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**UNIVERSITIES IN REGIONAL DEVELOPMENT: KNOWLEDGE
TRANSFER IN A LESS FAVOURED REGION**

NEBA SAMUEL FONGWA

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June 2013



**UNIVERSITIES IN REGIONAL DEVELOPMENT: KNOWLEDGE
TRANSFER IN A LESS FAVOURED REGION**

Thesis submitted in accordance with the requirements for the

Doctor of Philosophy Degree

Faculty of Economic and Management Sciences

(Centre for Development Support)

University of the Free State

Bloemfontein,

South Africa

Neba Samuel Fongwa

June 2013

Supervised by

Prof JGL Marais

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Dr N Cloete

DECLARATION

I, Neba Samuel, Fongwa hereby declare that the work contained in this dissertation is my own original work and that I have not previously submitted it at any university for purposes of an academic degree; either in part or its entirety.

I further attest that each significant contribution to, and quotation in, this dissertation from the work of others has been duly recognised and acknowledged.

DATE

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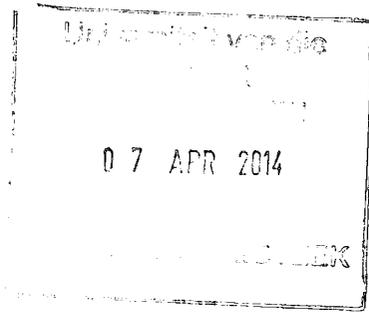
DEDICATION

To the Source of all Wisdom...

...the Giver of Life

... In whom all knowledge gets meaning,

Now and forever!



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I would first want to express profound gratitude to the Almighty God, who carried me through this academic journey; in fulfilment of His word "For it is God who is working in you [enabling you] both to desire and to work out His good purpose" (Philippians 2:13).

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LIST OF ABBREVIATIONS AND ACRONYMS

AFASA:	African Farmers Association of South Africa
CUT:	Central University of Technology
DACST:	Department of Arts, Culture, Science and Technology.
DST:	Department of Science and Technology
DTi:	Department of Trade and Industry
FSGDS:	Free State Growth and Development Strategy
GDP:	Gross Domestic Product
LFRs:	Less Favoured Regions
NAFU:	National African Farmer's Union
NDP:	National Development Plan
OECD:	Organisation for Economic Cooperation and Development
UFS:	University of the Free State
UNESCO:	United Nations Education, Social and Cultural Organisation

CHAPTER ONE

INTRODUCTION TO THE STUDY

Much of our economic challenge can be summarized in two words: knowledge and innovation. These are the new raw materials of the 21st century economy. They are the key to a country [region] that can race forward when the global seas are calm, and ride out the rough weather safely when they are not. Innovation and knowledge are two sides of the same coin – the true hard currency of the future.

Paul Martin, 1999¹

1.1 Background to the study

Present-day global economic change is both progressive and rapid. Major paradigm shifts amid which the role of universities and knowledge in regional and national development has increasingly gained currency in development discourse. Even in Developing countries and sub-Saharan African countries, the role of knowledge is increasingly bringing pressure to bear on universities and knowledge-producing institutions to contribute to socio-economic development. The Organisation for Economic Cooperation and Development (OECD) argue that these trends have been motivated by demands on the university from national and regional governments and development agencies to become more relevant in addressing the tangible needs of their regions and nations (see Bloom et al., 2006; OECD, 2001). At the universities themselves, budget cuts have forced academics to produce the more relevant knowledge that is needed to attract ‘third-stream’ funding to complement government subsidies. Barnett (2000:17) observes that “the knowledge society certainly requires knowledge, the university has now tied up new opportunities for those knowledge clients”.

These changed dynamics have brought about enormous policy and practical implications for universities. While encouraging academics to move out of their ‘ivory towers’ so as to reach out to society, the changed dynamics have also had implications for policy makers, for national and regional development agencies and for regional stakeholders who now have the task of incorporating higher education institutions in their development planning and processes (Benneworth & Sanderson, 2009; Charles, 2003; Silver, 2007). The prominent part that knowledge and innovation have to play in respect of enhancing the competitiveness of regions and nations has intensified the demand for the contemporary university to produce

¹ In Feldman & Stewart, (2006:1)

knowledge. According to Lundvall (1994), “[C]ontemporary capitalism has reached the point where knowledge is the most strategic resource and learning the most important process” (in Morgan, 1997:493). The European Commission has called on higher education institutions to participate more actively in the construction of what is termed a ‘Europe of Knowledge’ (Maassen & Olsen, 2007). Similarly, as witnessed in scenarios such as the Silicon Valley, Route 128 (Saxenian, 1994; 1996) and New England (Florida & Kenney, 2006), knowledge has in the United States of America become the tool with which to increase economic growth and development.

The notion of the ‘contemporary university’ (Nongxa, 2010; Rinne, 2004; Santos, 1996) refers to universities that, while they are engaged in teaching and research, also face an increasing demand to integrate ‘third-mission’ activities in their missions (Conceicao et al., 1998). The present-day university, irrespective of its history, size and orientation (entrepreneurial or traditional; technical or research oriented), faces the challenge of being relevant to both its immediate and its extended society, while not neglecting the two core functions of research and teaching (Castells, 2001b). This situation is further compounded by the need to cope with restricted budgets from governments as university funding continues to experience downsizing amid a simultaneous increase in student numbers and greater diversity as regards student types (Conceicao et al., 1998). The present-day university is thus increasingly moving from an ideological position to one that is more instrumental or utilitarian, and from one whose focus is on knowledge creation to one whose focus is on knowledge application with a view to meeting day-to-day needs (Readings, 1996).

Empirical studies, both in more developed economies and, increasingly, in developing nations indicate that universities – through knowledge production and innovation – have significantly altered regional and national developmental pathways. Recent research has shown that higher education is a net contributor to the prosperity of a modern economy (Bridges, 2007; Benneworth & Charles, 2002; Hill, 2004; OECD, 2007b). Universities have mainly achieved this contribution to development via engagement mechanisms that are described as backward and forward linkages. Backward linkages include direct econometric contributions to regional economies such as, *inter alia*, job creation, student, staff and visitor expenditure and their trickle-down effects (Carroll & Smith, 2006; Fongwa, 2010). Forward linkages include knowledge production and transfer, spin-offs, human capital production and the retention of such human capital in the region, and through its crucial role in knowledge production and

innovation (Bramwell & Wolfe, 2008). Understanding the role of knowledge has led to new concepts such as the *knowledge economy* (Cooke & Leydesdorff, 2006; OECD, 2004), *knowledge capitalism* (Slaughter & Leslie, 1997; Ylijoki, 2003) and *the learning economy* (Florida, 1995).

In more successful economies, knowledge organisations like universities have evolved to become prominent agents in the discourse on the production, diffusion and application of knowledge (Florida, 1995). While universities have served as knowledge and innovation producers, there is still a large gap between the amount of knowledge produced and the amount of knowledge being used and applied by firms and industries for economic growth and development. Anderson (1992) attributes this lack of application to a lack of transfer in that more academics spend more time and efforts in knowledge production while ignoring its transfer. Unfortunately, there has been much mutual distrust between private research firms and research universities. This has significantly obstructed the process of knowledge transfer (Slaughter & Leslie, 1997).

Bercovitz and Feldman (2006) maintain that though universities are often regarded as holders of significant assets that could potentially be leveraged for economic growth and development, knowledge productivity by universities is only a necessary condition and not a guarantee that the knowledge production will have socio-economic impact. For effective knowledge transfer to occur there needs to be a detailed understanding of the complex processes involved – personal and institutional processes and processes related to the knowledge itself and to the communication channel. Effective knowledge transfer, according to Siegel and Phan (2005), involves willingness both on the part of the producing side (supply) and on the part of the receiving or application side (demand). Similarly, Davenport and Prusak (1998) maintain that knowledge transfer involves two actions, namely transmission – which involves the sending of knowledge to a potential recipient – and the absorptive capacity by that person or group or institution.

Two forms of knowledge feature prominently in the literature on knowledge transfer – explicit and tacit knowledge. *Explicit knowledge* refers to knowledge that is scientifically expressed and easily passed on, while tacit knowledge cannot be easily articulated or codified (Nonaka, 1994). In the process of knowledge transfer, both forms of knowledge remain critical for economic growth and development. Both forms of knowledge have their advantages and their challenges in transfer endeavours and they are moreover influenced by

the particular situations and the characteristics of both the producing and the receiving institutions or individuals.

In this study, two important aspects of knowledge are considered to contribute to regional development. The first is that knowledge is most often embodied in people, and hence the transfer mechanism is both highly personalised and highly localised. From a regional perspective, and given the highly personalised nature of most knowledge, geographical proximity to the source of knowledge production is important for that knowledge to be able to make a significant and sustained contribution to the development of the region. The *proximity effect* of knowledge transfer therefore requires that a strong relationship should exist between universities and regional economic development agencies, especially in knowledge-intensive sectors (Bramwell & Wolfe, 2008:1177). While one could argue that knowledge produced in the Silicon Valley area is made available across continents, it is important to note that this kind of transfer is limited to codified forms of knowledge and that closer proximity however involves both tacit and codified knowledge transfer.

The second aspect of knowledge that contributes to regional development is the appropriate level of engagement or connectedness between the university and the regional stakeholders towards socio-economic development. This can be observed in the depth and breadth of university linkages with industry, government and civil society. Using the notion of social networks, Inkpen and Tsang (2005:154) identify three network types (intra-corporate networks, strategic alliances and industrial districts) and state that organisations grow better by transferring knowledge through any of the identified networks. Viewed from a network perspective, “networks can facilitate the transfer of knowledge from one firm to another and secondly networks may become the locus of knowledge creation” (Inkpen & Tsang, 2005:154). An important aspect of networks, one that will be considered in greater detail in the learning region concept, is the aspect of trust (Dyer & Singh, 1998). Inkpen and Tsang (2005:158) outline the benefits of trust: “When the relationships between industrial networks’ members are embedded in trust, firms may be more willing to share valuable knowledge and accept the risk of spillover to competitors”.

To summarise: Knowledge, in the present-day economy has become a significant part of production. Successful regions have identified the need to integrate knowledge-producing institutions in their development strategies. Developing economies are only now beginning to recognise the role of knowledge in development – as opposed to a dependence on primary factors of production such as raw materials. There are increased expectations regarding a

paradigm shift among African governments and higher education institutions so as to include knowledge-producing institutions in development planning processes. For this to be fully achieved, the knowledge that is produced must be transferred to the potential users.

1.2 Problem statement

This study is based on two broad bodies of literature. The first comprises analysis of the role of universities in socio-economic development in the knowledge economy. This approach emphasises the continually increasing role that knowledge and learning have in contemporary development discourse (Morgan, 1997; OECD, 2001). The second body of literature emphasises the importance of knowledge transfer from the university to society (Maskell & Malmberg, 1999; Siegel & Phan, 2005; Siegel et al., 2003).

While most studies have focused on the economic and spending impact of universities in their regions (Carroll & Smith, 2006; Fongwa, 2010; Farrant, 2001; Simha, 2005) very few studies have been conducted with a view to understanding the dynamics involved in knowledge production, diffusion and application in enhancing regional development. While only a limited number of such studies have been carried out in the West (Benneworth, 2006; Doutriaux, 2003), even fewer have been conducted in developing economies in general and particularly in sub-Saharan Africa. One example of a study of this nature is the recently published report on the HERANA² Project (Cloete, et al., 2011) in which the role of knowledge production for economic development in eight African universities was examined at a broader level by looking at policy, funding and the academic culture of institutions, and by using an input/output analytical framework.

Garlick (1998), supported by Thanki (1999), has vehemently criticised the methodological and conceptual tenets of university impact studies. These authors both propose that mainly two aspects need to be reviewed in these studies, namely the issue of the limited or narrow measurement of the value of universities in regional development (to be accomplished through establishing causal relationships that are seldom obvious) and the traditionally narrow views that universities have of their own roles in local and regional economies (Keane & Allison, 1999). This narrow view in many cases ignores the knowledge aspects and focuses on direct income impacts. Garlick (1998:27) further describes most of the approaches used to

²² Higher Education Research and Advocacy Network in Africa.

measure the economic value of universities as 'passive economic approaches' that significantly ignore the social aspects of knowledge transfer and development

Against this background, there is an urgent need for more detailed empirical studies that will enable us to gain a better theoretical and conceptual understanding of the roles of higher education, universities and knowledge in regional development. According to Castells (2001a), African economies have a unique opportunity to leapfrog their development process by means of knowledge creation, application and dissemination. This can be better achieved if there is a more precise theoretical understanding of how relevant knowledge can be produced, applied and transmitted at the regional level, while involving all the stakeholders in an interactive learning process (Morgan, 1997).

While the first gap concerns methodological aspects of university impact studies, the second gap observed from the literature relates to the fact that most studies have focused primarily on successful regions while less favoured or peripheral regions have not significantly featured in university impact studies (Hassink, 2005:527). The concept of *less favoured regions* has been used to describe regions in which cultures, economic structures and institutional arrangements present a *barrier* to economic success (Linders et al., 2005 in Benneworth, 2006:2). These regions most often do not have the same economic resources or the infrastructural capacity able to sustain innovative systems and they thus need special attention at the institutional level (Morgan, 1997).

A last gap identified in the literature, one which this study seeks to fill, relates to the fact that the literature on knowledge transfer has focused more specifically on intra-organisation knowledge transfer within firms (Tsai, 2001; Yang, 2007). To a significant extent, this has ignored the transfer of knowledge across different institutional boundaries, cultures and conventions. These identified gaps will be addressed using a set of core research questions.

1.3 Research questions

The following research questions must be answered to meet the aims and objectives of the study:

- How has the process of knowledge transfer (demand and supply) evolved in Western economies and particularly in successful regions? This will be discussed in terms of both policy and practice.
- How has the relationship between universities and their regions evolved in the broader development discourse?

- What are the main aspects of the learning region concept in understanding regional and development in successful areas and how does this relate to less favoured regions?
- What political, economic, administrative and social issues – as laid down in policies (national, regional and institutional) – have influenced the relationship between the university and its departments in their engagement with external stakeholders towards knowledge production for application and development?
- How has research and knowledge specialisation in the Faculty of Agriculture developed over time? What have been the main informants or drivers of this development?
- What have been the dominant forms of knowledge transfer from the Faculty of Agriculture to the agricultural sector and to the province at large?
- How has the notion of the Third Mission (which involves engagement with community and society beyond teaching and research) been developed and implemented?
- What have been the main factors of demand and supply that have affected the creation, transfer and application of knowledge from the faculty to regional stakeholders?
- What are the relevant strategies for effective knowledge transfer in a less favoured region?

1.4 Aim and objectives of the study

The aim of the study was to examine the role of universities in knowledge production, dissemination and application towards regional development, with particular reference to dynamics present in less favoured regions. The study made use of the vast body of literature on similar studies in the West so as to understand the differences and similarities responsible for the production, demand and supply of knowledge (both tacit and explicit). The relevant factors and the necessary preconditions for knowledge transfer were analysed with a view to understanding its operationalisation in an African setting. This provided a useful framework for less favoured regions in terms of knowledge transfer for regional development. The empirical investigation examined the factors and the agents responsible for both the demand for knowledge by regional development stakeholders and for the supply of knowledge by the university to be used for regional development. The following objectives guided the study:

- To provide a thorough theoretical review of regional development paradigms;

- To develop a theoretical and conceptual framework to explore the *learning region* concept in attempting to understand knowledge transfer in a less favoured region;
- To provide a policy review and analysis of the South African higher education and development environment;
- To conduct an empirical investigation of the factors that influence the demand and supply of knowledge from the Faculty of Agriculture at the UFS to its region and of the major channels of knowledge transfer; and
- To contribute to the theoretical discourse on knowledge transfer using the learning region concept.

1.5 Defining concepts

1.5.1 The 'region'

A *region* has been defined differently in different fields of study. In the literature on universities in regional development, Chatterton and Goddard (2000:478) observe that "regions are emerging and are being defined...". This implies that areas that have not previously been considered to be regions could, based on different social, political, economic and cultural contexts, develop into regions. Cooke and Leydesdorff (2006:6) have a more practical take on the concept: "The concept of region as administratively defined is of primary importance ... leading to the definition of region as an administrative division of a country". The OECD (2001:24) has defined a region as "a territory or level of authority in between the local and the national level". However, other supranational territories such as sub-Saharan Africa, the European Union and South East Asia have emerged in the discourse on regional development.

Using the OECD's conceptualisation, the notion of region in this study refers to an area around the university, in which the university has the ability to engage with development stakeholders in a relatively sustained and meaningful manner. In the case of the UFS, the region covers a wider geographical and socio-political territory. Being the only centrally placed Research University, the region is perceived as covering the Free State Province and extending to the semi-arid regions that include the eastern parts of the Western Cape and the northeastern parts of the Eastern Cape. However, in this study, the regional focus is the Free State Province with Bloemfontein as the focal point.

1.5.2 Less favoured regions and less favoured areas

It is important to provide a conceptual distinction between less favoured regions and less developed regions. The concept of *less favoured regions* has been used to describe regions in which cultures, economic structures and institutional arrangements constitute a *barrier* to economic success (Linders et al., 2005 in Benneworth, 2006b:2). These regions most often do not have sufficient economic resources or the infrastructural capacity required to sustain innovative systems and special effort is thus needed to strengthen local institutions (Morgan, 1997). The main distinction between *less favoured regions*, *less favoured areas* and *less developed regions* is at the level of regional gross domestic product (GDP) and the level of infrastructural development. The main defining characteristic of less favoured regions, as will be observed in later sections of the work, is the peripheral location of the areas and also the lack of clear university-based education research.

Less favoured areas is a concept usually used for areas with low agricultural output. According to the Scottish Parliament (2001), less favoured areas are defined by:

- The presence of poor productive land, which is difficult to cultivate and with limited potential to increase the productivity, except with excessive non-economically feasible cost. These kinds of areas are usually more suitable for extensive livestock farming.
- Having lower-than-average production capability in comparison with the main agriculture economic indices.
- Being characterised both by a low and dwindling population and being predominantly dependent on agriculture, with a risk of rural depopulation.

Less favoured areas therefore usually refer to geographically bounded areas characterised by being based on natural endowments of land and other natural factors affecting agriculture.

1.5.3 Knowledge transfer

The concept of *knowledge transfer* as used in this thesis is based on Mayr's understanding (2010) that technology transfer is only a subset of all the knowledge supplied by a university to its regional stakeholders. Knowledge, in this context, combines both tacit and codified outputs from the university's mission of teaching, research and community engagement. Such outputs could be academic publications, skilled graduates, research and development innovations and also conferences, reports and other consultancy activities. The notion of *transfer* in this thesis follows Mathieu (2011:4) in arguing that, while knowledge transfer has

been most often regarded to be one-way traffic from university to industry, the term *transfer* should refer to relationships between universities and industry (society) in the context of “open, networked and interactive innovation” (also see Perkmann & Walsh, 2007). This leads to the next key concept in this thesis the *learning regions*.

1.5.4 Learning regions

The learning region concept is used by regional economists to address issues of lock-ins in former industrial regions (Hassink, 2005:522). This concept analyses social and cultural contexts in regional development planning. As will be seen in Chapter Three, the learning region concept, though still in its empirical testing phase, provides tools for applying knowledge and learning in regional development. According to the OECD (2001:24), the learning region can be perceived as “a regional innovation strategy in which a broad set of innovation-related regional actors (politicians, policy-makers, chambers of commerce, trade-unions, higher education institutions, public research establishments and companies) are strongly, but flexibly connected with each other and who stick to a certain set of policy-principles” (Hassink, 2005:525). The key features of the learning region are agglomeration economies, trust, networks of business and supporting institutions, and, above all, a culture of learning.

1.6 Rationale for and significance of the study

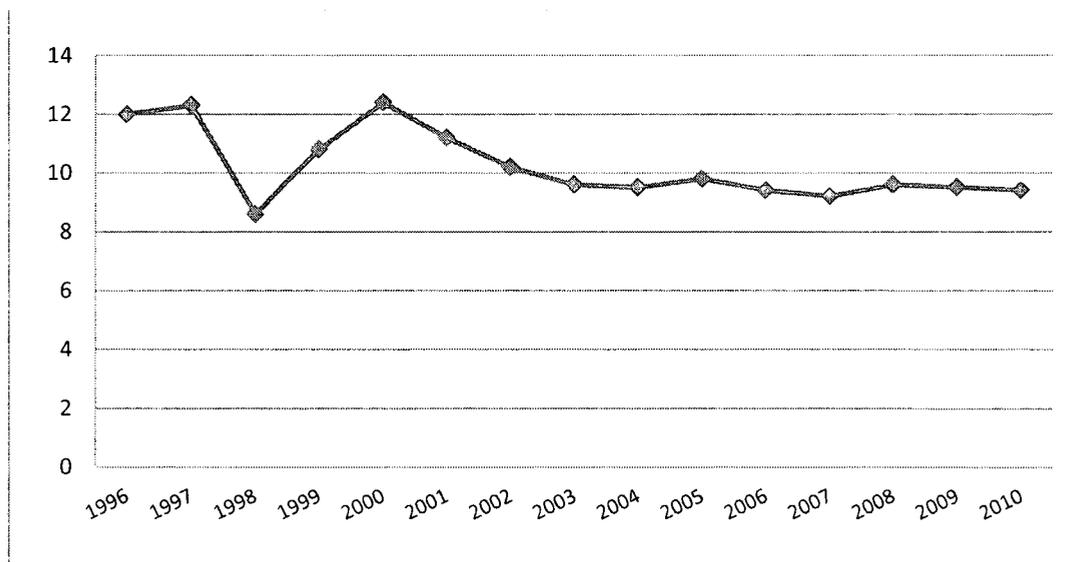
Studies on the role of universities as knowledge producers for regional development, based on a learning region concept approach, have been more prevalent in developed economies. According to Newlands (2003:15), “[R]egional economic development policy and practice are multi-layered, with universities involved at different levels and (with) different roles”. This highlights the need for more rigorous studies on the role of knowledge in regional development studies. Newlands (2003:15) further maintains that “[T]here is more appreciation and understanding of the importance of knowledge effects”. However, as the literature does not provide a significant amount of research in the African subregion, this study thus seeks to fill this gap, both in applying the basic assumptions in a different region and thus understanding the challenges that enhance or limit this process.

An empirical study of the chosen departments was analysed in terms of theoretical concepts on knowledge transfer, especially in less favoured regions (Glaser & Strauss, 1967). The study is also significant in that it utilised a conceptual and empirical approach different from those used in impact studies that have characterised much of previous research in the

subregion. In the approach followed in the present study, the relationship between the university and the region focused primarily on the strategic and conscious efforts by the university to provide relevant knowledge to meet regional needs. This was done by using a demand-and-supply analytical framework that looked at knowledge-transfer policy and the channels and the networks that have been developed and sustained. Another interesting aspect was investigating the attitudes of governments and the agricultural sector regarding their demand for agriculture-related knowledge.

In this study the Faculty of Agriculture was chosen. This choice was based on the importance of the sector in supporting provincial and national development and GDP. In the past four decades, there has been significant evidence of the commercial agricultural sector growing at a rate of approximately 14%. The agricultural sector is estimated actually to contribute about 14% of South Africa's GDP. In 2010, the Free State Province contributed about 5% to the national GDP. Yet, as Figure 1.1 reveals, the contribution being made by the province has steadily been declining over the past fifteen years.

Figure 1.1: FS agriculture's contribution to agriculture production, 1996–2010 (%)



Source: Free State Agriculture Position Paper, 2011

While agriculture contributed only 1.8% to the national GDP for the same year, agriculture in the Free State contributed 3.42% of the Free State's GDP. The Free State agricultural sector contributed 9.5% to the total national agriculture GDP. This indicates that the agricultural sector in the Free State Province has a significant potential to support economic development, not only

of the province, but also of the nation. We thus need to understand the role and the potential role that knowledge, learning and innovation play in enhancing the sector's development.

1.7 Research paradigm and methodology

The next section contains an overview of the main research paradigms and also a rationale for the particular research design and methodology employed in this study. The research process included a combination of methods used in most post-positivism research designs (Moore, 2006:106–111). It included a literature review, Internet search and also an analysis of key organisational and policy documents such as national, provincial and institutional policies.

Scientific research practice has evolved over time. This evolution has been significantly based on the philosophies, assumptions and norms peculiar to the time at which the research was conducted (Collins & Hussey, 2003). The methods used for any scientific inquiry lean on the assumptions regarding reality, knowledge and what is legitimate (Patton, 1990). The theoretical position held by a researcher reflects his or her perception of the nature of reality and the philosophies of knowledge that he or she embraces are directly related to the methods adopted in the pursuit of knowledge (Findlay & Li, 1999).

Lather (1992:89) identifies four methodologies or research paradigms, each of which provides a philosophical framework for addressing particular types of research objectives. These are: the positivist or empirical-analytical paradigm that seeks to predict; the interpretive design that seeks to understand; the critical paradigm that aims to emancipate; and the post-structural that seeks to deconstruct. For the quantitative researcher, the motivating purpose is to test theory by applying a deductive logic; the qualitative researcher's intent is to build theory by employing an inductive logic (Newman & Benz, 1998). Schwandt (2000) posits that there are three general epistemological positions that can be utilised for qualitative inquiry: interpretivism, hermeneutics and social constructivism. However, other qualitative researchers do not include 'interpretivism' as a distinct paradigm, but rather perceive it as being included in the constructivist and post-positivistic approaches (Denzin & Lincoln, 2005).

These two epistemological approaches to scientific inquiry have also been referred to as the positivist and the post-positivist research designs. Based on the two above-mentioned epistemological approaches, researchers have employed and applied different research methodologies. The positivist approach is based on the assumption that knowledge is objective, quantifiable, independent of real life and not influenced by the observer. In this

approach, knowledge can be measured quantitatively either by the use of an instrument or experimentally. The interpretive or qualitative research approach views reality as subjective and tries to understand knowledge through the meaning assigned to it by people. According to Boland (1985), the philosophical bases of interpretive research are hermeneutics and phenomenology (see Table 1.1).

Table 1.1: Dominant research paradigms in social research

Underlying Assumptions	Positivism	Post-positivism or interpretivism
Reality is	<ul style="list-style-type: none"> - objective - perceived uniformly - governed by universal laws - well integrated for the good of all 	<ul style="list-style-type: none"> - subjective - created, not found - interpreted - communally driven
Humans	<ul style="list-style-type: none"> - are rational - are obedient - have no free will 	<ul style="list-style-type: none"> - are creators of the world - assign meaning to the world - are not restricted by external laws - create systems of meaning
Science	<ul style="list-style-type: none"> - is based on strict rules and procedures - is deductive - is nomothetic - is based on sense impressions - is value free 	<ul style="list-style-type: none"> - experiences and contextualises - is inductive - is ideographic - is based on interpretations - is value driven
Purpose of research is	<ul style="list-style-type: none"> - to explain facts, causes and effects - to predict - to emphasise facts and to predict 	<ul style="list-style-type: none"> - to interpret the world - to understand social life - to emphasise meanings and understandings

Source: Adapted from Alexopoulos, 2008

1.7.1 Research paradigms

This study makes use of the interpretive or qualitative research design. It draws on Denzin's (2002:362) premise that interpretive studies embody elements of what he calls 'illumination' of 'thickly contextualised materials':

An interpretation must illuminate or bring alive what is being studied. This can occur only when the interpretation is based on materials that come from the world of lived experience. Unless ordinary people speak, we cannot interpret their experiences ... Interpretations are built up out of events and experiences that are described in detail. Thickly contextualised materials are dense. They record experience as it occurs. They locate experience in social situations. They record thoughts, meanings, emotions, and actions. They speak from the subject's point of view.

The study applies aspects of the learning region concept as a theory so as to understand the dynamics involved in the transfer of knowledge from the Faculty of Agriculture at the case-study university. As proposed by Neuman (2006:72), the qualitative research design enables

the researcher to “document the actor’s point of view and translate it into a form that is intelligible to readers”. This fits the purpose of this study that focuses on the process of knowledge transfer by academics to regional stakeholders. This is also referred to by Leedy and Ormrod (2005) who contend that the qualitative research design aims at leading the researcher to describe and interpret participants’ understanding of aspects under investigation, which, in this case, are the factors affecting knowledge transfer. The researcher in the present study investigated factors responsible for both the demand for knowledge from the region and its supply by the university. He also sought to build a theoretical understanding of the factors responsible for knowledge transfer in less favoured regions.

The qualitative design helped the researcher provide an in-depth understanding of the process of knowledge transfer by academics. As for cultural, intellectual and experiential diversity, the interpretive design makes allowance for an understanding of knowledge based on the meanings attached to phenomena and further also for the values and behaviours assigned to them by society. This further enables the social scientist to develop profound knowledge and theory based on the learned experiences in situ (Laverty, 2003). In summary then, the present researcher opted for an interpretive methodology on the strength of Bryman’s argument that it is “... predicated upon the view that a strategy is required that respects the differences between people and the objects of the natural sciences and therefore requires the social scientist to grasp the subjective meaning of social action” (Bryman, 2001:13).

1.7.2 Research methodology

This study employed the case-study method. According to Yin (2003), the case-study method is important when one wishes to answer the questions ‘how?’ and ‘why?’. Cavaye (1996) argues that case study research is considered to be particularly appropriate when theoretical knowledge on a phenomenon is limited or when the need for capturing context is important. Yin (2003:53-54) maintains that case studies seek to “fill theoretical categories aimed at extending emerging theory”. While the majority of similar studies have been carried out in developed economies, the aim of the present study was to develop – on the basis of the case study – knowledge transfer from universities in more rural regions or less favoured regions.

The choice of a case-study method supports the process of knowledge inquiry in more exploratory studies that provide opportunities to gain rich and deep insight into a specific phenomenon. Analysis of context also helps other researchers in similar regions to identify important issues. This view is supported by Barrett and Walsham (2004) who point out that

cases based on interpretive case studies can highlight key learning for other researchers (Chen, 2010). New knowledge generated from case studies can also generate new questions and theoretical issues for other researchers.

There were two major reasons for choosing the University of Free State, the first being that the province's economy was heavily dependent on agriculture and on a declining mining industry. The level of knowledge creation and knowledge transfer in the agricultural sector would go a long way towards supporting the sector in the face of, on the one hand, increased competition, and, on the other, a global decline in agriculture-related economy in that agriculture was being replaced by innovative products and services. Secondly, in a recent study by Boshoff (2010) that examined the performance of sixteen selected African universities between 2000 and 2007 based on the International Science Index, the UFS was found to have had the second highest output in agricultural science and the fourth in the natural sciences, with less impressive outputs in the fields of health and social sciences. This raises the interesting question whether there could possibly be a link between the heavily agriculture-dependent nature of the province and the university's huge output in terms of agricultural research.

1.7.3 Sampling and data-collection method

The research employed a purposive sampling technique in identifying the respondents. Most qualitative researchers employ the purposive sampling design, in which sample sizes tend to be small (Patton, 1990). Purposive sampling has been described by Merriam (1998:61) as being "based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned". Based on this, respondents to the semi-structured questionnaires were carefully identified in order to gain the maximum quantity of data and contextual information.

So as to ensure proper representation of the participants involved in the study, interviews were conducted with researchers and academic staff at the Faculty of Agriculture. This provided an understanding of their perceptions regarding the process of knowledge transfer towards regional development and also of the different facets of this transfer. For purposes of this study, the term Faculty of Agriculture is used to refer only to the agriculture-related departments involved in the study. Reasons for selecting particular departments for this study were as follows:

- Not all departments in the faculty had a direct or even significant impact on the agricultural sector in the region. Thus, departments such as Chemistry, Physics, Mathematics and such were not contacted for data collection.
- Secondly, initial analysis of the faculty reports of the 1990s separated the current faculty into two different faculties: the Faculty of Agriculture and the Faculty of Natural Sciences.

Table 1.2 below indicates the departments that make up the Faculty of Agriculture as the term is used in this study and from which data were collected.

Table 1.2: Departments investigated, 1990s and 2000s

Departments in the 1990s	Departments and centres in the 2000s
Agricultural Economics	Agricultural Economics
Agronomy/Agrometeorology	Animal, Wildlife and Grassland Sciences
Animal Science	Plant Sciences
Food Science	Soil, Crop and Climate Sciences
Grassland Science	Disaster Management Training and Education Centre for Africa
Plant Pathology/Breeding	Centre for Environmental Management
Soil Science	Centre for Sustainable Agriculture, Rural Development and Extension
Ground Water Studies	Institute for Groundwater Studies

Twenty-one interviews were conducted at the UFS, a sample that included fifteen academic staff and six senior administrative staff. The second group of respondents included stakeholders in the agricultural sector and in the local or regional governance structures in the province. These included farmers, farmers' union representatives, government agencies and private industries. A sample comprising twenty (n = twenty) respondents was targeted. Using both snowball and purposive sampling methods, three interviews were conducted in the Bloemfontein region. Osuala (1982:127) proposes that "many sociological research studies focus on very specific subgroups of the population, for whom sampling frames are not readily available". Purposive sampling methods were thus used to identify key informants in the region who had been active in knowledge supply and knowledge demand. Snowball sampling was also used to identify knowledge users who could not easily be identified via purposive sampling. Respondents were then asked to refer the interviewer to other stakeholders in the region who could provide relevant information and data for the study.

Data were collected by means of interviews conducted with academics in the Faculty of Agriculture and with other regional stakeholders. Semi-structured interviews were used. This being a qualitative research design, data collection included in-depth interviews, document reviews, field observations and the use of memos. Related prior studies were also used to inform the conceptualisation of the study and analysis of the collected data. The semi-structured interview design is a useful means of conducting empirical research because of its flexible approach and because it provides a balance between structure and the quality of the data obtained (Gillham, 2005). The process further involved the use of formalised questions, permitting the researcher to include more questions aimed at obtaining “more detailed information about a particular answer or to explore new issues that arise from a particular answer” (Collis & Hussey, 2009:195). The latter process generally allows interviewees to share their thoughts and insights, and so to provide rich data for interpretation. This researcher designed a different set of questions for each interviewee group (Chen, 2010).

The researcher also visited the community sites where there were UFS agricultural training centres. Figure 1.2 shows some of the farmers during and after a weekly meeting. The researcher attended the meeting so as to have first-hand experience of the training going on at the farm.

Figure 1.2: Researcher visits Lengau farmers during and after training



Secondary data were also collected from analyses of departmental reports. Faculty reports between 1996 and 1998 and between 2009 and 2011 were collected and reviewed. The comparison of data for these periods provided an excellent background for viewing both

changes and responses from the UFS. In the review process, key facets of knowledge transfer from the faculty to the community, farmers and local government were identified and analysed. Table 1.3 provides a summary of interviews conducted for this study.

Table 1.3: Summary of qualitative data-collection design

Stakeholders	Academics, management and stakeholders	
	Target	Conducted
Academic management at the UFS	5	6
Departmental academics	20	15
Farmers, farmers' associations and organisations	15	8
Local/provincial government departments	5	2
Total	45	31

Though based primarily on the interpretive paradigm, the research also made use of a short quantitative survey, using a structured questionnaire. Mason (1996:4) supports the use of this technique, stating that "qualitative research usually does use some form of quantification, but statistical forms of analysis are not seen as central". The quantitative data provide some form of triangulation, thereby increasing the understanding of the social dynamics. More quantitative data were thus collected from key departments and, where necessary, from previous research to substantiate qualitative findings and analysis.

1.7.4 The data-collection process

The data-collection phase started with the process of negotiating access to the faculty and to relevant departments, centres and staffs. At the UFS, the interview process began with the Office of the Vice-Chancellor. An interview was scheduled and conducted with the Dean, who also provided helpful departmental reports that supported the qualitative data. Appointments with faculty staff were made via emails and phone. Other administrative offices contacted for interviews included the Office for Community Development, the Technology Transfer or Research Commercialisation Office, the Office for External Relations and the Office for Internationalisation. With a view to enhancing triangulation of data and gaining insight into the conceptualisation and implementation of knowledge transfer and engagement with the region, interview sessions were scheduled and conducted with at least one representative from each of these offices.

The major challenge faced during the data-collection process concerned government and the private sector in that most of the contacted offices did not respond to emails, while a majority

of those who responded did so late into the research process. There was much scheduling and rescheduling of interview dates and some were subsequently cancelled. As with most private sector organisations, information is usually considered sensitive to both competitors and even the media. Some of the respondents could thus not provide information as detailed as would have been desired. However, the information and data collected and here presented provide an adequate understanding of the key issues being investigated.

National policy documents were also collected using search engines, while provincial policy documents were supplied by contacts in the Office of the Premier. Letters of introduction and permission were sent and permission obtained for the use of every policy document. At the institutional level, the University Strategic Plan was made available on the website after finalisation in May 2012 and was thus available for analysis. The Commercialisation Policy was obtained from the Office of Technology Transfer and the Community Service Policy was obtained from the UFS website.

Quantitative data included undergraduate and postgraduate outputs between 1996 and 1998 and between 2009 and 2011. Research outputs from the faculty in the form of publications and also Master's and Doctoral theses were collected from faculty reports.

1.7.5 Data analysis and unit of analysis

The analysis was done in two phases. The first phase focused on the policy environment surrounding universities and the expectations placed on them as knowledge producers in national and regional development. This was done via a thorough review of national and regional (provincial and institutional) policies as observed in Chapter Four. The second phase focused mainly on empirical data collected by means of interviews. Data were transcribed and analysed using codes, patterns and themes. Faculty reports were also captured in categories and analysed using content analysis and thematic analysis methods.

Thematic analysis was opted for as it would provide a useful way of recovering structures of meaning embodied and represented in the text (Braun & Clarke, 2006). Thematic analysis has been defined as the "search for themes that emerge as being important to the description of the phenomenon" being studied. Themes are identified by careful reading and re-reading of the data (Rice & Ezzy, 1999:258). According to Braun and Clarke (2006:10), "[A] theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set". Repeated reading of the transcripts and reports provided an opportunity to review and compare the

codes against emerging themes from the analysis – as a means of ensuring validity. An Excel database was developed to capture, index and analyse the transcripts and reports. Continuous review of analytical notes and re-analysis were undertaken to ensure reliability.

Quantitative data was also used to support qualitative data. Quantitative data was collected mainly from secondary sources and analysed using the Statistical Package for Social Sciences (SPSS). Research output from the faculty was captured into SPSS using key concepts relating to the regional area of focus (Free State, national or international), the agricultural subject area (maize, meat, breeding, etc) and the means publication (journals, book chapters, seminars or conferences) and place of publication (local, regional, national or international). These were analysed using descriptive analysis and presented through charts, tables and figures. Other quantitative data was collected from databases of farmer organisations and analysed using excel. These have also been presented using charts and figures.

The data were analysed and interpreted to provide an understanding of the demand and supply factors affecting knowledge transfer. An inductive approach, as described by Babbie and Mouton (2001) enabled the researcher to build a hypothesis or theory, based on the happenings that were observed in the field. However, though situated in a particular space-bounded institution, as argued for by Yin (2003) in case-study designs, the study sought to understand broader contextual and theoretical aspects from regional stakeholders aimed at building a possible theory for knowledge transfer from universities. Hence, the use of the grounded theory approach in this study reflects the relevance and rationale for the study at a PhD level, which requires a contribution to the theoretical discourse of the concept being investigated.

Grounded theory seeks to provide the analytical tools needed to derive theory of human behaviour systematically from empirical data (Glaser & Strauss, 1967). The grounded theory research design uses a decidedly more inductive approach with regard to theory and research. In order to ensure a fit with the ontological and epistemological aspects of a qualitative study, a constructive grounded theory approach was used. This approach acknowledges the participant experience, a wide range of perspectives from different stakeholders and minimises researchers' bias so that a theory may be constructed from the data (Strauss & Corbin, 1998).

Dey (1999:1–2) defines grounded theory as 'an analytical tool, aimed at generating theory on human behaviour based on interactive relationships'. The generated theory is most often

reported in a narrative framework or as a set of propositions. One important aspect of application of the theory, according to Strauss (1987) and Glaser (1992), is the *constant comparison* of data. Urquhart (2001:3) offers a lucid explanation of the concept: "Constant comparison is the process of constantly comparing instances of data that you have labelled as a particular category with other instances of data, to see if these categories fit and are workable". According to Glaser (1992), the emergent nature of grounded theory provides its analytical strength in data analysis, which argues that data should not be forced into conceptual categories. In this analytical approach, data analysis involves an inductive approach rather than a deductive one (Urquhart, 2001). While in a deductive approach the aim is to test a specific theory based on defined hypotheses and indicators, the inductive approach aims at building theory from observations and generalised patterns (Crowther & Lancaster, 2009).

Miles and Huberman (1994:25) define the case or unit of analysis as "a phenomenon of some sort occurring in a bounded context". The unit of analysis in this study was the Faculty of Agriculture at the UFS. The main aspects of the study can be summarised as follows:

- Understanding university engagement from the historical context of the university, such as complementarities between knowledge output and regional needs;
- The politics and policy environment informing knowledge transfer through university engagement within the case-study regions;
- Understanding the orientation of the UFS as a knowledge producer towards regional development (institutional and Faculty of Agriculture levels);
- The nature of regional industry demand for university knowledge and partnerships, and the absorptive capacity of regional firms/ industries; and
- The knowledge-transfer networks and the social associations enhancing knowledge transfer.

These issues formed the basis of the thesis structure, data collection and analysis to provide a case-study context-specific understanding of the relationship between universities and regional development through knowledge transfer.

1.7.6 Reliability

In contemporary empirical research it remains important that the researcher should ensure the application of a rigorous process of scientific inquiry. This, according to Lincoln and Guba

(1985), can be assured by establishing four types of checks on the validity and reliability of qualitative data. The credibility of the research process was guaranteed by following a design that ensured that the data were collected in an appropriate manner (Collis & Hussey, 2009). The latter authors propose three tactics: firstly, the researcher needs to spend adequate time at a research site; secondly, multiple data sources (interviews, document review, observation and key informants) should be used to ensure triangulation; and thirdly, the research has to be subjected to peer review – by supervisors, co-supervisors and fellow research colleagues. These prescriptions were closely followed in the research process.

While positivist research designs expect the generalisation of the findings beyond the study objects, proponents of the interpretive research design have questioned the notion of generalisation in case studies. Bassey (1981:85-86) contends:

... the reliability of a case study is more important than generalizability ...if case studies are carried out systematically and critically, if they are aimed at the improvement of education, if they are reliable, and if by publication of the findings they extend the boundaries of existing knowledge, then they are valid forms of educational research.

For qualitative studies, the above argument takes the focus away from the need to provide evidence that the findings can be generalised and rather focuses on how these findings can be related to real-life experiences and how the latter improve our understanding of the phenomenon being investigated and reported on.

1.8 Thesis outline

Chapter One provided a broad background to the study by presenting an introduction, stating the aims and objectives, the research problem, and outlining the methodology that has been employed towards attaining the stated objectives. Chapter Two offers an historical overview of the changing paradigms of development thinking and focuses on theoretical approaches regarding the role of universities as knowledge producers in regional development. Chapter Three delves into the theoretical aspects of knowledge in regional development from a knowledge-transfer perspective and ends with a conceptual section that employs the learning region concept to provide indicators for the empirical study. Chapter Four is an analytical review of the national policies that inform knowledge production for development. Chapter Five provides a broad analysis of the regional policy context, which includes regional development and the UFS institutional policies and how these relate to knowledge production

and transfer for development. Chapter Six and Chapter Seven contain the analysis and discussions of the empirical findings. The final chapter, Chapter Eight, provides a summary of the study lists the conclusions and highlights their implications for knowledge-transfer theory and for the role of universities as knowledge producers in regional development. It finally proposes areas for policy development and further research.

CHAPTER TWO

A REVIEW OF DEVELOPMENT THINKING: FROM CLASSICAL DEVELOPMENT TO KNOWLEDGE CAPITALISM

Capitalism is undergoing an epochal transformation from a mass production system where the principal source of value was human labour to a new era of 'innovation-mediated production' where the principal component of value creation, production and economic growth is knowledge.

