# The impact of infrastructural change and regulation on entrepreneurial competitiveness in the South African telecommunications sector

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The fast pace of technological advancements is regarded as one of the global drivers of change. In the telecommunications sector in South Africa, these technological advancements as well as sector transformation pose competitiveness challenges to entrepreneurs. This paper reports an empirical study performed to contribute to the promotion of entrepreneurial competitiveness within the telecommunications sector of the South African economy. From the empirical study, significant relationships proved to exist between the intervening- and independent variables and the dependent variable of this study, namely Perceived Entrepreneurial Competitiveness. The independent variable Infrastructural Change positively influenced both the intervening variable Entrepreneurial Orientation and dependent variable Perceived Entrepreneurial Competitiveness. In the same manner, the independent variables of Regulatory Alignment and Entrepreneurial Mindset did positively influenced Perceived Entrepreneurial Competitiveness within this study.

The study found that entrepreneurs can position their businesses more competitively if the factors that impact directly or indirectly on Entrepreneurial Competitiveness in the South African Telecommunications sector are taken in consideration.

## Introduction

Entrepreneurial activity is regarded as one of the driving forces for economic development in a country (Nieman, Hough & Nieuwenhuizen, 2003). The field of entrepreneurship emphasises value creation through innovation, creativity and opportunity seeking (Shane & Venkataraman, 2000). Technological entrepreneurs however must be able to cope with significant ambiguity in the sectors in which they operate to ensure competitiveness. Within the telecommunications sector of 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).

A country's telecommunications sector is divided into highly competitive and advanced technological industry segments (Levin & Schmidt, 2010). Recently, regulatory changes, together with the promulgated Electronic Communications Act of 2005 in South Africa brought about a transformation stage in the country's telecommunications sector, where possible new entrepreneurial opportunities opened. Operators in this sector provide fixed or mobile telephony and others data services whilst the larger operators build network infrastructure. Data communication networks in particular, widely deployed effective broadband technologies, along with other Information and Communication Technologies (ICT) (Boorsma, 2009;

Jackson & Crandall, 2001). Deployment and utilisation of these networks bring about innovation and enhance national competitiveness (Intel World Ahead, 2009).

In this paper, a theoretical model exploring the relationship between Entrepreneurial Orientation and Entrepreneurial Competitiveness in the South African telecommunications sector is proposed and empirically tested. The study explores the intricate relationship between Entrepreneurial Orientation (EO) and Entrepreneurial Competitiveness (EC) in the South African telecommunications sector.

## Entrepreneurial orientation

Researchers use the term Entrepreneurial Orientation (EO) to describe a set of related entrepreneurial activities or processes, including processes, methods, styles, practices and decision-making activities employed by entrepreneurs that lead into the creation of new markets (Clausen & Korneliussen, 2012; Idar & Mahmood, 2011; Quince & Whittaker, 2003; Lumpkin & Dess, 2001, 1996). The term EO has also been used to refer to the strategy-making processes and the styles of companies that engage in entrepreneurial activities (Quince & 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 & Dess, 2001). Recently, organisational theory perspectives

emphasise that entrepreneurship is an organisational level phenomenon (Boehm, 2008). In particular, increasing attention has been paid to the argument that EO is a process that is reflected in repetitive organisational behaviour, rather than the actions of individuals possessing certain attributes or characteristics (Edelman & Yli-Renko, 2010; Quince & Whittaker, 2003).

A popular model of EO suggests that there are five dimensions to EO, namely: autonomy, innovativeness, risk-taking, pro-activeness and competitive aggressiveness (Lumpkin & Dess, 1996). 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 & Yli-Renko, 2010).

What drives entrepreneurs to start or persevere in conducting and organising business activities? Entrepreneurship studies have adopted structurally deterministic explanations based on opportunity discovery and resource mobilisation (Edelman & 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, Carter, Gartner & Greene, 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).

## Telecommunications

Global telecommunications trends during the past decade featured regulatory and technological change (ITU, 2012; Ponelis & Britz, 2008; Tsai, Chen & Tzeng. 2006). Telecommunications industries, by nature, are 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 both the beginning of the 20th and 21st centuries. International telecommunications players invent and provide disruptive technologies, which caused deep structural adjustment throughout society (Linstone, 2002). Technological drivers include data networks, broadband internet access and mobile communications (Jackson & Crandall, 2001).

