructure rollout in South Africa occurs at a fast pace</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>IC8 Recent infrastructural change in the telecommunications sector is evident</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>IC9 Telecommunications infrastructural changes have an effect on my business</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>IC10 My business adapted to new infrastructural technologies in this past year</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>IC11 The adoption of new infrastructure technologies makes my business more competitive</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>SR12 The telecommunications sector has changed in the past 5 years</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>SR13 Telecommunications sector reform is a catalyst for new business opportunities</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Statements relating Entrepreneurial Competitiveness in the telecommunications sector in South Africa</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>SR14 The new Electronic Communications Act of 2005 (ECA) brought about changes in the telecommunications sector</td>
<td>1</td>
</tr>
<tr>
<td>SR15 Sector reform stimulates competition in the telecommunications industry</td>
<td>1</td>
</tr>
<tr>
<td>SR16 Reform in the telecommunications sector opened new opportunities for my business in the past 5 years</td>
<td>1</td>
</tr>
<tr>
<td>RL17 The South African telecommunications sector is properly regulated</td>
<td>1</td>
</tr>
<tr>
<td>RL18 Compliance with the Electronic Communications Act of 2005 results in a more competitive business environment</td>
<td>1</td>
</tr>
<tr>
<td>RL19 Strict regulation in the telecommunications sector is necessary</td>
<td>1</td>
</tr>
<tr>
<td>RL20 Telecommunications regulations in South Africa stimulates competition</td>
<td>1</td>
</tr>
<tr>
<td>RL21 The telecommunications sector in South Africa is highly competitive because of effective regulation</td>
<td>1</td>
</tr>
<tr>
<td>OR22 I often spot new business opportunities</td>
<td>1</td>
</tr>
<tr>
<td>OR23 My ability to identify new opportunities leads to new business initiatives</td>
<td>1</td>
</tr>
<tr>
<td>OR24 For my business to survive I must be able to identify new opportunities</td>
<td>1</td>
</tr>
<tr>
<td>OR25 I am faster than my competitors in utilising a new opportunity</td>
<td>1</td>
</tr>
<tr>
<td>OR26 I have a systematic process that is used to identify new opportunities</td>
<td>1</td>
</tr>
<tr>
<td>EM27 I find it easy to identify a business opportunity</td>
<td>1</td>
</tr>
<tr>
<td>EM28 When it comes to business I am adaptable in my thinking</td>
<td>1</td>
</tr>
<tr>
<td>EM29 I have a need for achievement when it comes to business</td>
<td>1</td>
</tr>
<tr>
<td>EM30 I am prepared to take high risks in my business if the rewards are perceived to be high</td>
<td>1</td>
</tr>
<tr>
<td>EM31 When it comes to business, I can set goals and achieve them</td>
<td>1</td>
</tr>
<tr>
<td>EI32 I am innovative by nature</td>
<td>1</td>
</tr>
<tr>
<td>EI33 I am creative by nature</td>
<td>1</td>
</tr>
<tr>
<td>EI34 Business innovation is directly associated with high risk taking</td>
<td>1</td>
</tr>
</tbody>
</table>
### Statements relating Entrepreneurial Competitiveness in the telecommunications sector in South Africa