Florida and Kenney, 1991:637

2.1 Introduction

The process of economic growth and development at global, national or regional levels has undergone significant and almost irreversible transitions. Development thinking has witnessed several paradigm shifts evolving from natural-resource dependence, through the Industrial Revolution to what has been referred to as the era of knowledge capitalism (Burton-Jones, 1999; Foray, 2000; Ordóñez, 2010), with universities, research and development and other knowledge-producing institutions gaining more relevance in national and regional development theory and practice. This has partly been triggered by broader global forces that include, *inter alia*, the end of World War II, the end of the Cold War, the rise of global development institutions (the International Monetary Fund and the World Bank), the prominence of globalisation, the post-industrial economy and the rapid increase in codified knowledge production. Knowledge capitalism has also been manifested in various ways, such as the rapid changes in information and technology advancements, the rise in application science as in nanotechnologies and the Internet. The role of knowledge has, in a proactive way, begun to form the central discourse in development thinking both in a reactive and increasingly in a proactive manner.

Before engaging in the various ways in which universities and knowledge have become so critical in social and economic development in the last few decades, it will be important to provide an historical snapshot of development thinking as a major foundation on which economic capitalism has evolved. One important aspect of this review in the context of the present study is to situate the historical influence these development approaches have had on both education in general and on higher education as knowledge producers in developing economies especially in sub-Saharan Africa. It will be interesting to see that education, higher education and knowledge production have not been unaffected by shifting development theories and approaches. Development approaches have had significant

influence on the ability/inability to enhance the transition from industrial to knowledge capitalism.

The next section thus engages with a theoretical overview of development discourse over the past half-century. It will look at the classical development theories and also at other development approaches that have influenced the latter part of the twentieth century. There will subsequently be a broad overview of the role both universities and knowledge have recently played in contemporary economic growth and development thinking.

2.2 Development thinking: a theoretical overview

The broader definitions of development have been highlighted in Section 1.1.1 of Chapter One. In strict economic terms, Todaro and Smith (2003) argue that *development* has traditionally been conceived as “the capacity of a national economy, whose initial economic condition has been more or less static for a long time to generate and sustain an annual increase in its gross national product at rates of perhaps 5% to 7% or more of its gross national product” (Bremer, 2009:12). Alternatively, development was evaluated using the per capita income or per capita GDP that measured the ability of a nation to expand its output at a rate faster than the rate of its population growth (Todaro & Smith, 2003).

Early literature on development thinking reveals that development was initially viewed from and measured largely in terms of econometric parameters by focusing on rapid industrialisation – often in agriculture – rural development and the social aspects of values and cultures of the subjects of development. In the process, the masses were expected to benefit from development efforts through a ‘trickle-down effect’ in the form of jobs and social benefits from national economic growth. However, with the increased criticism of classical development thinking, development approaches – while increasingly seeking more inclusive and sustained forms aimed at ensuring growth in national GDP – came also to address softer social, cultural and political issues.

The following section highlights the main arguments that have characterised different periods over the last half-century or more. It should be mentioned that the theories and approaches did not evolve in strict succession. Some have persisted with changing forms and degrees of influence, while others have been completely replaced. The review provides a tool towards better understanding development thinking in an evolutionary approach, thereby setting up a platform for a better discourse of contemporary knowledge in regional development.

2.2.1 Modernisation theory

Modernisation theory is conceived to have originated in the 1930s as a response to world economic depression and as a potential answer to the underdevelopment of most developing countries (Davids, 2005; Evans & Stephens, 1988; Hettne, 1983). The theory drew on various streams of socio-economic thinking emanating from Western social scientists such as Durkheim, Marx, Tonnies, Spencer, Weber and Parsons (Evans & Stephens, 1988; So, 1990) and enjoyed immense popularity during 1950s and 1960s in the Western First World countries as a strategy to shake off the threat of communism during the Cold War (So, 1990). Following its emergence, development studies became largely dominated by the modernisation paradigm, which proposed the construction of a single model of modernity based on the experience of a few (industrialised) countries (Brohman, 1995).

The protagonists of modernisation theory, particularly in the nineteenth century, drew much inspiration from the work of Darwin who equated development to the process of evolution. According to So (1990) and Webster (1990), modern societies had evolved gradually through a series of earlier and more primitive stages. Through evolutionist thinking, So (1990) further believes that the fundamental idea of evolution is centred on the social changes within human societies gradually and over long period of time. In this evolution, all societies go through similar social, economic and political stages of modernisation. This evolution is irreversible and progressive; later societies are assumed to be superior to earlier ones and converge in a single form so that all societies end up on a par with one another. This was supported by Parsons's evolutionary universalism that argued that human society had evolved through a series of stages, namely the primitive, the advanced-primitive, the intermediate, the advanced-intermediate and the modern (Parsons, 1964). Another modernisation thinker, Rostow (1960), in his stages-of-growth theory presents a classical example of the practical application of modernisation theory. Davids et al. (2005) contend that, according to Rostow, countries and societies follow a series of five stages from underdevelopment to development: traditional society; precondition for take-off; take-off; drive to maturity; and age of mass consumption.

Valenzuela & Valenzuela (1978:537) succinctly encapsulate the general assumptions of modernisation theory:

Since societies are understood to move from tradition to modernity, the ideal typical dichotomy constitutes the polar ends of an evolutionary continuum, though at some point incremental changes give way to the qualitative jump into

modernity. The location of this point is unclear; and yet developing countries, including Latin America, are perceived to be below the threshold of modernity, with a preponderance of traditional features.

Modernisation theorists tried to provide an understanding of the social and economic changes and the factors affecting them. De Beer and Swanepoel (1998) opine that modernisation theory was equally used to explain the process of cultural evolution. In this process, traditional societies that were considered to be 'less' complex than their First World counterparts were expected to evolve into modern ones. The rationale here – also expressed by economists – was that traditional or developing economies had to repeat in the 20th century what First World countries had undergone in the 18th century so as to replace traditional values, attitudes, practices and social structures with more modern ones. This was based on the assumption that the developed economies were unquestionably right and thus provided a model to be copied. Modernisation theory was thus an effort by the colonial powers to impose their cultural ideologies on their colonies. The main ideology to be promoted was the notion of liberal democracy and how to transform societies to conform to what they considered ideal.

Modernisation theorists assumed that the values, institutions and patterns of action of traditional societies were both the causes and effects of underdevelopment and, that for development to be achieved; these values and patterns had to be taken out of the way (Valenzuela & Valenzuela, 1978). Another major assumption inherent in modernisation thinking is the fact that humans from developed and developing countries are seen as being psychologically very different. Humans from developed countries are individualist, rational and goal oriented in contrast to the humans from developing countries who are perceived to be collective, irrational and fatalist (McClelland, 1964). This view significantly stresses the need for the much-argued 'evolution' of both the culture and the physiology of people in developing countries for modernity to be attained (Yousfi, 2007).

Modernisation theorists were fundamentally economic-growth inclined and based their thinking on two main assumptions that were later strongly criticised by subsequent development thinkers. In view of the fact that the theory focused on economic growth, its first assumption was that there would be a subsequent increase in the demand for labour and hence for increased income. This increased income would lead to economic growth, which would trickle down to the lowest levels of society. The second assumption of the theory, which was later shown to be a weakness, was its top-down approach (Streeten, 1979:22).

Modernisation theory has come under scrutiny following mixed reactions from different development theorists. Brohman (1995) maintains that a growing number of social theorists have recently rejected modernisation theory, which is regarded as outdated and inapplicable to contemporary global conditions. This is due to there being no blueprint for society to become modern in terms of development. There are many social dynamics that need to be taken into consideration, as he argues that “the importance of studying processes of development within their social and cultural contexts has been ignored by most development theories” (Brohman, 1995:124).

The criticisms levelled against modernisation theory resulted from shortcomings such as expecting too much of developing countries, being prone to generalisation and universalism, ignoring the social context that forms the basis of development, and, undermining the influence of external forces that hinder development in developing countries (Graaff, 2004; Seers, 1969; So, 1990). In light of the above, development theorists tried to redress the issue by developing another development model for developing countries, which saw the rise of dependency theory.

2.2.2 Dependency theory

Considered by many as having emerged from the criticisms of modernisation theory, the thinking of the dependency school first surfaced in the 1950s in *The Political Economy of Growth*, by Paul Baran. This was however in an era when modernisation theory was still strongly acclaimed. Dependency thinking emerged from Marxist thinking and the United Nations Economic Commission for Latin America (Love, 1990) and began to gain currency in the mid 1960s as modernisation and Westernised elites were increasingly perceived as being the major cause of the continuous underdevelopment of the homelands (Replay, 1996).

A fundamental argument was that independence was a mere political slogan, that, in effect, was not reflected in the existing economic realities, and that the spread of capitalism from First World countries had a destructive influence leading into the underdevelopment of developing countries (Frank, 1966). The one-time relationship between the colonial powers and the colonies before independence had rather been replaced by a core-periphery power relationship that ensured an unequal flow of capital from the periphery to the core. Andre Gunder Frank, one of the proponents of the theory, later referred to this relationship as the ‘development of underdevelopment’ (Chew & Denmark, 1996:3). According to Frank, the development of the Western economies and the underdevelopment of the peripheral countries

were two sides of the same coin (in Graaff & Venter, 2001), and that one could only take place with the influence of the other. This implied that the rich were the cause of poverty. It has been argued that dependency relationship ushered in a new form of colonialism, namely neo-colonialism – an indirect and subtle form of domination by political, economic, social, military or technical means (Martin, 1982:227).

Baran (1973) maintains that this relationship was established and fully sustained through the role of the bourgeoisies in developing countries who allied themselves with traditional landed elites who spent national profits on ostentations rather than on investment aimed at accelerating growth (Rapley, 1996). This class of elites became the major interest of most First World foreign policies as they sought to protect the interests of this class, thus protecting their own interests. This development or rather underdevelopment pattern was observed practically in Cote d'Ivoire by Samir Amin (1967), where he discovered the 'planter bourgeoisie' – a small ruling class "that evinced little interest in development and was content to be a parasite living off the avails of foreign capital" (Rapley, 1996:21).

A main characteristic of the dependency relationship was that developing countries remained locked in this classical dependency, producing primary products for Western markets while importing finished goods. It was also observed that some Western industries in search of raw materials and cheap labour began to establish some of their subsidiaries in developing countries. Dependency theory subsequently came under severe criticism. Authors such as Smith (1979), and Graaff & Venter (2001) observed that the theory was overly pessimistic with too much attention being focused on external factors as causes of underdevelopment while paying little attention to the actual and potential forces responsible for underdevelopment. Smith (1981:757) succinctly articulates this in arguing that:

... the major criticism to be made of dependency theory is that it exaggerates the explanatory power of economic imperialism ... Too much emphasis is placed on the dynamic, molding power of capitalist imperialism and the socioeconomic forces in the league with it locally; too little attention is paid to political motives behind imperialism or to the autonomous power of local political circumstances in influencing the causes of change in Africa, Asia, and Latin America.

Another criticism arose from the proposed delink from Western economies, which dependency theorists view as the only remedy for the development of developing countries (Gilbert, 1974). While dependency thinking evolved with a more nuanced understanding of the theory, one thing remained fundamental: as long as developing countries remained attached to the core or developed countries, they would never attain development. In the

dependent relationship, development was not expected to originate from within but was steered by exogenous forces in First World countries (in the core) endowed with technological, commercial and socio-political knowledge who dominated over the periphery (Todaro & Smith, 2003). Dependency theorists provided a different view of the challenges facing developing countries in their development effort but were even less successful at providing a way out. This is seen in their attempt to solve the development dilemma, to which end they proposed a total delink from the West (Replay, 1996) and to become self-sufficient. However, the theory focused on the power relations and their negative externalities in the developing world and opened up avenues for more thinking on the development pathways for most developing countries.

As will be further discussed and analysed in much later stages of this thesis, modernisation and dependency can be argued to have affected even the process of education and higher education in developing countries in general and particularly sub-Saharan Africa. Major international funding bodies have greatly influenced higher education in Africa in that much of the continent has been dependent on these bodies for funding. Higher education has also largely followed the same pathway: indigenous knowledge, which is most often treated as second-class knowledge, is not considered able to address problems, the preference rather being for Western knowledge. Visvanathan (2001:40) criticises Castells' notion of knowledge when he argues that "to define knowledge as formal, abstractable knowledge is to impoverish knowledge and to deny the existence of tacit knowledges, embodied knowledge, alternative knowledges". He further argues that in the epistemological framework of knowledge, African systems of agriculture and healing have been relegated to a black box rather than considered an alternative paradigm. This tacitly implies that African systems must conform to the Western methods before they can be considered knowledgeable enough. It therefore reveals a subtle form of modernisation theory in which developing countries must imitate the West before either being considered 'good enough' or being developed.

A closer look at universities in most African states reveals that most of the universities were derivatives of universities of the colonial powers, with the same mission of training elites that ultimately strengthened the bourgeoisies' notions that existed during the dependency era. British colonies, according to the Asquith Commission Report (1945), had universities set up according to the model of British civic universities, while the universities in most of the French colonies were seen as an extension of the French university system ... (Sherman, 1990). The absence of technical universities in the post-independent era is probably

attributable to the fact that most of the technical and research-related work was done in the West. This practice has also been current in most developing countries for the past five or more decades with the establishment of greater numbers of universities for law, arts, humanities and social science and fewer technical universities or engineering faculties. This lack of skills development has held back most countries in developing economies in that such countries have depended on expatriates who were paid with local tax payers' money and donor money.

The failure of the classical development theories to address the development needs of developing countries, caused other theories and approaches to evolve, which are generally referred to as post-development theories or alternative paradigms. The next section will highlight some of these paradigms by presenting their main arguments, their strengths, and the challenges they faced in addressing development issues in developing countries in general and Africa in particular.

2.2.3 Neo-liberalism (structural adjustment programmes in Africa)

Neo-liberalism, to a large extent, eliminated the foundations of development economics in the late 1970s and brought a market approach to the development discourse. The nexus, according to neoliberal thinkers, was to get the markets right (Pieterse, 2010). Strongly backed by the World Bank and the International Monetary Fund proponents argued that economic growth would ultimately ensure that development needs were achieved via deregulation, liberalisation and privatisation. Governments (especially those of developing economies) were placed under strict regulations to privatise as many of the enterprises that were state-owned and-controlled as was possible.

In the neo-liberalisation process, also captured by Williamson (2000; 2004) as the Washington Consensus, structural adjustments programmes were imposed on developing countries by both the World Bank and the International Monetary Fund structural adjustments programmes were aimed at breaking the strong grip of governments on the economic-development agenda while ushering in a more market-driven economic pathway. While detailed analysis of the programme will not be done in this review, it is worth mentioning that the structural adjustments programmes had dire implications for fiscal austerity (Williamson, 2000). The programmes enforced increased privatisation of previously state-owned and -run enterprises, this resulting, among others, in huge retrenchments, trade liberalisation and currency devaluation and in the abolishment of marketing boards (Replay, 1996). The

structural adjustments programmes approach to development in developing countries however had vastly different results in Latin America. There, considerable success was recorded in comparison with the situation in sub-Saharan Africa, where most countries still suffer after the demise of the programme and where success stories are few and far between. However, it is important to undertake more region- and country-specific studies so as to have a better understanding of the discrepancies witnessed (Porter, 1990).

Neo-liberal thinking, according to Morse (2004), refers to a neo-populist approach, one that criticised the central decision-making approach and argued for local participation in all levels of decision making aimed at human development. The other school of thought whose emergence coincided with neo-liberal thinking was the anti-development school that viewed development as a North-based product imposed on regions, without any consideration for local contexts, cultures and values (Willis, 2005). Proponents of the anti-development school argued that development should incorporate grass-roots involvement such that the values and views of the local community should be reflected in any and every development programme.

While neo-liberals continued to pursue the same goal as did development economics theorists – namely economic growth – they prescribed a very different praxis in the process of which the agents for development moved from the state to the market. Neo-liberalism was observed to have its effects not only in the economic sphere but also in the socio-academic domains. In the economies of developing countries and particularly in Africa, the shifts to market forces had significant policy shifts in education funding, which were severely felt by higher education. Primary education, considered to provide better returns for economic growth, received increased funding at the expense of higher education (Psacharopoulos, 1988). There was thus a need for a major rethink of development thinking in the late 1970s. Seers (1969:3), is believed to have significantly influenced the thinking at the time in that he posed the basic question about the meaning of development. Seers (1969:3) asserted further that “[T]he questions to ask about a country’s development are therefore: what has been happening to poverty? What has been happening to unemployment? What has been happening to inequality”? Seers (1969) also emphasised that a decline in these three indicators in any given period would indicate that that economy had witnessed development.

However, Cornia et al. (1987) later maintained that the process and agents of neo-liberalisation lacked a ‘human face’ in their implementation of economic and social programmes in Africa. Replay (1996) thinks that in focusing on rolling back the arm of the state from the development process, neo-liberals overlooked some of the problems inherent in

a strict market economy, which most African states were not ready to face – hence there was a continuous search for a newer or better development alternative. In its 1991 report, the World Bank expressed a volte-face of sorts from its previous economic-growth approach to development in that it echoed this new, broader perspective of looking at development. The report asserted that “the challenge for development ... is to improve the quality of life” (World Bank, 1991:4). The report further argues that, especially in less developed and poor countries, development should be reflected through better education, less poverty, cleaner environments and greater freedom and cultural life – development must therefore be guided by a multidimensional approach.

This argument attracted new stakeholders – other than the state and the market – to the development process. It became obvious that, while, in a strictly capitalist environment there could very well be economic growth at the macro level, poverty could nevertheless remain a major issue that could further exacerbate social inequality. This ushered in the need for new forms of organisation (especially in developing countries) that were neither capitalist in nature, nor were they of the state, but were non-governmental organisations.

2.2.4 Non-governmental organisations

Non-governmental organisations, as development agents, evolved against the backdrop of the failure of most development policies in most of the post-colonial countries. The rise of international non-governmental organisations was partly seen to assist weakening national governments to deliver their promises of greater emancipation and socio-economic development (Manji & O’Coill, 2002). This development paradigm paved the way for further debate about states’ regulatory function and their emancipatory function. States were expected to respond to the expectations of the more powerful ruling class in the form of global and international non-governmental organisations and capital fora. In the critical condition in which states found themselves, African states were in an even more precarious situation – they were as yet lacking as regards attaining adequate levels of legitimacy. African states were plagued by ills such as “corruption and subject to acute problems of clientelism” and were in need of a social revolution to address institutional chokepoints (Castells, 2001a:103). However, Kraak (2001:103–104), from a synthesis of Castells and Carnoy’s thinking, argues that, in spite of all the pressure that faced the nation state in response to globalisation imperatives:

... the state is still a pivotal institution in the life of national economies, although its interventionist role in the economy has shifted in the advanced economies from that of

being a bureaucratic Keynesian welfare state heavily involved in production to a state that is less bureaucratic, less involved in production, more efficient, incentivising and wise; a state that focuses on building key infrastructural capacity ... and function[s] with information networks.

The weakening role of the state as a response to the globalisation push ushered in new political and social dynamics to ensure stability in national development, especially in the more enclave territories as a result of which 'local' powers – regional, local communities and non-governmental organisations – emerged. Communities thus identified themselves with non-governmental organisations, which became the new frontier in national and regional development efforts (Carnoy & Castells, 1999:31). This paradigm shift from nation state to more fragmented regions and localities heralded a new approach to development, namely regional and local development. This study will focus more specifically on the approaches that have characterised regional development, and on how the role of knowledge has significantly steered regional development.

As argued by Manji and O'Coill (2002:568), "Non-governmental organisations today form a prominent part of the 'development machine'", which consists, among others, of vast networks of official agencies, development practitioners, scholars and experts producing and consuming knowledge about Africa's development. The rise of non-governmental organisations however followed a trend less similar to the majority of other development approaches of the time. With increasingly freer markets, capitalism ushered in a period "when industrialists were amassing fortunes to rival the aristocracy", while most of the population could hardly survive above the poverty line (Manji & O'Coill, 2002:568). This trend was first observed in the West and later reflected in Africa when colonial powers had no desire to finance state welfare programmes. The solution to welfare programmes was thus dependent on voluntary organisations. These came either as overseas missionary societies or as charitable bodies, with the latter addressing issues of development in war-torn zones, areas hit by natural disasters and problems of the economically weak (women and the elderly) and also social issues.

Universities and knowledge has increasingly been seen in the operation of most supranational non-governmental organisations. Organisations like the United Nations through the United Nations Education, Social and Cultural Organisation (UNESCO), the New Partnership for Africa's Development, the OECD and the United States Agency for International

Development, among many others, have all clearly stated the importance of bringing both the university and knowledge into national and regional development efforts. The European Union has also demanded that its universities assume a more prominent role in development as the continent focuses on its goal of becoming the 'most competitive and dynamic knowledge-based society in the world'. This has been consolidated as the European Union sees knowledge production to be the engine for economic and social development. The Commission of European Communities thus believes that "given that they are situated at the crossroads of research, education and innovation, universities in many respects hold the key to the knowledge economy and society" (CEC, 2003:58).

2.2.5 Alternative development approaches

As observed above, the ideology of classical development emphasised economic growth at the expense of sociocultural issues and failed to respond to issues of abject poverty and social equality (Onimode et al., 1990). In the late 1980s, it was argued that the continuous underdevelopment of most developing countries was not only due to misguided concepts and theories, but also institutional limitations. This highlighted the notion of 'another developmental' or alternative development (United Nations, 1975) approaches focusing on the more human aspects of development. These included, *inter alia*, notions of participation, empowerment, people-centred development and the role of communities in taking part in decisions concerning their own livelihoods – thus community development (Sullman, 1990).

The human development approach to development thinking emerged strongly in the 1990s, when the United Nations Development Report argued that development has more to do than merely increase income. The grand idea behind the approach was that development needs to be more inclusive and aimed at increasing life expectancy, gender equality, educational attainments and basic standards of living (United Nations Development Programme, 1995:12). This approach therefore questioned the ability of market forces to address a greater number of social issues (Sen, 1985; 1999), thereby paving the way for public policy (Martinussen, 1997). Some of the main tenets of the human development approach will be discussed in the next sections and key arguments will be highlighted.

People-centred development: People-centred development as a development approach stresses the importance of the subject of development more than it does the object as expressed in classical development theories. De Beer and Swanepoel (2001) contend that people-centred development is founded on participation and learning processes. The main

components of people-centred development include participation of all stakeholders, sustainable development and advocacy for the voiceless in making decisions that concern them. In a nutshell, Davids (2005:23-24) argues that people-centred development should be characterised by the following:

- People should be at its centre; issues of inequality and political oppression should be addressed;
- It should be considered a universal issue and not limited only to developing countries: issues of urbanisation, pollution, environmental degradation, HIV/AIDS and unfair trading practices are all global issues affecting people across national and continental boundaries;
- It should be a more holistic approach not limited to macro-level aspects but should include more micro-level aspects like community values, indigenous knowledge, customs and values; and
- It should focus on relationships between people at all socio-economic levels and should aim to bridge the poverty gap.

People-centred development, like other human development approaches, places more emphasis on people, especially the disadvantaged who are unable to compete equally in a natural system.

Participatory development: It can be seen to have evolved from the people-centred development approach. Participation has been understood and applied differently by local governments, regional development agencies, community-based organisations and non-governmental organisations in designing rural livelihood strategies. The concept of *participation* in human development, (World Bank, 2000), is a voluntary contribution by different stakeholders in development projects concerning them. This includes the planning, decision making, implementation, and the monitoring and evaluation phases. It is argued that in the process of participation, there is a sharing of local (indigenous) and expert knowledge, one which ensures the sustainability of development efforts (Chambers, 1983). It has however been argued that true participation is difficult to achieve and has hardly ever either been properly employed or sustained in development processes.

Empowerment: One of the challenges that seems to have hindered adequate and sustained participation is the lack of sufficient knowledge to make relevant decisions. Empowerment

broadly refers to aspects of power sharing and distribution (Page & Czuba, 1999). In a development context, empowerment has been defined as

... the process by which people, organisations or groups who are powerless become aware of the power dynamics at work in their life context, develop the skills and capacity for gaining some reasonable control over their lives, exercise this control without infringing upon the rights of others (Vijayamohanan & Asalatha, 2011:15).

In the people-centred development approach, empowerment has increasingly gained currency. Key aspects of empowerment that make it a strong tool in development practice include participation, learning, capabilities. Empowerment largely involves the processes of learning new behaviours and unlearning old attitudes.

2.2.6 Sustainable development

There is a proven, close link between an increase in the world population, a rise in income and a net degradation of the global environment. For the past two decades, the global environment has faced severe unsustainable exploitation. This was a major theme in the 1992 United Nations Conference on Environment and Development (World Earth Summit) in Rio de Janeiro. Neo-liberal economic-growth patterns in developed economies have encouraged the pursuit of profit regardless of the social and environmental cost that may be involved. This has resulted in new forms of poverty and given rise to the argument that, for development to meet its true and holistic essence, economic growth and prosperity must take cognisance of the environmental impacts. According to the Brundtland Report of 1987, for economic growth to be sustainable, it will have to support present-day development needs without compromising the potential of future generations to meet their own development needs (Beckenstein et al., 1996:9).

Critical aspects of the environment that have been significantly affected include, among others, water pollution, water scarcity, air pollution, solid and hazardous waste disposal, deforestation, loss of biodiversity, soil degradation and global atmospheric changes. Global dynamics provide arguments that environmental issues go beyond national and continental boundaries. Sustainable development has thus emerged with a number of 'best practices' and approaches to development management seeking to restore some level of equality and to ensure that development and economic growth are not only limited to those able to make the most of neo-liberal capitalism but to address issues of social and cultural justice in development efforts.

Development policies in the majority of less developed countries have thus been enacted to respond to the environmental challenges related to environmental sustainability. These include proper resource pricing, community involvement in development projects, clearer property rights and resource ownership, alternative economic programmes for the poor, ones that will enhance livelihood options away from natural resources alone, emission-abatement policies (such as the polluter pays principle), and raising the economic status of women (Todora & Smith, 2003). These notions have been incorporated in national and regional development programmes and approaches to enhance development and economic growth, while also ensuring the sustainable use of the environment.

The challenge of ensuring environmental sustainability can be perceived as both a cause and an effect of a bigger or broader force – globalisation (which will be discussed next). Global forces indicate that actions of one agent in one part of the world can greatly affect events in another continent. With the merging of major economic and financial spaces, and given that national governments are being significantly influenced by larger markets, e-business and bigger institutions – such as the World Bank and the International Monetary Fund – and that geographical borders are also increasingly losing relevance faster and climates merging, development is fast becoming more of a global than merely a national or regional issue.

2.2.7 Globalisation – the emergence of regions?

One major force that has been affecting both global and national economies, politics, values and the process of social and economic evolution or development since the early 1980s, has been that of globalisation. The topic has been the centre of fierce theoretical debates between anti-globalists and national governments, the latter arguing that globalisation has always existed and should not be attributed to most of the changes that are affecting the global systems (Mrak, 2000). However, the effects of globalisation are argued to have been responsible, *inter alia*, for the loss of state sovereignty and control, increased emphasis on market forces, the increase of networks and technological innovation, the broadening of environmental challenges and social aspects (Rennen & Martens, 2003).

Defining and understanding globalisation have not been unambiguous in that its actual meaning, its nature, extent, the cause-and-effect relationships and the macro, meso and micro levels of influence inherent to the process remain elusive to many laypersons and somewhat normative to most scholars (Robinson, 2001). Globalisation has been defined from various perspectives: economic, political, cultural, and even environmental. In broad terms, Keohane

and Nye (2000:105) define *globalisation* as “networks of interdependence that span intercontinental distances”. However, more detailed and sector-specific definitions will be highlighted to present the complex but interconnected nature of globalisation and its influence on development thinking.

Held et al., (1999:16) defines *globalisation* as “a process (or set of processes) that embody a transformation in the spatial organisation of social relations and transactions ... generating transcontinental or interregional flows and networks of activity, interaction and exercise of power”. From this definition, it becomes evident that Held (1999) is defining the process rather from the perspective of a sociologist or social scientist in highlighting aspects of power and governance. While Held’s definition does not make mention of the possible economic, political and/or environmental aspects of the globalisation process, it however does not deny the existence and/or link of globalisation to aspects of the economy, environment and politics.

From an economic perspective, most economists have conceded that the process of globalisation has ushered in a significant reduction in economic barriers by enhancing trade and capital exchange, thus creating one larger economic space from many such spaces (Kahler & Lake, 2008). Based on this concession, Friedman (1999:7–8) defines *globalisation* as “the inexorable integration of markets, nation-states and technologies to a degree never witnessed before – in a way enabling individuals, corporations and nation-states to reach around the world farther, faster, deeper, and cheaper than ever before ...”. Friedman’s definition highlights some market and economic implications of the globalisation process. Still looking at globalisation from an economic point of view, Langhorne (2001) contends that globalisation can be traced back to the Industrial Revolution and the invention of the steam engine, which greatly affected the technological innovation that has enforced the process of globalisation. This brings in the dualistic characteristic of globalisation: local realities become reflected globally and global patterns tend to shape local dynamics.

Still on the economic viewpoint, Castells (2001a:4) contends that “at the heart of the process of globalisation [*sic*] is the emergence of global financial markets, the integration of capital markets and money markets in a system which works in unit real time”. What is important to note here is that in the new global world, markets in different parts of the globe run simultaneously in real time, which explains the place of networks; hence “the core of production of goods and services in every sector has been internationalised through transnational networks” (Castells, 2001a: 8).

Globalisation has also influenced the debates around global climates and environmental sustainability. While globalisation does not have a direct impact on environmental aspects, it is being argued, to have profound and far-reaching effects on the environment. The increase in air traffic, the proliferation of cars and other transport means such as railways and the heat from electronic devices all have both local and global environmental impacts. Deforestation or an increase in sea levels in one part of the globe has been argued to generate negative impacts for the entire planet. However, according to Rennet and Martens (2003), the environmental aspects of globalisation are to be considered more as consequences of rather than the actual driving forces behind globalisation. This notion of globalisation is reflected in Santos's (2002:178) definition of globalisation as "the process by which a given local condition or entity succeeds in extending its reach over the globe and, by doing so, develops the capacity to designate a rival social condition or entity as local".

Further consequences of globalisation relevant to this study are the aspects of national state legitimacy and the rise of regions – both as the consequences of globalisation and as agents thereof, or as an approach in development planning and practice. Globalisation is seen to have given rise to new forms of power struggle between the state and emerging forms of national governance. The role of the state appeared to be one of capturing "historical time through its appropriation of tradition and the (re)construction of national identity", yet with limited proof of legitimisation because it was increasingly being displaced from the centre of the global order to a position "in the network of supranational macro-forces and sub-national micro-processes" and agents (Boyd, 2008:39). Castells (1998:213) further suggests that "as a result of globalisation, national states are 'adrift' and that the developmental state has sunk and is a captive of its anchoring in national shores".

With national and supranational forces failing in the face of the forces of globalisation, development has been supported largely through the agglomeration of firms in specific localities. Whether based on comparative advantage or other factors, industries have been seen to locate themselves spatially (Crafts & Venables, 2001; Williamson, 1998). Scott and Storper (2003:9) further argue that "today's wave of globalization appears to be similarly anchored in (and is also partially responsible for) an expanding intercontinental patchwork of urban and regional economic systems".

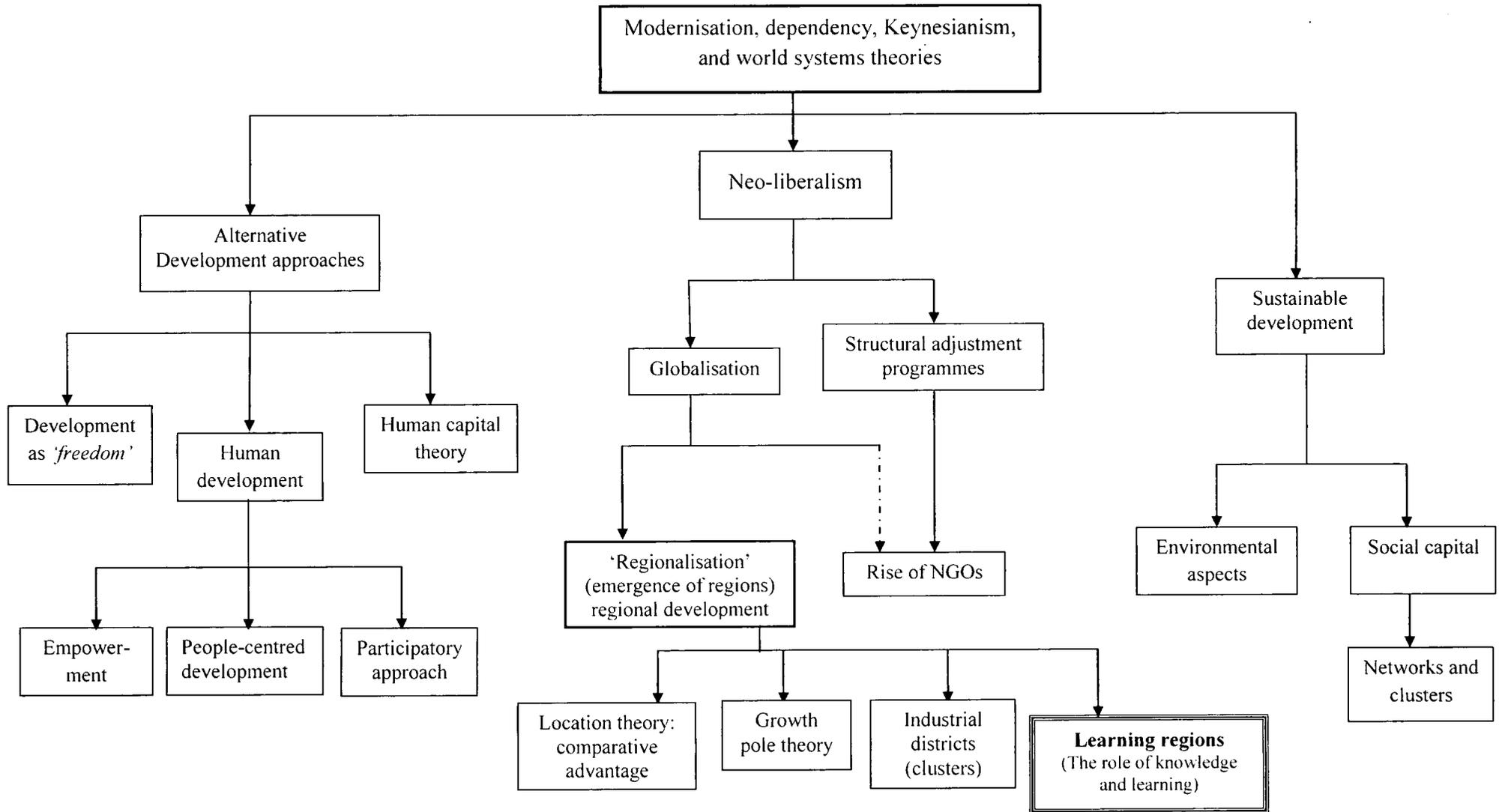
The above section has looked at the classical development theories from which development thinking evolved. This was followed by a review of alternative development paradigms. While classical development to a greater extent focused on economic growth and capital

accumulation and on capitalism at the macro-level, alternative development approaches argued for more human-centred development with a greater emphasis on humanistic approaches that were both people-centred and more focused on micro-economic aspects. Figure 2.1 below provides an overview of the trends in development discourse between the 1950s and 2000. It should be noted that the figure does not attempt to delineate these approaches or concepts on a timeline, but rather aims to highlight the major trends through which development discourse has evolved during the past six to seven decades up to the recent 'post-development' approaches. As described by Pieterse (1998), post development as conceptualised by other others is by no means a homogenous current and it in no way reflects an ecological evolution, but a continuous overlapping between development and alternative development .

2.3 Regional development

One of the major paradoxes that the concept of globalisation presents in contemporary development discourse is the emergence and importance of 'regions'. Though not a complete shift, regions have become more important analytical units in enhancing technological change, capital mobility and more regional-level interventions (Coe et al., 2004). A vast range of theoretical and practical interpretations has been advanced in an attempt to understand this paradox between the ever-increasing influence of globalisation and the rise of regions and regional development (OECD, 2007). However, two of the most recent strands in the literature will be further examined in later stages of this thesis so as to provide a clearer understanding of this dynamic. The one strand places significant emphasis on the capacity of endogenous institutional structures to limit the impact of globalisation networks (Macleod, 2001; Scott, 1998; Storper, 1997), while the other strand to a greater extent focuses on the inter-firm relationship and on global networks, and on "how particular regions 'slot into' these networks with varying impacts on industrial upgrading" (see Gerefi, 1996; Gerefi & Kaplinsky, 2001).

Figure 2.1: Overview of trends in development discourse, 1950–2000



Source: Author (2011)

Regional development is about the geography of welfare and its evolution (Njikamp & Abreu, 2009), the focus being on regional economic performance that is socially and politically created. This has led to a new regional policy – new regionalism – (Amin, 1999; Lovering, 1999) that focuses on bottom-up strategies to promote endogenous growth through mobilising of all the available resources for local development. Critical to this new regionalism is the need to highlight the factors affecting economic growth in regions, which Coe et al. (2004:469) identify as “knowledge capital and labour flows and also the wider institutional structures within which regions are embedded” (see also Amin, 2002; Bunnell & Coe, 2001; Mackinnon et al., 2002). Based on this thinking, regional development has been defined as “a set of relational processes” characterised by interdependent processes and actors whose interactive effects contribute to the development of a subnational, geographically, economically or administratively bounded space.

While development theory as a whole looked at development from a broader, macro perspective – such as national and even continental levels – regional development can be argued to focus on the more geographically defined and the more specific spatial aspects inherent in regions. This makes for more refined and context-specific analysis in designing or approaching regional development. As will be observed in most of the approaches in subsequent sections, the focus of regional development has most often centred around two key issues – “how is regional wealth created and how regions can cope with undesirable interregional welfare discrepancies?” (Njikamp & Abreu, 2009:2). These two issues seem to form the basis for understanding regional development on a number of foundations. The first main building block is that regional development, contrary to national development, follows a different pattern in attaining and ensuring welfare. Secondly, regional development theory should seriously take into consideration the differences that exist between regional and national characters. Context-relevant methodologies are therefore required when examining regional development strategies.

The following section will subject those aspects of regional development that form the main focus of this study to close scrutiny. Major trends in regional development discourse will be highlighted so as to provide an introduction to the conceptual aspects that characterise regional development. This will serve to introduce the literature on higher education and universities in regional development, and also the literature on the various ways in which universities have become instrumental in promoting regional well-being.

2.3.1 Location theory (comparative advantage)

Location theory is broadly seen to be a reflection of the concept of comparative advantage that tends to affect whether or not people, firms and businesses are disposed either to locate or relocate in specific areas. Factors that initially influence location include accessibility (in the form of roads, river banks, coastal areas) and favourable physical geographical conditions. In this approach, areas with better natural endowments and physical accessibility are described as having a better comparative advantage to adjacent regions or to regions lacking such endowments (Weber, 1929).

Location theory has played a key role in increasing an understanding of people and economic activity. The approach has been applied in analysing cost minimisation and profit maximisation as industries decide where and when to locate and relocate (Zook, 1997). Expanding his thinking, Weber (1929) proposed the argument that production costs affect the location of industries and firms across space. He highlighted three interrelated cost-affecting factors, namely transportation, labour and savings gained from agglomeration economies. Based on such thinking, Lösch (1975) and Christaller (1933) explained their understanding of location theory by arguing that a 'threshold' market size, able to support firm production, was a key aspect affecting the location of firms in a particular place. This is supported by later observation that the agglomeration of firms or industries in a particular area with "static honeycomb market structure in which each firm's market area is packed next to neighbouring firms" maintains market equilibrium based on the expansion or contraction of other firms (Zook, 1997:4).

Location theory was thus seen to build sophisticated regional development models based on industrial location and the growth of firms. However, it did not take too long before the approach was subjected to severe criticisms. While location theorists held to the fact that market equilibrium was a strong factor on which these regional economies depended, this could not be guaranteed. Chinitz (1961) highlighted the fact that regional planners had to recognise the fact that the actions of one industry could have a significant impact on other industries through its purchasing or internalising of activities and services.

2.3.2 The growth pole concept

The growth pole theory was initially conceived by the English economist William Petty (1623–1687) but has been further and better elaborated upon by French economist François Perroux (in Gantsho, 2008) to whom much of the credit for the theory now goes. The concept is more often

than not regarded as a theory of polarisation, which argues that economic development does not spread itself evenly throughout space but manifests itself first in points or poles from which growth eventually spreads further (Higgins & Savoie, 1988). According to Perroux, growth pole – as a concept – seeks to explain the process of economic growth in an abstract (spatial) setting. Perroux (1950) maintains that the impetus for economic development comes from technological progress or innovation and that large industries thus tend to be clustered in a particular region such as areas of high-technology agriculture – plantations, wheat belts or corn belts – or more advanced technology-oriented firms typical of Western regions.

The Geography Dictionary (2004) defines a growth pole as “[A] point of economic growth. Growth poles are usually urban locations benefiting from agglomerations of economies and should interact with surrounding areas, spreading prosperity from the core to the periphery”. Based on this definition, Higgins and Savoie (1988) hints that most often the concept of space has been applied with an overly simplistic mindset. He contends that in Perroux’s line of thought, it is difficult if not impossible to determine, a priori, where the economic effects of these poles will be felt. They could be felt in the immediate regions yet could also go beyond national boundaries and be felt in another country. As he puts it, “certainly there is no assurance that they will be felt in the immediately surrounding peripheral geographic region”, which Perroux dismisses as ‘banal’ space (Higgins & Savoie, 1998:42). This has also been mentioned as a weakness or limitation of the concept in that it cannot be adequately steered.

According to Davin et al. (in Gantsho, 2008), a growth pole is formed when a large industry (or institution), through the flow of goods and incomes that it generates, is able to stimulate the development and growth of other industries related to it – a concept referred to as ‘technical polarisation’. These authors further argue that this industry might well be able to determine the prosperity of the tertiary sector by means of the incomes it generates, this resulting in what is also referred to as ‘income polarisation’. The industry could also stimulate an increase in the regional economy by causing a progressive concentration of new activities, in a process referred to as psychological and geographical polarisation. Polarisation in a typical growth pole thus assumes three forms.

However, in most institutions, a simplistic approach of the growth pole theory seems to have dominated regional planning. This has led to a wide range of success levels that have also been influenced by other factors on which development inclines. In most of the planning, growth poles were conceived as urban centres, the argument being that development would spread to adjacent

peripheral areas. This approach was later referred to as the Boudeville (1976) version of Perroux's concept and had some success in respect of regional planning, particularly in cases where the industries in the urban centres were more natural resource-based and could thus affect development in the adjacent peripheries that were able to supply the required natural resources. In cases where the peripheral areas could not support the industries, natural resources were imported from other regions. This highlights evidence of the failure of the concept in regional planning. It was also seen as a failure in cases where the urban areas had more scientifically oriented firms and tertiary services. This thus clearly highlights the abstract notion of space as argued by Perroux.

Perroux's growth poles concept nevertheless represents a huge breakthrough in helping us to understand regional development. Though the theory has not adequately been dealt with in this section, growth poles have been argued to provide more than mere instruments for regional planning and development: they provide a whole corpus of conceptual tools, formalisations and models for regional planning (in Gantso, 2008).

2.3.3 Industrial districts

As seen in the previous section, the growth pole concept involves the presence of a large industry in a region to stimulate regional development. Industrial districts as a regional development strategy is rather characterised by economic growth that is led by small firms (Harrison, 1992). Though the concept was developed in the early twentieth century by English economist Alfred Marshall (1919), it seems later to have been forgotten and relegated in favour of the giant corporations. However, Piore and Sabel (1984) came up with the concept of the *second industrial divide* in which they argued for a return to regional economies organised around networks of small firms in the same industry. They argued that large firms could not as readily respond to the need for reprogrammable technologies as could smaller firms (Amin, 2000).