The state of the South African telecommunications sector's performance is described as poor and inefficient (Bagdadioglu & Cetinkaya, 2010; ITU, 2010b; Gillwald, 2005). Increased competition induction is argued as a vital catalyst to increase performance and competition in the South African telecommunications sector (Levin & Schmidt, 2010). The mandate of the South African Department of Communications, derived from relevant legislation, is "*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 to give support to the African Agenda by contributing to building a better world*" (DOC, 2010:10). Empirical evidence indicates that political accountability is an important determinant of regulatory performance, where it is also argued that policies aimed at enhancing politically accountable systems should be given the necessary attention in development programmes (Gasmi & Recuero Virto, 2010; Gasmi, Noumba & Recuero Virto, 2009).

The Independent Communications Authority of South Africa (ICASA) is the South African composite ICT regulator. The strength of ICASA is defined in terms of its regulatory capacity, compliance monitoring and enforcement. Although ICASA's mandate proved to be sound, Ayogu and Bayat (2010) as well as Gillwald (2008) highlight its failure to deliver on this mandates. The regulator's enforcement mandate has been found to be especially crucial in the areas of interconnection, facilities leasing and consumer protection (Ayogu & Bayat, 2010). ICASA therefore ''has a singular challenge to create, through sound regulation, an environment conducive to the growth and development of the communications industry'' (Ayogu & Bayat, 2010: 244).

## Problem investigated

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. The perceived factors relates to sector transformation, regulatory changes, infrastructural and technological change. In addition, market volatility and uncertainty have also become more evident in the transformation process. Entrepreneurs therefore face challenges with the re-organisation of competitive strategies in these uncertain conditions. Against this background, the research problem is formulated as: entrepreneurs face the problem of identifying the factors that influence the competitiveness of their businesses in the transforming telecommunications sector in South Africa.

## Research objectives

The primary objective of this study is to investigate perceived factors impacting 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*) were identified, investigated and empirically tested. The study confirms the existence of relationships between the dependent and independent variables as their influences were measured.

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

- To develop a conceptual 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 having influencing entrepreneurial competiveness) and the dependent variable (*Perceived Entrepreneurial Competitiveness*);
- To develop a measuring instrument that will empirically test the relationships described in the conceptual model;
- 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
- To propose recommendations based on the results of the statistical analysis.

## Methodology

According to the literature, entrepreneurs seek competitive advantage by pursuing higher levels of effectiveness and better business performance. In order to support this, the independent variables are grouped with the intervening variable as proposed in the hypothesised relationships in Figure 1.
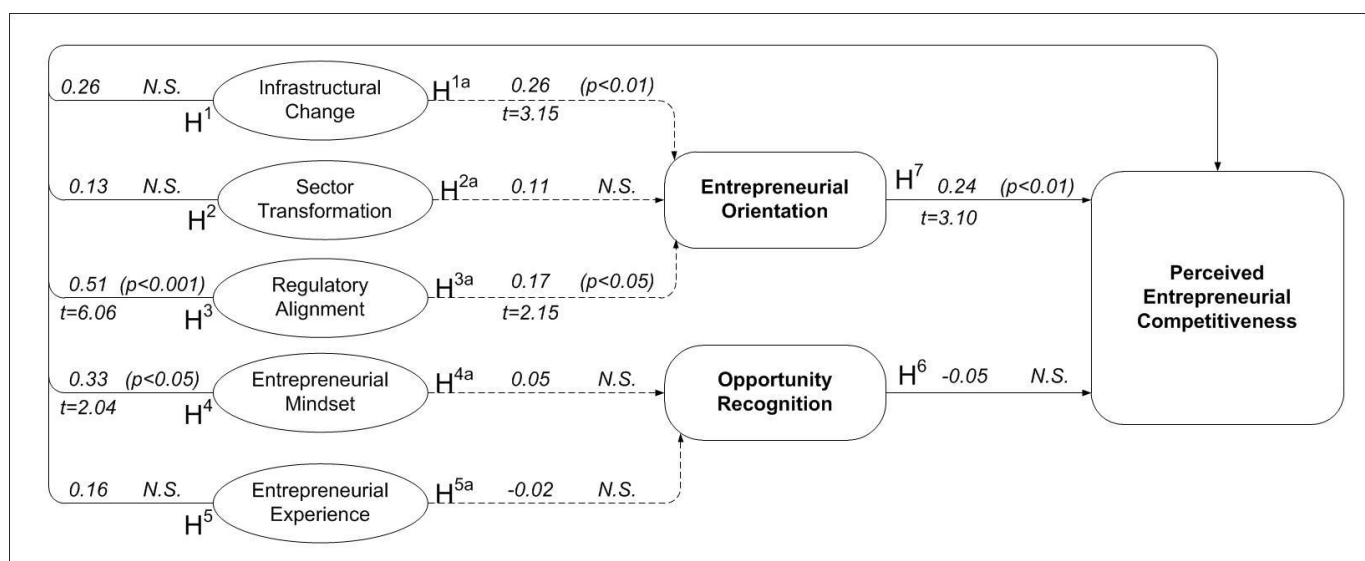