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neutral or no opinion</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>E135 My business can be more competitive when creative ideas are transformed into new business ventures</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>E136 My business has to adapt to my ability to be creative</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>7</td>
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<tr>
<td>E137 My business introduced market-leading products in the last 3 years</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>E138 I am a fast mover with innovations and creative ideas</td>
<td>1</td>
<td>2</td>
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<td>6</td>
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<tr>
<td>EE39 My experience in the telecommunications industry gives my business a competitive advantage</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>6</td>
<td>7</td>
</tr>
<tr>
<td>EE40 I make business decisions based on my experience in the telecommunications industry</td>
<td>1</td>
<td>2</td>
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<td>6</td>
<td>7</td>
</tr>
<tr>
<td>EE41 Based on my experience, the business is run effectively</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>7</td>
</tr>
<tr>
<td>EE42 I am technically experienced in the telecommunications industry</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>7</td>
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<tr>
<td>EE43 I can identify new business opportunities based on my experience</td>
<td>1</td>
<td>2</td>
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<tr>
<td>RA44 When I spot new business opportunities, my business resources need to be re-arranged to turn them into business ventures</td>
<td>1</td>
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<td>7</td>
</tr>
<tr>
<td>RA45 My business allows the employees to recognise new opportunities and turn them into new business ventures</td>
<td>1</td>
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<td>7</td>
</tr>
<tr>
<td>RA46 My business continually rearranges resources (material, human and financial) to remain competitive</td>
<td>1</td>
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<tr>
<td>RA47 My business can attract the resources required to be competitive</td>
<td>1</td>
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<tr>
<td>RA48 The re-arrangement of my business resources has to accommodate changes in the telecommunications sector</td>
<td>1</td>
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<td>6</td>
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</tr>
<tr>
<td>EL49 I organise business resources effectively</td>
<td>1</td>
<td>2</td>
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<td>6</td>
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<td>EL50 I adapt easily to an uncertain situation</td>
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<tr>
<td>EL51 My business deploys human resources effectively</td>
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<td>EL52 The employees in the business have trust in my leadership style</td>
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<td>EL53 The employees in the business have confidence in my leadership abilities</td>
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<td>ELS4 Constructive communication between management and employees is important in my business</td>
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<td>ELS5 The leadership in my business makes accurate decisions</td>
<td>1</td>
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<td>ELS6 I have the ability to lead the business in uncertain times</td>
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<tr>
<td>HCS7 Employees are a critical resource to ensure a business’s success</td>
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<td>HCS8 The employees contribute effectively to the business’ competitive advantage</td>
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<td>HCS9 My business invested intensively in human capital and therefore has a clear competitive advantage</td>
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<td>HC60 Human capital directly affects my approach to the utilisation of opportunities</td>
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<td>HC61 The effective use of human resources is positively related to my business’s new venture strategy</td>
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<td>FR62 My business utilises financial resources effectively</td>
<td>1</td>
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<td>FR63 Access to financial capital is beneficial to my business</td>
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<td>FR64 My business is financially sound</td>
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<td>FR65 I have access to finances to convert new ideas into products</td>
<td>1</td>
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<tr>
<td>FR66 My business has access to financial resources for capital expenditure</td>
<td>1</td>
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<td>SP67 I actively pursue business opportunities to gain a strategic competitive advantage</td>
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<td>SP68 My business benefits from new opportunities I identify</td>
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<td>SP69 My business follows a strategic plan to gain competitive advantage</td>
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<td>SP70 My business develops partnerships with other companies</td>
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<td>SP71 My business’ awareness of competitor activity enhances our ability to compete effectively</td>
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<tr>
<td>LA72 The competitiveness of my business complies with the regulatory environment in South Africa</td>
<td>1</td>
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<td>LA73 The Electronic Communications Act (ECA) creates a stable environment in which my business can operate</td>
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<td>LA74</td>
<td>It is an advantage to my business to comply with the Electronic Communications Act of 2005</td>
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<td>LA75</td>
<td>It can benefit my business to be an ECNS and iECNS licensee</td>
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<td>LA76</td>
<td>Legislation in the telecommunications sector is necessary to ensure a stable business environment</td>
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<td>BM77</td>
<td>My business analyses the telecommunications industry</td>
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<tr>
<td>BM78</td>
<td>I know what my competitors do</td>
<td>1</td>
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<td>BM79</td>
<td>The business offers competitively-priced products and/or services</td>
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<td>BM80</td>
<td>I use external benchmarking indicators to analyse the industry</td>
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<tr>
<td>BM81</td>
<td>My business performance is measured and compared against industry norms</td>
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<tr>
<td>TE82</td>
<td>My business operates in a hi-tech environment</td>
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<td>TE83</td>
<td>It is my responsibility to identify technological changes in the telecommunications market</td>
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<td>TE84</td>
<td>My business is likely to adapt to technological changes in the future</td>
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<td>TE85</td>
<td>I can foster technological change and sustain lower margins at the same time in the changing telecommunications sector</td>
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<td>2</td>
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<td>TE86</td>
<td>The telecommunications industry is regarded as a highly technological environment</td>
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<td>EC87</td>
<td>The effective adoption of new infrastructural technologies makes my business more competitive</td>
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<td>EC88</td>
<td>Effective adoption to change in the telecommunications sector enhances the competitiveness of my business</td>
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<td>EC89</td>
<td>The effective adaptation to new telecommunications regulations allows my business to compete more effectively</td>
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<td>EC90</td>
<td>My business is more competitive because we identify new opportunities and turn them into new ventures</td>
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<td>EC91</td>
<td>Deployment of skilled workers gives my business a competitive advantage</td>
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<td>EC92</td>
<td>Effective use of sound financial practices gives my business a competitive advantage</td>
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</table>
Demographic Information

The following questions include individual questions. All information will be treated as confidential and will not be used other than for demographic purposes towards the research project.

93. What is your gender?
   (Select only one.)
   □  Male
   □  Female

94. What is your present age?
   (Select only one.)
   □  18-25
   □  26-35
   □  36-45
   □  46-55
   □  55+

95. What is your home language?
   (Select only one.)
   □  English
   □  Afrikaans
   □  Zulu
   □  Xhosa
   □  Other

96. To what ethnic group do you belong?
   (Select only one.)
   □  Black
   □  Indian
   □  White
   □  Coloured
   □  Other

97. I own the business where I presently work
   (Select only one.)
   □  Yes
   □  No

98. Did you identify a unique opportunity/ies and as a result start a business?
   (Select only one.)
   □  Yes
   □  No

99. Did you buy into an existing business venture?
   (Select only one.)
   □  Yes
   □  No
100. Which one of the following factors motivated you most to start your own business? (Mark one block)

(Select only one.)
- The ability/opportunity to make more money than a salaried position
- The challenge of building a successful business
- Independence from an employer
- Non-employment
- Other

101. To what degree was existing technology (i.e. processes, service methodology etc.) transferred from your previous employer to your new enterprise?

(Select only one.)
- Direct
- Partial
- Vague
- No transfer
- Not applicable

102. My business is a licensed ECNS or iECNS provider

(Select only one.)
- Yes

☐ No

Basic Information (please be assured the information will not be distributed or used in any matter)

First Name*

Last Name*

Email*