The renewed interest in industrial districts in the 1970s, as argued by Salmi et al. (2001), was stimulated by observations in Italy that led to the notion of the 'Third Italy'. This phenomenon described the rapid emergence and growth (expansion) of small-firm districts in north-eastern and central Italy. In Marshall's thinking, its most significant interest being in industrial districts was derived from the fact that it was considered to be a major shift to a wider phase of capitalism, one that was people-centred, democratic and regionally oriented (Marshall, 1919). In this new capitalism, it became increasingly difficult or unrealistic to attempt to separate the local industry system from local society. The industrial district was thus defined as "a socio-territorial entity

which is characterised by an active presence of both a community of people and a population of firms in one naturally and historically bounded area” (Becattini, 1992:38).

Markusen’s (1999) argument, based on an empirical study conducted in the US, is that alongside the Marshallian industrial district, there are three other typologies of industrial districts that have demonstrated resilience in assisting regional economies in advanced industrialised countries. These districts are the hub-and-spoke industrial districts, the satellite platforms and the state-anchored districts. Table 2.1 below highlights the main characteristics of these districts in regions. However, of these four variants of industrial districts, it is the Marshallian model that has been the subject of enormous interest in the literature and has dominated the discourse on industrial districts.

In the early 1990s, the Marshallian industrial district approach came under intense scrutiny. The model was initially criticised for focusing more on success stories in developed countries and for not taking into consideration contextual issues in developing countries. In developing countries, industrial districts emerged that emphasised family ties, the active role of local states, frequent informal networks, the cohabitation of small firms and Fordist giant companies with a relatively lower degree of specialisation than was apparent in industrial districts in developed economies (Park & Markusen, 1995; Schimtz, 1995). On a global level, this introduced inconsistency into the notion of industrial districts and subsequently threatened their survival. Another critique on Marshallian districts was that, amid increasing globalisation and new global challenges, non-Marshallians such as Harrison (1992) feared that these districts “would be incapacitated by the predatory behaviour of incoming large firms and financial institutions who would incorporate them hence destroying the local tacit arrangement between small and medium-sized firms and banks” (Amin, 2000:164). Positivists of the Marshallian school however predicted a shift from vertical integration of firms at the global level to vertical disintegration so as to enhance local production networks (Storper & Scott, 1989).

As industrial districts continued to be examined closely, case studies of some old industrial clusters started expressing instabilities to changing regional dynamics and thus needed some form of insulation for survival. Hassink (2005:523) argues that these old industrial areas characterised by insular, inward-looking production clusters suffered from a combination of negative lock-ins: functional, cognitive, political and institutional tissues, some of which led to path-dependency and subsequent stagnation. Building on Martin and Sunley’s (2006) thinking, Wei et al., (2007:425) argue that “the key determinants of breaking out of lock-ins are large firms, research institutions

and human capital". These key determinants significantly employ the role of knowledge-producing institutions such as secondary and high schools and also universities. For relevant and much-needed human capital to be produced there is the requirement of active partnership between the industries (as users/demanders) and the knowledge institutions (as suppliers). This sets the stage for the learning-region concept and its assets for responding to challenges in industrial districts.

2.3.4 The economy of knowledge

The role of knowledge and learning, as will be more comprehensively discussed in the next chapter, has increasingly taken centre stage in the development discourse. This discourse in no way implies that knowledge has hitherto not been a part of development planning and policy, but rather that the significance of knowledge and the rate of knowledge accumulation and of its application have, in the past two to three decades, gained prominence. Moreover, they have forced national and regional development thinkers to start talking development in terms of knowledge and knowledge-producing institutions. Porter (1990) captures this in his renowned thesis on the competitive advantage of nations. This kind of thinking has led to new concepts and approaches to both national and regional development.

Industries have grown into experiencing lock-ins, path dependency, and stunted development as a result of, *inter alia*, thick institutional tissues that hold the regions in ultimate backwardness (Hassink, 2005:522). Unfortunately, very few studies have been undertaken to explain the reasons for the fall of such areas and to make suggestions as to how the situation is to be remedied. Contemporary regional development discourse and practice (especially in developed economies) have significantly shifted from notions of industrial agglomeration or clustering of firms in a defined region (Maskell & Malmberg, 1999) to current notions of innovation systems and learning regions (Morgan, 1997; OECD, 2001).

Table 2.1: Characteristic features of new industrial district types

	Marshallian districts	Hub-and-spoke districts	Satellite districts	State-anchored districts
1	Small locally owned firms	One or several large, vertically integrated firms surrounded by suppliers	Large externally owned and externally headquartered firms	Several large government institutions (military bases, national capitals, universities, etc.)
2	Relatively low-scale economies	Relatively high-scale economies	Moderate to high-scale economies	Relatively high scale economies in public-sector activities
3	Substantial intradistrict trade	Substantial intradistrict trade	Minimal intradistrict trade	Substantial intradistrict trade among dominant institutions
4	Workers committed to district rather than to firm	Workers committed to large firms first, then to district, then to small firms	Workers committed to firms rather than to district	Workers committed to large institutions, to firms, then to districts, then to small firms
5	Long-term contracts and commitments between local buyers and suppliers	Long-term contracts and commitments between dominant firms and suppliers	Absence of long-term commitments to local suppliers	Short-term contracts and commitments between dominant institutions and suppliers, clients
6	High degree of cooperation in firms to share risk, stabilise markets	High degree of cooperation, linkages with external firms, both locally and externally	High degree of cooperation, linkages with external firms (parent company)	High degree of cooperation, linkages with externally headquartered supplier organisations
7	High rate of labour in-migration, lower levels of out-migration	High rates of labour in-migration, but less out-migration	High rates of labour in-migration and out-migration at managerial, professional and technical levels; little at blue and pink-collar levels	High rate of labour in-migration, but less out-migration unless government is closing down
8	Strong local government role in regulating and promoting core industries	Strong local government role in regulating and promoting core industries in local, provincial and national governments	Strong local government role in providing infrastructure, tax breaks and other business inducements	Weak local government role in regulating and promoting core activities
9	High incidence of exchange of personnel between local customers and suppliers	Labour market internal to the district, less flexible	High incidence of exchange of personnel between customers and suppliers externally; not locally	Internal labour market
10	Turmoil, but long-term prospects for growth and employment	Long-term prospects for growth dependent upon prospects for the industry and strategies of dominant firms	Growth jeopardised by intermediate-term portability of plants and activities elsewhere to similarly constructed platforms	Long-term prospects for growth dependent on prospects for government facilities at core

Source: Developed from Markusen, 1999

The learning-region concept, according to its proponents and users (scholars, regional planners, regional and national governments and also business and industry), could help solve the question pertaining to what distinguishes 'good' from 'bad' industrial agglomerations and how the former can contribute to improving regional economies. When compared with other new-regionalism approaches, "learning regions are more involved in learning from institutional errors made in the past" and, by so doing, avoid path-dependent development at regional levels (Hassink, 2005:522). As will be more fully described in the next chapter, the learning-region concept is argued to provide both a theoretical approach and practical model for regional development, which emphasise interactive, decentralised partnership networks between the producers and users of knowledge. The concept argues that the main actors are strongly but flexibly connected with each other and open to "intraregional and interregional learning processes" (Hassink, 2005; Morgan, 1997), all aimed at improving the economic and social welfare of the region.

The learning-region concept comes in time as the global economy moves from a formerly industry-based economy to one that is becoming increasingly knowledge based (knowledge economy) with a need for continuous learning and unlearning so as to meet the challenges of ongoing knowledge transitions (OECD, 2001:23–24). The challenge of breaking path-dependency and industrial lock-ins has been addressed by a number of other regional strategies such as regional innovation systems and innovative milieus. The learning region concept has been viewed as more practical and able to address "a broader range of regions than the other models which turned out to be difficult to transfer to structurally weak regions" (Cooke & Morgan, 1998:331), as has also been the case in most developing economies (Hassink 2005; OECD, 2001).

As already mentioned, better justice will be done to the conceptualisation and application of the learning-region concept in Chapter Three. Yet it will be important here to highlight the main tenets on which the concept is built. As conceived by Florida (1998) and other authors (Morgan, 1995), the concept stresses the importance of the role of research and development, knowledge creation and application as driving forces for regional competitiveness and development. In Florida's (1995) view, "regions are becoming focal points for knowledge creation and learning in the new age of global knowledge-intensive capitalism, as they in effect become learning regions ... functioning as collectors and repositories of knowledge and ideas and provide the underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning" (in Lukesch & Payer, 2009:1). This environment has been

argued to function best in a partnership of a decentralised interactive network (Jucevičius, 2004:9).

Based on the above understanding of learning regions, Baumfeld (2005) stipulates three dimensions of the learning region to be expounded and more fully conceptualised in the conceptual section of this thesis. These dimensions are:

- A comprehensive attitude in favour of the continuing education of the people;
- A comprehensive attitude favouring empowerment and networking the educational capacities of the region (schools, universities, vocational training services) in order to upgrade the educational infrastructure of the region and thus enlarge the region's knowledge base; and
- Ongoing investments to integrate all the regional (and potential) subsystems and institutions (stakeholders) into a sustainable process of mutual learning and innovation (adaptation) towards better socio-economic output

These three dimensions of the learning region bring to the fore the role of knowledge and knowledge-producing institutions in regional development – which will be the focus of the next section.

The review has provided a broader understanding of the major theoretical shifts that have characterised regional development thinking. Crucial is the shift from notions of comparative advantage in location theories, through economies of scale in the industrial districts, to the significance of knowledge and innovation in regional development. From the above review, it can be argued that knowledge is taking a significant place in development discourse. If we focus on Africa, it can be argued from the few studies available in the region that, for development to be enhanced in the subregion, knowledge-producing institutions – such as universities – must be consciously involved in policy-driven efforts. The next section will provide an overview of the various ways in which universities in the more advanced economies are responding to regional development needs. It is hoped that this will set the stage for the proper theoretical construction of the conceptualisation of this study in a less favourably endowed African region.



2.4 Universities in regional development: evolving approaches

2.4.1 General overview

The literature on regional development has evolved to a point where knowledge has become a major resource and knowledge-producing institutions the major agents in the process. In more successful regions, as we will see in some case studies, regional development agents have increasingly looked up to knowledge and innovation as more sustained resources in the development business. Bullen, et al., (2004:3) emphasise the global nature of the demands, stating that

[T]he combined forces of globalization and the global economy have exerted pressure on higher education and research institutions to serve the needs of the emergent knowledge economy. Knowledge economy policy increasingly tends to evaluate the worth of knowledge along economic lines rather than as a social good. Thus, the academy increasingly situates itself as a supplier of knowledge and knowledge workers – those capable of converting research and knowledge into economic commodities.

As a result of the above argument, diverse branches of studies, concepts and theories have emerged. Notions such as the triple helix concept (Etzkowitz & Leydesdorff, 1998), university engagement (Goddard & Chatteron, 2001; OECD, 2001; 2007), constructive advantage (Cooke & Leydesdorff, 2006), knowledge economy (Powell, & Snellman, 2004), innovative milieus (Aydalot, 1986; Camagni, 1991; Ratti et al., 1997) and the learning-region concept (Florida, 1995; Morgan, 1997) – which will largely form the basis of the present study – provide diverse perspectives on the role of knowledge in regional development. Limitations in respect of space and for reasons of focus, certain of these concepts will be highlighted in later parts of this work, and references to authors who have elaborated on the other concepts will be provided.

The approaches listed above have been used to assess and evaluate the contributions and impacts of universities on their immediate and extended regions. They have further been used as conceptual tools and to inform policy aimed at seeking 'best practice' for universities' role in development. According to Castells (2001b), universities have evolved to have four functions, some of which are considered to be both complementary and contradictory. These functions are: to train the elite class; to produce human capital; to transfer national ideologies, and to promote scholarship. However, university development and transformation in the West have seen the university increasingly taking centre stage in regional development not

only through human capital production but also principally through knowledge and innovation.

Universities in Europe established since the 12th century have experienced significant shifts in their roles and functions. These shifts and functions have often been in contention with the expectations and demands of their societies (Altbach, 2008). Besides their teaching functions, medieval universities in Europe preserved and disseminated knowledge through the translation of scientific and other literature from Arabic to Latin. The religious role of universities was strongly witnessed in the 13th century when the University of France helped to settle schism in the Catholic Church in 1409 (Perkin, 2006:168). The 16th century also saw the sustained religious role of the university when ideas from the universities in Germany led to the Protestant Reformation (Altbach, 2008:8).

Universities up to the 16th century were involved in both religious and (some) societal issues. The 17th century University shielded itself from Enlightenment ideas then current and so entered the doldrums. Perkins (2006:173), commenting on the university of the time, holds that "their role was limited to training priests and a few civil servants". Altbach (2008:8) maintains that it was partly because of this passive, unresponsive attitude of the university to societal needs that Napoleon abolished the *ancien régime* of the French universities and instituted the *grandes écoles*, which had a more professional orientation. This reform was also followed in Germany in 1810 when Wilhelm von Humboldt established the initial form of the modern university, one that was not only committed to bringing research to the centre of academic work, but also to linking knowledge to applied science and national development.

In America, the 19th century witnessed the emergence of a new form of university that engaged with societal needs. This was set in motion by the passing of the Morrill Act of 1862, and the establishment in 1890 of land grant universities/colleges of agriculture (McDowell, 2003). This policy was supported by funding allocations from the state government through the allocation of state land and other support. The American concept of engagement, according to Graubard (1997 in McDowell, 2003), ushered in a unique approach, not only because of the innovative idea it introduced, but more so because of the 'service' concept that gave a novel meaning to state universities aimed at assisting society in ways hitherto unknown (McDowell, 2003:33).

Cloete et al. (2011) further argue that, in the development context, universities have been perceived to have one of two roles in enhancing economic development. They have either an

instrumental or an 'engine-of-development' role in development practice. Going back to the broader and global literature, the contribution of universities and knowledge to development has emerged through one of these roles. The next section will highlight the various approaches through which universities have supported and/or steered national and regional development practice. However, the engine-of-development approach has generated more sustained development impact through its knowledge-production and engagement functions will form the main basis of this study. Based on the 'engine-of-development' approach, various university and knowledge-based approaches will be discussed. These will include university engagement, the triple helix scholarship, innovation systems, and knowledge networks for development. It should be noted here that while ample justice will not be done to them in this thesis, they will provide the theoretical understanding required to situate this study in the appropriate conceptual framework upon which the empirical study will be built.

2.4.2 Economic impact approach

Numerous impact studies (Anton & Burns, 2007; Carroll & Smith, 2006; Simha, 2005) have been carried out to assess the regional role of universities. Most of these studies have been done in Western Europe, North America and Canada. The opportunities that have significantly contributed to the shift in the roles and added functions of the universities in regional development can be viewed as being due to both the nature of the university and the expectations that have been placed on universities in roughly the last two decades. As argued by Atkins et al. (1999:97), the emerging and changing role of the university in respect of regional development efforts partly "stemmed from the recognition that they are often major employers in their locality, significant consumers of local goods and services, their role in knowledge production and transfer, and the potential role in human resource and skills development" (see also Harvey et al., 1997; Woollard, 1995).

The economic impacts of universities, as will be reviewed in this section, are built on arguments from studies in locations where universities have contributed to regional development simply by virtue of their presence in the region. Such studies have argued that the university has the potential of becoming a hub of economic activities in most regions. While this can sometimes be through a conscious effort by the university, most often, the economic linkages result from the huge student and staff numbers, and from other university-related business activities. The point, as argued by Bridges (2007:105), is that "independently of what precisely they are teaching or researching, universities bring all sorts of economic and other benefits to the places in or near which they are located".

Economic impact studies have most often focused on the economic impact of the university ranging from job creation by the university and related business activities, through revenue collected as a result of students and staff expenditure, to tax, and the multiplier effects of all of these in the region. Simha (2005:275), in a study on the impact of eight research universities in the Boston region, established that:

... the universities purchased goods and services valued at \$1.3 billion dollars in 2000. The multiplier effect of the direct purchases is estimated to be \$3.9 billion. Student expenditures for housing, food, etc. are estimated to be \$850 million per year. Expenditures by visitors that are related to university destinations and events are estimated to be \$250 million per year.

Another study in Minnesota reveals that Minnesota State University, Mankato adds an estimated \$377 133 147 per year in activity to the local economy and an estimated 5278 jobs to the local economy (Anton & Burns, 2007). Job creation by universities is done both directly, through its employment of faculty and staff, and indirectly, in that its spending and the spending of its students support additional jobs in the community. This trend has also been seen to manifest itself in African universities as was revealed in a recent study at the University of Buea, Cameroon (Fongwa, 2010).

From an impact-study perspective, it can be argued that the presence of a university in a region results in the corresponding development of the region's economic base. This most often has happened through the following channels:

- Direct university spending, which includes wages and salaries, contracted services, supplies, repairs, and other related activities;
- Spending by students, many of whom come from other regions and localities;
- Visitors who come to attend events or visit students or friends spend money in the local economy;
- The university has a multifaceted impact on the local labour market: it employs local residents; spending by visitors, and students creates indirect jobs; many students work part-time while going to school; and, some students stay in the local area after completing their studies; and
- The multiplier effects of these expenditures and activities, which could often even be difficult to measure.

Though universities have impacted on and continue to impact on their regions by virtue of their economic activities, what has emerged that is of more interest to regional development practitioners, university management officials and business is how to make the university more conscious of the needs of the region. This will help higher education institutions to engage to a greater extent with their regions. Regional engagement is thus “becoming the crucible within which an appropriate response to overall trends in higher education is being forged” (Chatterton & Goddard, 2000:475).

Impact studies have also been used by universities both to argue for legitimacy and support demands for increased funding from local and national governments. Universities have used impact studies not only to seek legitimacy from their immediate communities but also to show that by their very presence in the community they contribute to local economic development. Though not always policy steered, universities, through the supply of human capital to the local economy, increase the knowledge stock. The presence of a growing human capital base supported by university graduates in the region has also been seen to be a major factor affecting firms’ location.

Detailed university impact studies (Charles & Benneworth, 2001; Fongwa, 2010; Tilak, 2003) reveal that the impact of a university in a region extends far beyond mere economic contributions. Research has shown that universities also have social, cultural, political and moral impacts in their regions or localities. As described by Silver (2007:548), “universities have a massive impact on their locality, not only as a result of the – often large – movement of people ... [but] their social and cultural impact is felt through their provision of sports facilities, art galleries, cinemas and theatres ...”.

Finally, while impact studies may have come under stern criticisms from some authors (Garlick, 1998; Thanki, 1999) for their ‘passive economic approach’ to understanding the role and contribution of universities to regional development, impact studies nevertheless reveal that higher education institutions have a huge potential to enhance regional development if, that is, better conceptual and theoretical methods are employed. One of these theoretical notions is the university engagement approach as argued by Goddard and Chatterton (2000) and supported by many others.

2.4.3 University engagement

Community engagement has for some time been a major aspect of universities’ policy and practice. The previous section focused largely on the economic impacts of universities

without a formal policy- and action-steered approach. As regards university engagement in regional development, the UNESCO Framework for Priority Action for Change and Development in Higher Education argues that institutions of higher education need to “develop innovative schemes of collaboration between institutions of higher education and different sectors of society to ensure that higher education and research programmes effectively contribute to local, regional and national development” (Chatterton & Goddard, 2000:477).

In the midst of the arguments for higher education institutions to engage with regional and local development stakeholders, it has been continuously observed and argued that “the issue of how they should respond to regional needs is relatively uncharted territory for most higher education institutions, especially for older and more comprehensive universities” (Chatterton & Goddard, 2000:477). Though increasing studies by the OECD, the European Union and other regional and national development agencies in the West have caused the situation to improve immensely over the past decade; African states however continue to fall short of these expectations. This was recently reflected in a study by Cloete et al. (2011) – involving eight African universities – in which the authors argue that there is a significant lack of evidence of a strong pact being required to steer universities towards a sustained contribution to regional development. A pact, in their opinion, is a “broad agreement between government, universities and core socio-economic actors about the nature of the role of universities in development” (Cloete et al., 2011:xvii).

University engagement in regional development has evolved through the process of the teaching skills related to local needs, carrying out problem-solving research applicable to the regional or local economy and also through community service. The need for university engagement has also ushered in not only new forms of scholarship but has also led to the establishment of new universities being established with dedicated regional missions. Typical examples include the land grant universities in the United States (McDowell, 2003; Taylor, 1981), regional colleges in the Nordic countries (OECD, 2006), entrepreneurial universities (Clark, 1998) and service universities (Blažénaitė, & Tjeldvoll, 2007).

Universities have increasingly been viewed as able to contribute to national development through the creation, dissemination and application of knowledge useful in promoting scientific innovation and development (OECD, 2007). This innovative role of the university has spawned new forms of partnership between the university, national governments and

industry. One thesis of this partnership is the widely acknowledged triple helix approach to regional engagement (Etzkowitz & Leydesdorff, 1998). This approach contends that "... university-industry-government network relations are the key to knowledge-based economic development in a broad range of post laissez-faire capitalist and post-socialist societies" (Leydesdorff & Etzkowitz, 2001:7). The triple helix has brought in a new form of university engagement, one that lays emphasis on the role of each of the three key development stakeholders – each has a role of play in ensuring sustained development efforts.

2.4.4 Universities in innovation systems

Another aspect of universities and their role in development discourse not discussed in the section above, is the role of universities as agents in innovation systems. Based on the arguments of universities as scientific knowledge providers, innovation through problem-based research has resulted in the concept of innovative systems. Innovative systems have significantly influenced the development pathway of national and regional economies in Europe. With innovation seen to be increasingly occupying a crucial role in development in the 21st century, the innovation systems approach has emerged, which significantly challenges the former linear innovation model (Tödtling, 1998). Innovation systems for purposes of better analysis and understanding have been classified into two broad categories – national and regional. The national innovation system focuses largely on the wider national organisation with more stakeholders and more complex planning. The regional system is more context specific and regionally inclined. A myriad definitions and interpretations of innovation systems have been proposed and used. A few of these definitions will next be highlighted.

Nelson and Rosenberg, (1993:4) define *innovation systems* as "a set of institutional actors that together play the major role in influencing innovative performance", while Lundvall (1995:2) considers an innovation system to be "... constituted by the elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge". Gergerson and Johnson (1997:484) define an innovation system as "a system of actors (firms, organisations and government agencies) who interact in ways which influence the innovative performance".

Of the above definitions, it is that of Lundvall (1995) that provides the basis of my understanding and application of the concept in this study. What makes this definition more relevant to the study is the fact that it looks at not only the elements (factors) but also the

relationships in an interactive environment that are all aimed at economic relevance or usefulness. It thus goes without saying that this thesis argues that for innovation to be good enough, it should have a direct or an indirect impact on economic output. Another aspect of the study, which is reflected in Lundvall's definition, is the notion of knowledge diffusion that has otherwise been referred to as 'knowledge transfer'.

Innovation thus looks at the factors and relationships responsible for the adequate and sustained production and transfer or diffusion of new knowledge necessary to affect economical processes for the better. In this understanding, innovation occurs at two broad levels – national and regional systems of innovations. These systems are not distinctly separated from each other but function in two somewhat distinct spaces. At the national level, innovation systems have a broader and more inclusive focus, looking at different aspects relevant to national development needs. This, to an extent, limits their capacity to focus on particular key aspects as regional systems in which the focus is on particular, distinctly regional needs. I next turn to a detailed discussion of national and regional innovation systems.

2.4.4.1 National innovation systems

The national innovation system approach to development discourse and policy emerged in the 1980s after the work of pioneering authors Freeman (1987). The World Bank (2002:24-26) concisely defines a national innovation system as follows:

A national information system is a web of (i) knowledge producing organizations in the education and training system together with (ii) the appropriate macroeconomic and regulatory framework, including trade policies that affect technology diffusion; (iii) innovative firms and networks of enterprises; (iv) adequate communications infrastructures; and other selected factors, such as access to the global knowledge base or certain market conditions that favour innovations.

As further elaborated upon by subsequent innovation scholars, for example Lundvall (1992), the main tenet of this approach emphasises the notion of interactive learning between knowledge users and knowledge producers as a micro-foundation of the concept. As later captured by Balzat and Hanusch (2004:197–198), a national information system can be attributed to “a historically grown subsystem of national economy in which various organisations and institutions interact with one another in the carrying out of innovative activity”.

Over the past two decades, a significant number of studies (particularly in developed and emerging economies) has been carried out under the national information system approach, all being aimed at characterising innovation systems (Lundvall, 2005). These studies have provided a better understanding of the concept, arguing that the structure and the main actors in the respective innovation systems have hardly followed a clearly defined pattern owing to the lack of a clearly defined theoretical understanding of the notion at the time (Lundvall, 2005). This resulted in a plethora of approaches originating from the mother notion of innovation systems but different on the levels of analysis or the economy. These include, *inter alia*, technological systems (Carlsson & Stankiewicz, 1995), regional innovation systems (Doloreux, 2004; Doloreux), and sectoral innovation systems (Breschi & Malerba, 1997).

The national information system approach to economic development has focused largely on providing an understanding of the changes at the national level and how innovation systems and processes could enhance and improve organisational setups. The two main aspects of the approach are *innovation* and *systems*. In this approach, innovation is defined as “a continuous cumulative process involving not only radical and incremental innovation but also a diffusion, absorption and use of innovation” (Lundvall, 2005:12). The systems approach to a greater extent focuses on the social systems in which the institutions interact. This facilitates interactive learning as a social activity. Another aspect of the systems approach is its dynamic nature as a result of which “the elements either reinforce each other in promoting processes of learning and innovation or, conversely, combine into constellations blocking such processes” (Lundvall, 1992:2). The social system aspect of the approach however has shown that innovation is better effected at the regional level, hence the notion of regional innovation systems.

2.4.4.2 Regional innovation systems

More stakeholders are being grafted into regional development approaches and policies (Amin & Thrift, 1994; Maskell et al., 1998). This is partly due to the increasing emphasis on regions rather than nation states. For this reason, there has been a renewed need for regional-level intervention (Doloreux, 2003; 2004). Regions need to own their respective developmental pathways, survive and thrive in a rapidly changing technological world system (Amin & Thrift, 1994). Based on this argument, product and process innovation will have to focus on regional processes. It has thus been argued by a number of regional geographers and researchers (Doloreux & Parto, 2005; Lundvall & Johnson, 1994) that, in the present knowledge flow dynamics, it is the region’s capacity to support its processes of learning and innovation that

will ensure its competitive advantage. Hence, the notion of regional innovation systems as arguably, watchdogs for regions' survival in the knowledge economy.

A *regional innovation system* can be defined as "a system stimulating innovation capabilities of firms in a region so as to enhance the region's growth potential and regional competitiveness" (in Lim, 2006:4). Approaching innovation systems at the regional level, Bathet et al. (2004) maintain that regional innovation systems provide connections between global and local actors, thus "allowing regional combinations to be made from the various global flows passing through the region producing a 'local buzz'" (Benneworth, 2006:3). The main aspect of the region is the possibility for knowledge to spill from producers to users – referred to as spillovers. For knowledge spillovers to be effective and sustained there is a need for geographical proximities, between the universities and the firms, and also for financing bodies that are able to supply venture capital. Attempting to estimate the knowledge-production function in regional innovation systems, Griliches (1990) argues that spillovers are enhanced by the geographical coincidence of universities and research laboratories in states in the US. Acs (2002) further argues that for regional innovation systems to be triggered and sustained, regional institutions – universities, research laboratories, specialised business services and related industries – and entrepreneurship are key ingredients in promoting regional development. Table 2.2 compares regional and national innovation systems.

Spillovers in the context of regional innovation systems are achieved by diverse means. However, primarily it is achieved by means of personal contacts, face-to-face communications aimed at transferring tacit scientific knowledge from producers to users and from users to users so as to achieve growth in jobs and in product output. Universities, with their huge wealth of high-skilled academics, enhance regional innovation through formal and informal interaction with local firms and industries.

Table 2.2: Comparing aspects of national and regional innovation systems

	National innovation systems	Regional innovation systems
Elements of the system	Mass-production economy Process innovation	Knowledge economy Product innovation
Inter-firm relationship	Market authoritarian relationships Emphasis on competition Arm's-length supplier Relationships	Network economics clusters and social interactions Supplier chains as sources of innovation Cooperation and trust
The knowledge structure	Formal research and development laboratories Focus on process research and development Public research and development laboratories Focus on broad national needs	University research Focus on new-product research and development External sources of knowledge Local research and development spillovers
Community and the public sector	Emphasis on national level Paternalistic relationships Regulation	Emphasis on regional level Public-private partnerships Community cooperation and trust
Internal organisation of the firm	Mechanistic and authoritarian Separation of innovation and production Multidivisional firm Hierarchical	Organic organisation Simultaneous innovation and production (feedback loop) Matrix organisation: consensus-seeking learning process
Institutions of the financial sector	Formal savings and investments Formal financial sector	Venture capital Informal financial sector
Firm strategy, structure and rivalry	Difficult to start new firms No access to new knowledge Little or no entrepreneurship	Easy to start new firms Inexpensive access to knowledge Entrepreneurship is crucial

Source: Adapted from Acs, 2002

It should however be highlighted that the role of universities in innovation systems also hinges on context-specific aspects of the national or regional environment. Some of these aspects include but are not limited to the structure of the domestic industry, the size and structure of other publicly funded research performers and also the entrepreneurial culture.

While universities have significantly been perceived to stimulate regional innovation processes, Mowery and Sampat (n.d.) assert that there is little evidence to support the claims that the presence of universities 'causes' the development of high-technology clusters. They further contend that a number of research universities have not succeeded in producing industrial agglomerations, while an attempt to copy the 'Silicon Valley' experience has proven less productive than initially conceived (Leslie & Kargon, 1996). They thus argue that despite being a considerable body of success stories on the role of universities as innovative agents through their linkages with business and regional governance, there is also a need for detailed studies on the systematic evidence based on policies that are needed to package knowledge

from universities to stakeholders for economic growth and development. A typical example of such efforts was the passing of the Bayh-Dole Act – being emulated within the OECD – thus making central the role of codified knowledge.

2.4.5 Strategic knowledge producers and networkers

In the present global economy, knowledge is increasingly becoming the most sustained resource, and innovation and learning are the processes through which firms, industries and government strengthen their hold on regional economies. With concepts such as the knowledge economy, knowledge capitalism and knowledge transfer, knowledge has increasingly become the new resource in development thinking. The role of knowledge in development has significantly pushed universities to the central focus of recent development discourse.

This new knowledge agenda has already witnessed the theoretical and practical shift in knowledge production at universities from what has been referred to as 'Mode One' to 'Mode Two' knowledge forms. According to the proponents of this line of thinking (Gibbons et al., 1994), Mode One science is generated within disciplinary contexts; in which problems are analysed in distinct disciplinary communities, while in Mode Two knowledge production, research is created in a much broader trans-disciplinary context, with the aim of addressing real-life situations. This new form of knowledge is produced in the context of application and thus brings closer connections between different institutions and actors – hence the notion of networks.

In this new kind of knowledge thinking, it has been argued that it becomes at best difficult for economies, regions and organisations to compete on the basis of comparative advantages based on either natural resources or geographical location (Harloe & Perry, 2004). Proximity to both tacit and codified knowledge thus becomes a major factor in the location and localisation of business and development agents. Understanding the dynamics inherent in the role of knowledge in regional development, Cooke and Leydesdorff (2006) developed the notion of constructed advantage. According to them, there was a major shift since the 1950s when regions were valued based on the availability of initial natural-resource endowments, to the 1970s when these regions began to import technology-intensive goods and services. This shift ultimately resulted in uneven development in that the latter regions prospered more than those based on natural resources.

In their knowledge-production role, higher education institutions are increasingly viewed as key potential actors in networks of clusters in knowledge-based activities or systems (Saxenian, 1994). This is tied to the argument that once knowledge is produced, it needs to be transferred to industry, government and other knowledge users. For this to be achieved effectively without compromising the role of higher education institutions as knowledge producers there is need for an effective transfer policy. This policy should aim at ensuring that 'Mode Two' knowledge production is adequately funded, protected and transferred to the relevant users. The Bayh-Dole Act, enacted in the United States of America in the 1980s, is a typical example of a policy of this kind. In terms of the said Act, universities were allowed to access commercial research funding through, *inter alia*, patents and licences.

In Europe, there has been a shift in university ethos: new universities are emerging with particular missions aimed at producing relevant knowledge for economic growth and relevance. The notion of entrepreneurial and regional universities in Europe and in most Scandinavian countries provides typical examples of such policies (Clark, 1998; OECD, 2006). While traditional universities focus on Mode One knowledge production, these new universities, to a larger extent, engage in issues that are more relevant to both society and industry. Scholarship here is aimed at meeting industry and societal needs. The land grant universities in the United States of America are also examples of these strategic university models aimed at meeting development needs.

Therefore, while knowledge remains a major resource in contemporary development thinking, its production is also an important process. The appropriate policy structures and frameworks are thus required to shape the role and function of universities as knowledge-producing institutions. Based on success stories of the role of knowledge in industry development (OECD, 2001; 2007) it has been argued that there is a need for strategic policy to enhance the following aspects of knowledge production:

- Knowledge infrastructure: presence of universities, public research sectors, mediating agencies, professional consultants, all involved in problem-solving capacities;
- Economy: integration of knowledge and commercialisation, inter-firm interaction and knowledge sharing;
- Governance: multilevel governance with stakeholder interest, strong policy support for innovation, enhanced research budgets and global positioning of local assets; and

- Community and culture: talented human-capital base, diverse open culture, social tolerance and a creative cultural environment.

While universities continue to be sources of public and private good for their regions through the economic impacts, innovation and engagement activities, one thing remains crucial for the survival and success of universities – knowledge production. If universities, particularly African universities, have to establish their relevance to an increasingly demanding society, they need to leapfrog their developmental pathways. Knowledge production must be planned, steered, funded and transferred such that it meets economic needs. The contemporary economy has been labelled the knowledge economy (Powell & Snellman, 2004) and thus needs knowledge and specifically applicable knowledge.

2.5 Development implications for African economies in knowledge capitalism

The review so far has revealed that knowledge has increasingly become the focus for socio-economic development in the contemporary economy. A critical review of development approaches reveals that the economies that have adjusted quickly and smoothly to applying knowledge in their development policy and planning have proven to be the success stories. There are many case studies of successful regions that have benefitted from knowledge application in the process of changing their economic fortunes. Economies such as those of Finland, South Korea and the economies of the Association of South East Asian Nations reveal that knowledge, when properly applied in development policy and practice, can change fortunes (Pillay, 2010b). Knowledge, as Castells (2001b) asserts, has the potential to enable Africa to leapfrog its development growth pathway. For this to be achieved, higher education, as an institution, will itself have to make significant strides in all areas, while particularly focusing on knowledge production.

As argued by Burton-Jones (1999:vi), “knowledge capitalism describes the emergence of a new breed of capitalism: one dependent on knowledge rather than physical resources”. Knowledge capitalism is thus perceived to be the simultaneous utilisation of economic theories and knowledge-based theories, in partnership with major development organisations, and with knowledge-producing institutions being the major platforms for development practice. This developmental approach, one that is increasingly yielding rapid economic growth in developed and emerging economies, is however greatly lacking in sub-Saharan African economies. Major development agents – such as the New Partnership for Africa’s

Development and the World Bank – and national governments themselves, in response to this need, continue to have significant expectations of African universities.

Based on this observation among others, development organisations such as the United Nations, the World Bank, the Africa Union, New Partnership for Africa's Development and scholars in the field (Bloom et al., 2006; Castells, 2001a) began to express increased interest in the role of universities in regional and national development in Africa. African scholars (Ajayi et al, 1996; Assié-Lumumba, 2006; Mamdani, 2008; Sawyerr, 2004) have however revealed that African higher education systems, given their history and their current institutional capacities, lack the required motivation, incentives and cultural mindset to meet these expectations. They contend that most African universities are plagued by severe developmental and institutional challenges that have not only compromised the production of relevant knowledge but also universities' ability to transfer relevant knowledge for development. Knowledge production has been characterised among other things by poor research funding, out-dated or irrelevant curricula, poorly paid academics who do more teaching and 'moonlighting' than research, and also poor institutional management skills.

On another note, Okolie (2003:235) contends that "development policies and programs in Africa have been shaped by knowledge and knowledge production that is primarily Euro-American centred ...". Knowledge production has, to a greater extent, been steered and directed by funding organisations from Western countries, which does not always reflect the needs of Africa's national or regional economies. Oladele (2001) uses the notion of the national information policy to explain the state of most higher education policies in the rise of the knowledge economy. He argues that the national information policy was accepted and implemented not as a conscious effort by most sub-Saharan African governments but rather as a compliance measure requested by major development-funding agencies such as UNESCO, the United Nations Development Programme, and the Canadian International Development Research Centre. This lack of relevant knowledge-related policy towards regional development has significantly hampered development efforts in most parts of the sub region. The production, transfer and application of knowledge in the knowledge economy have been sustained by adequate infrastructure. This infrastructure includes physical infrastructure, the presence of sustained information and communication technologies and also the presence of appropriate economic and political institutions with the ability to enhance national and regional knowledge innovation. Most African economies, especially in sub-Saharan Africa (excluding South Africa, Mauritius and Botswana), significantly lack the infrastructure

required to enhance the expected role of knowledge in regional development (Morales-Gomez & Melesse, 1998).

In their paper presentation at the Annual Bank Conference on Development Economics, Barry and Sawyerr (2008) attempted to highlight the key challenges characterising the HE system in Africa. They argued that three key aspects were attributable to higher education having been relegated to knowledge production for industry growth and national development. The first proved to be a significant limitation of discussion on the role of higher education linking with industry towards development, particularly in sub-Saharan Africa. Secondly, there was a significant lack of adequate and consistent intercountry and national data. According to their findings, very few studies had at that point been conducted to understand the forms and structures of interaction of higher education institutions and industry or government. Lastly, they contended that the near absence of a strong high-technology industry base in the subregion with which universities could effectively engage remained yet another challenge for the role of knowledge in development.

Barry and Sawyerr (2008) further contended that for higher education institutions to become relevant to the process of industry partnership for development, two key conditions had to be met by universities and knowledge-producing institutions: (i) the production of skilled technical and managerial graduates and usable knowledge; and, (ii) the capacity and disposition of institutions of higher education to transmit such knowledge to end users. This highlights the focus of this thesis, namely attempting to discover the factors that are affecting both the demand for knowledge by industry and government and the supply of knowledge by the university, and also the factors that are affecting this knowledge-transfer process.

2.6 Conclusion

The chapter has provided an in-depth review of the shifts and trends that have characterised development thinking during the past half century. This review has demonstrated that there is an ongoing shift away from development approaches based on the natural resource endowments of a region. This shift goes beyond the industrialisation notion to a post-industrialisation approach to national and regional development and includes development approaches based on knowledge. Using examples of research conducted particularly in the more developed economies, it has been shown that development discourse at both the national and the regional levels has shifted from a stage theory approach to one that is more spiral,

dynamic and interactive. In this new approach, knowledge is increasingly becoming the main resource and learning is the main process.

In this knowledge-dependent economy, knowledge-producing institutions are increasingly expected to play significant roles in development. Through their roles in teaching, research and community engagement, universities are being pushed out of their comfort zones in order to contribute to their regional economies. From the literature on university engagement, Goddard and Chatterton (2001:9) arguing that universities are being asked by new sets of agents and demands to become more specific in meeting regional needs, contend that "... [N]owhere is this 'demand for specificity' more clear than in the field of regional development". They further maintain that "[W]hilst they are located in regions, universities are being asked by a new set of regional actors and agencies to make an active contribution to the development' of these regions".

The above discussion thus serves to strengthen the argument that development thinking has shifted and is shifting from the resource-based capitalism to knowledge-based capitalism. In this new capitalism, as has been revealed, universities are increasingly forging and are indeed expected to forge more partnerships with social and economic production processes (Ordóñez, 2010). This places more value on knowledge as a production factor and thus by extension on knowledge-intensive goods and services, while less value is placed on the manufacturing and the labour-intensive aspects of the economy.

It is furthermore evident from the literature that the contemporary economy needs new kinds of skills, knowledge and relationships to achieve its developmental needs. While the different spheres of society, government, academia and society at large including business, industry and civil society formerly worked separately with minimal interaction, the current state of the economy, as witnessed in more advanced economies, demands a strong sense of interaction and linkages. Argued from the triple helix approach, development – especially at the regional level – is increasingly moving to a network system, one in which all the spheres of society will be required to forge stronger and longer partnerships in order to achieve sustained development.

For these partnerships to be attained and for knowledge to become the central aspect in development thinking in less developed economies, there is need for more theoretical and practical investigations with a view to better understanding of the dynamics involved in the production, diffusion and application of knowledge. Chapter Three provides a theoretical

understanding of the notion of knowledge transfer from university to regional knowledge users. Using knowledge transfer theory and the learning region approach in understanding the role of universities in development, the chapter provides a theoretical understanding of knowledge transfer. Furthermore, a conceptual framework for empirical investigation is designed.

CHAPTER THREE

THEORETICAL AND CONCEPTUAL FRAMEWORK FOR KNOWLEDGE TRANSFER

Truth [Knowledge] is not born nor is it to be found inside the head of an individual person, it is born between people collectively searching for truth, in the process of their dialogic interactions

Bakhtin, 1984:110

3.0 Introduction

Chapter Two provided a succinct demonstration of the strong link between universities, knowledge and regional development. Seen from the vantage point of the different paradigm shifts through which development thinking has evolved, it would appear that knowledge and innovation have become the new resource in the development process (OECD, 2001). Because of the failure of classical development theories and the unsustainable nature of human development approaches in a world in which sustainable development principles are less than welcomed, and also because of the increasing forces of globalisation and the global competition of industries, it is knowledge and innovation that have become the new revolution – the ‘Knowledge Revolution’ (Harris, 2001). Chapter Two further revealed that socio-economic development in the current economy hinges largely on knowledge-intensive activities that contribute to the accelerated pace of technological advance and that the societies which have kept abreast of development are those that have adapted to contemporary demands in respect of knowledge (Powell & Snellman, 2004). Such adaptation has been achieved principally by means of the process of creating, transferring and applying knowledge through innovation systems and also through the concept of learning regions (Morgan, 1997; OECD, 2001).

This body of literature provides tools for the theoretical and conceptual understanding of the role of knowledge and knowledge-producing institutions in regional development. New and evolving concepts like knowledge-based economies, innovative milieus and learning regions, which demonstrate a significant application of knowledge and innovation in development and production processes, serve to demonstrate that the role of knowledge has become increasingly critical in developing regions. In the majority of successful regions, the application and use of knowledge has been significantly institutionalised through new and different kinds of knowledge-exploration policies and platforms (Kosonen, 2005). Key to this has been the

university-industry interface, one that is becoming increasingly borderless and characterised by more interaction across the erstwhile 'ivory tower', thereby enhancing the flow of knowledge.

According to the relevant literature, the role of knowledge has provided much of the stimulus required for regional economic development (OECD, 2007). The application of knowledge has been important in generating new products, services and processes aimed at enhancing local and national socio-economic development. In the West, knowledge production and transfer have been strongly supported by national and regional development policies so as to link the knowledge-producing institutions and the development agencies. African economies, on the other hand, are just beginning to recognise the role of knowledge in development and they thus significantly lag behind in the process of integrating national and regional development efforts with knowledge-based processes (Okolie, 2003). Yet South Africa, with a significantly different development path from most countries in the sub-Saharan region has been observed to be investing much effort in the knowledge-based economy (Castells, 2001a).