**Figure 1: Hypothesised relationships and structural model estimation**

This research project can be described as a theoretical model-building study. From literature, as many factors as possible were identified in order to propose the conceptual model. In order to test the propositions formulated in this study, the proposed model has been empirically tested. The Structural Equation Modelling (SEM) technique was 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 & Tatham, 2006).

### Measurement instrument

The purpose of the measurement 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. A questionnaire was developed and consisted of 42 closed ended statements. Questions were coded according to the variables identified in the conceptual model. All questions were worded statements and respondents had to indicate 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, Cooper & Schindler, 2008).

The use of the interval scale chosen was a strong motivation to use the chosen statistical SEM method. A positivistic research paradigm was adopted for this study and a quantitative research design applied. The proposed theoretical model was also 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 presented to the respondents for completion.

## Statistical procedures

Exploratory Factor Analysis (EFA) was used to assess the discriminant validity of the measuring instrument. The multivariate technique procedure is 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 then used to factor analyse the data. The data were pre-examined in order to confirm if they were suitable for factor analysis.

The Cronbach-alpha coefficient was calculated for each of the variables proposed in the conceptual model in order to assess the degree of reliability of the measurement instrument. In order to evaluate the relationships amongst the set of independent variables identified as *Infrastructural Change, Regulatory Alignment and Entrepreneurial Mindset*, the intervening variable identified as *Entrepreneurial Orientation* and the dependent variable as *Perceived Entrepreneurial Competitiveness* in the South African telecommunication sector, the theoretical model was statistically assessed using the structural equation modelling software application LISREL (Jöreskog & Sörbom, 2006).

## The sample

The sample selected for this study was directed to a population, which included entrepreneurs within an existing businesses environment and were operational in the South African telecommunications sector. 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 335 questionnaires were collected and 301 accepted, which represents a response rate of 37%. 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, with the majority of respondents represented between the ages 26 to 55. It is also noted that 81.7% of the respondents started new businesses whilst 18.3% 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. From the demographic section, it was observe 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.

## Operationalisation of the variables

### The dependent variable: Perceived entrepreneurial competitiveness

In this study, Entrepreneurial Competitiveness refers to the ability of entrepreneurs to reorganise their businesses more competitively in the fast-paced telecommunications sector in South Africa, with specific reference to infrastructural development, regulation and sector change. This ability is supported by literature in context with the new, independent entrepreneurial business and the linkage of technology to markets which is seen as the responsibility of everyone, especially of the founder of the company (Phan & Foo, 2004). These entrepreneurial businesses also 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 & Foo, 2004).

The telecommunications sector in South Africa is highly competitive and constitutes advanced technological industry segments (Levin & 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 fosters technological change while sustaining lower margins better than larger companies can and endure higher risk levels in this uncertain market sector (IMD, 2012). Apart from change in technology, competition has also proven to be the most effective agent of adjustment in a telecommunications sector (Engman, Onodera & Wilson, 2006). The increase in data and infrastructure capacity resulted in lower telecommunications prices to the consumer (Jackson & Crandall, 2001). Lower prices in return created 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 regulation and legislation (Jackson & Crandall, 2001), created an environment where entrepreneurs are forced to re-evaluate their strategy in how the changes should be approached (Ireland & Webb, 2009).

The national regulator in South Africa, ICASA, issued electronic network licences in 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. This expansion of infrastructure enabled licenced entrepreneurs to capitalise on the opportunity to build their own data networks, using wireless and fixed line technologies to increase competitiveness. In order to measure the dependent variable *Perceived Entrepreneurial Competitiveness* (coded EC), a six-item scale was constructed. The developed scale was based on the various academic resources used to develop the independent and intervening variables and related to competitiveness factors.

### Independent variable 1: Infrastructural Change

There has been significant interest in what would be necessary for productive entrepreneurship to flourish within specific sectors in a country (Venkataraman, 2004). With reference to the telecommunications sectors, technological

drivers include infrastructural development, fixed line to mobile substitution (FMS), mobile communications, broadband data access, and broadband internet and penetration. Entrepreneurs therefore need to recognise infrastructural 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). According to the ITU (2010b), global demand for higher-speed access networks and mobility grows daily. Tsai *et al.* (2006) also postulate that the development of the knowledge economy promotes broadband network construction that leads to the information society, which leads to the deployment of high technology infrastructure to accommodate expansion and 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:

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

*H2: There is a positive relationship between Infrastructural Change and Entrepreneurial Orientation.*

Based on work by Tsai *et al.* (2006) and Venkataraman (2004), a five-item scale was constructed.

## Independent variable 2: Sector Transformation

Telecommunications sectors globally are characterised by highly competitive and advanced technological markets (Levin & Schmidt, 2010). These sectors tend to allow market forces to establish market segmentation and competitive industry participation. Operators in the telecommunications sectors do so by formulating strategies which create market segments dictated by regulation, price, quality, technology or economies of scale (Levin & Schmidt, 2010; Walsh, 2005; Grant, 1998). As a result, competitive industries never reach a static state, but rather exhibit continuous change over time (Levin & 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). The South African telecommunications sector is currently subjected to transformation due to changes in legislation, regulation and infrastructural development. These changes open new opportunities, challenges and threats to entrepreneurial activities to industry players. In addition, market volatility and uncertainty becomes evident in the transformation process. Introduction of competition is therefore vital for the South African telecommunications sector in order to increase performance and competition across the spectrum of telecommunications service delivery (Levin & Schmidt,

2010). Market variables arising from environmental change within a sector may require a change in a business's competitive advantage strategies in order to respond to the potential opportunities created by these variables (Walsh, 2005). It was therefore hypothesised that:

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

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

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

## Independent variable 3: Regulatory Alignment

Telecommunications industries, compared to 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 & 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 transformation path where entrepreneurs have to build competitive businesses. 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 South African Electronic Communications Act (2005) makes provision for operators in the telecommunications industry to be licensed. Businesses in the South African telecommunications sector are to obtain licences and comply with the regulatory framework as prescribed in the ECA of 2005. It is therefore hypothesised that:

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

*H3a: There is a positive relationship between the Regulatory Alignment and Entrepreneurial Orientation in the telecommunications sector in South Africa.*

A five item scale was self-constructed based on regulatory conditions in South Africa in studies by Levin & Schmidt (2010), the DOC (2010), Ayogy & Bayat (2010) and Gillwald (2008).

## Independent variable 4: Entrepreneurial Mindset

Research by Haynie, Shepherd, Mosakowski and Earley (2010) represents the foundation of the entrepreneurial mind-set to 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. Entrepreneurship research, engaged in cognitive research, seeks to understand how individuals identify entrepreneurial opportunities and act on them (McMullen & 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 mind-set" and "the ability to rapidly sense, act and mobilise, even under uncertain conditions" (Ireland, Hitt & Sirmon, 2003: 963). The ability to sense and adapt to uncertainty characterises a critical entrepreneurial resource and extant conceptualisations of the entrepreneurial mind-set indicate that this resource is cognitive in nature (Haynie *et al*., 2010).