Zeelie and Lloyd (2010:3) argue that "the impact of knowledge services on regional development may however, be area dependent and vary from region to region". While practices from more successful regions cannot be transported to and/or superimposed on less developed or less favoured regions, there is a need to understand the dynamics in these regions. There is thus a need for a proper understanding – via in-depth analysis of the characteristics of the lagging regions – to enable one to understand the role or rather the potential role of knowledge in their economic performance. Given that studies of this nature are quite rare, this thesis seeks to provide some insight into the dynamics inherent in the process of knowledge transfer in less favoured regions.

The theoretical and conceptual questions that this chapter thus seeks to answer are: How has knowledge transfer been conceptualised? What are the factors responsible for enhancing knowledge transfer in successful regions? What are the key channels through which knowledge has been successfully transferred? What are the challenges or barriers faced in the knowledge-transfer process? What are the theoretical aspects of learning regions in knowledge transfer as opposed to less favoured regions? How do these aspects inform the empirical part of this study? The final section will provide a conceptual framework based on the demand-supply relationship approach, which will be used to investigate how knowledge transfer has evolved in a typical African context.

3.1 Knowledge transfer versus technology transfer

Knowledge transfer and technology transfer have been defined differently by different authors and some have even used the terms interchangeably. In this study, a few definitions are examined and the similarities and the differences highlighted. From the review of their usage, the study adopts a knowledge-transfer approach over a technology-transfer approach so as to provide a better conceptual understanding. The next section provides a range of definitions of both concepts and a rationale for using the concept knowledge transfer over that of technology transfer.

Technology transfer has been defined by scholars and practitioners from diverse fields of study. Originating mostly from a 'hard-science' background, technology transfer has been defined to describe the process by which ideas move from a scientific laboratory to the business place (Philips, 2002; William & Gibson, 1990). Levin (1996, In Wehab, et al., 2012:43) goes further to argue that technology transfer is the "application of technology principles to solve practical [day to day] problems". A more nuanced definition by the OECD sees technology transfer as "the process of transferring scientific findings from one organization to another for the purpose of further development and commercialization ... to identify, protect, exploit and defend intellectual property" (OECD, 2003:37). Based on this definition, technology transfer is conceived as a process with three key objectives:

- Identifying new technologies;
- Protecting these new technologies through patents and copyrights; and
- Developing commercialisation strategies such as marketing or licensing with existing companies or creating new start-ups.

From a social science perspective, Levin (1993) defines technology transfer as "a socio-technical process implying the transfer of cultural skills accompanying the movement of machinery, equipment and tools" (see Wahab, et al., 2012:64). Inherent in this definition is the transfer of the physical movement of artefacts and the embedded cultural skills.

Harmon et al. (1997), from a technology-transfer perspective, have argued that studies carried out to explore the process of technology transfer from the university to the private sector fall into one of two broad philosophical perspectives. One argument regards technology as an

“arm’s-length”, buy-sell transaction between university labs and private companies, while another perspective considers the process to be a “collaborative activity occurring within the established network of formal and informal relationships” (Harmon et al., 1997:425). This conceptualisation provides a broader understanding of the widely adopted narrow design of technology transfer beyond the commercial and economic value to the social and political ends of society at large.

On another note, Newlands (2003:7) contends that “the term technology transfer, though widely used is potentially misleading since implicit in the expression is the simple unidirectional model employed in the early stages ... of industrial innovation”. He maintains that a better way to understand technology transfer is by using an interactive model as applied in the learning-region context (discussed in Section 3.5.3 below). In these relationships, aspects of trust, mutual respect and interest are established, and resources are even shared and applied towards the ultimate success of the whole (Inzelt & Hilton, 1999).

Knowledge transfer, on the other hand, has also been defined differently based on the specific context of the discipline or scholars’ background. The European Commission describes knowledge transfer as “...involv[ing] the processes for capturing, collecting and sharing explicit and tacit knowledge, including skills and competence. It includes both commercial and non-commercial activities such as research collaborations, consultancy, licensing, spin-off creation, researcher mobility, publication ...” (European Commission, 2007:6). The Consortium Research Council of the United Kingdom (RCUK, 2006) defines knowledge transfer as:

... [T]he two-way transfer of ideas, research results, expertise or skills between one party and another that enables the creation of new knowledge and its use in the development of innovative new products, processes and/or services [and] the development and implementation of public policy (Research Council of the United Kingdom, 2006:35).

The Council further argues that knowledge transfer encourages the dissemination and assimilation of knowledge and stimulates engagement between society at large and regional stakeholders (Research Council of the United Kingdom, 2006). It further reveals that contrary to technology transfer, knowledge transfer covers a broader range of skills and ideas and will thus require a more interactive and even informal transfer mechanism.

These definitions highlight key similarities and differences between technology and knowledge transfer. A review of the literature reveals that little attention has been paid to the differences in

that most scholars have used the terms interchangeably. According to Gopalakrishnan and Santoro (2004), the fundamental difference between technology transfer and knowledge transfer lies in the purpose of each. They state that “knowledge transfer focuses on a broader and more inclusive construct which is directed more towards the ‘why’ for change, whereas technology transfer focuses on a narrow and more targeted construct that usually embodies certain tools for changing the environment” (see Wahab et al., 2012:65).

Mayr (2010) argues that knowledge transfer is much more than commercialising patents; there are more benefits inherent in the interactions, collaborations and partnerships in the process. Most benefits of knowledge transfer will come from exploitation of the collaborative research and tacit knowledge derived from experience depending on the social and cultural factors in context (Mayr, 2010). From a learning-region perspective therefore, while not ignoring the importance of technology transfer as a concept, this study largely focuses on the process of knowledge transfer through both the formal and the informal channels fostered by partnerships and by interactions between various regional and local stakeholders, and also on how knowledge transfer enhances the process of regional development in a less favoured region. This conceptualisation aligns with Dougherty (in Li-Hua, 2003:2) that “knowledge transfer is about connection and not collection and that connection ultimately depends on choice made by individuals”. Hence for purposes of consistency, knowledge transfer will be used and not technology transfer as it covers aspects of technology and other knowledge aspects such as ideas, advice and social aspects; but goes further to provide understanding of the different connections (social capital, networks, embeddedness, trust) which influence and inform the process.

3.2 Factors affecting knowledge transfer: theoretical review

While universities have served as knowledge and skills producers, there is as yet a large gap between the amount of knowledge that has been produced and that which is actually being used and applied by firms, industries and regional development agencies. Anderson (1992) attributes the dearth of application to a lack of transfer, as most academics focus on knowledge production. Bercovitz and Feldman (2006) argue in this regard that though universities are often regarded as holders of significant assets that could be leveraged for economic growth and development, knowledge-based development may only be a necessary condition and not a guarantee.

For effective knowledge transfer to occur there is a need for willingness among institutions and individuals to transfer knowledge on both the production side (supply) and on the receiving or application side (demand). Once both sides are favourably disposed then there can be an effective demand-supply relationship in the transfer of knowledge. According to Davenport and Prusak (1998), knowledge transfer involves two actions, namely transmission – which entails the sending of knowledge to a potential recipient – and the absorptive capacity of that person or group or institution. Based on Gouza's (2006) 'hard' and 'soft' factors affecting knowledge transfer, the next section identifies the key factors that affect knowledge transfer in successful regions.

3.2.1 National, regional and institutional policies

A key aspect among the factors affecting knowledge transfer is the institutional, regional and national policies around knowledge production and its application to development planning and policy. This section seeks to highlight both key policy issues that have informed knowledge transfer in other successful regions and the context in which these policies have been established and sustained.

A review of knowledge-transfer literature provides evidence that there is a strong link between knowledge-transfer policies and effective knowledge transfer from an organisation. Becheikh et al. (2009), from a detailed review of the literature on improving knowledge-transfer strategies, agree with previous research in asserting that organisations with clear internal policies to encourage knowledge transfer between and by their employees, succeed better in transferring knowledge than those that do not have such policies (Huberman, 1983). The success of the innovation system in the United States of America has been strongly linked to the development and implementation of strategic policies to incentivise and support academics to become more entrepreneurial and make their research more accessible and relevant to the public (Barbieri, 2010). This trend has also been followed in other successful countries, regions and economies that have excelled at knowledge commercialisation and at bridging the gap, not only between academia and industry but also between basic research, applied research and the commercialisation of knowledge. The next section highlights some of the main policy reforms and tools in selected regions.

The 1975 National Science Foundation initiative in the United States of America is considered to be one of the pioneer policies that brought about a major revolution in the university-industry relationship. The initiative resulted in the first set of University-Industry Cooperative Research

centres. This was followed by the Bayh-Dole Act of 1980 and the Economy Recovery Tax Act of 1981 in the United States of America and by the Loi Allégre in France. The Bayh-Dole Act, as a policy reform, was enacted to “use the patent system to promote the utilization of inventions arising from federally supported research or development [...] to promote collaboration between commercial concerns and non-profit organizations, including universities...” (Bayh-Dole Act, 1980, Article 200). The Act, gave universities the power to commercialise their research findings for economic returns. The Economy Recovery Tax Act, on its part, extended industrial research and development tax breaks to support research. These policies ushered in a new and successful era of university-industry cooperation towards national development. Another key policy was the Alvey Programme in the United Kingdom which was designed to foster university-industry relationships (Geuna & Muscio, 2008). In Germany, the revision of the Law of Employee Inventions of 2002 was aimed at encouraging and steering academics to patent more, hence source more income for the institutions.

In Canada, the University of Waterloo has been recognised as an institutional centre that has supported the growth of high-technology firms clustered in the Waterloo region (Bramwell & Wolfe, 2008:1178). Though being only one of the seven universities in the region, its key asset has been its strategic policy and innovative decisions, which laid the groundwork for its success. According to Bramwell and Wolfe (2008:1179), three key policy decisions contributed to the success of the university: the University decided to find an academic niche that would be different from other universities and thus keep them from duplicating the activities of other institutions; it designed and implemented an innovative cooperative education programme and initiated an intellectual property rights policy in which full ownership of the intellectual property rests with the creator; and, it allowed the individual faculty member and students to commercialise their ideas.

While universities have been argued to have the potential to stimulate regional development through knowledge production and application, it has been postulated that the absence of clear national and institutional policies for engagement and knowledge transfer constitutes a major hindrance to the regional potential of universities. A study by Feldman (1994) on the case of Johns Hopkins University in the Baltimore region of the United States of America reveals that the region has, compared with the regions where the Massachusetts Institute of Technology or Stanford are located, not been able to benefit from research funding. The university’s limited regional impact, argue Feldman and Desrochers (2004), can be strongly linked to the lack of a sustained policy aimed at fostering and enhancing long-term relationships between Johns

Hopkins University and its immediate region. Bercovitz and Feldman (2006:186) supports Link (2002) who argues that, in contrast to the Baltimore region. "the development of North Carolina's Research Triangle Park was the result of deliberate policies that began in the 1920s and took 50 years to realise tangible economic benefits in terms of job growth and enterprise development".

3.2.2 Types of universities and/or knowledge source

It has been argued that the availability of problem-solving research, the quality of the knowledge produced, the level of entrepreneurialism of the academics or university and also its broader mission will determine the quantity and quality of the knowledge available for transfer. In a paper entitled '*The evolution of the university species*' Martin and Etzkowitz (2000) provide a review of the evolution of the university from the traditional university to present-day entrepreneurial university? They highlight two forms of university that they refer to as the 'immaculate' and the 'utilitarian' university species. The latter conception perceives universities as producing knowledge for use by society and industry and not merely for the sake of scholarship and knowledge. This particular conception evolved from the results of demands on the university to meet relevant societal needs. The 'immaculate' university species has, on its part, focused on knowledge production for the sake of increasing academic scholarship. This highlights the fact that, though they are all knowledge-producing institutions, they each have a different ethos that can be viewed as being externally oriented in the case of the utilitarian university and internally oriented in the case of the immaculate university species.

Together with the Second Academic Revolution (Ylijoki, 2003) the format of scholarship has changed significantly, with new forms of knowledge being produced, new stakeholders being involved in the knowledge-producing process, requiring new forms of funding, setting new demands and giving rise to new expectations. Gibbons et al. (1994) adopted the terminologies of Mode One and Mode Two knowledge forms, with the Mode Two knowledge form being aimed at meeting societal needs. Concepts such as *academic capitalism* (Slaughter & Leslie, 1997), *triple helix thesis* (Etzkowitz & Leydesdorff, 1998), and the *university third mission* (Burlin, 1998) have evolved to provide theoretical and conceptual niches for these emerging demands on the contemporary university and also for the internal structural changes taking place in the university in response to these demands. A shift such as this calls for clear strategic and policy guidance, while also being careful not to undermine the core university functions of teaching and research.

What is more important is that new forms of universities have emerged with particular scholarship missions. Examples include the entrepreneurial universities in Europe (Clark, 1998), the land grant universities (Boucher et al., 2003), research universities in the United States of America (Pillay, 2010a), and the regional universities in the Scandinavian regions (OECD, 2006). While a detailed description of these university forms will not be done here, it should be mentioned that in an earlier research paper (Fongwa, 2010), I provide a more succinct discussion of these university forms. Pinheiro (2012:3) provides an improved classification of universities in which he describes modern universities as falling into three broad categories. They include the globally oriented research-intensive university, the regional university and the recently emerged entrepreneurial university. Table 3.1 below provides the key characteristics and features of the different university models.

Table 3.1: University models and their characteristics

	Research-intensive (Traditional) University	Entrepreneurial University	Regional University
1	Contemporary form of the globally oriented university which emerged in the 19 th Century with the Berlin University; only emerged in the 20 th century;	Emergence of the second academic revolution	Dates back to the mid-1800s. Land grants in United States of America and specialised training in Europe
2	Comprehensive academic core	A strengthened steering core	Strong vocational orientation
3	Emphasis on teaching-learning nexus	An expanded developmental periphery	Importance on students' teaching and learning needs
4	Highest level of academic excellence	A diversified funding base	Local embeddedness of university
5	Institutional and academic autonomy	A stimulated (entrepreneurial) academic heartland	High bulk of students from region
6	Universalistic or global orientation	An integrated entrepreneurial culture.	Knowledge production for application with local/regional partners

Source: Adapted from Pinheiro, 2012

While the classification can be considered to be too broad and simplistic, it provides some theoretical guides as to some of the attributes of universities and why they engage at the levels at which they do engage. This further supports arguments that the attitude of a university and its academics to knowledge transfer and societal relevance relates significantly to the nature of the university. While most of these new forms of university have contributed to the role of knowledge in the West, universities in the less developed regions in general and particularly

those in sub-Saharan Africa are still lagging behind and are characterised by decidedly more elitist system.

Individual researchers, when viewed as sources in the production and transfer process, too have a major role to play in the process of knowledge transfer. Thursby and Thursby (2002) provide three potential ways in which researchers affect the transfer process. Firstly, researchers who specialise in basic research tend not to disclose their findings as they seek to avoid the application phase of the knowledge. Secondly, academics who seek quick publications in journal articles will be reluctant to engage in transfer processes and, finally, the conservative academics who believe "commercial activity is not appropriate for an academic scientist" (Thursby & Thursby, 2002:180).

According to Bercovitz and Feldman (2004), an academic's inclination to engage in knowledge transfer depends on three things. The first factor hinges on where he/she received his or her training; the second is related to the knowledge-transfer disposition of the faculty or departmental chairperson, which the authors consider to have a direct effect on most of the academics under them. Thirdly, Bercovitz and Feldman (2004) argue that the 'cohort effects' have a significant role to play in the disposition of an academic towards engagement in knowledge transfer. According to the latter author, the cohort effect is the effect of fellow academics on any academic.

3.2.3 Factors related to knowledge users/recipients

A growing body of literature is showing an interest in the characteristics of firms and knowledge users that influence the ability to take-up and apply externally generated knowledge (Cohen & Levinthal, 1990). A number of key aspects have been identified as having a significant influence on the capacity of firms to apply university research so as to increase productivity. The first such aspect is the notion of the absorptive capacity of the firm. Cohen and Levinthal (1990) further developed the concept of absorptive capacity as it relates to its prior in-house research and development. At the regional level, the notion of absorptive capacity looks at the level of human capital present in the region and how the knowledge can easily be assimilated and learned.

Easterby-Smith, et al., (2008:678), in an analysis of the donor and recipient factors affecting knowledge transfer, concurs that the ability of firms, industries and business to recognise the value of new knowledge and to assimilate and use that knowledge will affect how much knowledge can be transferred to the firm. This capacity to absorb is also significantly

influenced by, *inter alia*, the past experiences, culture and knowledge-retention abilities of the firm or recipient organisation. While the concept remains somewhat fuzzy in its conceptualisation and operationalisation, efforts have been made by scholars to provide a useful set of indicators to measure and understand absorptive capacity at different levels. Schmidt (2005) uses previous work (Zahra & George, 2002) to develop three different levels of absorptive capacity:

- Absorptive capacity for knowledge transfer within the firm industry;
- Absorptive capacity for knowledge transfer originating from other industry; and
- Absorptive capacity for scientific knowledge from university to industry.

Given the focus of this study, the discourse on absorptive capacity largely concentrates on the third level of analysis of absorptive capacity. At this level, the focus is on the relationship between the university as an institution and also between academics and their immediate community at the local and the regional level. A key aspect of the knowledge transfer from the university that this study seeks to emphasise – one reiterated by the Australian University Community Engagement Alliance (AUCEA) (2008) – is the aspect of regional or local relevance. Based on this thinking, the capacity of a region to absorb university knowledge depends also on the extent to which the university is responsive to the contextual characteristics and issues of its immediate communities. This demands that the university should keep in line with its particular research strengths and teaching abilities as it engages with its community.

The absorptive capacity of a region is also indicated in the presence of adequate skills and human capital able to make use of new knowledge. Hence, if a region has a good research university but no economic or industrial base capable of retaining its postgraduates who then migrate to other regions, the transfer of knowledge aimed at regional economic development in the region will be less successful. This has been argued to have been a major strength of the success of the Silicon Valley experience, namely a huge pool of high-quality graduates and staff (Cohen & Levinthal, 1990).

3.2.4 Mechanisms for knowledge transfer

Evidence from the literature reveals that knowledge transfer has evolved through diverse phases. In the present study, the term *mechanism of knowledge transfer* refers to the formal and informal facets through which knowledge is being or can be transferred. It should however be

mentioned that the use of the terms *channel* and *mechanism for knowledge transfer* are generally used interchangeably (Mayr, 2010). However, in this study the term *channel* refers to the forms of knowledge transfer (Bekkers & Freitas, 2008; Van Gils et al., 2009), while the term *mechanisms* refers to the routes that can either be formal or informal, tacit or codified (Nokes, 2009).

Formal knowledge transfer has been conceived to constitute legally instituted and agreed-upon routes for knowledge transfer (Link et al., 2007), which have resulted in formal instrumentalities. This was first witnessed with the passing of the 1980 Bayh-Dole Act in the US, and has been followed by licensing agreements, joint research ventures and start-ups. Formal transfer, so it is argued, potentially generates more revenue for the knowledge-producing institution and enhances the economic growth of the region (Siegel & Phan, 2005). This, at university level, is enhanced by the presence of knowledge- and technology-transfer offices. Informal knowledge transfer on its part consists of facilitating the flow of knowledge through informal and/or casual communication processes, achieved through a range of activities such as collaborative research, technical assistance, informal meetings, social interactions and networks.

Markman et al. (2006a; 2006b) provide a strong argument that the bulk of transferable knowledge (technology) is indeed “going out the back door”, suggesting that, in spite of the benefits accruing from formal knowledge transfer, university administrators and academics need better to understand informal knowledge-transfer channels and how to enhance them. Reagans and McEvily (2003:240) support the view that “informal interpersonal networks are thought to play a critical role in the knowledge transfer process”. Using the notion of ‘tie strength’ to understand knowledge transfer, it has been argued that the strength of the tie between people could be a strong causal mechanism for successful knowledge transfer within and between organisations (Hansen, 1999). Other aspects inherent in the informal transmission channel to be discussed in latter part of this thesis include trust, face-to-face meetings and perceptions.

In summary then, though formal transfer channels from universities appear to provide a legal and institutionalised platform for knowledge transfer, the complex nature of the process, the normative positions of academics and the social embeddedness of the communication mechanisms of the process require that more attention be devoted to the informal transfer route (Gouza, 2006).

3.2.5 Synthesis

University knowledge transfer is in many ways similar to intra-firm and inter-firm knowledge transfer. As in the other forms of knowledge transfer, key factors are responsible for enhancing or hampering knowledge transfer between universities and their local, regional or national communities. While the knowledge gap between knowledge users and recipients in a similar firm or industry may not be very large and thus enhance better knowledge transfer, the process of knowledge transfer from the university depends also on how much the university decides to make its knowledge relevant to the local community. This will depend on the knowledge-transfer policies that govern knowledge production and training and also on how the university perceives itself in its community. Different kind of universities will produce different types of knowledge that will require different forms and mechanisms of transfer. Thus, just as the kind of university does not necessarily define the kind of knowledge being produced, so the nature of the recipients may also have very little influence on the kind of knowledge being produced and transferred. This serves to introduce the role of policy in bringing together the factors affecting knowledge transfer and in satisfying the need for alignment in the institutional policy, the regional needs of the community surrounding the university and the kind of knowledge produced and transferred by the university.

3.3 Channels for knowledge transfer

Many avenues of knowledge transfer from university to industry and other knowledge users have been identified. Brennenrardts et al. (2006) offer a list of ten channels by means of which the knowledge that is aimed at regional development can be transferred from the university to the region. They further suggest that the traditional channels of knowledge transfer –mainly publications and conferences – have become outdated and inefficient as only codified knowledge is able to be transferred through these routes. Depending on their contextual peculiarities and the challenges faced in the regions, different case studies have emphasised different channels. The mechanisms for knowledge transfer have been classified under three broad headings: innovation, human capital and entrepreneurial culture (entrepreneurship). Yet this classification does not constitute any standard classification and it moreover varies with authors.

3.3.1 Innovation

Innovation as a form of knowledge transfer takes place through *inter alia* the process of intellectual property rights, privately sponsored research, joint research collaboration, academic publications in journals and conferences.

- Intellectual property rights: This incorporates patents texts, licence agreements and copyrights, and involves the almost total sale or transfer of rights of use of an invention to an established or start-up company in exchange for up-front fees and regular annual royalty payments. Licence agreements relate to final applicable technology and also to technology that may require further development before eventually ending up in the market place. In the transfer process, agreements regarding the usage and usage rights are agreed upon. Specific attributes of the technology are discussed and negotiated, and sometimes one of the key researchers in the patent development is included in the licence agreement to ensure the smooth running and application of the product, thereby fostering both tacit and codified knowledge transfer (Siegel et al., 2004).
- Privately sponsored research: This refers to research projects based on contracts between an academic entity and a private body or company and usually comprises the generation of applied research outcomes. While formal knowledge is being generated in the research process, it is always vitally important and advantageous that the company should have a few of its employees included in the research group. This ensures that the industry benefits from formal knowledge for new product production and from skills transfer through interactive learning of tacit knowledge from the academic core to the industry (Wright et al., 2008). The amount of industrially funded research varies both with regions and countries. Previous research findings indicate that regions with a strong university-industry partnership have more such contract-research projects, which eventually has a positive impact on the regional economy.
- Academic publications: These include scientific publication in internationally recognised journals and co-publications with other academics or business entrepreneurs. Publication makes knowledge available in the academic domain and can potentially be made accessible to non-academics. This is a typical transfer channel for explicit knowledge and requires a corresponding ability on the part of the knowledge users to translate this published knowledge into practice. Knowledge transferred through academic publications yields fewer economic benefits as there is no rigorous mechanism – patents and licence agreements – to check its usage and application.

- Cooperation in research and development: The process of collaborative research, supervision of Masters' and Doctoral students, sponsorship of academic degrees and research contracts by industry and also joint research and development research projects have all evolved to provide a strong channel for knowledge transfer from university to industry and *vice versa*. The concept of research goes beyond the mere flow of finances and knowledge between partnering institutions to one of increasingly establishing long-term relationships. Unfortunately, it has been easier to maintain relationships of this kind with big companies and MNCs than with small and medium-sized enterprises. This is largely tied to the financial powerhouse that these large corporations will bring with them and also their proven ability and experience in making better use of research findings than would be the case with SMEs.

Innovation as a knowledge-transfer channel thus looks at the university's capacity to produce new knowledge and how this knowledge is translated into socio-economic value. The next channel is the role of universities in transferring knowledge through the relevant skills they produce.

3.3.2 Human capital

Human capital entails the transfer of tacit knowledge through both formal and informal channels. Human capital is the movement of qualified personnel from the research institutions to and from the industry into society at large.

- Hiring students and academic staff: Another major channel for the diffusion of knowledge from the university to the region lies in firms' hiring graduate students. These students also stay in touch with their lecturers, there by contributing to social networks. The value of such knowledge is such that an effective channel is created through the interactive learning process (Morgan, 1997). This has historically been illustrated by the 'German model', which provides an apprenticeship for students as part of the academic process, hence ensuring not only knowledge transfer but also a better transition process from academia to business (Bercovitz & Feldman, 2006:179). This form of knowledge transfer is mainly local or regional as there is a need for face-to-face contact between both institutions.
- Mobility of academics, students and professional experts: The exchange of academic staff from university to firm and of professionals from firms and industry to university faculties and labs is a key form of knowledge transfer. Kim (1997) argues that "the

mobility of experienced scientists not only provides a one-time technology transfer of information ... it also facilitates the transfer of competencies” through the accumulation of knowledge (in Catherine et al., 2004:633).

- Retention of postgraduates in the region: This has been shown to be a major source of knowledge transfer between universities and local or regional business/economy. The transfer of these skilled graduates increases the knowledge base of the region. Senker (1995) suggests that graduates bring into a region an “attitude of the mind” and a “tacit ability” to acquire and use knowledge in different relevant ways. According to Bramwell and Wolfe (2008:1181), an empirical study of an entrepreneurial university in Canada confirms that “not only are graduates well trained within the university, they also come with practical experience gained through co-op placement”. Graduates therefore take with them experience gained through service learning, internships and other co-op programmes and so bring new types of skills into the workplace at the regional level. Such non-codified knowledge serves to enrich local industry or the community wherever they are.

The role of the university in producing human capital is important. However, for regional development, the university will have to engage more closely with regional stakeholders to ensure that the kind of skills produced and regional needs align. This will ensure the retention of skills in the region; which will be absorbed by local industry, government and business. The supports the knowledge base of the regional sectors and thus increases the potential of more socio-economic output.

3.3.3 Academic entrepreneurship

A third knowledge-transfer channel that has been observed to occur between the university as a research and knowledge-producing institution and its region concerns the entrepreneurial orientation of the university.

- University spin-off firms: Pirnay et al. (2003:356) define spin-offs as “new firms created to exploit commercially some knowledge, technology or research results developed within a university”. These firms significantly assist regional and national economies through their diverse impacts on the business environment. In the US, it is estimated that spin-off firms contributed 280 000 jobs to the national economy and about \$33.5 billion in economic value-added between 1980 and 1999 (O’Shea et al., 2007). One important aspect of university spin-offs in regional development is that they

are usually locally anchored as they provide skilled labour and experts related to the core technology. Spin-offs possess two main characteristics that make them very important at the regional level: they are promising tools for the transformation of regional and local economies, and their proximity to research universities provide other forms of support from universities and other regional stakeholders. An example of an African spin-off is the Uganda Gatsby Trust. Created in 1994, the non-governmental organisation is based at the Makerere University and seeks to support manufacturing and value-added industry (Barry & Sawyerr, 2008).

- Business start-ups: These are new small firms with close ties, which provide a link between universities and firms. These firms are aimed at developing knowledge that was created in the university lab. Start-ups have been prominent in the fields of biotechnology, information and communication technologies, applied health sciences and pharmaceutical innovations.
- University research parks: Science research parks have been identified as a key source of university knowledge transfer. Etzkowitz (2002) suggests that the science park concept is one of the key mechanisms that may spawn norms for inter-firm collaboration and trust. Research parks have become major users of university research and are providing employment to several thousands of high-tech workers while also adding a technology presence where once there was none.

3.3.4 Synthesis

The above section has reviewed the various channels of knowledge transfer. It should here be mentioned that knowledge transfer does not always take place in the strict separation suggested by the categories: the human capital category could still apply when academics take part in firm start-ups and university spin-offs. Siegel et al. (2004) maintain that the entrepreneurial (knowledge transfer) orientation of a university can be promoted through addressing five organisational and managerial aspects. These are: the reward system for knowledge and technology transfer; staff attitudes and practices at technology-transfer offices; designing policies that are flexible and enhance technology transfer; taking measures to reduce cultural and informational barriers; and, finally, devoting additional resources for innovation and technology-transfer efforts.

These aspects are strongly linked to the context of Sections 3.6 which presents the theoretical and conceptual aspects of learning regions. Section 3.4 below presents some of the main barriers to knowledge transfer.

3.4 Barriers to knowledge transfer

The literature reflects that the process of knowledge transfer is fraught with numerous challenges that range from the institutional and the geographical to the cultural. While most of these challenges have been identified in the more successful regions, they will be reviewed and further investigated in this study within the context of the less favoured regions. Key barriers highlighted in this review include institutional, cultural, organisational and geographical barriers. It should be mentioned that other barriers that are more context specific have not been discussed. These four however represent the major barriers that are most often experienced in most knowledge-transfer offices and in university-industry interfaces.

3.4.1 Institutional barriers

The institutional design of universities and research institutions will either enhance or impede the successful process of knowledge transfer. Meissner and Sultanian (2007:18) acknowledge that "excessive bureaucracy and [the] high transaction cost related to the acquirement of patents and licences are critical factors for a firm's willingness to cooperate with academic research institutions". Institutional barriers are also often reflected in the policy structure related to knowledge transfer. The absence of a clear transfer policy aimed at benefitting all in the transfer process will not provide the necessary stimulus for transfer. In this process, it must be mentioned that direct benefits also need to be directed to the researchers and not only to the institution, faculty or department. This has been observed by the European Patent Office as one of the major reasons why knowledge transfer through patents has significantly lagged behind when compared with their American counterparts.

Institutional barriers however go beyond issues of patenting and are also reflected in the funding models, promotion criteria and the particular research focus (basic or applied) of the university. An emphasis on research funding could either encourage researchers to engage in regional engagement research that enhances knowledge transfer or focus on basic research aimed at academic publication, which is argued to have a lower knowledge-transfer rating (Siegel et al., 2003). This also applies to aspects of how academic output is considered.

3.4.2 Cultural barriers

Cultural barriers are expressed in the perspectives and values shared between academia and the business community. Dougherty (1992:195) observes that there is a strong likelihood that the difference in cultures between academia and business can reflect in differing mind sets, in distinct languages of communication, in organisational structures and in customs that could significantly hinder knowledge and technology transfer. Bercovitz and Feldman (2006) further contend that because research universities and private firms may each have profoundly different missions, they often display mutual distrust, with the one seeking to acquire exclusive knowledge and the other seeking to disseminate knowledge. Academics perceive the transfer of knowledge as a social obligation, while businesses may look at the process from a purely economic vantage point and non-governmental organisations and governments may consider knowledge to be a public good. The commercial orientation of knowledge transfer has ironically been relegated by some academic circles who are arguing that “they would endanger the ‘open science environment’ by cooperating with industry which leads to secrecy about research results in the departments ‘hallways’” (Nelson, 2001:17). It has also been broadly observed that universities have a culture barrier that seems to favour partnerships with large organisations and other MNCs rather than small and medium-sized firms (Hölttä & Palliainen, 1996). They argue that “for partnership with small and medium-sized enterprises cultural differences may constitute barriers for collaboration, and the universities have to build up interfaces in the form of additional organizational units (knowledge transfer offices) supporting knowledge transfer” (Hölttä & Palliainen, 1996:121).

These cultural challenges are being addressed in some higher education and national systems by the creation of entrepreneurial universities or by faculties, schools or research centres with more entrepreneurial orientations, while the open-science nature of basic research is preserved in other, more traditional universities or faculties (Clark, 1998). Another means of addressing cultural barriers – one proposed by Siegel et al. (2003) – recommends that officials hired by university (industry) to manage the knowledge-transfer process should have a background of industry (university). This, they argue, will help reduce the cognitive gap between entrepreneurs and academics (Geuna & Muscio, 2008).

3.4.3 Organisational barriers

One major aspect of knowledge and technology transfer relates to the organisational structures that are in place. There is need for a good interface between the university and other spheres of

society, such as government and business, for knowledge transfer to be enhanced. Two key aspects of organisational structure at the university that affect knowledge transfer are the value given to tacit knowledge transfer through informal routes –as opposed to published papers or conferences –and secondly, the presence or absence of a system to enhance knowledge transfer, such as a technology- or knowledge-transfer office. Link and Siegel (2005) maintain that universities at which higher percentages of royalties go to faculty members are more efficient in knowledge-transfer activities.

Kober (2009) argues that at the university organisational level, a decentralised management unit inside the university could be more sensitive to the needs of all stakeholders in the process of knowledge transfer. Another important aspect that has been said to affect knowledge transfer at the organisational level are the links between the university or knowledge-producing institutions and the businesses or society. Macho-Stadler et al. (2007:486) observe that universities with strong links to industry tend to have more decentralised models of technology transfer than do universities without a strong link to industry. The former better enhances knowledge transfer than does the latter.

3.4.4 Geographical barriers

The transfer of knowledge has been observed to thrive at regional or more localised levels partly because of the nature of the knowledge and partly as a result of the importance that has been ascribed to geography in the knowledge-transfer processes. Knowledge in its tacit form is most suitable to be transferred through human contact. Hence there is need for human or social interaction between the knowledge ‘owner’ and the receiver of knowledge (Howells, 2002). By using codified and also tacit knowledge to understand the part played by geographical distance in knowledge-spillover processes, it has been argued that there is a “distinct distance-decay effect” in knowledge-transfer processes (Maskell & Malmberg, 1999). Another aspect related to geography is the notion of absorptive capacity, which has been discussed in Section 3.2.1.

In the next section, a more theoretical learning concept is reviewed. The learning-region concept aims to provide potentially stronger conceptual tools for understanding knowledge transfer in a broader context. The main tenets of the concept are discussed along with the main theoretical aspect of the concept that makes it suitable for transferring knowledge for development even in less favoured regions.

3.5 Theoretical models of innovative knowledge transfer

Technological and innovative knowledge have been observed to follow different routes of transfer from the research institutions to potential users. In this theoretical review, four of these routes are identified. Their main characteristics, strengths and weaknesses are highlighted. The four models are the linear model, the triple helix model, the participatory model and, lastly, the interactive-learning approach, which introduces the learning concept in the knowledge-transfer discourse as discussed in Section 3.5 below.

3.5.1 The linear model

The linear model, also referred to as the transfer of technology approach (Chambers & Ghildyal, 1985), is considered currently to be the dominant mode of knowledge transfer around the world. In this model, knowledge generated in scientific labs is tested in the field and, if successful, is directly transferred to potential users. As this knowledge is usually applied in the fields of agriculture and technology development, there is little or no form of feedback between the producers and the users of the knowledge. The success of this particular model is based on three key strengths: it leads to increased production; it can potentially be applied internationally in similar environmental conditions; and, it has a high potential for the production of cutting-edge scientific publications by academics. The main criticism is that, the model cannot be adopted by resource-poor industries that are not able to take-up high-technology innovation. This includes poor farmers who may have specific needs not addressed in the broad innovative model. Another criticism levelled at the model is that its description of knowledge transfer is simplistic. The situation is most often not that simple in that various stakeholders are involved in the process.

3.5.2 The triple helix model

The triple helix model has been identified as one of the successors of the linear model. Proposed by Leydesdorff and Etzkowitz (1996), knowledge and innovation transfer in the model emanate from a reflective process involving three key spheres or stakeholders in the knowledge-production process: government, industry and the research institution (university). This interactive process is a key aspect lacking in the linear model. The model has been strongly prescriptive and it is argued to enhance knowledge transfer at the national and the regional levels through an active interaction process between the three main actors. However, it has been cautioned that applying the triple helix model in knowledge transfer only provides a necessary condition that is not always sufficient for effective knowledge transfer with a view to

accomplishing successful, innovation-based development. The triple helix also has been more applicable to large firms able to engage with governments and universities, thereby limiting the role of smaller firms.

3.5.3 Participatory model

The participatory knowledge-transfer model has been more relevant in terms of addressing the needs of small and medium-sized firms that have not been enhanced by using the linear and triple helix models. The participatory model thus seeks to address the needs of smaller knowledge users. Specifically in the areas of farmer innovation and small industry, the model aims at engaging small knowledge users from the research-design phase through to knowledge application and transfer (Cornwall et al., 1993). This model takes cognisance of the complex power relations, conflicts and negotiations involved in innovative knowledge-transfer processes and also of the sociocultural structures necessary to sustain effective knowledge and innovation transfer (Bunders et al., 1996). The overall strength of this model is to broaden the decision-making process on the design and redesign and application of new knowledge aimed at meeting not only economic but also social and cultural goals. The main challenge or limitation of this process is the contextual isolation of knowledge as it seeks to address particular and usually small numbers of people and thus ignores wider scientific development.

3.5.4 Interactive learning approach

The interactive learning approach seeks to integrate the particular strengths of the previously discussed model while introducing the learning notion into innovative knowledge transfer. Proponents of the approach argue that the innovation process needs to be centred on a 'vision' that science-based innovation is able to contribute to development and poverty alleviation. This vision highlights the need for clearly stated knowledge-based policies in the process of knowledge transfer. The model is further dependent on the participation of interdisciplinary networks of actors so as to achieve this vision.

According to Bunders (2001), the interactive learning model is based on five key aspects. Among these figure trust relationships between members of the interdisciplinary team and the participating actors, and mutual learning processes between actors though without a supplier-recipient relationship. The latter aspect has been described as the learning attitude or culture among members, which also strengthens the mutual respect of all in the team. The third aspect of the interactive learning model is the need to build coalitions that enhance support and the legitimacy of the knowledge- or innovation-transfer process. Finally, there is a need for

intermediaries to “guide the process of communication, cooperation, learning and coalition building between the various actors” (Bunders, 2001:30).

Before moving on to the theoretical understanding of the learning region concept, it will be important to highlight some of the challenges facing knowledge transfer. These challenges range from the institutional to the geographical. What is further important about the learning region concept and its role in enhancing knowledge transfer is that it addresses some of the challenges faced by less favoured regions in the production, transfer and application of knowledge.

3.6 Learning regions: a theoretical model for knowledge transfer?

The learning region concept also known as the *learning city* (Jucevičius, 2004), as highlighted in Section 2.2.4, has emerged as a major regional development policy and model in recent theoretical and policy discourse (Hassink, 2005; OECD, 2001). One major aspect of the concept that will be discussed below is the level of interaction and networking, which has been said to integrate knowledge from the higher-education and knowledge-producing institutions in the process of regional development. As was discussed in Section 3.5.3, learning regions provide a strong platform for such interaction when the different stakeholders seek to break cultural, language and other barriers as they forge successful partnerships for regional competitiveness.

The next section provides comparative definitions of the learning region concept with a view to highlighting the different perspectives from which the concept has been approached. This is followed by a review of the key literature in which the emphasis is on the emergence of the concept, the characteristics of learning regions and how these have enhanced the concept both as a model and a policy in regional development. Finally, there are the theoretical tenets that make the learning region concept such a useful concept in regional development discourse from a knowledge perspective.

3.6.1 Defining the learning region concept

A range of definitions of the learning region exists. These vary across theoretical perspectives. In many academic and policy circles there seems to be a lack of consensus as to what the true definition is, and what its practical translation actually entails. In the present review, the prominent definitions of the concept highlight the key issues in each definition that are relevant to this study so as to provide a better conceptual lens through which to view the importance of

the role of knowledge transfer in regional development. Morgan (1997) refers to the learning region concept as "the new generation of regional policy which compared to traditional regional policy focuses on 'infostructure' instead of infrastructure, on opening minds instead of opening roads..." (Hassink, 2005:525). Viewed in this light, information (knowledge) thus becomes more important than physical infrastructure.

Asheim (1998:3) defines a learning region as "representing the territorial and institutional embeddedness of learning organisations and interactive learning". Based on this definition, Asheim can be interpreted as proposing that, in the promotion of innovative regions, there is the strategic need for inter-linking or cooperation. This happens through intra-organisational and inter-organisational partnerships between firms and institutions across diverse sectors of society, which he terms *regional development coalitions*.

The OECD (2001:23–24) perceives the learning region to "constitute a model towards which actual regions need to progress in order to respond most effectively to the challenges posed by the on-going transition to a learning economy". The OECD (2001:24) finds the learning region to be "characterised by regional institutions which facilitate individual and organisational learning through the co-ordination of flexible networks of economic and political agents". Based on this perception, Hassink (2005:523) defines the learning region as "a regional innovation strategy in which a broad set of innovation-related actors (politicians, policy-makers, chambers of commerce, trade unions, higher education institutions, public research establishments and companies) are strongly but flexibly connected with each other by sticking to a certain set of policy principles".

Florida (1995:528), writing in the context of the United States of America, defines learning regions "as collectors and repositories of knowledge and ideas and [that] provide an underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning". In this definition, he argues that the ability of a region to generate, attract and retain the high-skilled workers needed for expanding the knowledge and technology base is critical to the success of these regions. He adds that their capacity goes beyond the reputation of local universities and research institutions and also depends on the presence of a wide variety of social and environmental amenities able to attract academics, and students to the region (Florida, 2000). The role of information structures, which Morgan (1997) terms info-structures, is also highlighted.

From the above definitions, the learning region concept can be understood to provide a platform for regional innovation and development based on the ability of all the regional stakeholders to learn and 'unlearn' (Maskell & Malmberg, 1999). In this form of learning, emphasis is laid on building competences rather than on increased access to information. Learning takes place in all parts of society and not only in the high-tech sectors, which leads to the creation of more jobs and the betterment of the regional economy. Thus, in the learning region concept, knowledge (information, skills and competences) has become the main resource and learning (interactive and transfer) in the process of economic production and growth (Lundvall, 1994). The next section provides a review of the theoretical and policy origins of the learning region concept.

3.6.2 Emergence of learning regions in regional development discourse

Studies of the role of universities have increased significantly over the past couple of decades. These studies have most often followed the traditional approaches of impact studies. They accept growth theories and focus on areas such as industrial development and labour-market dynamics including economic impact indicators (Keane & Alison, 1999). Garlick (1998) argues that these methods and approaches are passive and do not capture the linkages with the region and the manner in which an organisation becomes embedded with the local economy. Thanki (1999:86) contends that "another concern which flows from the limited capacity of traditional approaches rests with current limitations in understanding the qualitative impact of economic development initiatives in general and specifically the value of knowledge and learning infrastructure". Alison and Keane (2001) later propose the learning region concept as an analytical framework to assess the role of higher education institutions in regional development. They argue that the concept is a rigorous tool to "accommodate interviews and surveys designed to better capture the impact of universities at regional development" (Popescu, 2012:3). Building on such arguments, the learning region has been used as a concept to provide a tool for in-depth studies of the role of universities in regional development.

Section 2.1.7 above furthermore argues that the forces of globalisation have increasingly limited the role of states in planning, managing and steering development. Florida (1995:531) contends that "the nation state has become an unnatural, even dysfunctional unit for organising human activity and managing economic endeavour in a borderless world". He further argues that "the new age of capitalism requires a new kind of region... [needing] a knowledge-intensive firm – continuous improvement, new ideas, knowledge creation and organisational learning... [and that] regions in effect must become learning regions" (Florida, 1995:531).

Learning regions have emerged strongly in development discourse in which there is a greater emphasis on the role of knowledge and regions. As put by the OECD (2001:11), when compared with other new regionalism concepts (innovations systems, industrial districts, innovative milieus and regional clusters), “learning regions are more involved in learning from institutional errors made in the past and by doing that avoiding path-dependent development”. They contend that the learning regions seem to be more reflective and monitoring or “virtuous” regional innovation systems.