Adaptable cognitions are therefore important for achieving desirable outcomes from entrepreneurial actions (Krauss, Frese, Friedrich & Unger, 2005). Haynie *et al*. (2010) developed a five step situated metacognitive model of the entrepreneurial mind-set. 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' that is representative of a "fully engaged thinker who has multiple cognitive strategies available" (Fiske & Taylor, 1991: 13). The entrepreneur, motivated by goals, motives and needs has to decide whether to act in response to perceived opportunities or discard any actions. He, therefore, chooses from perceived strategies (McMullen & Shepherd, 2006; Schmidt & Ford, 2003).

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:

*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.*

A five-item scale was constructed for use in the present study based on the work of Haynie *et al*. (2010), Timmons & Spinelli (2007), McMullen & Shepherd (2006), Ireland *et al*. (2003) Schmidt & Ford (2003), Gaglio (2004) and Fiske & Taylor (1991).

## Independent variable 5: Entrepreneurial Experience

The attributes of innovative individuals can also 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 (Batjargal, 2007). At the heart of the entrepreneurial process is the innovative and creative spirit (Timmons & Spinelli, 2007). Smaller entrepreneurial businesses do things differently when it comes to research and development (Timmons & Spinelli, 2007). The literature 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 (Timmons & Spinelli, 2007; Lumpkin & Dess, 1996).

Changes in technology which are driven by continuous innovation and changing market landscapes, affect all businesses within the telecommunications sector (Veugelers, Bury & Viaene, 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:

*H5: There is a positive relationship between Entrepreneurial Experience and Entrepreneurial Competitiveness in the telecommunications sector.*
*H5a: There is a positive relationship between Entrepreneurial Experience and Opportunity Recognition.*

A five item scale was developed based on the theory of Timmons and Spinelli (2007) and Baron and Ensley (2006).Not in ref list

## Intervening variable: Opportunity Recognition

Without an opportunity, entrepreneurship does not exist (Short, Ketchen, Shook & Ireland, 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 & Ensley, 2006). Previous research describes the term opportunity recognition as a cognitive process by which entrepreneurs conclude that they have identified an opportunity (Ardichvili, Cardozo & Ray, 2003; Solso, 1999).

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 & 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 & 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 & Venkataraman, 2000). Personality traits, social networks and prior knowledge are identified an antecedents to the entrepreneurial alertness needed to recognise, evaluate and develop opportunities (Alvarez & Barney, 2007; Ardichvili *et al.*, 2003). It is therefore hypothesised that:

*H6: There is a positive relationship between Opportunity Recognition and Entrepreneurial Competitiveness in the telecommunications sector.*

A five-item scale was constructed for use in the present study based on the work of Ardichvili *et al.* (2003), Baron & Ensley (2006) and Schwartz & Teach (2000).

## Intervening variable: Entrepreneurial Orientation

Previous research suggests that Entrepreneurial Orientation is described as a series of activities or processes (Idar & Mahmood, 2011; Quince & 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 & Whittaker, 2003). In addition, the five dimensions of Entrepreneurial Orientation according to 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 indicated 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 & Dess, 1996; Covin & Slevin, 1991).

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 & Barney, 2007). When a business senses that change is occurring, it will be acknowledged and it should respond by changing its structure, strategy and processes (Kathuria, Maheshkumar & Dellande 2008). It is therefore hypothesised that:

*H7: There is a positive relationship between Entrepreneurial Orientation and Entrepreneurial Competitiveness in the telecommunications sector.*

A six item scale was used to measure Entrepreneurial Orientation. The developed scale was based on work by Clausen & Korneliussen (2012), Short *et al.* (2010), Idar & Mahmood (2011), Quince & Whittaker (2003) and Lumpkin & Dess (1996).

## The empirical results

## Discriminant and construct validity assessment and reliability assessment

Exploratory factor analysis was conducted to identify the potential, underlying dimensions of 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. Table 1 indicates five factors extracted from the model, namely *Entrepreneurial Mind-set* (coded EMINDSET), *Regulatory Alignment* (coded REGULATE), *Sector Transformation* (coded SREFORM), *Infrastructural Change* (coded INFRASTR) and *Entrepreneurial Experience* (coded EXPERIEN). All items 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 1: Rotated factor loadings: Antecedent variables**

| ITEM | FACTOR | | | | |
|------|--------|--------|--------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 |
| | EMINDSET | REGULATE | SREFORM | INFRASTR | EXPERIEN |
| EE43 | **.785** | -.013 | -.044 | -.089 | .140 |
| EM27 | **.733** | .024 | -.003 | -.013 | -.053 |
| EM31 | **.662** | -.011 | .018 | .077 | -.079 |
| EM28 | **.533** | -.006 | .036 | .043 | .114 |
| RL21 | .046 | **.765** | -.056 | -.039 | -.036 |
| RL20 | .055 | **.707** | .041 | -.044 | .023 |
| RL18 | -.038 | **.662** | -.009 | .077 | .004 |
| RL17 | -.054 | **.545** | -.053 | .039 | -.037 |
| RL19 | .011 | **.531** | .091 | -.054 | .050 |
| SR16 | .043 | -.002 | **.747** | .030 | -.031 |
| SR13 | -.068 | -.037 | **.686** | -.012 | .043 |
| SR15 | -.006 | .049 | **.680** | .050 | .011 |
| SR12 | .000 | .019 | **.665** | .008 | .013 |
| SR14 | .028 | -.010 | **.467** | -.036 | -.035 |
| IC10 | -.071 | .011 | -.014 | **.834** | .012 |
| IC11 | .051 | .061 | .010 | **.812** | .027 |
| IC09 | .058 | -.079 | .026 | **.768** | -.005 |
| EE39 | .124 | -.003 | .075 | -.008 | **.740** |
| EE42 | -.076 | -.057 | .000 | -.006 | **.652** |
| EE41 | .067 | .096 | -.065 | .056 | **.586** |
| **EIGENVALUE** | **3.635** | **2.630** | **2.467** | **2.273** | **1.404** |

The factor EMINDSET was measured by 3 out of the initial 5 items. The item EE43 intended to measure the factor EXPERIEN 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 (see Table 1). EMINDSET returned an Eigenvalue of 3.635. 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. For the purpose of this study *Entrepreneurial Mindset* 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.

All the initial 5 items measured the factor REGULATE. The factor 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 (see Table 1). The Cronbach-alpha coefficient returned a value 0.774 and therefore indicates that the instrument used to measure this construct is reliable (See Table 4). 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. All the 5 items expected to measure the factor loaded onto SREFORM 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 1. The instrument used to measure this construct is reliable because the five items returned an acceptable Cronbach alpha coefficient of 0.785. 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. The factor INFRASTR 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 (see Table 1). 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. 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 factor EXPERIEN 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 (see Table 1). 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. For the purpose of this study *Entrepreneurial Experience* refers to the ability to take advantage of personal experience in order to improve competitiveness.

The intervening variables, 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 2 and followed by the individual factor analysis results.

**Table 2: Rotated factor loadings: Intervening variables**

| ITEM | FACTOR | |
|---|---|---|
| | 1 ORIENT | 2 RECOGNISE |
| EO3 | **.724** | -.050 |
| EO5 | **.659** | .042 |
| EO4 | **.620** | .007 |
| EO6 | **.545** | .003 |
| EO1 | **.487** | .002 |
| OR22 | .058 | **.740** |
| OR23 | -.021 | **.739** |
| OR26 | -.054 | **.538** |
| OR24 | .062 | **.451** |
| **EIGENVALUE** | **2.232** | **2.612** |

Five of the initial 6 items measured the factor ORIENT. The factor explains 17.95% of the variance in data. ORIENT returned an Eigenvalue of 2.232 as displayed in Table 2. The 5 items returned a Cronbach-alpha coefficient of 0.740 and therefore suggest that the instrument used to measure this construct is reliable. The factor RECOGNISE was measured by 4 items. The factor 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. The acceptable Cronbach-alpha coefficient of 0.711 for the factor suggests that the instrument used to measure this construct is reliable.