A final point regarding the learning region concept, which serves to strengthen its contextual importance in this study, is the argument advanced by Hassink (2005:11) that, contrary to the other theory-led development models (Section 2.2 above) that are characteristic of the more successful regions, for example the Silicon Valley and Third Italy experiences, the learning region concept “is not derived from any particular kind of region” and can easily be applied in other regions, including those that are structurally weak. This makes an argument for the concept having potential relevance in a less favoured region – the case in this study. It should however be mentioned that Brenner (2003), using some key indicators, has described Silicon Valley as a learning region. Christopherson and Clark (2010:127), writing about the emergence of learning regions, are of the opinion that “[T]he learning region concept opened the eyes of both economic development practitioners and researchers to a broader set of regional conditions and institutions that affect the functioning of regional innovation systems”.

3.6.3 Characteristics of learning regions

The question this section attempts to answer concerns what it is that makes a learning region different from both a policy model and a regional development approach. In trying to understand the properties of a learning region, the table below offers a comparative analysis of the basic set of ingredients that constitute a production system at the regional level (see Table 3.2).

Florida (1995:534) concludes that “learning regions provide the crucial inputs required for knowledge-intensive economic organisations to flourish”. This, he argues, takes place through the establishment of a manufacturing and service infrastructure of interconnected vendors and suppliers, a knowledge infrastructure base able to produce and recruit knowledge workers, enhance partnerships, enhance lifelong learning and facilitate the sharing of information using information and communication technologies. Table 3.2 provides the key characteristics of learning regions in comparison with old mass-production areas. The next section will go a step

further to describe how knowledge transfer is enhanced in learning regions. This will highlight the key aspects of the above-mentioned characteristics that serve to keep such knowledge in learning regions.

Table 3.2: Comparing characteristics of mass production with the learning region

Characteristic	Mass-production region	Learning region
Basis of competition	Comparative advantage based on: - Natural resources - Physical labour - Poor finance opportunities.	Constructed advantage: Sustainable development based on: - Presence of higher education institutions - Knowledge creation and application - Increased interactive learning - Available venture capital
Production system	Mass production: - Physical labour as source of value - Separate innovation and production	Knowledge-based production: - High-tech, continuous-input goods - Knowledge as production resource - Integrating innovation and production
Manufacturing infrastructure	- Arm's-length supplier relationship - No trust among suppliers and between suppliers and clients	- Firm partnerships, networks and supplier systems as sources of innovation - Trust and social capital base
Human infrastructure	- Low-skill, low-cost labour - Taylorist workforce - Taylorist education and training	- Knowledge workers - Continuous improvement of human resources - Lifelong learning - Refresher courses and training
Physical communication infrastructure	- Domestically oriented - Closed system	- Globally oriented - Open system with presence and use of information and communication Technologies
Industrial governance system	- Adversarial relationships - Command and control regulatory framework	- Mutually dependent relationships - Network organisations - Flexible regulatory framework

Source: Adapted from Florida, 1995

3.6.4 Features of learning regions in knowledge transfer

The previous section has drawn from the literature the key characteristics that make a region easily identifiable as a learning region. The next section goes further to present the main principles and features required for the transition from a mass-production region to a learning region. The features identified have, across various successful regions, emerged as key aspects in breaking institutional lock-ins and enhancing regional development. They include the following:

- Knowledge production and innovation: The first key aspect of learning regions' abilities in respect of knowledge transfer starts with the presence of knowledge-producing institutions. "At the heart of learning regions are post-secondary academic institutions and the research university" (Christopherson & Clark, 2010:120–121). Knowledge institutions increase the stock of human capital in a region, thereby increasing the region's capacity to apply more innovative ideas. In these regions learning takes place in diverse ways: interactive learning (Lundvall, 1992), learning-by-doing (Arrow, 1962), learning-by-using (Rosenberg, 1982) and learning-by-searching. Learning-by-interaction has been recognised as the key learning aspect in that organisations learn by adapting to 'best practices' as they interact with other firms or knowledge institutions (Hudson, 1999).
- Entrepreneurial academic culture and available venture capital: The entrepreneurial culture of most learning regions has provided a stronger ability to transfer knowledge than is the case in other regions. In some regions, the absence of the finances needed to translate inventions into innovations has limited the regions' ability effectively to transfer knowledge. The lack of entrepreneurial orientation in the local university (Case of the Johns Hopkins University, Feldman & Desrochers, 2004) leaves a region without the needed impetus for effective knowledge transfer. The absence of an entrepreneurial culture at the regional level limits both the absorptive capacity of the region and its capacity to transfer knowledge. Learning regions possess both entrepreneurial drive and venture capitalists to support innovation and regional competitiveness.
- Untraded interdependences among firms: This aspect has also been identified as key towards enhancing knowledge transfer. Porter (1998) considers untraded interdependencies to be triggered by the clustering of groups of interconnected firms and related institutions (including knowledge institutions) in close geographical proximity. These firms are linked by commonalities and complementarities between large firms and their forward and backward linkages with smaller firms. Some of these linkages include knowledge-transfer linkages with public universities and other research institutions. A key strength in forming these linkages is social capital and trust. Wolfe (2001) argues that the competitive advantages that flow from untraded interdependencies are closely linked to the value of the information and knowledge that firms share. Learning regions have thus been observed to display strong interdependence between firms and other institutions, based on qualities of trustful partnerships.

- Regional governance: In the European context, regional governance has been identified to play a key role in animating the regional innovation system. Wolfe (2001) believes that regional governments provide the central stimulus to spark the transition and success of learning regions. This spark is argued to be enhanced by a cultural and organisational shift from traditional bureaucratic structures to more flexible and less rigid institutional forms. Landabaso et al. (1999) maintains that this shift in respect of the governance role is paramount to the formation of the good social capital networks and trust associated with learning regions. Several authors hold that the 'learning region' paradigm represents a "radical democratic agenda" (Amin & Thrift, 1995b:60), which aims at ensuring that economic efficiency goes along with social equity (also argued by Cooke & Morgan, 1998).
- Regional embeddedness: Embeddedness stresses the role of social relations – such as social capital, networks and structures of these relations – in generating trust and discouraging opportunism (Dayasindhu, 2002). Universities in learning regions are relationally embedded with regional stakeholders and have gained trust, which facilitates knowledge transfer. Social relations are fostered through formal and informal relationships.

In summary, I adopt a concise description of the key aspects and characteristics of learning regions from Baumfeld (in Lukesch & Payer, 2005) who considers the three key aspects and dimensions of the learning region to be the following:

- Comprehensive activities and endeavours in favour of the continuing education and lifelong learning of the people;
- Enhanced activities for empowering and networking the educational institutions and the abilities of the region ultimately to upgrade the institutional and human-capital base of the region; and
- Investments towards integrating all functional systems and institutions in the region in a sustainable process of mutual learning, 'unlearning' and innovation.

The above section has provided arguments to support proponents of the learning region (OECD, 2001; Morgan, 1997) who consider the learning region concept to be both a potential policy and a development model to enhance regional development in the contemporary knowledge economy. With the increasing importance of knowledge and the need for learning, the learning

region falls within the ambit of the new regionalism approaches that argue for more inclusive and participatory development models to bring all stakeholders into a partnership for collaborative engagement. Supported by the triple helix thesis (Etzkowitz & Leydesdorff, 1998), the learning region concept provides the necessary tools for regional engagement but with the role of knowledge and learning being critical to such engagement (see Table 3.3).

However, for the concept to be successful in achieving its desired regional development objectives, researchers and policy makers will have to be sensitive to areas whose history, geographical position and other social aspects have placed them in rather difficult stages of development. These regions have been described as less favoured regions, less favoured areas and lock-ins and there is thus a need for contextual analysis by development policies when addressing them in the learning region context. The next section provides an overview of such regions and looks at how a chosen case study has evolved from a less favoured region to a learning region. The contextual aspects of less favoured regions are next highlighted with the aim of informing the empirical stage of the present study.

Table 3.3: Characteristic of knowledge transfer in the learning region

Characteristic aspect	Descriptive aspects
Networks	<ul style="list-style-type: none"> - Partnerships and collaborations - Double, triple and quartet helix partnerships - Social capital - Information-sharing 'info-structure' - Professional and social networks
Innovation	<ul style="list-style-type: none"> - Entrepreneurship (academic and business) - Competitive culture - Research and development institutions - Local firms open to change
Learning and 'unlearning'	<ul style="list-style-type: none"> - Tacit knowledge exchange - Codification of knowledge - Sharing of ideas across disciplines and sectors - Transfer of best practices - Lifelong learning opportunities
Infrastructure	<ul style="list-style-type: none"> - Knowledge infrastructure (universities and research institutions) - Attractive lifestyle - Recreational amenities - Presence of information and communication technologies
Venture capital	<ul style="list-style-type: none"> - Presence of venture capitalists - Strong private sector - Good entrepreneurial culture
Institutional thickness	<ul style="list-style-type: none"> - Institutional embeddedness - Local relevance - Cultural identity
Local and regional governance	<ul style="list-style-type: none"> - Transparent governance - Stable political system - Decentralised governance system - Bottom-up approach

Source: Adapted from Toland, 2010

Baumfeld (2005), another learning region scholar, has described three dimensions of learning regions that could be used to characterise different kinds of learning regions or learning regions at different levels of complexity.

The first dimension is characterised by comprehensive and holistic endeavours to ensure that activities in the region favour continuous and lifelong learning. This dimension could be argued to focus on the development of skills and human capital at formal and informal levels towards increasing the human-capital base of the region, which is needed to enhance innovation. However, this dimensional level of the learning region arguably remains in a relatively infancy stage. This is because lifelong learning /continuing education is aimed at developing a human-capital base for increased engagement in development initiatives– hence the need for more engagement, which evokes the second dimension.

Baumfeld (2005) perceives the next dimension of a learning region to be “characterised by comprehensive activities in favour of empowerment and networking the education capacities of the region (for example schools, universities and vocational training services) in order to upgrade the educational infrastructure of the region and to enlarge the knowledge base of the region” (Lukesch & Payer, 2009:2). This brings in some key aspects of the learning region that have already been discussed above. Specifically related here are Lifelong/continuous learning and networking for collaboration between institutions.

The third dimension is the integration of not only the educational institutions but of all other institutions to develop a system or a subsystem. This is aimed at enhancing collaboration, networking and mutual learning and innovation. The use of the notion of mutual learning indicates that learning works both ways in a loop-and-feedback approach. In this framework, knowledge-producing institutions do also learn via tacit knowledge from other stakeholders and thus continue to improve in a dynamic innovation system at the regional level.

The next section provides a conceptual analysis of the literature on knowledge transfer and its application to this study. Using a demand-supply analytical model, the section seeks to extract from the literature the main factors and indicators for assessing knowledge transfer from the university to regional stakeholders. While there seems to be considerable overlap in the literature on knowledge transfer from industry (at the inter-firm and intra-firm levels) (Easterby-Smith et al., 2008; Ko et al., 2005; Szulanski, 1996), it is important to note that this study focuses specifically on knowledge transfer from the university (the supplier) to the

regional stakeholders (the demanders). Some of the indicators operationalised do therefore not necessarily apply to industry-related knowledge transfer.

3.7 Theoretical framework for knowledge transfer

3.7.1 Introduction

The literature on knowledge transfer offers a number of key indicators to investigate in any case study aimed at understanding the aspects of knowledge transfer in regional development. However one aspect of knowledge transfer that has been less studied and documented is the demand-supply relationship inherent in the knowledge-transfer process. Most studies on knowledge transfer seem to be based on a general assumption that knowledge will always be demanded by local or regional firms, business and societies. Most studies have consequently focused on the factors affecting knowledge transfer. Among the few authors who have highlighted this argument, Davenport and Prusak (1998) argue that knowledge transfer involves two actions, namely transmission (the process of sending knowledge to a potential recipient) and absorption by that person or group. The next section identifies and conceptualises the factors responsible for the demand and supply of knowledge in a less favoured region in the African context.

3.7.2 A demand–supply relationship

In an attempt to provide a conceptual model for understanding knowledge transfer from the research institution (source) to the regional knowledge user (recipient), Szulanski (1996) supported by Gouza, (2006) identifies four main factors responsible for knowledge transfer. These four factors are the nature of the knowledge being transferred, the source, the recipient, and the context in which the transfer takes place. In the present study, the factors or indicators identified to affect the transfer of knowledge from the university are understood to go beyond those mentioned here. While not ignoring the context of knowledge transfer as mentioned by Szulanski (1996), previous studies of university knowledge transfer in regional development (Bercovitz & Feldman, 2006; Huggins et al., 2007; Newlands, 2003) have revealed finer aspects that have been conceptualised in this study. Finer aspects have therefore been identified for empirical investigation and will provide a better conceptual tool for understanding the process of knowledge transfer at the chosen case-study faculty. Table 3.4 summarises demand and supply factors in respect of knowledge transfer.

Table 3.4: Summary of demand and supply factors affecting knowledge transfer

	Factors affecting knowledge supply– University researcher	Factors affecting knowledge demand – farmer x
1	Entrepreneurial orientation of institution	Perceptions by potential knowledge users
2	National, regional and institutional policies	Absorptive capacity of the region
3	Knowledge management in organisational culture	Graduate retention capacity of region
4	Knowledge-transfer channels	Knowledge infrastructure
5	Quality of researchers	Presence of information and communication technologies
6	Ability to attract A-rated students and academics	Policy aspects in firms
7	Social and class orientation of researchers	
8	Nature of the relationship: Trust, reciprocity, sharing	

Source: Author (2013), Adapted from Davenport & Prusak (1998); Lukesch & Payer, (2009) and other Learning region and knowledge transfer scholars

In this study, the knowledge-transfer relationship has been described as the ‘demand versus supply relationship’. While other literature (community development, participatory development) argues that in this kind of relationship there is no supplier and no recipient because each end-user in some way uses knowledge and ideas from the other, the literature on universities’ contribution to regional economic development is more squarely focused on codified knowledge and its application by regional stakeholders. This study will therefore consider the university to be a supplier of the knowledge that is of interest, while the regional stakeholders act as recipients. Doing so will facilitate a better understanding of the factors affecting the said relationship. This does not however ignore the role of a feedback mechanism in the process of knowledge transfer. Because it is considered the process through which knowledge production is both informed and made relevant to the local and regional needs this feedback mechanism is considered important.

Understanding the transfer of knowledge from the producers to the potential regional users requires a conceptual analysis of the factors that affect the demand and supply of knowledge within a learning-region framework. In this framework, the main aspects and conditions for the creation of a learning region are analysed and in the less favoured regions context, the focus falls on understanding how cultures, traditions and institutional arrangements either facilitate or hinder the development of a proper knowledge demand-and-supply relationship in the region.

Major analytical factors have been identified to be significant in the process of knowledge supply from universities and will be investigated using appropriate indicators. These include:

- Knowledge-transfer policy: This will examine the policy environment aimed at promoting knowledge production for regional consumption. It will analyse policies to encourage academic relevance as regards regional needs via research, teaching and engagement.
- Disposition of faculty academics: This will investigate the quality of staff (PhD students, senior researchers and rated researchers), the level of knowledge management, entrepreneurial motivation and engagement culture.
- Knowledge type produced: Local relevance of knowledge, applied or theory-based research, codified or tacit and funding (for locally relevant research).
- Transmission channels: This will look at aspects of formal and informal platforms, face-to-face forums, lifelong learning opportunities for workers, social networks with regional stakeholders, organisational distance and geographical distance from potential users and former industry workers engaging with academic work.
- “Third-stream” research funding: While most universities proclaim their interest in community and regional engagement, the majority of these universities have not allocated funding for such research and engagement. This significantly hampers academic interest in such research, thereby limiting the role of adequate knowledge supply.

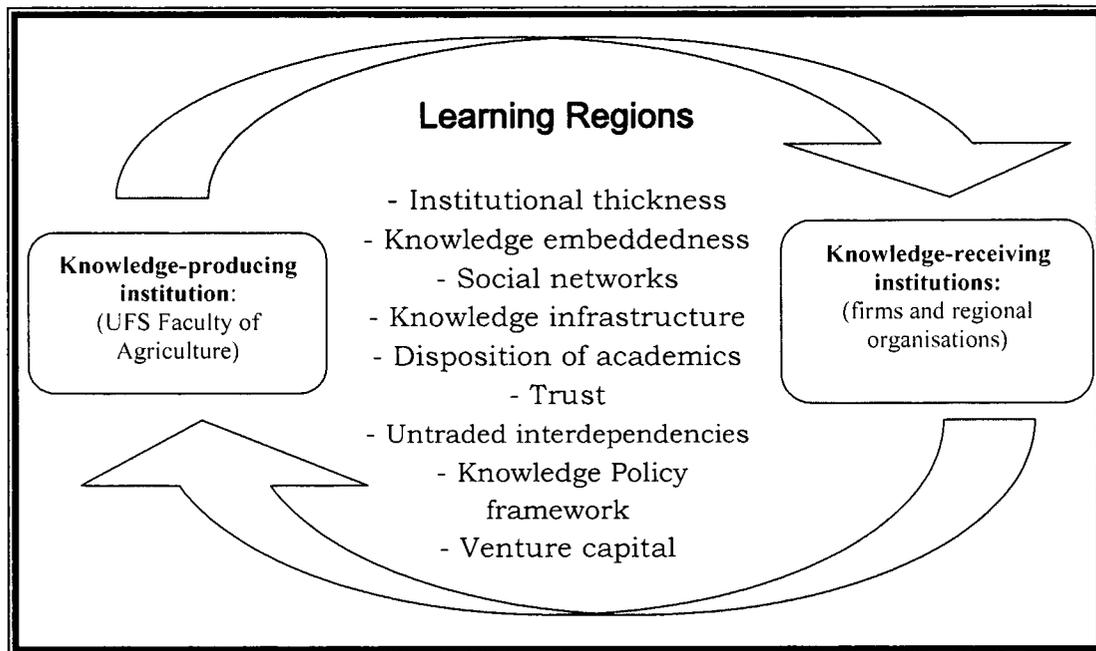
The demand side analysis, too, has generated its own, unique set of key aspects for investigation and analysis:

- Absorptive capacity of the region: This will investigate indicators such as skills (educational) levels of firm employees, the amount of venture capital from financial houses, the presence and use, by firms, of recent information and communication technologies.
- Regional-knowledge infrastructure: This will engage with the following aspects: industrial liaison agencies and social networks.
- Firm receptivity: This will look at firms’ desire to engage with academia (versus other institutions), their technological competence, the lifelong learning of the firms’ workers, the level of innovative drive, openness to new ideas and the funding available for relevant knowledge.

- Communication infrastructure: Access to information and communication technologies, use and application of information and communication technologies in firms' activities and their networking with distant firms.

See Figure 3.1 for a conceptual summary of the supply-demand relationship.

Figure 3.1: Conceptual framework of knowledge supply and demand in the learning region



Source: Adapted from Havelock, 1969; Cooke and Piccaluga, 2004

As for the main aspects of the learning region – trust, institutional embeddedness, social networks and interactive learning – this particular conceptual framework provides the tools for an empirical investigation of the process of knowledge transfer in a less favoured region. This is analysed using the learning-region framework. This framework, according to (Jucevičius, 2004), posits that the successful and sustainable transfer of knowledge from a university to regional stakeholders (and *vice versa*) depends strongly on the development and consolidation of a region having the characteristics of a learning city. Interviews with stakeholders provide different perspectives from the various groups being interviewed on how this has affected/is affecting the level of knowledge transfer in the region. The empirical study uses indicators from successful regions to examine the challenges facing knowledge transfer in a less favoured region.

Using Baumfeld's (2005) dimensions of a learning region, it is apparent from the above section that effective knowledge transfer seeks to ensure an integrated system or subsystem aimed at bringing together all the major role players in a regional economy in an interactive learning approach. This integrated system makes use both of the hard aspects of knowledge (namely, codified knowledge, higher education institutions) and also of the soft aspects (trust, social capital, and institutional embeddedness) in an interactive, feedback approach aimed at improving the regional competitiveness of the whole.

3.8 Conclusion

As seen in the above section, knowledge transfer has evolved in response to the knowledge demands of the fast-growing knowledge economy. Using the available literature, the above section has facilitated a holistic understanding of both the theoretical and the practical aspects of the knowledge-transfer concept. This has been systematically done, while also signalling the changing contextual discourse of the knowledge-transfer process from more successful regions to less favoured regions. The theoretical aspects that enhance knowledge transfer in both regions have been highlighted and conceptualised in a framework that informed the empirical part of the study.

An overview of the global literature produced three key aspects that inform the empirical rationale for the study. These aspects have been classified as theoretical, conceptual and methodological. They constitute gaps which have been identified from the literature and provide a rational argument for the theoretical and empirical relevance of this study. In addressing these identified gaps, the present study provides both the theoretical contribution and the originality expected of a study of this nature.

From a theoretical perspective, the literature review reveals that the use or application of new regionalism in understanding national and regional development pathways has been significantly underutilised. New regionalism concepts such as learning regions, industrial clusters, innovative milieus, etc. provide better tools for understanding development concepts in a more knowledge-dependent society. At a broader level, development studies in most developing countries, particularly those in sub-Saharan Africa has focused rather on classical theories and on human development approaches and only in the late 1990s did the role of higher education and knowledge start featuring in regional and national development discourses. This thus provides a strong basis for contributing to the body of theoretical literature from a specifically African perspective.

At the conceptual level, knowledge-transfer studies have focused largely on knowledge and technology in the high-tech sectors. Agrawal (2001:286) speculates that “perhaps the two most active areas of university knowledge transfer are the life sciences and electronics, including electrical engineering and computer science”. This argument seems to ignore other disciplines that could be more relevant to the local context in which the university is located. While this study recognises the importance of these highly researched areas, it however seeks to contribute to filling the gap by looking at a less researched area – agriculture research – and how it can contribute to the development of the Free State Province as a less favoured region.

From a methodological point of view, the literature has indicated that most studies on knowledge transfer have used joint methods, with the survey (quantitative) components forming the bulk of the data-collection tool. This study employed a strict qualitative research design that utilised national and institutional policy documents, and qualitative interviews with academics and regional development stakeholders.

The next chapter provides an overview of the knowledge policy environment. Compared with most economies in the sub-region, the South African economy is considered to have made considerable strides in the process of integrating knowledge in national and regional development goals. This has been done with a focus on knowledge-transfer mechanisms from public universities to regional development stakeholders.

CHAPTER FOUR

KNOWLEDGE PRODUCTION FOR SOCIO-ECONOMIC DEVELOPMENT IN SOUTH AFRICA: A POLICY REVIEW

... [S]uccessful cases of economic development, prove the importance of simultaneously providing not only a flow of better educated people, but also jobs where the skills are demanded ... Nations that only address the supply side of educated people [and knowledge outputs] end up educating for migration.

Reinert, 2007:320

4.1 Introduction

The previous chapter provided a detailed theoretical review of the discourse on the role of universities as knowledge producers and innovators in regional development. Emphasis was laid on the factors affecting knowledge transfer in learning regions and on the theoretical aspects that affect knowledge transfer in less favoured regions. The chapter concluded by identifying key indicators of knowledge transfer as conceptualised in a demand/supply framework that will guide the empirical section of this thesis. One of the key issues identified in the theoretical review, as observed in the preceding chapter, is the role of policy – national, regional and institutional – in informing and enhancing the process of knowledge creation, its application and its transfer with a view to enhancing socio-economic growth.

This chapter focuses on a detailed review of higher education and of development policies in South Africa in the context of knowledge production and knowledge transfer for development. Simply put, the chapter seeks to interrogate “how ... development policy in South Africa [is] steering higher education and universities to respond to the needs of a knowledge economy through relevant knowledge production, its application and innovation”. In other words, how the demand for knowledge and learning is created and sustained in the different development, innovation and knowledge-production policies. The review focuses on the notion of the national innovation system in South Africa, the application of knowledge generation and the funding of policies aimed at enhancing relevant knowledge for development and economic growth. This review and analysis focus on, but are not limited to, five key policy documents: The National Commission on Higher Education Reports of 1996, the South African Science and Technology White Paper of 1996, the National Research and Development Strategy (NRDS) of 2002, the Ten-Year Innovation Plan of 2007, and the recent National Development Plan (NDP, 2011): Vision 2030.

Before embarking on a detailed review of the South African policy environment, it is important to paint a clear picture of the policy environment surrounding the contribution of knowledge towards development in the continent at large. Though there is a significant difference between countries' policy efforts towards aligning knowledge production and application with development efforts, it can be argued that the development pathways, challenges, opportunities and prospects of most countries in sub-Saharan Africa still are very similar. This review therefore follows a general approach and highlights only a few specific countries that deviate significantly from the general trend.

The next section provides a review of policies that have enhanced the relevance of research and scientific knowledge in promoting the development and economic growth of the continent. This is followed by a detailed review of the South African higher education policy landscape and emphasises the key documents identified. The review also focuses on knowledge production and its application or exploitation and transfer for development. The final section highlights some of the potential strengths and weaknesses of the policy infrastructure that set it apart from those of other emerging and more advanced regions.

4.2 Knowledge and development in Africa: a policy review

Development efforts in Africa have been characterised by varying degrees of success, huge levels of dissatisfaction and significant failures. These failures and lack of sustainability in the successes witnessed have been attributed to various reasons. Some pessimists see the continent's development efforts as being marred by endemic political unrest, vast and deep-rooted corruption and a backward mentality, all of which characterise most of the continent. Optimists however argue that while the continent is blessed with huge natural resources, it has been held back by poverty and forces of dependency that are now deepening as a result of the negative impacts of globalisation (African Union, New Partnership for Africa's Development or others). There is thus an urgent need for new thinking on the way forward to liberate the continent from its poverty trap (Britz et al., 2006). This thinking also emerges from arguments such as those articulated by Henry Rosovsky, Professor Emeritus, Harvard University, who is also a member of the Task Force on Higher Education and Society. Arguing on behalf of Africa, he maintains:

Higher education is the modern world's 'basic education' but developing countries are falling further and further behind. It's time to drive home a new message: higher education is no longer a luxury, it is essential to survival (World Bank, 2000 in Brock-Utne, 2008:101).

Arguments such as these have heralded a new wave of policies aimed at securing funding for higher education and at strengthening it so that it will be able to contribute to poverty reduction and economic growth (Brock-Utne, 2004). A key emerging argument, however, has been that knowledge production and application have a limited role to play in development efforts. The significant absence of research and development and the failure to recognise the key role of knowledge workers produced by means of formal education remain major challenges to the continent's development. Ramphele (2003:1) contends that there is "a cruel irony in the inverse relationship between the size of development challenges that nations face and the capacity of their university systems to rise to meet them". The rationale behind this inverse relationship has been questioned by Rwandan President, Paul Kagame: "... the questions now facing many African countries is ... where are we headed, and what needs to be done to give science and technology their due weight in our development process" (in Teweldemedhin & Mwewa, 2013:66)

Questions of the nature of the one posed by Kagame highlight the already acknowledged fact that, in the present knowledge economy, the university in Africa must come to the fore and assume its role as an agent in national and regional development. In spite of the huge diversity both within and between countries in the sub-region, it is obvious that African policy makers must now negotiate and potentially overcome these differences if they are to enact policies that will extend beyond racial, tribal and gender barriers so as to ensure that they bring science, knowledge and universities into their development processes. It is therefore increasingly being recognised that "public engagement on the part of university faculty and students [through academic scholarship] must be connected to national and community [regional] development goals" (Juma, 2005:127).

The next couple of paragraphs provide a review of significant policy initiatives taken by some national governments and major development bodies across the continent in a bid to align the role of academic scholarship, scientific research and innovation with socio-economic development. Though these policies do not necessarily apply to all African countries, they are nevertheless broadly representative of contemporary discourse in the African context.

Bloom et al. (2006), in their famous World Bank report entitled, *Higher Education and Economic Development in Africa*, observe that a number of countries in Africa are recognising the role of higher education in their poverty-reduction strategies. Of the 22 poverty-reduction strategic papers reviewed, all of the countries, with the exception of Tanzania, make reference

to the role of higher education. This marks a major shift in higher-education thinking in Africa – moving away, that is, from the 1980s notion of its being a luxury (Brock-Utne, 2000) to its having a potential of changing economic fortunes. Bloom and his colleagues do nevertheless regret the fact that only three of the countries consider higher education to be a means of reducing poverty, and that only two of those three countries (Cameroon and Ethiopia) plan to increase funding for higher education. This contrasts with trends observed in most emerging economies in which higher education is increasingly taking centre stage in development planning. In the economies in which the link has been understood and acknowledged, there is a corresponding need for the initiation and implementation of policies aimed at placing higher education and universities at the centre of poverty reduction and development goals.

In a bid to enhance the role of research and development and of knowledge in development, the Southern African Regional University Association has proposed a policy document: *Meeting Regional and Global Challenges* (in Kotecha et al., 2011), which emphasises the shift to the role of knowledge, innovation and partnerships if the continent is to survive in the knowledge economy. This emphasis is succinctly captured by the European University Association:

Higher education is of crucial importance to the long term development of knowledge societies ... universities are vital for conducting research, researcher training, and therefore are important for knowledge generation and innovation to meet local and global, societal and economic needs. The development and modernisation of higher education is therefore a critical issue for governments and stakeholders around the world ... Urgent action is needed to ensure that African countries have the necessary higher education capacity to respond to domestic and global challenges in the decades to come.

The document further asserts that “universities do not only need to produce PhDs for their own purpose, but for societies and economies that require research-trained labour in [a] growing number of professional fields” (Kotecha et al., 2011:7). This argument resonates with the view of Gibbons et al. (1994) who proposed the notion of “Mode One” and “Mode Two” knowledge types. In their discourse, “Mode Two” knowledge must be able to extend beyond academic disciplines and become more interdisciplinary and relevant to the social and economic needs of the immediate society – a major argument in the knowledge-transfer literature. It is thus apparent that there is a significant understanding and policy emphasis in some parts of the continent of the role of higher education and universities – via research and development, innovation and the production of knowledge workers – in enhancing sustainable social and economic development. The document proposes an implementation plan that consists mainly of managing an research and development fund and monitoring knowledge outcomes.

Nonetheless, the document fails to identify and operationalise the practical notions of knowledge and innovation transfer across academic, government and industry levels.

As for regional and international policy initiatives, African leaders over the past decade have adopted more than twenty regional agreements regarding cooperation and economic development with the explicit recognition of the role of research, knowledge and innovation (Mugabe, 2009). In the East Africa Community Treaty, Article 80e stipulates that “[T]he East African Community Treaty shall promote industrial research and development and the transfer, acquisition, adaptation and development of modern technology, training, management and consultancy services through the establishment of joint industrial institutions and other infrastructural facilities” (EAC, 1999). The treaty further, in Article 103, elaborates on the notion of knowledge transfer in regional development. Accordingly, member states engage to promote cooperation in the development of science and technology within the community through two main channels. The first channel is the joint establishment and support of scientific and technological research. The second channel comprises the creation of an environment conducive to the promotion of science and technology within the community and to the harmonisation of policies on knowledge commercialisation and intellectual property protection (Mugabe, 2009). As observed in Section 3.3 above, these channels constitute some of the recognised channels of knowledge transfer.

In the treaty establishing the Common Market for Eastern and Southern Africa, Article 100(d) requires member states to engage with one another in the promotion of industrial research and development, and in the transfer, adaptation and development of technological know-how. The treaty goes further to provide an implementation plan through the creation of joint industrial support centres and an enabling environment for cooperation with foreign research and industrial institutions for innovation and development. The treaty of the Southern African Development Community stipulates a provision that promotes cooperation in science and technology. This cooperation is particularly important in the area of promoting the development, transfer and mastery of technology.

Empirical evidence from past studies (Bloom et al., 2006; Tilak, 2003) suggests that increases in the stock of educational levels will increase the levels of economic growth by definite margins. Bloom (2006:iii) and colleagues argue that, “expanding tertiary education may promote faster technological catch-up and improve a country’s ability to maximise its economic output”. Hence, education in general and particularly higher education are

increasingly gaining importance in the development discourse in most African countries and even more so in the major development agencies, such as the World Bank, the International Monetary Fund, the New Partnership for Africa's Development and the African Union. Other multilateral organisations, such as the Southern African Development Community, the Council for Development of Social Research in Africa, and the Southern African Regional University Association are helping to broaden the scope of research partnerships for development (Obamba & Kimbwarata, 2009).

Most countries in the sub-Saharan region have initiated policy documents and frameworks to promote research and development and align national development plans with university research. While this has been widely applauded, the bigger challenge has been one of both funding and making sustainable the implementation of such plans. Examples of such initiatives include Kenya's Science and Technology Act (enacted in 1977 and amended in 1980), Tanzania's eponymous Science and Technology Act, and Botswana's 2005 National Research, Science and Technology Plan and 1998 Science and Technology Policy. These policy frameworks all seek to improve investment in research for development, enhance collaboration with industry and, above all, raise public awareness on the importance of aligning research with national development objectives. Some other countries, such as Angola, Mauritius, and Swaziland, do not have clearly documented policies dedicated specifically to science and technology, but do however have integrated research and development policies in other sectorial policy documents such as agriculture, health and energy plans.

Some countries have initiated institutional policies and structures at national universities and research institutions to enhance knowledge and technology transfer. Barry and Sawyerr (2008) identify two such institutions. The Uganda Gatsby Trust was established in 1994 in the faculty of Technology at Makerere University. Its activities include technology transfer, business development services and a business park. In Ghana, at the Kwame Nkrumah University of Science and Technology, there is the Technology Consultancy Centre that serves as "a conduit through which university research is made available to industry" (Barry & Sawyerr, 2008:16).

In previous studies by Bloom et al. (2006) and more recently by Mugabe (2009) it has been remarked that most African countries are quickly recognising the importance of science, technology and innovation in poverty-reduction planning and in national development planning. However, the review in Chapter Two indicated the need for an active policy and political will on the part of African economies to steer their development planning towards the

role of knowledge and innovation for development. These policies, as observed by Bloom (2006), and Cloete et al. (2011), will seek to bring together all the spheres of government in a new kind of planning, with higher education and knowledge at the centre. The unfortunate state of innovation thinking on the African continent, as described by Sawyer (2006) – with students being taught to become experts in absorbing ready-made knowledge with little or no ability to create knowledge – must be relegated in favour of a new form of interactive learning and training for innovation.

As observed in the previous chapter, one significant aspect of the role of knowledge in development is the presence of venture capital – a significant limitation in most African and economies of developing countries where other social aspects (basic health, education and infrastructure) seem to make more demands on state budgets. However, in the context of this study in which success stories of innovation and economic transformation are used, the knowledge economy, knowledge production and knowledge transfer for development usher in new imperatives for African economies and for higher-education training. African systems will have to develop funding bodies and frameworks to support knowledge and innovation. University training will, *inter alia*, have to shift from merely forming human capital for the labour market to providing more entrepreneurial forms of training and education. These changes include organisational adaptation to global environmental and production changes (Clark, 1998), managerial and governance distinctiveness (Subotzky, 1999), and new activities that are oriented to the development of an entrepreneurial culture at all levels (Urbano & Guerrero, 2013:3). This would enhance the production not only of graduates able to create jobs for themselves and for others, but it will position the entire system so as not only to be more relevant to local needs but also to be more responsive and embedded (Porter, 2007).

4.3 The South African national policy environment

The importance and the potential contribution of universities and knowledge for national and regional development in the increasingly knowledge-oriented economy continues to gain currency in development discourse in South Africa. Coming from a previously distorted and skewed socio-political environment, the South African higher-education system was moreover caught up in a policy context during the apartheid regime that placed a number of constraints on the role of universities and higher education as a public good. This misguidance was manifested in the functions and classification of universities, the biased funding system, the racially divided nature of universities and the huge difference in the quality of input and output

factors that limited the role of higher education in development (Council on Higher Education, 2000).

In the early 1990s, this necessitated the need for a policy rethink to redress issues essential for a post-apartheid South Africa (OECD, 2008). Thus, during the Third International Organisation of Research Management Societies Conference, the South African Minister of Science and Technology at the time emphasised that governments had to develop policies and standards that would not only promote research and encourage the commercialisation of research and development products, but would also ensure that innovation led to social and economic benefits³. The Union for Democratic University South Africa and the Centre for Education initiated a number of such policy reforms for the new higher-education era in South Africa. These policies range from funding, access to higher education, university differentiation and subsequent mergers, to the role of universities in national socio-economic development via knowledge production, human-resource training and community engagement. For the purposes of this study however, the focus will be on policies related to the contribution of universities as producers and exporters of knowledge for socio-economic development. The South African NDP and also some higher education and training policy documents seem currently to be highlighting objectives to reflect this trend. The purpose of this section is thus to provide a detailed review of five policy documents that could be considered to form the nexus of knowledge production. The review seeks to unravel how knowledge production is expected to link up with national development. The documents identified for review are:

- The White Paper on Higher Education;
- The South African Science and Technology White Paper ;
- The NRDS;
- The Ten-Year Innovation Plan (2008–2018); and
- The NDP: Vision 2030.

One important aspect of the knowledge economy is the link between higher education, knowledge, and development policy and planning. As demonstrated by Pillay (2010b) in his study of three economies in the African context, economies that ensure this linkage have succeeded in developing knowledge economies and sustainable development. Many expect the NDP to be the one document that will be responsible for bringing together all the aspects of

³<http://www.inorms.org/documents/openingminnaledipandor.pdf>

development in a single framework. It is thus important that this review should investigate how these documents are aligned to one another, to their own knowledge-production objectives and also to national development objectives and priorities. It should however be mentioned that while the expectations of civil society and the private sector have been high regarding the role of the NDP, there has been significant tepidness on the part of government departments as regards the acceptance and implementation of the NDP.

Though other important policies and structures have been initiated at the national and even at the regional level, these are not discussed in this thesis. These include, *inter alia*, the Technology Innovation Agency Act of 2008, which aims at “stimulating and intensifying technology innovation in order to improve economic growth and the quality of all South Africans by developing and exploiting technological innovations” (Republic of South Africa, 2008:4). Other policies include the Joint Initiative on Priority Skills, the Intellectual Property Rights Act, the National Advisory Council on Innovation, and initiatives such as the National Research Foundation Centres of Excellence – committed to the production and diffusion of knowledge – the Technology and Human Resource Industry Programme – which promotes research and development across institutions engaged in developing the innovation system – and, lastly, the Department of Higher Education and Training. The Department of Trade and Industry has been implicitly incorporated in most (if not all) of the policies discussed here and it has thus not been discussed as a separate structure. While these policies already show a significant expectation being placed on knowledge and innovation for national development, the focus of the following analytical review is to analyse the channels of knowledge transfer in these policies by using the learning region theoretical tools as discussed in the previous chapter.

4.3.1 The White Paper on Higher Education

4.3.1.1 Introduction

The National Commission on Higher Education was initiated in 1994 by the Office of the President. In 1996, the first report entitled *A Framework for Transformation* was submitted with strategic recommendations on the role of South African higher education. The Commission’s report argues that:

The production, dissemination, acquisition and application of knowledge are shaping the structures and dynamics of daily life to an unprecedented degree. The learning society places a premium upon lifelong and continuing education: growing arrays of public and

private organisations (“non-specialised learning organisations”) share in knowledge production with institutions of higher education. The challenge to higher education is to adapt to these changes and to sustain its role as a specialised producer of knowledge. If knowledge is the electricity of the new globalisation, higher education institutions must seize the opportunity of becoming major generators of the power source. (NCHE, 1997)

For this knowledge role to be achieved, the report identified three key recommendations that will be dealt with in the next section.

4.3.1.2 Knowledge and innovation for development as contained in the White Paper

These recommendations, which were later referred to as pillars for a transformed higher education system, were:

- **Increased participation:** Increasing both the scope of and the stakeholders in the management and control of higher education was considered the first pillar. The Commission proposed that, for higher education to be able to be a public good of the kind that was envisioned, there needed to be a more holistic approach to management in higher education in terms, that is, of quality assurance, access control in the wake of an impending hike in enrolments, and also with a view to eradicating the ineffectiveness and inefficiency that plagued many institutions of higher education. This would require that, in one way or another, more stakeholders (students, government, and society) be brought on board in the management of higher education.
- **Greater responsiveness:** According to the commission, the second pillar proposed a shift in the attitude of both higher education and its academics towards the current social and economic needs of society. The commission’s report recommended a move from Mode One knowledge production to Mode Two as proposed by Gibbons et al. (1994). In this light, the report urged closer levels of interaction between higher education institutions and their surroundings as a means of ultimately incorporating the views and values of previously disadvantaged groups. This responsiveness was expected to bring about changes in the curricula in the form of more market-oriented academic programmes and enhanced responsiveness to society at large.
- The last policy pillar, as prescribed by the National Commission of Higher Education report of 1996, called for **increased cooperation and partnership in university governance**. The report advocated cooperative governance between the state and academia so that the state would merely be an enabler of the process instead of controlling it, as had been the case in the previous governance model. In this new

governance setup, higher education institutions were expected to work more closely with civil society groups.

Following the deliberations on the report, there was a need for both further consultations and also to build consensus between different education departments at the national and the provincial level. This led the Department of Education, in December 1996, to enact a Green Paper. Hard on the heels of this was a White Paper (April 1997) in which the new higher education policy was established as *Education White Paper Three: A programme for the transformation of Higher Education*. This White Paper was thus established to reshape the higher education system so as to be a more socially relevant system, its stated aim being "to redress past inequalities and to transform the higher education system to serve a new social [and economic] order to meet the pressing national needs and to respond to new realities and opportunities" (Department of Education, 1997:1.1).

According to White Paper Three, three key priority areas for South Africa's higher education had been identified as having a direct bearing on the socio-economic development of the post-apartheid system. The first area was human resources development. The need for human resources development, according to the White Paper, went beyond the regular schooling system by placing more emphasis on lifelong learning (a key aspect of the learning region concept) to accommodate a rapidly changing society. It was believed that this would contribute to the social, cultural, intellectual and economic life of the country.

The second area involved the training and production of the high skills individuals required for an economy, as argued by Cloete et al. (2011:9), to move from being factor driven to being efficiency driven and, ultimately, to being innovation (knowledge drive) driven. The White Paper continued to advocate social relevance in its emphasis on the need for intellectuals to be responsive, not only to the intellectual and economic needs of the economy, but also to its social needs.

The third and last focus area of White Paper Three was on the acquisition and application of new knowledge (Department of Education, 1997:1.12). This focus was also in line with global thinking. According to Lundvall (1995), in the economy of the time, knowledge had become the main factor of production and learning the process. These three priority areas were ultimately to place new demands and expectations on higher education in general and on universities in particular. This reveals that higher education in South Africa had, since the mid-

1990s, recognised the direct and the indirect role of knowledge in the process of national redress, equity and socio-economic development.

4.3.1.3 Analysis

The three pillars of the White Paper Three which were recommended by the National Commission of Higher Education heralded a new wave of policies and actions not only in South African higher education but also in national development planning. Some of the actions taken include the establishment of the Council on Higher Education and subsequently of the National Plan for Higher Education, both involving key policy changes (OECD, 2008). Yet, given the stated objectives of this chapter and the study at large, a detailed review of all the higher education policies falls beyond the scope of this thesis and will therefore not be addressed here. Other authors have however dealt in greater detail with major South African higher education policies (Badat, 2004; Cloete, 2002; OECD, 2008; etc.).

The White Paper failed both to provide strategic leadership in the context of knowledge transfer in the knowledge economy and to utilise the main theoretical tools available from the learning region concept. The first aspect, in which this leadership steering was evident, was the lack of a steering mechanism with which to integrate aspects of knowledge and innovation in national development policies at the time. This can however but a result of the emphasis on transformation and redress at the expense of the skills and knowledge aspects of development discourse at the time. The emphasis seems to have been on offering almost any kind of access to previously disadvantaged groups, while not reflecting on the current or strategic skills needs of the knowledge economy. This led to an enormous production of graduates with limited skills relevant skills to an economy needing different types of skills. Yusuf (2007:15) holds that “[N]ational and sub-national governments are the principal architects of the national innovation strategy because they set the parameters for higher education and craft the incentive mechanisms as well as the institutions that influence decisions regarding where to locate, what to produce and how much to spend on research, and the degree to which firms link up with universities ...”