**Table 3: Rotated factor loadings: Dependent variable**

| ITEM | FACTOR |
|---|---|
| | COMPETE |
| EC89 | **.539** |
| EC90 | **.495** |
| EC91 | **.449** |
| EC87 | **.747** |
| EC88 | **.699** |
| **EIGENVALUE** | **2.383** |

The dependent variable *Perceived Entrepreneurial Competitiveness* (coded as COMPETE) was tested for uni-dimensionality by means of EFA. A six item scale was developed to measure the construct. The number of factors to be extracted was not specified. A single factor was extracted, 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. 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 47.661% of the variance in data. *Perceived Entrepreneurial Competitiveness* returned an Eigenvalue of 2.383 (see Table 3). 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, regulation and technological change. The 5 items returned a Cronbach-alpha coefficient of 0.720 which indicates that the instrument used to measure this construct is reliable. The hypotheses depicting the relationships for the model remains unchanged.

All the items reported in Tables 1, 2 and 3 reveal statistically significant loading. Each item loads to a significant extent on only one factor, suggesting a high level of discriminant validity, construct validity and reliability. The exploratory factor analysis results reported in Table 1, 2 and 3 necessitated a revision of the original theoretical model. All the factors reported in Table 4 indicate an acceptable Cronbach-alpha coefficient of greater than 0.70.

**Table 4: Internal reliability assessment**

| Factor | Cronbach-alpha values |
|---|---|
| Entrepreneurial Mindset (EMINDSET) | 0.778 |
| Regulatory Alignment (REGULATE) | 0.774 |
| Sector Transformation (SREFORM) | 0.785 |
| Infrastructural Change (INFRASTR) | 0.848 |
| Entrepreneurial Experience (EXPERIEN) | 0.710 |
| Entrepreneurial Orientation (ORIENT) | 0.740 |
| Opportunity Recognition (RECOGNISE) | 0.711 |
| Perceived Entrepreneurial Competitiveness (COMPETE) | 0.720 |

## The structural model

Figure 2 describes the estimation for the structural model and the results produced from LISREL.
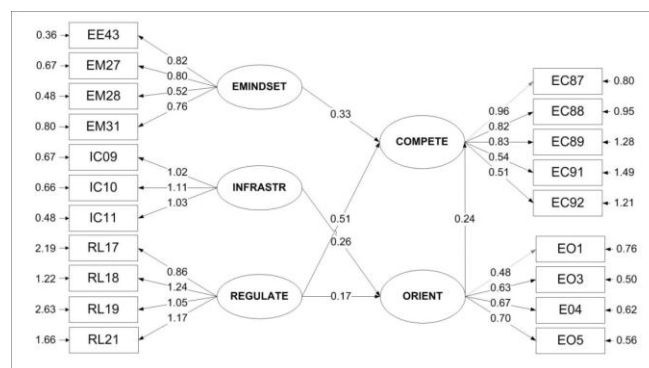


**Figure 2: Structural model estimation**

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 structural model represents 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 (Hair *et al*., 2006). 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.

## 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:

*H0: The data does not fit the model perfectly.*

*H1: The data fits the model perfectly.*

The goodness-of-fit indices of the measurement model and the structural model are identical in the model 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 various indices were calculated to measure the fit of the structural model. 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, Coughlan & Mullen, 2008). Against this background it was decided to use the Satorra-Bentler scaled Chi-Square ($\chi2$), 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.The goodness-of-fit indices for the structural model are reported in Table 5. 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 5: Goodness-of-fit indices for the structural model**

| Index | Value |
| --- | --- |
| Sample size | 301 |
| Degrees of freedom (*df*) | 442 |
| Satorra-Bentler scaled Chi-Square ($\chi2$), | 902.788 (P=0.00) |
| Root Mean Square Error of Approximation (RMSEA) | 0.0589 |
| 90 percent confidence interval for RMSEA | (0.0534 ; 0.0644) |
| P-Value for test of close fit (RMSEA 0.05) | 0.00414 |

## 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). 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 the structural model estimation in Figure 1 it can be accepted that 3 independent variables significantly 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* and *Entrepreneurial Mindset* positively influence the dependent variable *Perceived Entrepreneurial Competitiveness*. Against this background the hypotheses H[3] and H[4] are supported, whereas H[1], H[2] and H[5] 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] is not supported. The independent variables *Entrepreneurial Mindset* and *Entrepreneurial Experience* did not prove to positively influence the intervening variable *Opportunity Recognition* and therefore the hypotheses H[4a] and H[5a] not are supported. The Intervening variable *Entrepreneurial Orientation* positively influences the dependent variable *Perceived Entrepreneurial Competitiveness* and therefore H[7] is supported. The intervening variable *Opportunity Recognition* did not demonstrate significant influence on the dependent variable *Perceived Entrepreneurial Competitiveness*. Against this background the hypotheses H[6] is not supported.

## Summary of hypotheses tested in the revised 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 6 summarises all the hypotheses, to improve the readability of this section.

**Table 6: Summary of the hypotheses tested in the revised model**

|  | Hypothesis | Decision |
|---|---|---|
| $H^1$ | There is a positive relationship between Infrastructural Change and Entrepreneurial Competitiveness in the telecommunications sector | Not Supported |
| $H^{1a}$ | There is a positive relationship between Infrastructural Change and Entrepreneurial Orientation | Supported |
| $H^2$ | There is a positive relationship between Sector Transformation and Entrepreneurial Competitiveness in the telecommunications sector in South Africa | Not Supported |
| $H^{2a}$ | There is a positive relationship between Sector Transformation and Entrepreneurial Orientation | Not Supported |
| $H^3$ | There is a positive relationship between Regulatory Alignment and Entrepreneurial Competitiveness in the telecommunications sector | Supported |
| $H^{3a}$ | There is a positive relationship between Regulatory Alignment and Entrepreneurial Orientation | Supported |
| $H^4$ | There is a positive relationship between the Entrepreneurial Mindset and Entrepreneurial Competitiveness in the telecommunications sector | Supported |
| $H^{4a}$ | There is a positive relationship between the Entrepreneurial Mindset and Opportunity Recognition | Not Supported |
| $H^5$ | There is a positive relationship between Entrepreneurial Experience and Entrepreneurial Competitiveness in the telecommunications sector | Not Supported |
| $H^{5a}$ | There is a positive relationship between Entrepreneurial Experience and Opportunity Recognition | Not Supported |
| $H^6$ | There is a positive relationship between Opportunity Recognition and Entrepreneurial Competitiveness in the telecommunications sector | Not Supported |
| $H^7$ | There is a positive relationship between Entrepreneurial Orientation and Entrepreneurial Competitiveness in the telecommunications sector | Supported |

## Conclusions and recommendations

In this paper, the empirical results for the present study were presented. 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 of the instrument was assessed and reported. This resulted in four factors that potentially influenced the dependent variable: *Perceived Entrepreneurial Competitiveness.* These factors include *Infrastructural Change, Regulatory Alignment, Entrepreneurial Orientation and Entrepreneurial Mindset* To conclude, the empirical results were assessed against the formulated hypotheses. These factors were then used to empirically test the relationships illustrated in the conceptual model. As a result the objectives in this paper were achieved.

Entrepreneurial Orientation was described in this study 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. Therefore, to be entrepreneurially orientated in the telecommunications industry, an entrepreneur must be able to launch creative products, embrace a creative culture and be proactive in identifying industry trends. The entrepreneur must also ensure his / her business is competitively positioned in the industry by making on-the-go decisions, which involves changes of strategy and the adoption of new technologies.

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 Entrepreneurial Orientation in the telecommunications sector in South Africa. Entrepreneurs must therefore be able to acknowledge the opportunities associated with infrastructural change in the telecommunications sector in order to position their businesses more competitively.

The theoretical model proposed new propositions and significant relationships between various variables. New scales were developed for each of the variables in this study. The majority of the scales proved to be valid and reliable and therefore could be useful for future research as 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 other and less developed markets with specific environmental conditions.

To sum up, this paper contributes to the body of knowledge 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 at an accelerating 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. 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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