Secondly, knowledge production for development was, at the time, strongly embedded in the human capital theory thinking, the underlying assumption being that once young people were trained by the university and sent out they would find jobs and gainful employment and thus contribute to national development. There were only limited attempts to look at issues related to breaking the functional, cognitive or political lock-ins as proposed by Hassink (2005) in the

learning region approach. Hence, socio-political challenges inherent in the system as relics of the previous government were not addressed as part of a national development strategy.

Thirdly, while the plan emphasised the notion of cooperation and partnership in university governance, one could say that there was but limited manifestation of cooperation especially at the time when, arguably, historically disadvantaged universities could have expected restitution to be made by their previously advantaged counterparts and when proposals of mergers were a common occurrence that had, since the early 2000s, been a major issue in the South African higher education landscape. These external and valid concerns seem only to have served to undermine the levels of cooperation and also the very partnerships prescribed by the White Paper.

Furthermore, the crucial aspect of training the skills required to meet the needs of the economy had again eluded the policy makers. This can most probably be ascribed to the distant relationship between business, industry, government and the higher education sector – a matter to be addressed in detail using the Free State regional case study. The key stakeholders in the process of training and application seldom come together to determine the relevant skills required by an economy in transition. The Free State Review Committee of the OECD Review of the Free State Province pinpoints the problem: "... in general, however, [the] South African higher education sector is poorly connected to the business sector and the government (Free State Review Committee, 2010), but progress is being made in this domain" (in Puukka et al., 2012:160)

4.3.2 The White Paper on Science and Technology: 'preparing for the 21st Century'

4.3.2.1 Introduction

The White Paper on Science and Technology follows on the Green Paper released by the Department of Arts, Culture, Science and Technology (DACST⁴). The White Paper identifies innovation and the role of the national system of innovation as the two key concepts for take-off. According to the White Paper as conceived by the DACST, "... innovation is an encompassing notion that is based on the continuous production of new knowledge and its creative application in a number of spheres" (DACST, 1996:21). Therefore, "... *innovation must become a crucial survival issue ...*" that can no longer be treated as an optional issue by

⁴As of 1 August 2002, DACST was split into the Department of Arts and Culture and the Department of Science and Technology.

any society aspiring to pursue well-being and prosperity in the knowledge economy (DACST, 1996:8). Through basic, applied and social research, knowledge creation is expected to improve the scope of innovation by way of research and development.

The White Paper lays much emphasis on the collaborative action between eight main stakeholders in the innovation process. These are the central policy departments, government line departments, agencies (such as the Water Research Commission), Science, Engineering and Technology Institutions, state corporations, businesses, the higher education sector (comprising universities, universities of technology and other academic bodies), and non-governmental organisations. The identification of this broad spectrum of stakeholders in the process of national systems of innovation can be perceived to be a major stride towards ensuring that the knowledge actually produced is communicated to the right users and hence contributes to socio-economic development. Three key issues in the White Paper of importance to the theoretical discourse on knowledge transfer are discussed below.

4.3.2.2 Main attributes of the strategy

The strategy is presented under four broad attributes and how they relate to knowledge transfer and innovation in development.

Underlying requirements for science and technology policy: The White Paper identifies and highlights eight basic requirements that are needed to enhance the transition to a science and technology policy for supporting innovation and thus also knowledge transfer in the South African context. These basic requirements are:

- Having a competitive environment to support employment creation;
- Enhancing the quality of life of all;
- Developing human resources;
- Ensuring environmental sustainability;
- Realising the importance of knowledge creation;
- Promoting an information society;
- Appreciating the role of the humanities studies in innovation; and
- Funding, management and performance.

Six of the above are fundamental aspects of the learning region approach to regional development. The importance of knowledge creation highlights the role of universities and other research- and knowledge-producing institutions. Under knowledge production, the White Paper identifies three kinds of research for innovation: basic research, applied research, and social science research. This goes beyond the normal trend of innovation research, which has most often focused on basic and applied research at the expense of social and even human-related research. The role of the humanities and social sciences has been integrated in the learning region approach, with development being conceived as going beyond econometric indicators and parameters so as to include aspects of social and human development, and further also breaking political and cultural lock-ins. Funding highlights the importance of venture capital in knowledge creation and transfer, while the need to promote an informed society is the building block of learning, which includes, *inter alia*, learning by doing and learning by interacting (Arrow, 1962; Andersen & Lundvall, 1988).

The White Paper furthermore acknowledges the fact that there is a need for more stakeholders to be involved in the process and it thus identifies eight stakeholders in the national innovation system development framework. These stakeholders include government, business, non-governmental organisations and other funding and support agencies in the higher education and science, engineering and technology sectors. The next part looks at the main initiatives of the national innovation system strategy.

Linking science and technology development with imperatives for national growth: The link between innovation and national development is one of the pillars with which to build human resources development. While most African economies continue to be in dire need of human capital, the legacy of the apartheid era has compounded this challenge in South Africa. Thus, developing an innovation strategy requires a strong emphasis on human resources development. The Science and Technology Policy emphasises the need for human resources as one of the underlying requirements of a policy that will ensure the desired transition to a knowledge economy. The policy further posits that though the White Paper argues that these cannot be done separately, the National Growth Strategy and the Innovation Plan – as outlined in the White Paper – must be linked to each other. This is based on the argument that growth and development must focus on “investing in people as the productive and creative core of the economy” (DACST, 1996:38). Through its insistence on this linkage, it is obvious that the White Paper proposes to enhance knowledge transfer by means of the production of relevant human skills, training new skills, restructuring the education system for better quality and

ensuring social entrepreneurship. This will enhance social development by ensuring equity and redress, increasing research capacity in historically disadvantaged institutions, and supporting lifelong learning. These skills will ultimately enhance national economic development.

For this national development objective to be achieved sustainably, the policy identifies the need further to establish a link between government's science, engineering and technology institutions with postgraduate training. The establishment of this linkage acknowledges that a gap that has hitherto existed between the skills produced by science, engineering and technology institutions, on the one hand, and traditional higher education institutions, on the other. It is thus argued that for the country to move to the next development level (of being innovation driven), science, engineering and technology institutions and higher education institutions must work together to identify and address areas of need. In order to increase knowledge production and transfer, science, engineering and technology institutions should become active in developing and seeing to the throughput of postgraduate students. This requires, *inter alia*, the establishment of agreements, trust, and networks between the higher education institutions and postgraduate development (supervision, internships, training, etc.), which all go to enhance knowledge transfer.

Promoting linkages between sectors and between stakeholders: The White Paper in question identifies as important the need for better linkages between sectors and stakeholders in the science, technology and knowledge (producers and users) sectors for enhancing development. These linkages include, among others, links between firms, links for the application (testing) of scientific outputs from universities by firms before engaging in business production and links between small, medium and micro enterprises and research institutions. The White Paper states that "DACST⁵ will work with [the] Department of Trade and Industry on a range of relevant issues related to technology diffusion in small, medium and micro enterprises" and that "of particular importance in this collaborative activity is the need to define the best available means of financing technology development for small, medium and micro enterprises" (DACST, 1996:69).

In conclusion, it is clear that prior to the 1996 White Paper, the process of national development had not only been fragmented but was also found lacking in the requisite strategic skills and capabilities. While one could argue that there was already an awareness of the skills required for economic development and growth, there has hitherto been little effort at changing

⁵Department of Arts, Culture Science and Technology

the governance structures at the national and the regional level so as to promote better engagement between the various sectors such as higher education, industry and government. Key aspects relating to this challenge are addressed in the empirical case study. As will be seen in the next chapter, racial, social and historical heritages tend to present institutional challenges to institutional embeddedness. Culture, on the other hand, tends to place barriers in the way of active and sustained engagement in the knowledge production and transfer process. With the private sector still being strongly controlled by white middle-class businesses and the new government being controlled by emerging black bureaucrats, and with the universities still being in the process of defining themselves, networks and the required linkages as identified in the plan continue to be weak. All of these result in weak collaborations. According to Wolfe et al. (2011), the role of universities in regional innovation systems emphasises the relational nature of knowledge exchange and the importance of the social learning processes facilitated by local networks (Bramwell et al., 2012:13). There is thus need for active efforts to establish linkages and networks that go beyond policy and 'buzzwords' to more practical initiatives to enhance knowledge transfer.

Ensuring innovation funding: The White Paper acknowledges the role of finance and adequate funding in the national innovation system by identifying sources of government and private funding for the innovation system. The Innovation Fund was established to coordinate the granting of finance to the institutions in the higher education sector, to government science, engineering and technology institutions and to civil society with a view to promoting national innovation. The Fund's four agency divisions handle all areas of innovation – the natural sciences, the social sciences, the health sciences and the agricultural and environmental sciences. The White Paper also proposes that funding be made available for innovation-related activities through the Support Programme for Industrial Innovation, which will be administered by the Department of Trade and Industry. A proposed tax incentive for innovation firms will provide financial support.

4.3.2.3 Implications for knowledge transfer

From the White Paper it can be observed that the bulk of higher education funding comes from the public sector. The government thus remains the main funder of higher education and research institutions. As discussed in Chapter Three, this has both direct and indirect impacts on the level of venture capital available for knowledge production, application and transfer.

The main focus of the South African National Innovation System has been on the national aspects of knowledge with little regional or local contextualisation. In more successful systems like those in the United States of America and in Europe – where knowledge has increasingly taken centre stage in development planning and policy – higher education institutions have assumed specific regional functions. The land grant colleges in the United States of America or the regional universities in Scandinavian countries and especially in Norway serve to demonstrate the point (Fongwa, 2010; OECD, 2006). These regional universities and colleges have specific knowledge functions to address regional skills and innovation needs, which, in turn, fit into the national framework and national development planning. In the learning region concept this is conceived as the level of institutional embeddedness of higher education institutions in their local or regional contexts (Keane & Allison, 1999). This relates to the level of social ties, networks and trust developed with key stakeholders in the region, all of which help to transfer knowledge and enhance development (Inkpen & Tsang, 2005). According to Ozga and Jones (2006:2-3), embedded policy needs to be more localised, be able to relate global priorities and practices to locally existing ones and be able to mediate global or national policies in distinctive ways.

One of the main prerequisites for knowledge transfer is governance. National, regional and, institutional governance remain critical to how knowledge is produced, managed and transferred for the development of an innovative knowledge system. While the Science and Technology Policy confronts a relevant and fundamental issue facing the economy, the policy fails to create appropriate mechanisms to ensure that those at the helm of the innovation process have the relevant skills and disposition to drive such an effort. This can strongly be linked to institutional factors in that, in many quarters, governing is perceived to be a battle over spoils and not an agent for political and economic development or a facilitator of human transformation and development (Amundsen, 1999). At the regional level, the Puukka (2012:22) observes that “[O]ne of the main factors impeding human capital development is the absence of mechanisms to articulate a long-term vision and implement an integrated development strategy for all educational institutions ...” While this observation applies to the regional level, it can be argued that most government departments continue to lack the capacity to develop such mechanisms in that the political structure of the government most often does not easily provide for the conceptualisation of long-term visions with adequate monitoring and evaluation structures (Wolfe, 2001).

4.3.3 The NRDS of 2002

4.3.3.1 Introduction

Since the World War II era, research and development has been a major instrument in national development. Initiated primarily in the Western economies research and development became a key arm of national security, innovation, and sustainable development. Successful research and development initiatives towards enhancing national development have been characterised by linking research and innovation to national and regional development policies and initiatives. Using case studies of three OECD countries (Finland, South Korea and the State of North Carolina, in the US), Pillay (2010b) clearly demonstrates the critical need for this link between higher education, research, innovation and economic development. This critical link has nevertheless been absent in most development planning in Africa in that research and development policy initiatives for development planning have been lacking. Where the necessity for such a link has been recognised, its operationalisation has been limited by, *inter alia*, funding, management and governance challenges (Britz et al., 2006). South Africa, too, has hitherto been affected by some of these challenges. The 2002 NRDS was initiated by government to address strategic issues related to research, development and skills production in the country. The Strategy made significant efforts towards initiating a research and development policy aimed at enhancing national innovation and development.

The NRDS is considered to be a “key enabler of economic growth and [it] articulates other strategies such as the Human Resources Development Strategic Plan for South African Agriculture” (Republic of South Africa, 2002:15). It is essential to note that, in line with this study, the NRDS takes cognisance of the importance of agriculture in its research and development policy for enhancing development.

4.3.3.2 Overview of the NRDS

The NRDS sets out to identify key problems affecting and hampering research and development for innovation and development. Six key deficiencies are identified:

- There is too little spending on research and development as a percentage of its GDP;
- It is characterised by increased exposure to security risk;
- The scientific population is declining;
- Research and development in the private sector is weak;
- There is no policy framework for intellectual property; and

- Government's stance on science and technology is fragmented.

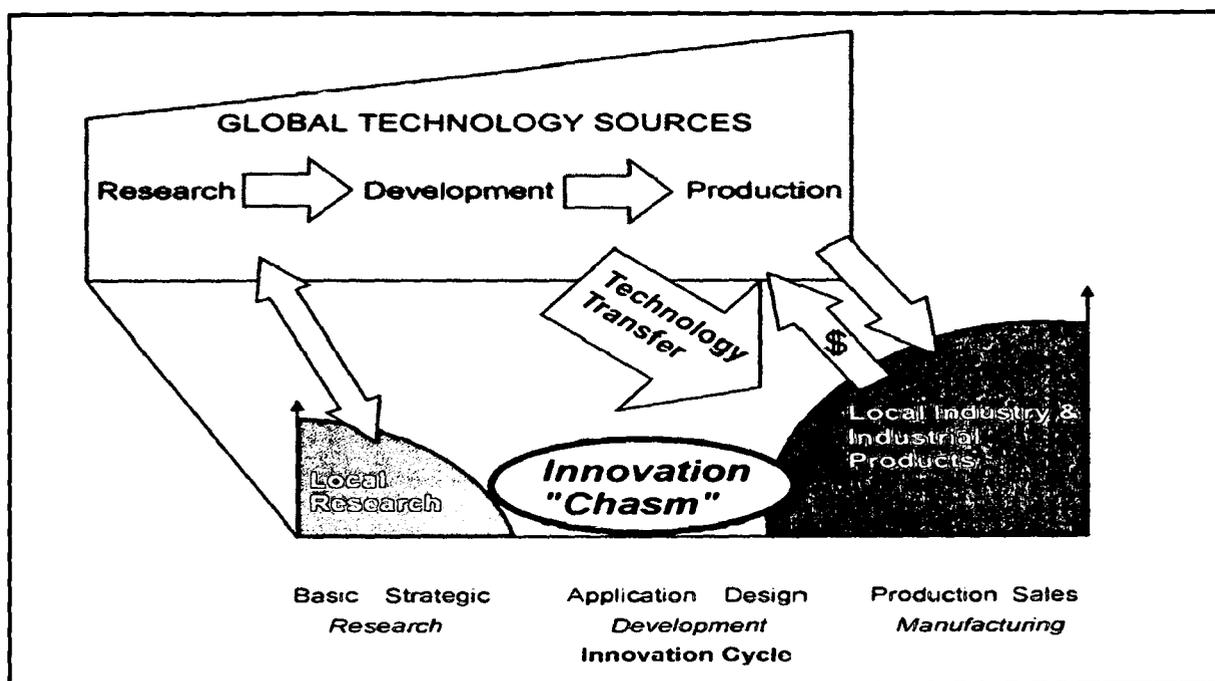
According to the NRDS, addressing these identified deficiencies will require three key pillars to drive strategic initiatives. These are:

- Innovation;
- Science, engineering and technology; and
- Human resources transformation and creating an effective government science and technology system

Innovation, according to the NRDS, demands achieving mastery of technological change in our economy and society. The strategy clearly recognises that "economic growth and wealth creation are based on innovation" (Republic of South Africa, 2002:23). In this innovation effort, "all relevant institutions, the private sector, research organisations, venture capital and universities will be mobilised to deliver innovation ... The achievement of coherence in the area of innovation is critical to strategic success" (Republic of South Africa, 2002:23). The above statements demonstrate a conscious effort coherently to involve universities, knowledge and other knowledge users in the development process. Critical to such collaboration is the level of collaboration between departments such as the DST, the National Department of Agriculture, and the Agricultural Research Council – the all-important issue of intra-governmental collaboration that has already been raised at the level of the Presidency (see Medium-Term Strategic Framework for the NDP).

A significant aspect of the NRDS is its identification of what has been referred to as the 'innovation chasm'. As can be observed in Figure 4.1 below, the notion of the innovation chasm captures the absence of the transfer of knowledge (technology) from local research (basic and applied) to local industry. According to the strategy, "tactical attempts to close the 'innovation chasm' focus mainly on connecting the human capital function (universities and technikons) more and more closely with the market" (Republic of South Africa, 2002:35). An important question to be asked is what role is to be played by sectorial departments in closing this chasm. This further highlights the significant lack of integration of the different stakeholders in the innovation process.

Figure 4.1: Diagrammatic representation of the innovation chasm



Source: NRDS, 2002

The notion of the ‘innovations chasm’ and the need to address this lack of innovation has also been referred to by other authors. Balázs (1997:1) – from studies conducted in Eastern Europe – acknowledges that “the research and development sector in most of the countries concerned has been generally viewed as overdeveloped in relation to the economic potential of the country”. On a practical point, Balázs recommends the need for more academic entrepreneurs as champions in the triple helix partnerships, academics able and willing to engage more actively with industry and government in innovation application and commercialisation. From the figure above it can be argued that the experience of Eastern European countries is mirrored in the South African environment in that the innovation chasm reflects a significant underdevelopment of the research and development sector towards enhancing national and regional development planning and practice.

From a “Mode Two” standpoint, Harloe and Perry (2004) agree that innovation has become the driving concern in meeting various socio-economic goals. Harloe and Perry (2004:214) argue that “this necessitates a new role for universities in which priority is placed upon extracting economic and competitive benefit from knowledge production”. However, “to fulfil this role, universities must produce exploitable knowledge and facilitate its diffusion” (Harloe & Perry, 2004:214). It can further be argued that, according to Harloe and Perry, overcoming the challenge of the innovation chasm requires that universities adopt a new attitude towards

knowledge production and knowledge exploitation. There are thus special expectations in respect of how universities manage their knowledge outputs. Agwara and Juma (2005), from a university-management perspective, state that for the university to be able successfully to bridge the innovation chasm through its knowledge production and exploitation or application activities:

... it [the university] may need to be restructured so that it becomes entrepreneurial, its management coming to resemble and to behave like that of a profit-making corporation directed at finding the best (business) opportunities, one not hamstrung by the perceived operational inefficiencies of traditional collegiality (Agwara & Juma, 2005:306).

Breaking the inefficiencies of traditional academic collegiality relates to aspects and characteristics of the university that attempt to insulate it from responding to the social and economic needs of society. This could include, *inter alia*, less academic autonomy as more stakeholders become involved in academic management, cuts in government funding to stimulate more engagement with external funders and an increased emphasis on the production of multidisciplinary knowledge relevant to the needs of the immediate society (Amaral et al., 2002). This stands in strong contrast to the notion of basic research and the practice of scholarship for its own sake that characterised the Humboldtian University (Shattock, 2005). In the South African context, the Minister of Higher Education and Training, Dr Nzimande, recently referred to this notion of the relevance of knowledge when he urged academics to break the attitude which reverts Mode One kind of knowledge and become more engaged in their scholarship functions (Dell, 2011).

A number of strategic initiatives have been put in place to address the challenges posed by the innovation chasm in translating local research and development to industry in South Africa. A key initiative has been the establishment of the Foundation for Technological Innovation created to provide the required environment for the financing of technology development and its transfer. While these programmes and their functions will not be discussed in this thesis, the above section reveals that there is a clear and conscious expectation in the NRDS that innovation shall take place. This recognition of innovation for development has been closely followed by clear funding and knowledge-transfer programmes and instruments.

The second significant pillar on which the NRDS rests is the **importance of human capital in the areas of science, engineering and technology**. In considering university graduates to be a key form of knowledge transfer from higher education institutions, the NRDS acknowledges

that, while university graduates in general are important, there is an increased need to focus on the production of greater numbers of skilled science-inclined graduates able to foster innovation and technology transfer. The emphasis placed on science, engineering and technology is observed to go beyond racial and gender barriers and is aimed at breaking apartheid trends that are unable to respond to current development needs. This particular emphasis has been articulated in the requirement to focus on centres and networks of excellence in science and technology, thereby strengthening international and African networks and connections in science, engineering and technology and in universities of technology.

Nonetheless, of greater significance to the context of the study is the emphasis that has been placed on **connecting SET production with government departments and programmes**. The two key identified strategies are the Human Resources Development Strategy and the National Plan for Higher Education. It is thus expected that the production of SET graduates must be in a demand/supply relationship with the human resources needs of the country and with the university funding frameworks. Government expects this demand/supply relationship to enhance knowledge transfer in national development through the production of requisite skills relevant to the economy as it strives to attain a knowledge economy.

In conclusion: the NRDS singles out three key areas that require urgent attention if the country is to emulate the developmental and transformative examples of the newly industrialised countries. Enhancing and supporting innovation, addressing human resources and training needs that have hitherto been grossly ignored and satisfying the need to provide a coherent and integrated governance framework should ensure that planning addresses key challenges sustainably.

4.3.3.3 Analysis of the strategy in enhancing knowledge transfer

The above-mentioned initiatives reflect both those of the Science and Technology White Paper and of the Higher Education White Paper. However, as in the policy documents reviewed up to this point, they fail to establish any strong, practical links between the research and industry at the local level. As argued in Section 3.6.4, the innovation chasm will only be bridged if local research attains a significant level of local and regional relevance and embeddedness. It thus remains important that higher education institutions at the national level do not lose perspective as a result of focusing on the global picture, but that they be more locally engaged while seeking to be more globally competitive (OECD, 2007b). Also, the policy document does not adequately explain how the entrepreneurial mindset that academics will require to

become actively engaged at the regional and the local level is to be cultivated. The entrepreneurial culture of any knowledge-producing institution determines how much applied knowledge is made available to business and also how strategic knowledge needs are identified and addressed.

Another major challenge in effective knowledge transfer that the strategy fails to explore adequately is the role of foreign technology in local innovation. As observed by Kaplan (2004:287), "the NRDS appears to have underestimated the importance of accessing technology acquired from there [abroad]". Successful industrialised countries and countries in transition started their knowledge transfer by imitation and then moved on to innovation. This highlights the need both for organisations that are able to identify and assimilate foreign technology and for policies and incentives for foreign investors to train and transfer skills. Thus, the dedicated fund of R60 million for global technology sourcing remains far too small to address this challenge. A significant part of learning in the literature on the learning region and innovation is dedicated to learning by interacting (Morgan, 1997) and for the latter to make the necessary contribution to innovation; firms and institutions will have to learn from foreign technology.

Finally, from a demand-side perspective, the policy fails actively to address the need for regional and local firms to develop adequate absorptive capacity. Furthermore, the plan seems to emphasise research and development governance at the national, centralised level rather than the regional governance structures. This resonates with the concerns of other scholars (Kaplan, 2004), namely that government over-steering could, in the long term, hamper adequate research and development and knowledge transfer. While the strategy seems to acknowledge and apply some of the principles of the National System of Innovation, there is little evidence of a regional system of innovation that is also key towards developing learning regions.

4.3.4 The Ten-Year Innovation Plan (2008–2018)

4.3.4.1 Introduction

The previous sections have reviewed three policy documents relating to the role of higher education in the national development of the South African economy. With a focus on the production and transfer of new knowledge and innovation towards development, the review highlighted the role of knowledge and innovation in South Africa's development goals. The next and final section of this review scrutinises South Africa's future prospects in the knowledge economy.

The 2008–2018 Innovation Plan, a report by the Department of Science and Technology, is described as “a high-level presentation of the principal challenges identified by the Department of Science and Technology” (DST, 2007:iv). The report builds on previous work undertaken by the Department of Science and Technology and provides draft goals for higher education and innovation in South Africa up to 2018. With a focus on innovation and knowledge in developing and sustaining the knowledge economy, the plan “is to help drive South Africa’s transformation towards a knowledge economy, in which the production and dissemination of knowledge leads to economic benefits and enriches all fields of human endeavour” (DST, 2007:iv). The focus of this review explores how the policy aims to integrate knowledge production and transfer so as to meet its stated objectives in socio-economic development. This, to a large extent, provides a platform for the translation of science and technology into exploitable knowledge. From a knowledge-transfer perspective, the Ten-Year Plan is driven by four key elements:

- Human capital development
- Knowledge generation and exploitation (research and development)
- Knowledge infrastructure
- Enablers to address the innovation chasm between research results and socio-economic outcomes

Previous sections of this thesis (Section 3.3.1 and Section 3.3.2) have identified two of the main channels of knowledge transfer to be human capital output and innovation. These include research and development and, most importantly, how research can be transferred and made relevant to meeting socio-economic milestones.

4.3.4.2 Innovation and knowledge attributes in the Ten-Year Plan

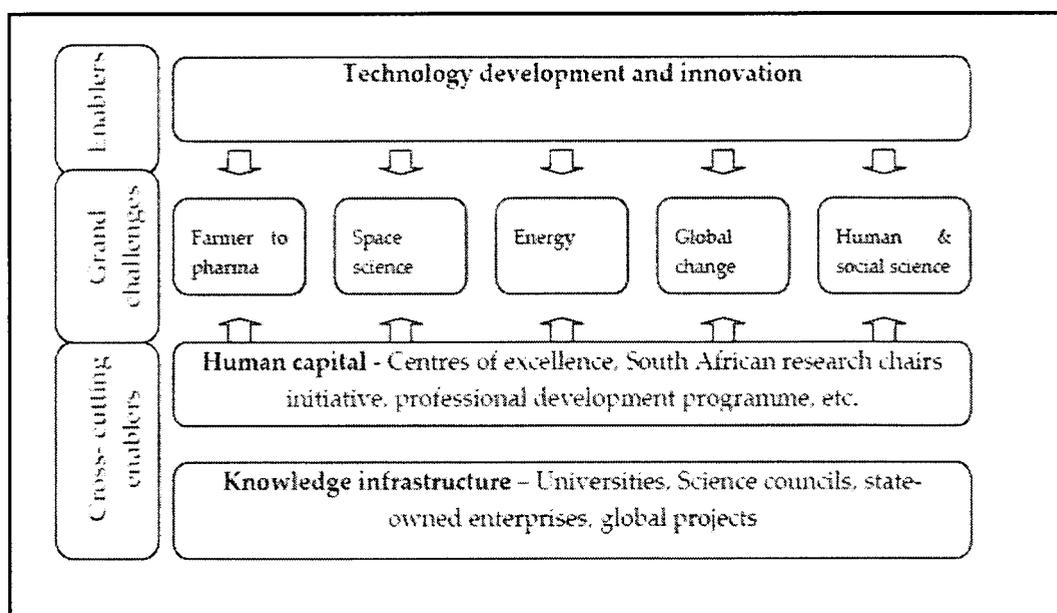
The Ten-Year Innovation Plan highlights five grand challenges that cover an array of social, economic, political, scientific and technological benefits. These challenges go beyond academic research and seek to use knowledge and innovation in addressing relevant development needs in the knowledge economy.

- The first challenge highlights the need to become a major leader in biotechnology innovation to solve basic problems ranging from health care to industrial applications (DST, 2007:11). This has been captured as the Farmer to Pharma shift.

- The second challenge, as identified in the Ten-Year plan, is that of expanding the limits of space science and technology so as to address environmental, security and economic growth needs (DST, 2007:11).
- Thirdly, the plan emphasises the search for new and renewable energy sources able to guarantee a secure and environmentally friendly source of energy (DST, 2007:11).
- The fourth challenge relates to addressing global climate changes and their impacts both nationally and globally.
- The fifth and final challenge goes beyond the natural science umbrella to address social issues related to human and social dynamics. These include but are not limited to poverty-related issues, sustainable livelihood sources and they address the sociocultural needs of South African society (DST, 2007:24).

Figure 4.2 below depicts the five grand challenges of the innovation strategy. Of significance are the identified enablers with which to overcome these challenges. Knowledge-producing institutions (universities, science councils and state-owned enterprises) are important enablers. This reveals that the innovation plan takes significant cognisance of knowledge and the need for knowledge and innovation transfer in attaining national development goals.

Figure 4.2: Major challenges and enablers of the Ten-Year Innovation Plan



Source: Ten-Year innovation Plan (Department of Science and Technology, 2007)

In the new knowledge economy, it has become imperative for successful regions increasingly to move away from comparative advantages based on natural resource dependence. This

requires a shift in development pathways in the development of more 'competitive and constructed advantages' based on research, technology and innovation (Cooke & Leydesdorff, 2006). The Ten-Year Plan aims to achieve this goal, as it seeks to move from the 'farmer to Pharma' value chain with a shift from indigenous resources to pharmaceuticals and biotechnology. Energy security is to be achieved by moving from non-renewable energy (coal) dependence to renewable energy (hydrogen economy).

One important aspect of the Ten-Year Plan is the recognition of innovation as a national competence for developing a more competitive foothold with a view to addressing development needs in the knowledge economy. An equally important aspect of the plan is the recognition of the innovation chasm in the NRDS as seen in Figure 4.1 above. The vital role of innovation has been made evident in the plan, as the government targets increasing investment in research and development to one per cent of the national GDP. The plan further argues that "it is vital that national public policies and existing innovation instruments are redesigned to create a strong incentive for innovation" (DST, 2007:25).

According to the plan, one of the initiatives for attempting to bridge the innovation chasm is the creation of the Technology Innovation Agency. The Technology Innovation Agency was created by merging seven former Department of Science and Technology entities that had previously been tasked with supporting and promoting national innovation, namely the Innovation Fund, Tshumisano Trust, Cape Biotech Trust, PlantBio Trust, LIFElab, BioPAD Trust and the Advanced Manufacturing Technology Strategy. Established in terms of the Technology Innovation Agency Act No. 26 of 2008, the main objective of the agency was to stimulate and intensify technological innovation in order to improve economic growth and the quality of life⁶. This objective was to be achieved primarily through the establishment of a network of competence centres focused on knowledge transfer mainly via partnerships between industry and public research institutions, which included universities.

Viewed from a knowledge-transfer and an economic-development perspective, the Technology Innovation Agency aims at (i) providing the funding and the services required to bridge the gap between formal knowledge (research) and the real economy; (ii) stimulating the development of knowledge- or technology-based services and products; (iii) providing intellectual property support and protection primarily through an Intellectual Property Management Office, which aims at ensuring synergy with other relevant policies; and (iv) stimulating the development of

⁶ (www.tia.org.za)

critical human capital and skills needed for development. These aims all reflect channels of knowledge transfer in one form or another. However, at the level of implementation the Technology Innovation Agency is faced with the challenge of the potential failure to link to universities and other higher education institutions.

Given the increasing need for knowledge production and knowledge workers, the Ten-Year Plan places a strong emphasis on human capital development primarily through the production of more doctoral graduates, increased publication of scientific journals and an increase in the number of innovation skills, which include engineering and technology in the economic interface. With a targeted 33 500 science, engineering and technology undergraduates and 3 000 PhDs in the science, engineering and technology fields, the plan envisages that South Africa will have the knowledge base to compete in the global science and technology arena. This, according to the plan, will enable the improvement of the number of patents and products that are developed locally, thereby enhancing national development.

Finally, the Ten-Year Innovation Plan recognises the role of integrated policy in meeting its stated objectives. The plan identifies the Department of Science and Technology as the main force responsible for strengthening cooperation across government departments and it facilitates the establishment of regional innovation systems by provincial governments. A key aspect of knowledge transfer as discussed in the theoretical section (Section 3.4.4 and Figure 3.1) is the need for networks – especially at the international level, across Africa, in other developing countries and in the global knowledge economy. The innovation plan recognises the need for networks across the continent and with international knowledge organisations. If the relevant networks are established, knowledge production and transfer can potentially be guided by an established demand and supply framework that exists between knowledge-producing institutions and industry.

4.3.4.3 Evaluating the Ten-Year Plan and knowledge transfer

Jucevičius (2004), in an analysis of the preconditions for a learning city, identifies a number of factors needed for developing a city of this kind. One of the factors that strongly relate to the learning region concept is the notion of an egalitarian society. This, according to Jucevičius (2004), is measured by the levels of income disparities, the share of people with secondary education and the percentage of secondary graduates who make it through higher education. The Ten-Year Plan, while it seeks to address issues of human capital and skills, fails to address social issues in its grand challenges. The higher education system has thus far not been able to

address higher education access for the 2.8 million youths who are not in the education sector or in any kind of employment or training⁷. The system will have to develop more innovative and sustainable ways to provide training and skills to these young people, increase human capital and integrate them into the economic mainstream. This will decrease both unemployment and underemployment and also reduce income disparities and support the development of a learning society. One of the preconditions for effective knowledge transfer is the presence of the relevant skills in appropriate numbers.

Secondly, in the conceptual analysis of the learning region in Section 3.6.4, the key prerequisites of knowledge transfer are adequate knowledge production and innovation. Analysis of the quality and quantity of the knowledge produced in the South African higher education system reveals that the country currently possesses too little innovative knowledge capacity to support a knowledge economy. A study by Centre for Higher Education and Transformation (2011) reveals that in 2010 South Africa produced only 1240 PhD graduates, while the University of Sao Paulo in Brazil – a country usually compared with South Africa because of similar socio-economic indexes – produced 2400 in the same year. Similar analysis, using publications from the International Science Index, reflects an even more dismal performance by South Africa. The Ten-Year Plan takes due cognisance of this challenge in stating that “to build a knowledge-based economy positioned between developed and developing countries, South Africa will need to increase its PhD production rate by a factor of about five over the next 10–20 years” (DST, 2007:29). This is thus in line with the learning region principle that enhancing knowledge transfer requires research institutions to produce relevant skills and innovative knowledge (Christopherson & Clark, 2010:120–121). However, there is a need for more concise implementation plans on precisely how to increase this knowledge production while simultaneously increasing responding to skills needs at the undergraduate and further education and training (FET) levels (intermediate levels).

In respect of a further aspect of the alignment of the factors that enhance knowledge transfer, the plan does well to outline the main challenges and to list the enablers with which to attain regional innovation. The plan does not however indicate the relationship between the sectors and how they fit together complementarily in achieving the wider objectives of the plan and of the economy.

⁷ NEET: Not in Employment, Education or Training

4.4 South African NDP: Vision 2030

4.4.1 Introduction

In 2012, the NDP: Vision 2030 was accepted by government as the main development plan. The NDP is the outcome of an extensive diagnostic process that contributed to a better understanding of the country's present national socio-economic situation. It provides strategic direction in respect of where South Africa intends to be in the next two decades. The fifteen chapters of the NDP each address one key development priority area such as social development, energy, economy, health, human settlements and education and innovation. This analysis will focus the key indicators of the learning regional concept as described in Chapter Three and how the NDP aims at enhancing the application of the learning region concept handles in enhancing the development of a knowledge economy. The NDP (Republic of South Africa, 2011) outlines nine central challenges to South Africa's developmental trajectory:

- Too few people work;
- The standard of education for most black learners is of poor quality;
- Infrastructure is poorly located, under maintained and insufficient to foster high growth;
- Spatial patterns exclude the poor from the fruits of development;
- The economy is overly and unsustainably resource intensive;
- A widespread disease burden is compounded by a failing public health system;
- Public services are uneven and often of poor quality;
- Corruption is widespread; and
- South Africa remains a divided society.

In order to address the above challenges, the NDP (Republic of South Africa, 2011:12) suggests, *inter alia*, that exports be increased, that the innovation system be improved, that the functioning of the labour market be improved, that small enterprises be supported, that the skills base be improved, that investment in physical and social infrastructure be increased, that the regulatory burden be reduced, and that the capacity of the state be improved. The next section focuses on the education, skills and innovation aspects of the plan and its recommendations in respect of these. Using theoretical tools from the learning region, an attempt has been made to analyse the NDP in support of knowledge transfer, innovation and

development. The next section starts with a review of the knowledge aspects of the plan and this review is followed by a critical analysis.

4.4.2 Innovation and education in the NDP

Against the backdrop of the above overview, some comments should be made on the role of higher education and innovation in achieving the above aims and objectives. Three points need to be made in respect of the overall aims and objectives related to innovation and education in the NDP.

It should firstly be mentioned that the plan is adamant about the imperative to improve the poor quality of basic education. Specific targets are set for school-participation and school-retention rates. The second point is that the plan largely accepts the problems in respect of the intermediate education sector. In this regard it is planned to increase the number of learners in this sector from the present 300 000 to 1.25 million in 2030, improve the current pass rate considerably and train 20 000 artisans per annum. Thirdly, higher education participation rates are envisaged to increase from current 17% to 30% of the potential age group with a specific emphasis on an increase both in the percentage of students studying mathematics and science and also of the percentage of the population holding doctorates.

The NDP suggests a number of key interventions with regard to achieving the above targets. In respect of FET, consideration, according to the plan, should be given to improving the system of skills planning and shaping the production of skills, to developing national qualification programmes, and to expanding the number of FET colleges. In respect of higher education, the emphasis is on the construction of two more universities.

The NDP (Republic of South Africa, 2011:262) further emphasises the role of universities in economic development: "Higher education is an important driver of the information/knowledge system, linking it with economic development". It further suggests that "[G]ood science and technology education is crucial for South Africa's future innovation" (Republic of South Africa, 2011:262). In this plan, the role of universities lies in developing the skills linked to employment and in their being the dominant sources of new knowledge. According to the NDP, universities are also important in respect of their role in ensuring social justice, equity and promoting democracy. The NDP (Republic of South Africa, 2011:262) summarises the role of universities in the following words: "In today's knowledge society, higher education underpinned by a strong science and innovation system is increasingly important to open up people's opportunities". Sen (1999) and later supported by Nussbaum (2011) and Walker

(2012) have reiterated the importance of inclusive development by increasing people's freedom and opportunities. This enhances capabilities of learning and the application of these skills.

4.4.3 Evaluating the NDP's role in enhancing knowledge transfer

Globally, the discourse in economic development and transformation has taken cognisance of the emphasis on the knowledge economy in planning, implementation and sustainability. As observed in Chapter Two of this thesis, the growing importance of knowledge in economic development has led to notions such as knowledge capitalism. This has in turn placed enormous significance on an economy's capacity to develop based on its competitiveness as demonstrated in its willingness, ability and success in producing, applying and transferring knowledge between the different sectors of society. In this approach, universities and other research- and knowledge-producing institutions have become the focus as knowledge has become the resource and learning the process of production in contemporary capitalism. According to Guruz and Pak (2002:7), "[I]n today's knowledge economy, knowledge produced by research and development, and inventions created in universities and industrial laboratories are creating the so-called knowledge industries".

The first general observation from the plan is the recognition that higher education, knowledge, training and innovation are central to South Africa's long-term development. Yet, the plan also acknowledges that with these prerequisites in place, "education, training and innovation are not a solution to all problems, but the society ability to solve problems, develop competitively, eliminate poverty and reduce inequality is severely hampered without them..." (Republic of South Africa, 2011:262).

This thesis has argued that the learning region concept goes beyond the hard issues of science, education, skills, knowledge and innovation by looking into the softer issues that support knowledge and innovation in development. These include, *inter alia*, networks at different levels, the capacity to learn new ways of doing things and 'unlearning' routine aspects that lead to lock-ins, the presence of human and physical infrastructure to support innovation and development, the institutional thickness of relevant institutions and the presence of good governance. The next couple of paragraphs highlight how some of these aspects have been articulated, both directly and implicitly, in the NDP and the potential implications of a lack thereof.

The NDP reiterates the role of the national innovation system as a major tool for national economic development. It states that in the current dynamics, "universities no longer hold the

monopoly on knowledge production” but that other private and government stakeholders – such as science councils, non-governmental and privately funded research organisations, state-owned-enterprises and even some government departments all form part of the knowledge and innovation system” (Republic of South Africa, 2011:262). It is noteworthy that, while European regional planning history has emphasised the importance of regional innovation systems (Freeman, 1995; Lundvall, 1992), the emphasis here is on a national system and that little reference is made to regional innovation systems. Furthermore, the plan acknowledges that the success of the national information system depends on the strength of formal and informal relationships between the different stakeholders in the system. This demands, *inter alia*, that a policy framework towards national development be developed in partnership with key departments such as Higher Education and Training, Science and Technology, Trade and Industry, Public Enterprise, the Treasury, Economic Development and even Home Affairs, such that further planning in these departments will not be in conflict with that of other departments but rather complement the planning of other departments. The plan assigns a role to Home Affairs in the development of the national information system by advocating that graduates from foreign countries – especially those at higher levels – be provided with working permits.

Though the plan emphasises the need for the academic excellence of universities in particular niches and areas of specialisation in which they can respond to the particular needs of their immediate environment, this emphasis however remains weak and fails to provide implementation guidelines for such a regional emphasis. On another level, the funding framework for higher education institutions is moreover clearly indicative of a national and international focus.

The role of learning (and ‘unlearning’) has been identified as a key component of innovation. The plan argues that with a view to enhancing the competitiveness of the national system of innovation – which is critical for development in the current knowledge economy (Bell, 2002; Lundvall, 1992) – it is imperative to develop a culture of learning. This, according to the NDP (Republic of South Africa, 2011), “will require interventions from the [whole] schooling system, through to shop-floor behaviour to research and development spending and commercialisation”. It is of specific interest to this thesis that the plan acknowledges the need for developing the competitive advantage that is needed to support the production of high-value products in, for instance, agriculture.

The NDP thus recognises that the economy needs to transform to a more dynamic economy by shifting from an over-reliance on the primary economy of mining and agriculture to acknowledging that for this to be done there is need for consistency in alignment between research priorities and national competitive advantage and growth priorities. This will require a strong and supportive steering role in respect of both research objectives and development priorities (Republic of South Africa, 2011:110). For this to be achieved, there are education implications. The plan identifies these implications at all levels of the schooling system – from primary, secondary, post-secondary and tertiary or higher education. While all are significantly important for developing a robust national innovation system and for enhancing development, only those issues relating specifically to higher education and training will be discussed in this thesis. These include but are not limited to the following:

- Developing a diverse range of FET institutions;
- Strengthening quality assurance and the qualification system of the higher education sector;
- Enhancing the innovation capacity of the nation by investing in the right people and acquiring the relevant equipment;
- Developing the entrepreneurial capacity of the nation by designing new courses to instil a culture of entrepreneurship; and
- Coordinating and steering a differentiated HE system to make maximum benefits of the strengths of the different higher education systems across the country.

However, while the NDP has made significant strides towards providing the necessary environment for a national innovation system able to enhance knowledge production, knowledge application and knowledge utilisation in the national development strategy, it must be mentioned that there are yet a number of inherent and practical issues that continue to stand as a major deterrent to the establishment of a knowledge economy. These issues include:

- For the government to achieve the stated objectives in the transition to a knowledge economy by 2030, higher education in South Africa will have to receive a higher funding percentage from the national education budget and from the national GDP. This implies the need for a U-turn from previous trends in which there was a decrease in higher education funding as a percentage of GDP, dropping from 0.76 per cent in

2000 to 0.69 per cent in 2009. The NDP (Republic of South Africa, 2011:293) thus observes that “to preserve the quality of higher education, additional funding will be needed to support an increase in participation and knowledge production”. While significant efforts have been made in a bid to attain the elusive 1% GDP target of higher education spending on research, this figure continues to fall short of higher education systems in countries at the same stage of development as South Africa. A closer look at the BRICS countries reveals that only South Africa spends less than 0.8 per cent of its GDP on research and that Brazil and India spend 0.9 per cent, while Russia spends 1% and China spends 1.84% of its GDP on research (Battelle, 2012).

- National governance and redress: The current socio-economic landscape continues to provide evidence of a highly unequal social and economic population with the historically disadvantaged continuously being locked in a cycle of poverty and limited resources: “With a Gini Coefficient increasing from 0.64 in 1995 to 0.69 in 2005, the country can be viewed broadly as the most consistently unequal country in the world” (Van der Westhuizen, 2012:33).
- Linked to the high inequality ratio is the significant lack of emphasis on the humanities and social sciences. The focus of higher education funding for development has to date been on fields related to science, engineering and technology. There seems to have been a neglect of the humanities and of the issues around which the social fabric of the country has developed over the years. Some of the issues identified in the plan are: emerging identities, language, ethics, morality, liberation struggles in the political, social and economic domains, and the discovery of humankind (*Ubuntu*). They constitute fundamental human projects for inquiry and development. Hence, development and innovation would have to be conceptualised more broadly beyond the economic and tangible parameters so as also to include the social and human aspects that are needed to build a knowledge economy in contemporary society.
- The last implication for developing and enhancing an innovation system able to respond to development needs will be the need for venture capital. While the first issue relates to government funding of higher education, it will be important for the economy and the private sector rapidly to enhance its capacity to support research and development through scholarships and to do so through a closer relationship between academic research funding and application. Top research universities and other research

institutions will have to forge better partnerships and networks with both national and foreign potential investors and sources of venture capital needed to ensure the required levels of innovation and technology transfer across the different sectors, institutions and disciplines. This closely links to the notion of absorptive capacity discussed earlier in the theoretical chapter (Section 3.2.3). Absorptive capacity will have to be developed by transforming existing firms and industry to enable them to make use of the increase in knowledge production by developing their innovative bases or through the attraction of foreign investment to make use of the human and intellectual capacity being developed through knowledge and innovation.

The South African NDP: Vision 2030 provides an accurate picture of the country's current development status in the context of all the different sectors relevant to development planning for economic development. While this thesis does not provide an in-depth review and analysis of the entire document, the above section has provided a broad review of South Africa's development thinking in the light of higher education planning for knowledge production, innovation and learning towards developing a knowledge-based economy. While the plan proposes important aspects for developing a higher education system fit for adequate and relevant knowledge, the success of the plan will however be measured by the success of all the other aspects in the process of national development that have direct and indirect implications for higher education access, funding, quality, equality and throughput. The success of the plan – and the subsequent transformation of the economy to a knowledge economy – will depend less on the higher education and training sector than on the integration of every sector contained in the plan and also of other policies related to higher education, knowledge production, innovation and economic development. The next section provides a short synthesis of all the policies reviewed in the chapter.

4.5 Synthesis: the South African national policy environment

Higher education, universities and knowledge-producing institutions have increasingly taken centre stage in contemporary development discourse. This is tied to the new and growing emphasis being placed on knowledge and learning in regional and national development (Florida, 1995; Morgan, 1997). For economies that have made the successful transition from being resource dependent to being knowledge and innovation based, there have been clear policies and timelines to ensure such change. South Africa, being an aspiring economy, has

also recognised the indispensable role of knowledge, knowledge workers and innovation in its development pathway. This recognition has been articulated in diverse ways across different government agencies, departments and policy channels.

The above review has featured four key policy statements that are aimed at placing the South African economy in a knowledge and innovation discourse – a paradigm shift towards knowledge, innovation and knowledge workers, one that is needed to integrate contemporary development policy and practice. As is evident from the review process, there is a gap between each of the policies reviewed. Though all the policies reviewed provide concise evidence of an attempt to bring knowledge and innovation into national development planning, there seems to be a disjoint between the different policies. Though all four policies are proposed and established by the Department of Science and Technology, they seem to lack coherence in that newer policies fail to build on previously existing policies so that there is both a limited emphasis on addressing the challenges faced by the previous policy and on how the newer policies aim to address such challenges.

At a comparative level, other key areas lacking sufficient emphasis in the policies reviewed are issues around adequate access to higher education, transition from the undergraduate level to the postgraduate level, and the throughput rate of knowledge producers in the form of PhD graduates. For higher education to be able to make the expected contribution to knowledge production and exploitation, knowledge producers and workers have a key role at both the policy and practical levels.

However, in emphasising the role of knowledge and development, of universities and research institutions and of human capital in development thinking, the policies also do much to build on best practices from other successful regions. This, according to the broader development literature, continues to be a challenge in most developing countries and especially those in the sub-Saharan region. All the policies recognise the following key areas:

- Scientific innovation;
- Human capital creation;
- Knowledge production and exploitation (research and development); and
- An integrated governance approach.

In summary, the South African policy environment, when compared across the African continent, provides a possible benchmark for other countries desiring to change to a knowledge economy. While the current policies may not provide a coherent and comprehensive framework for action, there is adequate government sensitisation and effort to steer both the knowledge institutions and the potential investors towards an economy less dependent on natural resources and moving more towards knowledge and human capital.

From a broader development-planning perspective, the next section provides an analysis of the above policy documents on knowledge production and innovation at the national planning level specifically in the context of the knowledge economy discourse as presented in Chapter Two and Chapter Three of this thesis. The aim of the analysis is to indicate the level of conceptual and practical alignment between the above policy documents – aimed at enhancing knowledge production, innovation and skills development – and the NDP and how in a bid to place knowledge at the core of socio-economic development.

Using the theoretical tools of the learning region approach to enhancing the role of knowledge and learning in development, one of the critical aspects that relates to every policy on higher education at the system and the institutional level is the extent of institutional embeddedness of research and learning organisations. Embeddedness, earlier defined by as the “intersection of multiple networks” (Smith-Doerr & Powell, 2003:35) provides the social and structural framework to understand how multiple networks stitch together a community [region or even nation] [by] generating multiple independent pathways.

A knowledge-based economy relies primarily on the use of ideas rather than on physical abilities, and on the application of technology rather than on the transformation of raw materials or on the exploitation of cheap labour. These ideas and knowledge however need the right ‘infostructure’ and social structure to enhance its flow to the relevant users. In a Taiwan case study on the transformation of a late-industrial district to a high-tech sector it was concluded that, besides the decentralised system of innovation, networks remain an essential aspect in innovation and economic and technological transformation. Hsu (2004:229) concludes that in the said transformation, “[L]earning by networking became dominant for the decentralised system. In the learning process, it took close social ties to identify the ‘right’ people, and thus the ‘right’ technologies, and ensure the transfer of the embodied tacit knowledge”.

While higher education, innovation and the national development policy in South Africa seek to enhance the transformation of the economy to a knowledge economy, a main prerequisite for

ensuring the transition is a decentralised knowledge-production and innovation system, one with close ties and networks that will ease the identification and use of the right resources, technologies and mechanisms to facilitate the proposed transition.

The need for a network structure, as observed in most developed and emerging economies, further provides a significant challenge to an economy and society like those of South Africa that come from a history of division not only along racial lines but also along social and ethnic lines. Coleman (1988) argues that institutional embeddedness depends strongly on social ties as an enabling environment; and if social ties originate from social capital – defined as “institutions, relationships and norms that shape the quality of a society’s social interactions” (World Bank, 1999) then institutional embeddedness is a direct result to the types of social capital present in a region, or community. Achieving institutional embeddedness will therefore require better social institutions and relationships. Stern (1991) calls this *social infrastructure*.

This links up with one more salient aspect of the learning region, namely trust. As pointed out, “a fundamental element in economic development is the progressive extension of trust from more immediate relationships of the personal kind to more formal ... institutions” (Solari, 2004:4). Inasmuch as the policy documents make significant efforts towards addressing institutional and financial aspects of innovation for development – including the need to retain and attract the right and needed human capital – less emphasis has been placed on the softer issues of developing and enhancing networks, trust and sustained interaction between key stakeholder sectors in the innovation and development process. While this relates to both historical and institutional challenges, overlooking these issues could hamper the overall role of knowledge and innovation for South Africa’s transformation and socio-economic development.

Furthermore, though the South African government has made major strides towards enlarging its research potential and improving the quality of research and development and innovation by now recognising the local and regional development, much still has to be done at a practical level to ensure that the regional emphasis goes beyond policy acknowledgement. Financial and other incentives are required so as to promote the regional/local RDI activities. The higher education sector, which includes both universities and FETs, has a crucial role to play as suppliers of human capital, skills and knowledge to the regional economies. While the higher education sector at large and the different universities seek to attain world-class status, able to compete with systems and institutions in more advanced economies, it is important that both the regional dimension and relevance of the system and of the institutions be upheld.

4.6 Conclusion

The objective of this chapter has been to provide a broad overview of the policy environment governing the production, exploitation and transfer of knowledge from universities in the South African context. The chapter has given a broad overview of policy initiatives and structures across the continent by referring to some countries and organisations. At the continent level, the review has revealed that the role and contribution of knowledge via research and development is taking an increasingly significant place in development discourse. This trend however, still has a long way to go both in developing appropriate implementation structures and in providing adequate funding mechanisms to enhance knowledge production and transfer from higher education institutions so as ultimately to enhance regional and national development by knowledge users.

At the national level, the review has revealed that South Africa has made significant efforts to enact concrete policies and funding mechanisms to support knowledge production and transfer from universities, research institutions and centres of excellence. The need for knowledge and technology transfer has both been recognised and developed through inclusion in national and institutional policies as observed in those of the UFS. There have also been policy efforts aimed at integrating various government departments and stakeholders in the process of knowledge production and application for development.

The review has further revealed that some key issues mentioned in the broader literature have not been addressed by the policy documents. First among these is the absence of policies and structures aimed at developing and enhancing the absorptive capacity of key firms and potential knowledge users at the national and the regional level. Agrawal (2001) along with other authors (Bramwell & Wolfe, 2008; Cohen & Levinthal, 1990) argues that while knowledge production by research institutions remains the first important factor in knowledge transfer, firms can only absorb as much knowledge as their absorptive capacity permits – hence the need to develop frameworks for reflecting on firms' strategies to influence absorptive capacity. While the NDP alludes to enhancing the entrepreneurial capacity of the nation, no precise plan of action is given nor are the responsible bodies designated to ensure that this is achieved. Another important aspect not significantly articulated in the review is the articulation of the notion of institutional embeddedness of the knowledge-production institutions and of the potential knowledge and innovation users in a networked structure. Table 4.1 below is a summary of the chapter and the key policy documents, their main attributes and how they relate or fail to relate to knowledge transfer and development.

Chapter Five provides an analysis of the higher education and development policy relationship at provincial level. Using provincial and institutional policies, the chapter provides an analysis using theoretical constructs from the learning region to see how the role of knowledge and its transfer have been articulated in the different policy documents.

Table 4.1: Summary of the South African policy environment in knowledge transfer and development

	Policy document	Main attributes	Relevance to knowledge transfer	Perceived shortcomings in knowledge transfer
1	The 1997 White Paper on Higher Education	<ul style="list-style-type: none"> - Increased participation - Greater responsiveness - Increased cooperation and partnership in university governance 	<ul style="list-style-type: none"> - Need for more skills training - Meeting the socio-economic needs of society - Ensuring networks, trust, partnerships and knowledge-sharing 	<ul style="list-style-type: none"> - Participation aimed at redress rather than development - Limited relevance of skills - Limited institutional cooperation and trust between historically disadvantaged Institutions and historical Afrikaans institutions - Ignores issues of lock-ins
2	White Paper on Science and Technology: "Preparing for the 21st Century"	<ul style="list-style-type: none"> - Identifies key science and technology requirements - Seeks to link science and technology with national growth - Promotes linkages between sectors - Emphasises funding for innovation 	<ul style="list-style-type: none"> - Provides the key aspects as identified in a learning region - Typical learning region aspects such as partnerships, venture capital and infrastructure 	<ul style="list-style-type: none"> - Fails to integrate governance issues - Limited private sector buy-in regarding venture capital - Relatively weak on social development
3	NRDS	<ul style="list-style-type: none"> - Focuses on innovation to bridge the chasm - Emphasises science, engineering and technology skills - Transforming human resources - Effective governance 	<ul style="list-style-type: none"> - Shift from White Paper's transformation overtone to relevant skills 	<ul style="list-style-type: none"> - Linear innovation thinking - Limited understanding of notion of learning and 'unlearning'
4	Ten-Year Innovation Plan (2008–2018)	<ul style="list-style-type: none"> - Identifies four key elements: human capital, research and development, knowledge infrastructure and enablers - Plan is enshrined in five grand challenges - Technology Innovation Agency identified to bridge innovation chasm 	<ul style="list-style-type: none"> - Follows integrated approach to include different sectors - Highlights the role of networks - Includes the social aspects of innovation 	<ul style="list-style-type: none"> - Inadequately integrates NEET youths in its conceptualisation - Seems to be weak on implementation
5	NDP Vision 2030	<ul style="list-style-type: none"> - Identifies education as one of the central challenges to South Africa's development - Role of the national information system in supporting national development - The importance of learning and 'unlearning' - Shift from overreliance on primary sector to innovation and competitiveness 	<ul style="list-style-type: none"> - Learning and unlearning skills - Emphasis on skills especially on the science, engineering and technology skills - Production and retention of skills to increase absorptive capacity 	<ul style="list-style-type: none"> - Less emphasis on social science innovation for development - Venture capital mainly rests squarely on government; limited role of private enterprise - Low HE funding (as % of GDP) to reflect development needs and those of emerging economies
<p>In the main, South African HE and development policy is making significant strides towards a national information system and towards increasing competitiveness in the knowledge economy. However, seen through the lens of the learning region more has yet to be done to enhance learning, 'unlearning', an innovative culture and inclusive development.</p>				

Source: Author (2013)

CHAPTER FIVE

THE FREE STATE PROVINCE OF SOUTH AFRICA: AN ASSESSMENT OF THE DEVELOPMENT AND KNOWLEDGE-POLICY NEXUS

At times the university in crisis has been rescued by the urban dynamic surrounding it; though at other times urban developments have threatened to undermine the stability of the academy. Conversely, the university has at times successfully provided a focus and a principle of coherence for the cultural life of a city, [whilst] at others it has withdrawn from the city and undermined urban culture.

Thomas Bender, 1988:4

5.1 Introduction

Chapter Four comprised a policy review and an analysis of some of the major higher education, knowledge production and development policies at the national level. The aim of the chapter was to investigate the extent to which the role of universities, knowledge production and transfer had been integrated into development thinking at the national level. In this chapter, the focus shifts to the regional/provincial level. The emphasis is on understanding the current state of development in the province, its development policies and the place of the UFS within the provincial development strategy. As seen in Chapter One, the notion of a region is continuously being defined and redefined, with definitions ranging from it being a political administrative boundary, a geographical area or an economic space (Chatterton & Goddard, 2000). In this study, while emphasis has been placed on Bloemfontein and its surroundings, the case study region is the Free State Province as a whole. The Free State Province boasts two universities, namely the Central University of Technology (CUT) and the UFS. In view of the fact that the UFS is the only traditional university⁸ in the central South African area, the role of this university is expected to have a significant impact far beyond the stated region.

Studies on universities' contribution to regional socio-economic development contend that the engagement of higher education is strongly linked to "the context of the higher education and regional policy drivers that are encouraging universities to become more engaged with regional business innovation" (Goddard et al., 2012:1). Based on previous OECD studies (2007b, 2011), it has also been observed that the drivers of and barriers to university engagement are significantly dependent on three issues. Firstly, the national and regional expectations placed on the university; secondly, the difference between economic sectors (agricultural versus industrial); and, thirdly, regional capabilities and institutional thickness. It therefore becomes important to

⁸

place the regional or provincial policy of the case-study area in historical and socio-economic context.

This chapter is divided into three main sections. The first section concentrates on the regional profile and the Free State Growth and Development Strategy (FSGDS). The second section, devoted to a profile of the UFS, examines three of its key policies that are indicative of how the university positions itself in the broader role of regional development. The final section assesses the OECD Higher Education in Regional and City Development Report on the Free State.

5.2 Socio-economic context of the Free State in the knowledge economy

5.2.1 Historical context

It is not the aim of this section to provide a full historical overview of the Free State Province. However, the current state of development in the province should be viewed against its historical context. A few important points therefore need to be made in this regard.

First, the Free State Province is one of the provinces in South Africa in which the relics of the apartheid system are still easily visible. Aspects of the previous regime – such as settlement and housing planning, and education patterns – remain strongly visible in the Free State. Areas such as ThabaNchu and Qwaqwa, both former black⁹ homelands, remain relatively less developed in comparison with neighbouring ‘white’ town and city areas (Marais & Pelsler, 2006). Second, the principle of land segregation that was enforced by the Native Laws Amendment Act of 1937 prohibited blacks from buying land in urban areas, thereby creating a highly segregated landholding system. Third, the education system was driven along racial lines so that schools in the urban (white) areas had more resources and performed better than their counterparts in the homelands and in the former black suburbs.

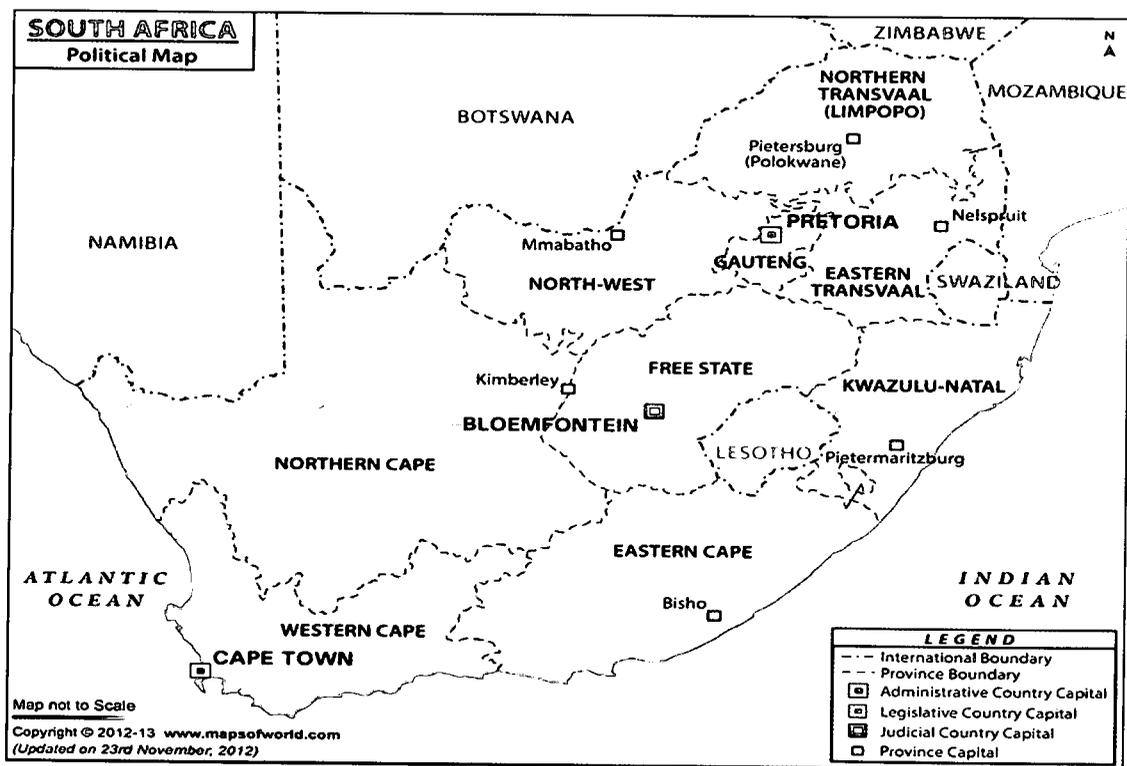
Following the 1953 Bantu Education Act, black education was aimed at providing a labouring class and thus higher education was not initially perceived as a necessity for black people in general. In an attempt later to provide black South Africans seeking higher education with access to such institutions, ‘black’ universities were established in the townships. In the Free State, two such universities for black people were established, namely the Vista University for urban blacks with campuses in Bloemfontein and Welkom and a rural campus attached to the University of the North in Qwaqwa. The UFS and the later established Technikon (now the CUT) were reserved mainly for whites.

⁹ *Black* here refers to black Africans, coloured and Indian people.

5.2.2 State of development in the Free State

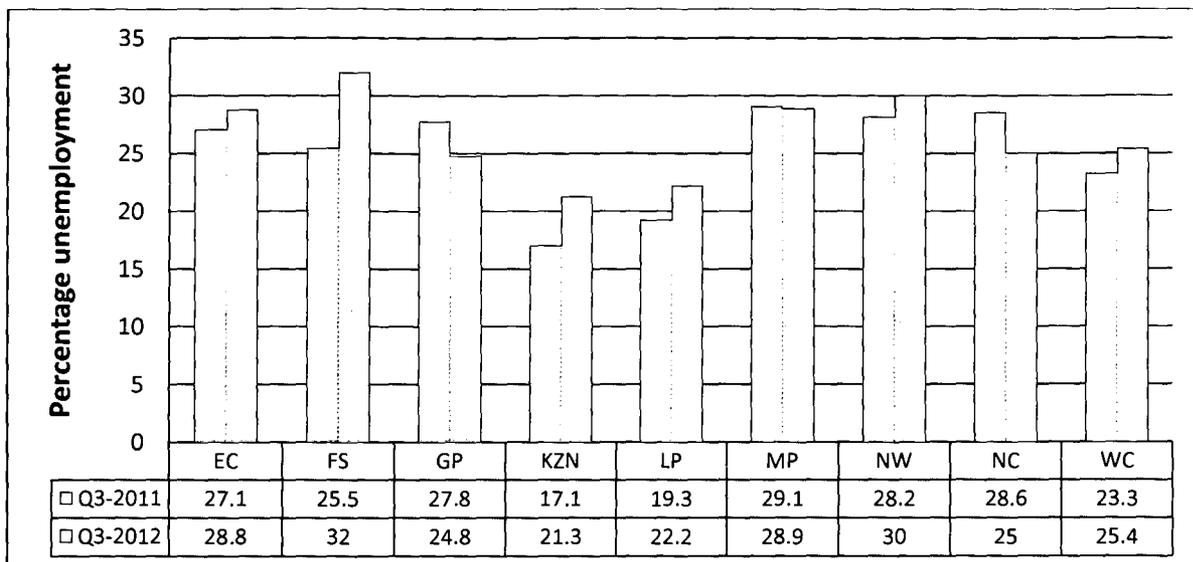
This section assesses the economic profile of the Free State Province and provides a review of its current level of development. The Free State Province is centrally situated in South Africa and shares boundaries with six other provinces and also with the Kingdom of Lesotho. The province has the third largest surface area of all the South Africa's provinces. This landlocked province with its predominantly semi-arid vegetation historically was and currently still is a strong production centre for agriculture. It has thus commonly been known as South Africa's 'bread basket'. Figure 5.1 provides a contextual location of the Free State province within the broader South African context.

Figure 5.1 Location map of the Free State province in South Africa



The province is divided into four administrative districts and a metropolitan area (Mangaung), with a total population of about 2.9 million people. Population growth has, in general, been lower than the national average, this reflecting an outflow of people from the province to other provinces in a search for better opportunities (Marais & Pelsler, 2006). While there seems to be a general South African trend towards increased unemployment, Gauteng excepted, the Free State Province has, in comparison with the other provinces, experienced the highest levels of unemployment between the third quarter of 2011 and the end of 2012 (see Figure 5.2).

Figure 5.2: Unemployment percentage per province in South Africa, 2011 and 2012¹⁰



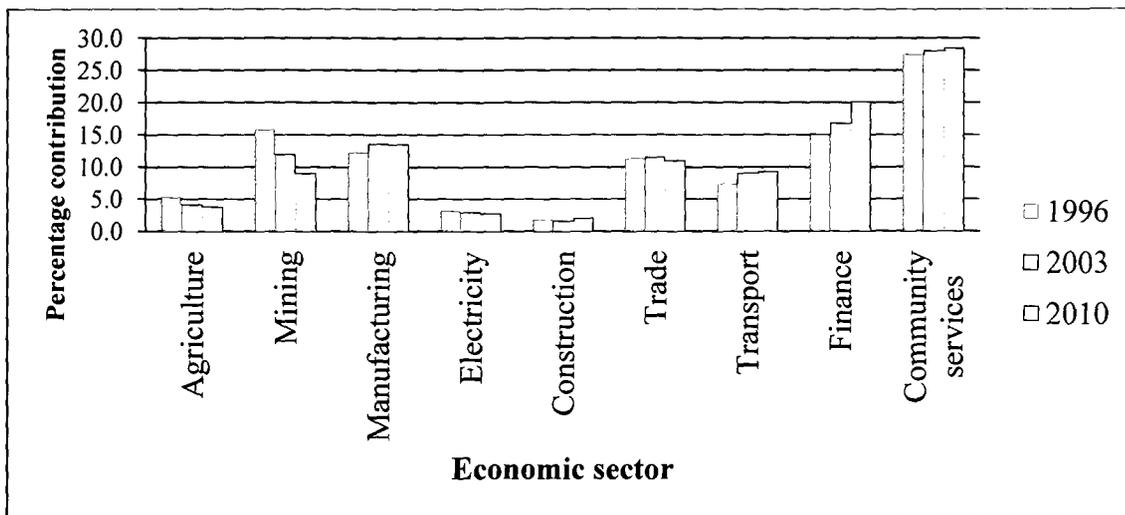
Source: Statistics South Africa, 2012

The main language of communication in the province is Sesotho, a language also spoken by the people of the neighbouring Lesotho. Sesotho is spoken by approximately two-thirds of the Free State population (mostly black Africans) while Afrikaans is spoken by the majority of the white and coloured populations (who respectively make up approximately 9% and 4% of the total population).

Historically, the province has been highly dependent on mining and agriculture (Marais, 2006). In the early and the mid-1980s, these two sectors contributed approximately 50% of the Free State's economy (Marais, 2011). Once significantly dependent on the primary sector, which included agriculture and mining, the province has, over the past two decades, witnessed a major decline in its primary sector with the current estimates at about 13% (Marais, 2013; Marais et al., 2011). Figure 5.3 provides a graphic representation of the contributions of the different sectors to the provincial economy over time. The significant decline in the primary sector (mining and agriculture) should be noted.

¹⁰ EC = Eastern Cape; FS = Free State; GP = Gauteng Province; KZN = KwaZulu-Natal; LP = Limpopo Province; MP = Mpumalanga Province; NW = North West; NC = Northern Cape; and WC = Western Cape.

Figure 5.3: Percentage contribution of economic sectors in the Free State, 1996, 2003 and 2010



Source: FSGDS, 2013

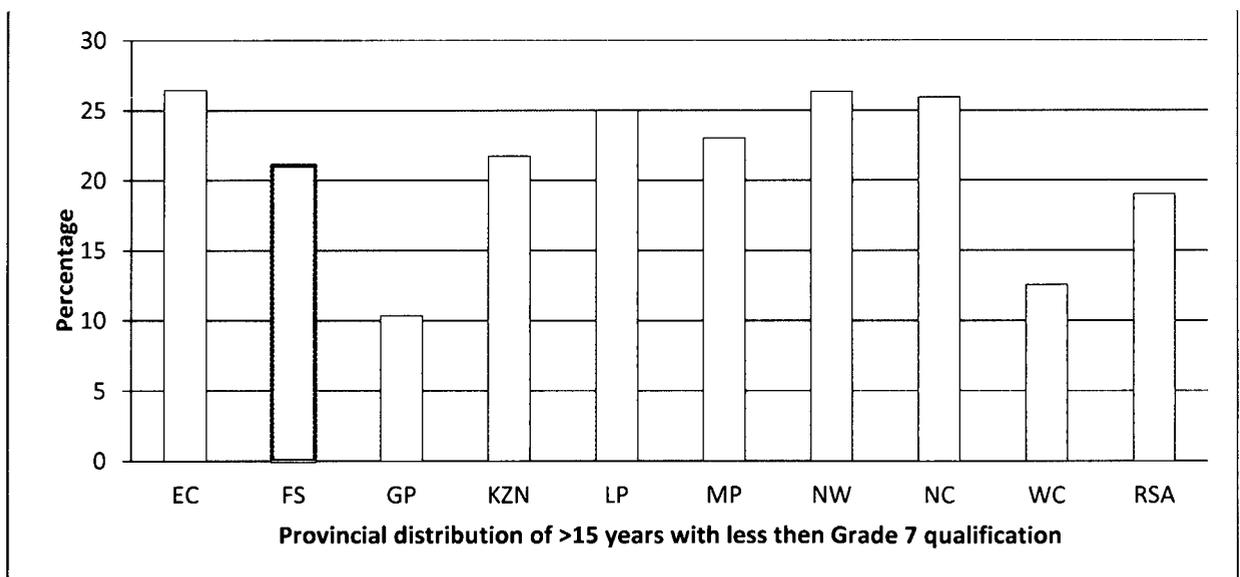
While the declining primary sector can be perceived as signifying progress and as reflecting the maturing of an economy as it shifts to secondary and tertiary sectors, the declining primary sector has in fact contributed to the poor socio-economic outlook of the province (Marais, 2006; 2011; 2013). The FSDGS observes that the decline of the primary sector coincides with high levels of unemployment in the unskilled and low-skilled population groupings (mainly in agriculture and mining). Low-skilled people have difficulty finding jobs in other sectors. In this regard, Marais and Pelsler (2006) have noted that approximately 230 000 people left commercial farms in the Free State between 1991 and 2001 – most of these being low-income farm labourers.

A number of complex reasons have contributed to this exodus. Firstly, Atkinson (2007a) notes the role of security-of-tenure legislation, while the role of increasing mechanisation on farms should not be underplayed in this regard (Marais, 2006; Marais & Pelsler, 2006). Farming has, to a large extent, changed from a labour-intensive industry to a knowledge-intensive industry, assisted by the fact that subsidies historically paid to farmers were phased out by the early 1990s. However, the labour-absorption rate of agriculture is still significantly higher than that of other economic sectors. Secondly, the decline of the primary sector was not followed or replaced by a growing secondary or manufacturing sector. Thirdly, the decline of farming and mining has led to a steady level of migration to metropolitan areas, thereby increasing demands on service delivery in the urban areas while exacerbating population decline in the previous mining and farming towns (Marais, 2006; 2011; Marais & Pelsler, 2006).

5.2.3 The state of education in the Free State

A recent study of the Free State reveals considerable improvements in functional literacy and in university entrance (Grade Twelve) pass rates since the immediate post-apartheid years. The pass rates have increased from an average rate of 56% in 1994 to 81.1% in 2012 (Department of Basic Education, 2012). However, considerable doubt exists whether these improvements in Grade Twelve pass rates have indeed improved the skills levels of people older than eighteen years of age. Of the total population of the age group older than fifteen years, more than 69% have a qualification lower than a Grade Twelve certificate. Only 23% have Grade Twelve certificates, while a meagre 8% have a tertiary qualification of any kind. The South African 2011 Census Report reflects that these trends have persisted. The Free State Province continues to show low educational levels in that more than 20% of the fifteen years and older cohort have a qualification of less than Grade Seven (Stats SA, 2012) (see Figure 5.4).

Figure 5.4: Educational level of the population >15years by province in 2011¹¹



Source: Adapted from Statistics South Africa, 2012

While a number of reasons could account for this poor performance in educational and skills attainment in the province, it is evident that the educational skills levels in the province remain low. This low skills level is also a key characteristic of a less favoured region and it limits the innovation capacity of a region. In the contemporary knowledge economy, societies that have succeeded in their development planning have strategically situated policies and practices to ensure that human capital development becomes a key asset in such development planning (Puukka et al., 2012).

¹¹ RSA represents the Republic of South Africa

Furthermore, the province significantly suffers from low levels of advanced research with no major research institutions other than universities. The low industrial base (Nel, Rogerson & Marais, 2006) and high primary sector employment also contribute to a high rate of brain drain, limited higher education research and development and also limited gross domestic expenditure on research and development. The Free State Province shows a significantly low GDP in comparison with those of the major industrialised provinces (Gauteng and Western Cape) that are striving actively towards developing a knowledge economy.

It is observed in the OECD report (Puukka, et al., 2012:78) that, “the strategic role of higher education institutions in the region is not reflected in the FSGDS ...” supports the argument that one of the major institutional challenges or lock-ins faced by less successful regions, as identified from the broader literature, is the lack of collaboration between the universities and the public and private sector stakeholders in less favoured regions (Hassink, 2005). Furthermore, the review acknowledges that there have been limited attempts by either the higher education institutions in the province or the provincial government towards regional collaboration. This perceived lack of synergy and integration – even where higher education and research institutions do exist – has been identified as a key problem confronting less successful regions.

Another significant finding from the policy analysis is the apparent omission of the OECD findings in the development of recent Free State policies. Both the UFS Strategic Plan and the FSGDS have failed to integrate the OECD Review recommendations in their design. The Commission of the European Communities posits that

... it is not simply the presence of units of research and technological development infrastructure but of the degree of interaction between them which is the most significant factor in local (regional) innovation. The quality of the linkage and the presence of local synergy is the key element. Therefore a system or network approach provides the best basis for understanding and promoting regional research and technological development-based innovation (Commission of the European Communities, 1988 in Morgan, 1997:S152).

The absence of such a system or network, of local buzz and of synergy contributes to the status of the Free State region as a less favoured region. The implications of this lack of local synergy on the role of knowledge in regional development will be dealt with in later sections.

5.3 The FSGDS

Given the comments by the OECD on the place of universities in regional planning documents, the focus now shifts to the FSGDS¹². The section starts off with a broad overview of the

¹²It should be noted that since the OECD Review in 2010, the Free State Provincial Government has embarked on the development of a new growth and development strategy.

FSGDS. This is followed by more in-depth discussion in respect of agriculture and skills development. The section concludes with an evaluation of the FSGDS against the backdrop of the knowledge economy and the learning region concept.

5.3.1 An overview of the FSGDS

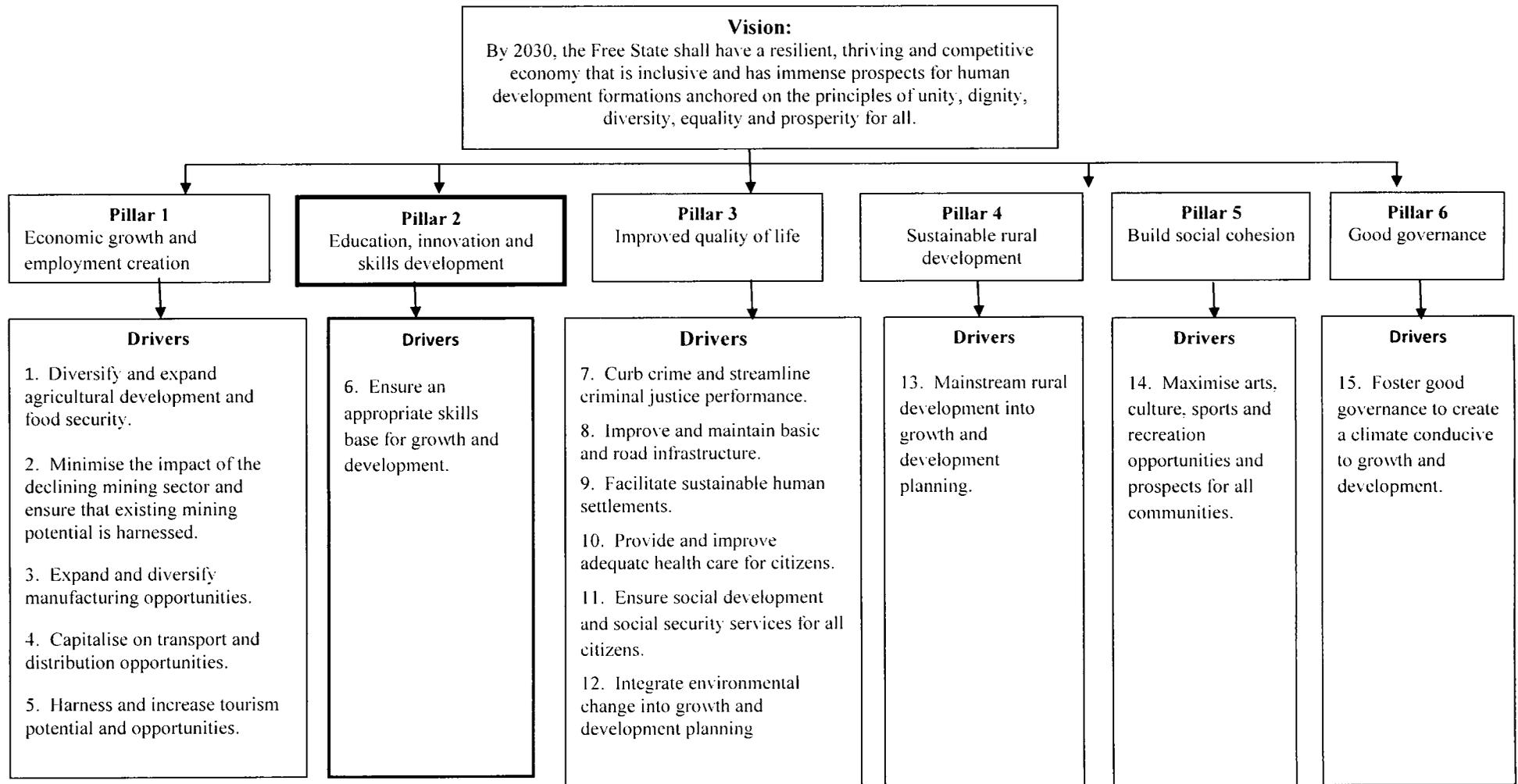
Though Rogerson (2010) maintains that provinces have a crucial role to play in respect of local economic development and regional planning, very little research has considered the role of provinces in either academic literature (Marais & Botes, 2008) or in grey literature (Lambshhead, 2007). According to the Free State strategy, the province envisions that “[B]y 2030, the Free State shall have a resilient, thriving and competitive economy that is inclusive with immense prospects for human development anchored on the principles of unity, dignity, diversity, equality and prosperity for all” (FSGDS, 2013:22). This 2030 vision is enshrined in six pillars (FSGDS, 2013:23):

- Inclusive economic growth and employment creation;
- Education innovation and skills development;
- Improved quality of life;
- Sustainable rural development;
- Building social cohesion; and
- Good governance.

According to the FSGDS, its vision and its mission extend beyond the above pillars. For each pillar, a number of drivers have been identified to address particular aspects of the pillar, which, in turn, are expected to contribute to the realisation of the vision (see Figure 5.5).

This thesis will not provide an analysis of the entire FSGDS. Rather, the focus will be on aspects related to education and higher education, education’s role in skills development, knowledge production, innovation and development with a specific focus on the agricultural sector. The principle of “education, innovation and skills development” forms one of the six pillars of the FSGDS. The FSGDS also proposes two key drivers that are both relevant to the Free State knowledge economy: “ensuring an appropriate skills base for growth and development”, and “diversify[ing] and expand[ing] agricultural development and food security”.

Figure 5.5: FSGDS framework, 2013



Source: Developed from FSGDS, 2013

5.3.2 Conceptualising agriculture in the FSGDS

Historically, agriculture has been one of the driving forces of the Free State's economy. Thus the role of agriculture as a job creator, particularly for low-skilled people, should not be underestimated. In a position paper on agriculture's contribution to the development of the FSGDS, nine crucial challenges are articulated. These include the following:

- The diverse nature of agriculturalists, ranging from commercial farmers and agribusiness to a new generation of black farmers, has implications for knowledge transfer.
- The Free State's agricultural sector focuses on commodities such as beef, mutton, wool, maize, fruits and vegetables.
- The overall profitability of the sector is under pressure mainly as a result of subsidised international production processes, intense competition on agriculture markets and because there is no tariff protection for South African farmers.
- Rural safety and security are major concerns, especially in commercial farming areas.
- The sector has shed a considerable number of jobs over the past twenty years, and although employment absorption in the sector remains high, it is considerably lower than it was twenty years ago.
- The importance of maintaining agricultural ecosystems has become an important international and national consideration. Agriculture is the main form of land use practised in the province, which has major impacts on especially river ecosystems and soil condition. This ecological imperative becomes even more important when one considers the potential influence of global warming.
- The introduction of genetically modified organism the management of these processes and the environmental risks associated with them should be acknowledged.
- Agriculture is important for food production and food security.
- Social issues such as temporary workers and farm labourer housing are also factors that cannot be ignored.

In addition to these issues, the FSGDS argues for a specific agricultural strategy on the basis of three main criteria: agriculture's importance for food security, its labour absorption rate and its contribution to rural development. Seven strategic interventions are proposed in the FSGDS with regard to agriculture:

- Expand and diversify sustainable agricultural production and food security;

- Accelerate land reform and also post-settlement programmes (the latter referring to the settlement of new black farmers);
- Strengthen agricultural research, knowledge and skills;
- Improve and maintain agrilogistics such as roads, rails and storage facilities;
- Establish and fast-track value-adding processes;
- Expand social service delivery to farm labourer communities; and
- Strengthen the rural safety of farm communities.

Though the FSGDS proposes a range of programmes within each of these strategic imperatives, these will not be discussed in detail. The relationship between agriculture and knowledge nevertheless has several dimensions. The FSGDS refers specifically to building skills so as to ensure adequate human resources development and the creation of social networks for emerging farmers. It focused on agricultural schools, the role of FETs in providing technical skills for agriculture, ensuring that agricultural curricula are in line with the needs and development challenges of agriculture in the province, the introduction of internships and the integration of entrepreneurship and agricultural training. At the same time, the FSGDS assumes that a considerable amount of knowledge is instilled through many of the programmes. One of the strategic interventions refers specifically to “[S]trengthening agricultural research, knowledge and skills”. The strategic imperative is thus to strengthen the linkages between universities, farmers and government. The FSGDS also refers to knowledge in respect of new products and market intelligence. Finally, the strategy emphasises the importance of adding value to agriculture, of stimulating the growth of the agricultural sector in the Free State and of creating new markets for existing products. The growth of the agricultural sector in the Free State is highly dependent on this notion because it will create new markets for existing products. This will however require a considerable amount of research and development.

5.3.3 Education, innovation and skills development

This section analyses two key factors. It firstly provides an overview of the FSGDS pillar “education, innovation and skills development”; secondly, it analyses skills development as an aspect that cuts across each of the six pillars.

The “education, innovation and skills development” pillar is based on one driver, namely to “ensure an appropriate skills base for growth and development”. Four main strategic interventions are linked to this driver (see Table 5.1).

Table 5.1: Long-term initiatives to ensure an appropriate education and skills base for growth and development in the FSGDS, 2013

Improve educator performance	Intensify and expand school management and performance programmes to ensure effective and efficient teaching ethics and environment.
	Improve the qualifications and performance of existing educators through bursaries, continuous professional development, mentoring and coaching (focused on mathematics and physical science).
	Implement a focused recruitment programme to attract suitable candidates for the education profession.
	Ensure that universities produce demand-driven, qualified educators.
	Intensify the early childhood hub of the service programme.
Promote an enabling environment to increase educational performance	Expand and intensify: <ul style="list-style-type: none"> • The school infrastructure programme (new schools and schools-related facilities including no-fee schools) • The comprehensive school maintenance programme • The rural/farm school development programme • The school nutrition programme and transport services • The comprehensive wellness programme • Libraries / mobile libraries
	Ensure provision of adequate and timeous learning materials and equipment.
	Capacitate school governing bodies of targeted schools to play an integral role in improving education.
	Revitalise extramural activity programmes in targeted schools.
Promote flexible and specialised learning systems	Institutionalise mother-tongue education for Foundation Phase to address numeracy and literacy in targeted schools.
	Develop and implement a specialised programme for mathematics and physical science for targeted schools.
	Extend early childhood development programmes to as many pre-school children as possible.
	Promote and implement e-learning approaches and programmes.
	Reposition the system of special schools and schools of industry.
Create an environment and relationships in which post-school education institutions / training agencies respond to the educational and skills demands in line with growth and development needs	Improve the ability of the intermediate sector (nursing college, agricultural colleges, FET colleges) to: <ul style="list-style-type: none"> • Improve post-Grade Twelve vocational training quality and results (first-qualification level). • Increase workplace experience. • Provide continuous training via vocational training.
	Position the FET colleges to: <ul style="list-style-type: none"> • Provide Grade ten to twelve vocational training. • Ensure bridging opportunities for non-qualified, out-of-school youth.
	Establish an operational, inclusive support system to foster collaboration between educational institutions, workplaces and the public sector.
	Ensure continuous responsive curriculum development in line with growth and development needs.

Source: FSGDS, 2013

The four interventions include: improving educator performance, improving the enabling environment in relation to school education, promoting flexible and specialised learning systems, and creating an environment in which post-school education institutions and training agencies respond to educational and skills demands in line with growth and development needs. The first two strategic imperatives are related mainly to school-level education. Strategies Three and Four have considerable implications for universities in the region and also for the relationship between places of work and institutions (both secondary and tertiary) of learning.

The provincial development plan highlights a wide range of social and economic issues that aim at transforming the economy to become more knowledge intensive. These include complementing primary agriculture by promoting agro-processing, enhancing tourism and value addition in the mining industry, and building on the importance of the petrochemical industry in Sasolburg. Appropriate skills and skills development are also required for governance and environmental management. Based on earlier findings (Centre for Development Support, 2004:14), there are three requirements for these targets to be met:

- Significant growth in the science, engineering and technology sectors;
- Well-structured innovation support systems and measures; and
- Improving the size and quality of the human capital base of the province at all levels of education, with emphasis on higher education and FET.

5.3.4 Evaluating the FSGDS

To start with, the specific structure of farm ownership and mechanisms for knowledge transfer are not considered by the PGDS. Investment in research and development in the agricultural sector has come from four main sources (to be discussed in greater detail in Chapter Seven), namely government departments, government-funded national research bodies, farm businesses and producer organisations. The fact that the Free State consists largely of individually owned farms suggests that the overall need for research and development will most probably be channelled through producer organisations and private agribusiness.

A second difficulty is that the FSGDS fails to examine the existing knowledge-transfer system in agriculture at the provincial level. Institutions such as farmer unions, the deeply embedded social relations between farmers (and within families) and a long-standing relationship between existing farmers and knowledge institutions that resulted from formal training have

all been important aspects in the knowledge-transfer discourse. Essentially, commercial farms have a higher knowledge absorptive capacity in the region (see Chapter Three) than do emerging black farmers. Although the FSGDS emphasises the importance of creating a formal association for black farmers and also of promoting knowledge and research, the strategy does however not articulate formal and informal knowledge-transfer systems and processes.

A third difficulty is that the FSGDS does not articulate a strategy to ensure significant transfer of knowledge between the UFS and government in the province. While policies allude to the need for knowledge and skills development, there is currently no formal structure through which the results of agricultural research are disseminated from university to government structures. This is in contrast to the process of knowledge transfer in other regions and sectors in which firms clustering and organisational structures at the inter-firm and the intra-firm levels support knowledge transfer (Amin & Thrift, 1995:102).

Despite the relationship between agricultural development and rural development having been articulated in the FSGDS, the pillar relating to rural development does not build on this notion. Historically, many of the small towns in the Free State have played the role of rural service centres based on agricultural production. More recent research has indicated that this relationship is in demise (Hoogendoorn, Marais & Visser, 2009; Toerien & Marais, 2012) in that commercial farmers seem to engage more frequently with agribusiness at the national level both for inputs and for the sale of their products. Although rural development is dependent on a range of other factors, the inherent relationship between agriculture and rural development warrants better understanding in a period of trade liberalisation and improved transport.

A fifth concern arises from the historical divide, which has taken its toll on the innovative capacity of the province. The process of redress, as observed by the Premier's Economic Advisory Council, has also contributed to the poor levels of engagement between different race groups (Premier's Economic Advisory Council, n.d.). The Premier's Economic Advisory Council argues that the transformation of the provincial legislature from a predominantly white chamber to a largely black institution took place very rapidly, which did not offer adequate opportunity for interaction, nor did it provide sufficient time to build the right institutional thickness, resilience, social capital and trust. Against this background, many white officials accepted severance packages and left the public sector for the private sector, with other skilled white people leaving the province altogether. This resulted in an initially

weak interaction between a largely white-dominated business sector and a black-dominated public sector (Premier's Economic Advisory Council, n.d.).

In trying to understanding the perceived breakdown in networking between the white private sector and the predominantly black public sector, research by the Human Sciences Research Council established the following:

It might be that white residents of the Free State have resigned themselves to the democratic dispensation to the extent that they are able to withdraw into a private zone away from the broader society. Such a perspective helps explain why cooperation between government and a largely white private sector has proved difficult in the Free State. Partnerships and/or regulation might be perceived as public interference in a zone increasingly deemed 'private' (Chipkin et al., 2010).

However, the Premier's Economic Advisory Council acknowledges that a positive trend of interaction and engagement between the race groups is slowly emerging. This would nevertheless need to be sustained over a long time to undo the fragmented social system that had come into existence. The Premier's Economic Advisory Council (undated) states that "although white-black relations have improved impressively over the past decade, it should be clear that such dramatic shifts also had an effect on professional and operational white-black interaction in the Free State public sector and in the transfer of skills and experience". In contrast, the Gauteng Blue IQ Project and the Western Cape's Knowledge Economy Strategy, have emphasised the "greater focus on building the research and development base of existing institutions and marginally improved levels of collaboration between the many stakeholder groupings across the system or region" (Centre for Development Support, 2004:6).

Such issues highlight the importance of effective knowledge transfer in creating learning regions. Factors like trust, institutional thickness and governance have been identified as being crucial in the process of knowledge transfer for regional development. Amin and Thrift (1995), in their identification of factors favourable for economic growth at the regional level, propose four aspects of regional governance and institutional relationships:

- Presence of strong local institutions: The presence of local business, chambers of commerce, trade unions, government agencies, innovation and research institutions and development agencies is, among others, a key factor.

- High levels of interaction between local organisations: Formal and informal regular contacts, cooperation and information exchange and forming a degree of mutual isomorphism (Amin & Thrift, 1995:102) are needed to create a mutual atmosphere.
- Mutual awareness: The feeling/notion of being involved in a common enterprise through the development of a common agenda between the different stakeholders in the region or community provides local legitimacy and relations of trust (Amin & Thrift, 1995:102).
- Structures of domination and patterns of coalition: These minimise sectionalism (MacLeod & Goodwin, 1999:513) and enhance both the socialisation of cost and regional coordination.

From the perspective of regional economic sociology and the key constructs of the learning region, it becomes evident that the Free State Province faces two main challenges. The first is its lack of a strong socio-economic base to support regional development, and the second is the absence of an institutional framework for cooperation and development. However, it remains important to examine the extent to which regional development policies seek to address some of these issues in the context of the learning region.

Another issue that the FSGDS fails to articulate is how to forge better relationships with knowledge-producing organisations. Compared with other major regions – the Western Cape, Durban in KwaZulu-Natal and Johannesburg and Pretoria in Gauteng – provincial structures in the Free State have very limited connections with knowledge-producing centres and institutions such as, among others, the Human Sciences Research Council and the Council for Science and Industrial Research. At the human capital level, the majority of graduates from the province seem to migrate to other provinces for better economic and academic opportunities (Puukka, et al., 2012).

However, the presence of the UFS and the CUT provides a potentially rich human capital and skills base, able to provide both formal and informal support and also tacit know-how from university departments, student internships and other forms of engagement. The FSGDS places minimal emphasis on the role played by knowledge generated by both the CUT and the UFS towards developing a regional advantage. Therefore, as observed from the FSGDS, the level of knowledge expectation towards regional development, as recommended by Cooke and Leydesdorff (2006), is weak.

The FSGDS makes virtually no reference to the role of knowledge: the word 'knowledge' appears not more than ten times throughout the document and the single instance of the word 'university' does not relate to an institution of higher learning as such. The term 'innovation' is used once in the title of the second pillar (education, innovation and skills development). Further analysis revealed that the word 'skills' appears more than 50 times throughout the strategy. This shows that, while there seems to be a general consensus on the role of universities and knowledge towards enhancing regional innovation and competitiveness, very few practical steps have been proposed (FSGDS, 2013).

The European Commission (2006:17) in a report entitled *Constructing Regional Advantage*, argues that achieving the goals of a knowledge region will require "changes in the mindset in terms of knowledge valorisation and specific regional advantages". This, it argues, "proves to be a crucial task and allows regions to achieve constructed regional advantage" (European Commission, 2006:17). The report further argues that two main theoretical and practical issues need application:

- Enhanced collaboration between the actors of the triple helix (industry, university and government); and
- Creation- and innovation-oriented work should be organised between the different sectors in order to turn the macro, meso and micro levels of the region into creative knowledge environments.

The FSGDS significantly fails to map out this triple helix or quadrihelix (including civil society) in its key strategies so that there is more emphasis on government and private sector while the role of knowledge and knowledge production institutions is ignored. Instead, the FSGDS places more emphasis on skills development, which, though important, will not provide the relevant absorptive capacity for adequate knowledge production and innovation.

5.4 The UFS in Bloemfontein

The UFS was established in 1904 and celebrated its centenary almost ten years ago. This section focuses on the review and analysis of the different policy avenues and structures aimed at enhancing knowledge production at the UFS and on how knowledge is transferred or utilised towards supporting regional socio-economic development. The CUT, though located less than ten kilometres from the UFS main campus, will not be included in this analysis, which focuses on UFS.

5.4.1 The UFS: an overview

This section of the review of the UFS has been divided into two subsections. The first section offers a historical overview of the university and the second reflects the current situation at the UFS in the context of recent changes.

5.4.1.1 The history of the UFS and the Faculty

The history of the UFS is intertwined with that of both the Free State Province and South Africa in general. Typical features of this history include not only 'separate development', historical privileges for the white minority and ethnic nationalism but also reconciliation, redress and united development. These traits can be identified at different levels throughout the history of the UFS as will be discussed in this section and in the next chapter.

Though it is generally accepted that the UFS was established in 1904, it is interesting that the university was originally established in 1855 as a seminary or theological college for the Dutch Reformed Church. After the birth of the Republic of the Orange Free State in 1854, the then governor of the Cape Colony, Sir George Grey, acquired funding for the college that was later called Grey College to celebrate his memory. Yet it was not until 1904 that the college became the Grey University College, which in that same year registered its first students as an institution of higher learning. Grey University College functioned as a fully-fledged tertiary education institution even though it was still a federated college of the University of South Africa. It was only in 1950 that it gained independence to become the University of the Orange Free State (UFS, 2006b).

Upon achieving independence, one of the milestones of the university was the establishment of a well-functioning faculty system and research institutes to serve the increasing number of students. It then began promoting research in earnest. Another important aspect was the development of early-career researchers into more established academics.

In the years after the 1950s, the university began planning for the establishment of faculties in the fields of agriculture, engineering and medicine. In 1952, at an annual Congress of the National Party (the then ruling party), Prof C van H du Plessis argued for the establishment of an agricultural faculty. He was strongly supported by Basie van Rensburg. This led to the then Minister of Agriculture, SP le Roux, a former student of the UFS, to announce the establishment of the Faculty of Agriculture at the UFS. In 1958, the doors of the faculty were opened and the first students were enrolled. During the inauguration of the Agriculture

Building and the laying of the foundation stone, Minister Le Roux said: "May it be realised more and more that science is the cornerstone of our agricultural industry and that a nation which takes care of its agriculture, is taking care of its future" (UFS, 2006:175). This quote reflects first that the white nationalists perceived the faculty to be of importance at the national level rather than at the regional level. Secondly, the quote emphasises the importance of agriculture within nationalistic ideology. Significantly, however, the requirement of superior knowledge is also embedded in the quote.

It is possible to describe the development of the agricultural faculty in four phases: In the first phase (1950s–1970s), the state was not only instrumental in the establishment of the faculty and supporting its progress, but the state went further to bear the full responsibility for agriculture faculties countrywide until the early 1970s. Faculty staffs were paid by the state and thus received pensions and benefits from the state. Nevertheless, because of the bureaucratic red tape involved in the process of state management, academics began to feel frustrated and therefore the government started handing over the faculties to the respective universities. This entailed a cut in the state's financial contribution that the university had received up to then – a step that plunged the UFS faculty into a period of uncertainty, which was only ended by the intervention of the UFS Senate Committee.

The second phase (1970–1990), involved a period of considerable interaction between the Faculty of Agriculture and the farming community. The research focus during this period was on farm-water management, mainly funded by the Water Research Commission. Grain-related research was another important focus, with extensive research being conducted on wheat pests, seeds and genetics. One of the main achievements during this period was the establishment of a research chair in farm management sponsored by the Maize Council. It was the first such research chair in agricultural economics in South Africa. The faculty also provided technical support through presentations at farmer days, articles in weekly, non-academic, agricultural journals and short courses to farmers. The knowledge produced and its dissemination through various means during this period, in addition to the existence of a highly state-supported industry, laid the foundation for commercial agriculture to prosper after the 1990s.

The third phase (1990–2000) was, in the main, dominated by the rise of the prominence of agricultural economics, while the pressure on sustainability in agriculture was addressed through the establishment of the Centre for Sustainable Agriculture. The Department of Agricultural Economics managed to establish a research chair in international agricultural

marketing and contract research was expanded to 50 researchers. During this phase, the faculty also introduced a question and research service to the agricultural community in South Africa. It also seems that there was a continuation of technical support to farmers, attempts to assist government services and the retraining of agricultural specialist and support workers.

The fourth phase started in 2000 with the amalgamation of the faculties of Agriculture and Natural Sciences. The detailed assessments in Chapter Six and Chapter Seven will provide more detailed accounts of developments during this phase.

Over the years, the Faculty of Natural and Agricultural Sciences has grown from strength to strength to establish itself as one of the best Agricultural Faculties in the country. While the idea of a Faculty of Agricultural Engineering has not yet come to fruition, levels of knowledge output have positioned the faculty on the national and even the international level. This will be explored in subsequent chapters.

To conclude this historical account, two key issues should be highlighted. Firstly, the faculty like, most faculties at the UFS, was established in response to a nationalist agenda. The decision to create the faculty was not a purely academic decision taken by the University council or by Senior Management. It was a state decision based on the state's perception of the university as an instrument to support nationalist ideologies. Secondly, despite its having arguably been created with a nationalist agenda, the faculty began to produce scientific knowledge for the agricultural sector and thus contributed to national and regional development.

5.4.1.2 The UFS today

The UFS has three campuses, of which its main campus is in Bloemfontein. Although the province has two universities with main campuses in Bloemfontein, the UFS is considered to be the only traditional university in central South Africa. In 1904, the UFS had six BA students. Today it has more than 30 000 students in seven faculties on three campuses. The university is host to South Africans from all over the country and also has a growing international student community¹³.

The UFS has only recently committed itself to being a research-intensive university. This has, *inter alia*, been articulated in a Research Strategy and a Research Management and

¹³www.ufs.ac.za

Implementation Plan. According to the extensively reviewed Research Strategy (2009–2013) and the Research Management and Implementation Plan (drafted during the same period), an overarching goal of the university's strategy is "to foster a contented, well connected and vibrant critical mass of researchers, especially in strategic priority areas, who champion the university's contribution to i) national growth, ii) regional advancement and iii) global excellence" (UFS, 2009:13). This statement echoes the mission statements of many African universities that lack both policy and practical steps to ensure attainment. In contrast though, the UFS has undertaken significant policy initiatives to enhance relevant knowledge production and transfer. Two initiatives have been developed specifically to ensure its vision: the South African Research Chairs Initiative and the strategic clusters. In brief, the South African Research Chairs Initiative Programme aims at attracting and retaining top-level academics and postgraduate students to the university and the region with a view to boosting the University's research-capacity base and its knowledge output so that it will be on a par with universities of research renown. This programme has however not demonstrated sufficient efforts at responding to the needs of teaching and of lower postgraduate students.

A second initiative has been the establishment of academic 'strategic clusters' and focus areas that are relevant to regional needs. The clusters focus on producing cross-disciplinary, relevant research in collaboration with stakeholders from diverse backgrounds. The five research clusters are: (i) water management in water-scarce areas; (ii) new frontiers in poverty reduction and sustainable development; (iii) technologies for sustainable crops industries in semi-arid regions; (iv) materials and nanosciences; and (v) advanced biomolecular research. These research clusters focus on producing both Mode One and Mode Two types of knowledge.

Based on these clusters, eight National Research Foundation-funded niche areas have been established by means of an institutional research development programme. Six of these niche areas are located in the Faculty of Natural and Agricultural Sciences. Some of the agriculture-based niche areas include: (i) integrated water-resource management; (ii) local development in arid and semi-arid areas of the central region of South Africa; (iii) the development of sustainable crop value chains for staple and underutilised crops in the semi-arid regions of Southern Africa; and (iv) agricultural risk management for Africa. These research niche areas focus on producing interdisciplinary research that displays academic excellence and meets output requirements. The knowledge thus gained should however also be transferrable to the region.

A key instrument for knowledge transfer at the UFS is the Technology Transfer Office. The South African Intellectual Property Rights Act enables higher education institutions and science councils to commercialise intellectual property produced by their academics. At the end of 2008, the Technology Transfer Office was established within the Directorate for Research Development. The office's mandate included business development and the promotion of an entrepreneurial culture at the university. The office has significantly increased the university's registration of patents and the Faculty of Natural and Agricultural Sciences has registered the highest number of patents (see Chapter Six). This office was established to provide an environment conducive to knowledge transfer from the UFS. The Intellectual Property Rights Act and the role of the Technology Transfer Office provide a policy framework to enhance the development of an entrepreneurial mindset.

The shift towards regional relevance has necessitated/involved a number of shifts. Prior to the political transition in 1994, the UFS enjoyed a fairly good working relationship with national government, provincial government and with white commercial farmers (though at a more personal and informal level). In the years after 1994, compounded by the structural change in government structures and personnel, this relationship with national and provincial government experienced a major setback. However, it has been observed that the relationship with government has again begun to change for the better. From a survey on regional engagement at the UFS, about 53% of the departments (mostly in the faculties of the Humanities and of Health Sciences) declared their willingness to share with provincial governments and local role players (Puukka et al., 2012). There is also a good working relation between the Department of History and the Bloemfontein National Museum. The Museum has also collaborated with various departments in the Natural Sciences Faculty. The Centre for Development Support has had a lengthy research partnership with the Free State Premier's office, while the Department of Agricultural Economics has enjoyed a long working history with the formal agricultural sector in the region. The Centre for Environmental Management is an extensive research partner of the unit responsible for water provision in the Southern Free State called "Bloemwater", which also plays a key role in the Orange-Senqu Commission that manages the Orange River and its tributaries.

5.4.2 The UFS Strategic Plan, 2012–2016

The UFS, in as recently as May 2012, approved a new strategic plan intended to provide the university's top management and its academic and research staff with strategic guidance over the next five years (UFS, 2012a). This section provides a brief overview of the UFS Strategic

Plan 2012–2016 and focuses on issues related to knowledge production and transfer, knowledge dissemination and regional engagement.

The Strategic Plan 2012–2016 aims to position the institution as “a university recognised across the world for excellence in academic achievement and in human reconciliation” (UFS, 2012a:10). This vision will be realised through seven clearly articulated mission statements:

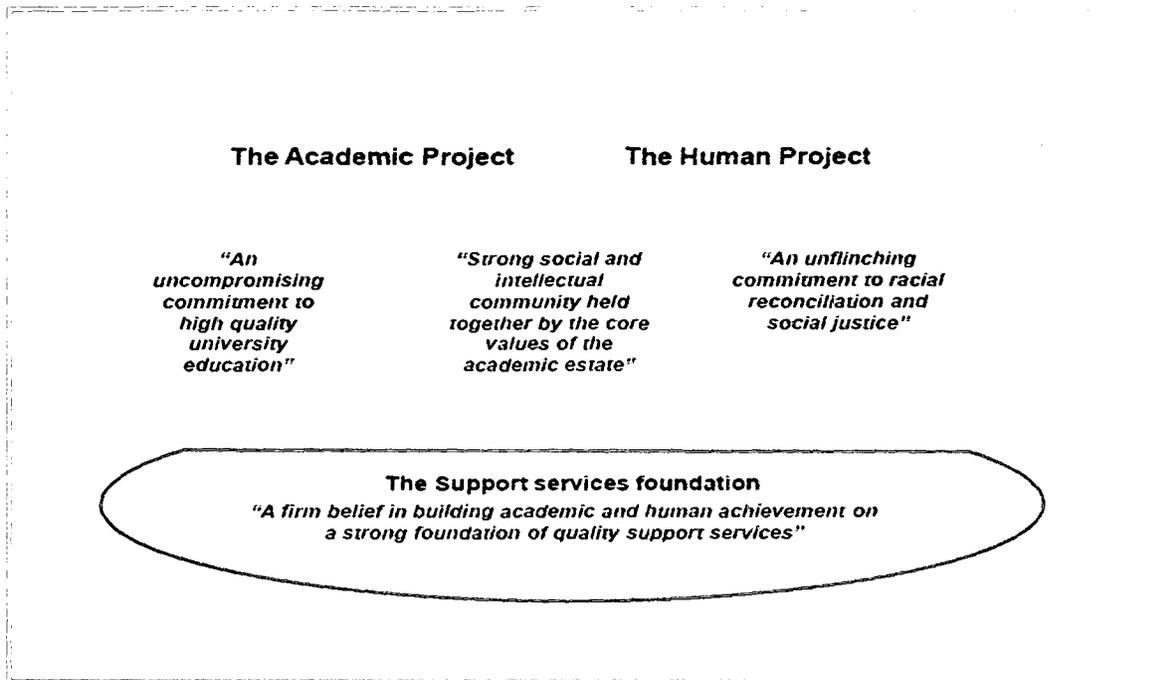
- Setting the highest standards for undergraduate and postgraduate education;
- Recruiting the best and most diverse students and professors into the university;
- Advancing excellence in the scholarship of research, teaching and public service;
- Demonstrating in everyday practice the value of human togetherness and solidarity across social and historic divides;
- Advancing social justice by creating multiple opportunities for disadvantaged students to access the university;
- Promoting innovation, distinctiveness and leadership in both academic and human pursuits; and
- Establishing transparent opportunities for lifelong learning for academic and support staff.

The UFS further identifies five core values to inform and steer the policy. These values are enshrined in its Academic and Human Projects:

- Superior scholarship: This will increase the quality level of entrance and appointments at the university and ensure best academic practice among staff and students.
- Human embrace: This deals with issues related to social inclusion, gender, race and other cultural and linguistic discourses aimed at providing an environment that celebrates the unique socio-political nature of the university.
- Institutional distinctiveness: This goal will promote new ways of doing things, going beyond the ‘prevailing orthodoxy’ to being more creative and exploring new, vibrant ways of promoting scholarship.
- Emergent leadership: This focuses on training, not only preparing students for future job markets or academic careers, but to train future leaders.
- Public service: This highlights the importance of student service learning.

Figure 5.6 provides a vivid representation of the foundations that underpin the UFS Strategic Plan.

Figure 5.6: Summary of UFS Strategic Plan 2012–2016



Source: UFS, 2012a

A key aspect that the plan fails to address is the implementation mechanism by means of the stated objectives is to be achieved. Mintzberg (1994:12) posits that university planning is most effective when all the subordinate plans are articulated with each other, integrated with the budget, and all things work together for the good of the whole. As this is a recent policy, it will be important to see how the strategic plan is articulated in other subsections and policy documents of the university.

In the context of universities and their role in regional development through knowledge production and transfer, it can be argued that the strategic plan fails to provide clear direction. This is observed in a lack of articulation of the process of knowledge engagement, the entrepreneurial orientation of the university and the needs of regional or national industry/firms, government and broader society. Though the plan attempts to address previous institutional failures at both the academic and the human level, the plan tends to emphasise international relevance without paying equal attention to its regional and local stakeholders, such as business and government.

This is in alignment with the 2009–2013 Research Strategy of which an overarching goal is to “foster a contented, well connected and vibrant critical mass of researchers, especially in

strategic priority areas, who champion the university's contribution to national growth, regional advancement and global excellence" (UFS, 2009:13) The evaluation by Haughton and Counsell (2004:137) that "a regional [or institutional] plan that is too tentative, bland in content, weak in strategic content and lacking spatial direction, is likely to impede regional [institutional] competitiveness and robustness" (see also Makoni et al., 2008:298). An important question relates to how the UFS Strategic Plan does justice to its regional role. The next chapter attempts to answer this question.

The OECD (2012) review of higher education institutions in the Free State Province, observes that:

In the Free State, two different approaches to knowledge generation and diffusion are prevailing. The CUT follows the 'University of Technology Business Model' and targets its interaction with the business sector. It provides services to firms and prioritises engineering research and development. In the UFS, research activities are focused on agriculture, water management and biotech with a more inward-looking posture (Puukka et al., 2012:144).

This internal institutional outlook limits the regional relevance of the UFS. Mayr (2010) asserts that knowledge and technology transfer must become part of the overall institutional strategy, which should be reflected in the mission, vision and external positioning of the university. Siegel and Phan (2005:4) also argue for the importance of strategic leadership in the institutionalisation of knowledge transfer through, *inter alia*, clearly defined goals and objectives. They moreover argue for the need for a monitoring and evaluation policy to assess the success of long-term goals. While the degree of variation across institutions makes it somewhat difficult to generalise, it is important that university administrators should consider technology transfer from a strategic perspective. Following a strategic approach implies that such initiatives be driven by long-term goals, be provided with sufficient resources to achieve these objectives and be monitored for performance.

Furthermore, Geuna and Muscio (2008:4) believe that "knowledge transfer has become a strategic issue: it is a potential source of funding for university research and has become a policy tool for economic development". Hence, if knowledge transfer from universities has become a tool for economic development, then it becomes imperative for strategic top management policy to articulate this in all its strategic planning documents. Operation management needs moreover to provide an active entrepreneurial image of the university. The distinctly entrepreneurial character of the university also needs to be accepted by academics and all who associate with the university.

Based on qualitative studies of five universities with outstanding performance in technology transfer in Europe, Clark (1998) concluded that “the existence of an entrepreneurial culture at those institutions was a critical factor in their success” (Phan & Siegel, 2006:93). This culture, they argue, should first be articulated by a university’s top level of management in an overarching policy document. The culture must then be extended to include faculties, departments and individual academics. The entrepreneurial character or nature of the UFS is at least partially expressed in the recently approved policy on knowledge commercialisation. As will be seen in Section 5.4.4, this policy, however, is itself fraught with conceptual and practical challenges.

Though the UFS Strategic Plan largely fails to project a knowledge-transfer and entrepreneurial culture, two additional policy documents have been adopted to enhance knowledge transfer in two main areas: community service and technology transfer or knowledge commercialisation. The respective policy documents are the Community Service Policy (UFS, 2006a) and the Policy on the Protection, Exploitation and Commercialisation of Intellectual Property approved in 2012. These policies will be described briefly and discussed in the light of the channels, mechanisms and factors affecting knowledge transfer as discussed in Chapter Three. In the next chapter, the level of institutionalisation of both policies will be analysed based on interviews with academics and with faculty management.

5.4.3 UFS Community Service Policy

The UFS Community Service Policy is arguably embedded in the UFS vision and mission. This policy seeks to meet the challenge of being a proactive transformation tool and a tool for a “scholarship of engagement” that aim to “enhance cooperation between the university and its surrounding community” (UFS, 2006a:2). The policy is also in accordance with South Africa higher education transformation as outlined in numerous national and institutional documents, *inter alia*, the National Commission on Higher Education Report and the Education White Paper of 1997, which have both been discussed in Chapter Four. The three key dimensions of these sets of policies are:

- Increasing a democratic and diverse participation aimed at eradication of inequality
- Greater responsiveness to a range of social and economic challenges
- Increased cooperation and partnerships with all role players in society

Community service is a cornerstone of the policy. These guidelines are in alignment with the learning region principles of networks and collaboration as seen in Section 3.6.3 and Section

3.6.4. The principle of partnership has been observed in the numerous memoranda of understanding that have been signed by the Office for Community Development and Diversity.

The Community Service Policy defines community service as “employing the scholarship and resources of the UFS to render mutually beneficial services to communities within a context of reciprocal engagement and collaborative partnerships” (UFS, 2006a:7). These services are seen to represent social responsiveness to development challenges through the key functions of teaching and research. This must however be done in close cooperation both with local communities and the service sector in order for maximum mutual benefits to be achieved. The policy further highlights the importance of liaising with other higher education institutions at the international, the national and the regional level. However, the CUT, which is situated less than ten kilometres from the UFS, is only mentioned in an appendix to the policy. The definition of the *learning region* highlights the need for networks and partnerships to be embedded at the regional level between higher education institutions and other stakeholders (Hassink, 2005:523).

While the policy sets out to support community service and to facilitate both staff development and capacity building in programmes related to community service, there is no mention of how community service will affect staff promotion. In Australian universities that have made a significant impact in regional and community development, academic promotion strongly links to community service and relevance (Australian University Community Engagement Alliance, 2006). Corbin (2010) has also identified the lack of incentives and motivation to be a major factor limiting university academics from engaging in knowledge transfer at the regional level (in Bramwell et al., 2012:17).

Community service is hardly mentioned in the recent UFS Strategic Plan (2012–2016), which casts doubts on the extent to which this Community Service Policy is aligned to the current university strategic drive (UFS, 2012a). The conspicuous lack of emphasis of this policy in the university’s ‘Human Project’ seems to suggest either that this policy is outdated and needs to be reviewed or that there is a major disjuncture between two seemingly related projects. Also, community service can be very significant in a knowledge transfer policy in that community service would create opportunities for university students to engage with and potentially inform members of the public.

5.4.4 UFS Knowledge Commercialisation Policy

In 2009, the UFS established a new office for research commercialisation and business development. The Technology Transfer Office is staffed by two permanent staff members and four related consultants. In 2012, the Policy on Protection, Exploitation and Commercialisation of Intellectual Property was approved.

Though relatively small, the Technology Transfer Office is considered a support service to faculties, departments, staff and students with a broader mission than that of a typical knowledge-transfer office. The functions of the Technology Transfer Office include, *inter alia*:

- To manage research contracts between faculties, academics or staff and other stakeholders;
- To generate value from academic know-how;
- To undertake intellectual property and patent negotiations and to protect intellectual property rights;
- To develop a strategy for student innovation;
- To develop and implement policies around Third Stream income management; and
- To promote the institutionalisation of short courses.

The office director explained that the office aims to reconcile the university and its immediate and extended community. He further stated that while the university is busy with its main functions of knowledge production and while society is out there trying to make life better, the office finds its niche in reconciling these two institutions. According to a respondent from the Technology Transfer Office, one of the aims of the office is to address the challenge of bringing the community to the university and making the university's knowledge available to the community in a systematic way.

One Faculty Dean agrees with this mission, welcoming the establishment of the Technology Transfer Office and emphasising the important need to relate the community to the knowledge created by the faculty. He observes that the creation of the office has been long overdue, especially "with the high number of technology (knowledge outputs) being developed, we need to work closely with the Technology Transfer Office to take the technology to the community out there".

The guidelines of the Technology Transfer Office reveal that the office is more of a technology process and that it is somewhat distant from the society in which it is located. The guiding principles of the policy are:

- Fostering academic excellence;
- Assuming ownership of intellectual property;
- Creating a conducive environment for intellectual property disclosure;
- Exploiting intellectual property; and
- Sharing of benefits.

While these principles align closely with the OECD (2003:37) principle of technology transfer, which is “to identify, protect, exploit and defend intellectual property”, the policy falls short of the human and societal aspects of knowledge transfer, which go beyond the commercialisation of patents. Mayr (2010:7) argues that published patents should only be a manifestation of immersed collaborative efforts with society and “tacit knowledge derived from experience, social and cultural factors”. Mayr (2010) emphasises the social aspect of knowledge transfer, which is inclusive of human and social imperatives, in addition to pure technological transfer. While it can be argued the UFS does not intend to ignore the role of collaborative research and other ‘softer’ aspects of knowledge and technology sharing, it seems that the focus of the current policy document is rather on the ‘hard’ and econometric aspects of technology transfer.

The policy does not refer to the necessary informal collaborative networks, especially at the regional level, which could inform and improve the research and innovation process. Allison and Eversole (2008:103) posit that “universities have an enormous potential to take a leading role in regional innovative development” through building and enhancing different forms of networks and alliances in their research and development processes, ranging from strategic alliances, and supporting industrial districts at both the formal and the informal level.

5.4.5 UFS policies in knowledge transfer: a critique

The previous section has dealt with the three main policy documents of the UFS that are expected to describe the role of the university as a knowledge agent in the region. Such a role can be actualised through the production, application and transmission of relevant knowledge to its immediate community and then to the extended community and to stakeholders. From the review and analysis of the policies, a number of aspects stand out in the context of knowledge transfer from a learning region perspective.

Firstly, the policies show a clear understanding of the role of universities as knowledge producers in development and of their social responsibility to society. This is demonstrated in the Strategic Plan's Academic Project and the Human Project and also in the Community Service and Knowledge Commercialisation policies. The former focuses on social development, while the latter is more economy oriented. However, the Human Project seems somewhat detached from the academic or theoretical orientation of the university, while the Academic Project seems to ignore the human and social role of knowledge transfer. The two projects are integrated neither with each other nor with other institutional policy and resource structures. This runs contrary to the scholarship of engagement. Boyer (1997:75) notes that "professional academics should recognise that ... teaching is crucial ... integrative studies are increasingly consequential and that in addition to research [and knowledge commercialisation] the work of the academy must relate to the world beyond the campus". Knowledge production should therefore not be separated from either community service or engagement.

Secondly, while the Academic Project of the Strategic Plan can be related to the Knowledge Commercialisation Policy, and the Human Project to the community service policy, there are but few links between the three documents. The Community Service Policy does not say much regarding its contribution to the Strategic Plan, nor does it envisage the Commercialisation Policy as playing a complementary role in achieving the institutional mission. The plans significantly fail to talk and respond to one another. Cloete et al. (2011) use the notion of *connectedness* to argue for the need for alignment between engagement activities, institutional mission and academic core. Finkelstein (2001:36) notes that a barrier to engagement could be the perception that engaged research is less scholarly than traditional research

Thirdly, with the exception of the Community Service Policy (UFS, 2006a), which can be considered as relatively old, more recent policies fail clearly to articulate a regional or local embeddedness of the UFS. Both the Strategic Plan and the Commercialisation Policy seem to place more emphasis on the national and international profile of the university mission, with little emphasis on regional connectedness. This lack of local connectedness significantly limits the regional relevance of the university in the kind of knowledge produced. These institutional policies fail to agree with the FSGDS. There is some connection with the national policies (Chapter Four) that are focused on national development issues, but there is little emphasis on the regional dimension in knowledge and innovation planning.

Furthermore, there is little evidence of cooperation either with other higher education institutions in the province or of cooperation with government and society. The Commercialisation Policy focuses on industry and understandably makes little mention of the Free State in that the province has a limited industrial base. It should however be mentioned that the Academic Cluster on Nanotechnology works closely with the South African Oil Refinery in the Northern Free State. The Strategic Plan uses the word 'collaboration' once and 'partnership' twice, but fails to link any of these partnerships to the regional context. There is however a considerable emphasis on the international, outward-looking nature of the university. The word 'international' appears eighteen times in the document, while 'regional' and 'provincial' appear respectively once and twice. In the first paragraph of the OECD's (2007:1) well-known publication *Globally Competitive, Locally Engaged* it is argued that "in order to be competitive in the globalising knowledge economy, the OECD countries need to invest in their innovation systems at the national and regional levels". In its concluding section, the report argues that:

Finally there is need to acknowledge that regional engagement can enhance the core mission of teaching and research and that the region can be seen as a laboratory for research projects, a provider of work experience for students and a source of financial resources to enhance the global competitiveness of the institutions (OECD, 2007:17).

Judging by recent institutional policies, the UFS can be said largely to have focused on positioning the university in the national and international arena, but that it has little relevance in its immediate region. This apparent lack of social capital and local networks and development coalitions between regional government and other sectors of society has been identified as some of the key factors that limit knowledge transfer (Asheim, 2011).

In less favoured regions, it is even more critical that universities should focus on the regional dimension because "the regional context has an increasing influence on a university's behaviour" (Beerkens & Van der Wende, 2005:24). The apparent lack of regional focus can be related to relatively weak regional institutions such as business, civil society and even government (Beerkens, 2004). This issue will be further analysed in Chapter Seven in which knowledge-demand factors are examined.

The above section has provided a detailed analysis of a few key policy documents that inform the knowledge engagement and transfer environment of the UFS from a regional perspective. The Strategic Plan, the Community Service Policy and the Knowledge Commercialisation Policy provide a background against which to analyse the process of knowledge transfer from

the faculties. Before this particular analysis is undertaken, it is important first to present preliminary findings from the OECD Review of the Free State Province on the link between higher education and regional development. The next section will thus be devoted to a summary of key findings and recommendations in this regard.

5.5 Higher education and regional development in the Free State: findings from the OECD review

The Free State Province is among the only regions in Africa and one of nearly 50 regions worldwide to have undertaken external reviews of the role of higher education in regional development (Puukka et al., 2012). These reviews provide an analysis of “how the higher education system impacts upon regional and local development and brings together universities, other higher education institutions and public and private agencies to identify strategic goals and to work towards them” (Puukka et al., 2012:226). The Free State self-report was conducted in 2010 and 2011, and the external review process was completed in October 2012. This section highlights the key findings and recommendations contained in the review and explains how they fit into the learning region approach to development.

5.5.1 Human capital and skills development

The development and retention of human capital has been acknowledged to be one of the most important factors affecting the development of nations and regions all over the world. According to the OECD (Puukka et al., 2012), education provides individuals with knowledge and competencies (skills) to participate effectively in a society and to break the cycle of disadvantage. In the Free State, there is some evidence that one of the reasons why the cycle of disadvantage has not been effectively broken can be linked to limited education and skills or to limited competency development. The OECD Report makes recommendations based on findings related to the historical nature of education and makes suggestions regarding what is to be done on the way forward if higher education is to take its rightful place as a producer both of relevant human capital and of the skills relevant to regional development. As per the OECD Report, “the overall low educational attainment levels call for a special focus on lifelong learning opportunities and skills development programme that build literacy and numeracy ... to enter the labour market or the educational system” (Puukka et al., 2012:124).

The report thus recommends that higher education institutions (UFS and CUT) and FET institutions go beyond their traditional roles and provide more opportunities to larger numbers of low skilled people, while also attracting talents into the region. School support systems

remain at suboptimal level, a weakness that has also been recognised in the FSGDS as an area for improvement. The review thus recommends the need to increase access, especially to the FET institutions in areas in which there are recognised skills needs in the province.

The review further identifies a significant lack of absorptive capacity in the regional economy to be able to absorb human capital and skills being produced by the higher education institutions. The weak industrial base of the economy and also the declining primary sector – which is not compensated for by corresponding growth in the secondary and tertiary sectors – has resulted in increased skills migration from the province to other, prosperous regions. This observed lack of local demand for knowledge skills can be a further reason why training at the higher education institutions, especially the UFS, has rather focused on producing skills for the broader national labour market.

The review observes that “the UFS has a strong focus on catering for the national needs rather than those of the Free State, despite the fact that it plays an important role in the training of teachers, health practitioners, legal practitioners and public administrators for the province” (Puukka et al., 2012:102). The CUT, in contrast, has adopted a mission to position itself as a critical element of the regional supply chain. “This positioning does not only manifest itself in skills development and students-work placement learning in local firms, but also on initiatives that aim to create a regional economy that can absorb these skills” (Puukka et al., 2012:103).

The OECD Report on the Free State observes that the higher education sector is fragmented. It is also limited in practice-based pedagogy, where entrepreneurship training and internships are integrated with teaching and learning, and with research. While the CUT has about 15% of students who are involved in some form of service learning, the UFS has a higher percentage of students (40%) involved. Though both universities have taken significant steps towards ensuring practice-based learning in a number of degree programmes and even making some programmes compulsory, further research is needed to assess the actual impact of the said programmes. The poorly diversified regional economy and the challenges faced in mainstreaming service learning into the curriculum have also increased the number of challenges currently confronting service learning.

The learning region approach places enormous emphasis on the role of collaborative knowledge production, research and learning in knowledge transfer with a view to enhancing regional competitiveness. As observed by Corredoira and Rosenkopf (2006), the process of

knowledge transfer hinges on a number of dynamics that are all linked to the relationship between human capital and social capital. Thus the “[S]ocial networks contained in a geographical region (geographical proximity) and absorptive capital all facilitate the transfer of technological knowledge ...” (Corredoira and Rosenkopf, 2006:20). Findings from the OECD Report suggest that levels of collaboration between the two higher education institutions in the Free State and the broader economy remain weak. The review recommends that increased participation between the various sectors will combine resources from the two universities and hence expand educational opportunities for working adults – including mechanisms of lifelong learning and more innovative curricula and modes of delivery.

The review also suggests that the development of a robust human capital and skills base will depend on the capacity of the region to internationalise itself by, *inter alia*, developing programmes aimed at attracting and retaining such talents in the province that would be able to support the development of key sectors. This will go a long way towards breaking the historical legacy of seclusion, one that continues adversely to affect the rapid and sustainable transformation of the universities and of the region.

5.5.2 Innovation

As posited by one scholar in the field of innovation, “research is the transformation of money into knowledge while innovation is the transformation of knowledge into money” (Nicholson, 2002:1). This statement builds on a number of assumptions that will be discussed below in light of the findings of the OECD Report in the Free State Province. The analysis will also examine the global interplay between universities, knowledge, innovation and regional development and look at how the different stakeholders at the regional level fit into the whole.

To increase the probability that innovation will occur, more applied research must be undertaken. The final interpretation is that, for research to be done, funding (money) is needed to support higher education and research institutions. Two assumptions underpin the foregoing:

- Money produces knowledge through research.
- Innovation produces money (economic prosperity) through knowledge application and transfer.

Data on research and development in South African universities indicate that more than 75% of higher education expenditure on research and development goes to five universities, while

eighteen universities, including the UFS, share the remaining 25% among them (OECD/Department of Higher Education and Training, 2007). The innovation landscape of the Free State is characterised by an underdeveloped innovation infrastructure, a scarcity of other research and development institutions – besides the universities – and a poor industry-higher education institution relationship. This situation can be linked to the province's weak industrial base and to the province's low levels of human capital. As already mentioned earlier on, poor relationships between the different sectors continue to take a toll on the innovation potential in the province.

At the institutional level, the review provides indications of there being a relatively weak innovation culture at the UFS. It should however be mentioned that the perception and process of knowledge transfer vary across faculties and across departments, centres and institutions. Amid such variance, some departments are very strong and others are relatively weak. The purpose of the recent establishment of the Technology Transfer Office is, *inter alia*, to strengthen knowledge transfer across the university. The review recommends a broadening of the understanding of knowledge production, its utilisation and exploitation. This would promote university industry relation, and encourage innovation with continuous collaboration between the Office for Technology Transfer and Industry (OECD, 2007). Another area of potential impact would be to focus on interventions with low financial earnings but high social returns.

Based on the low industrial development in the province, the review proposes that the university's innovation in partnership with FETs could rather focus on the low-tech sectors and on organisational and social innovation. This kind of innovation requires a demand-oriented knowledge and technology-transfer strategy from the higher education institutions. Higher education training and skills development will have to be aligned with the regional needs of industry and business. This will not only enhance graduate retention in the region but also increase the absorptive capacity and the innovation potential of the province.

5.5.3 Building regional capacity for development

According to OECD Review studies, successful cases of higher education institutions' contributions to regional socio-economic development have been characterised by a clearly articulated relationship between the higher education system and regional stakeholders. This relationship aims at encouraging specific and distinct contributions (Puukka et al., 2012:180). The review argues that developing such a system would require the following:

- Clear articulation of the needs of regional stakeholders so as, in turn, to inform institutional behaviour;
- Mechanisms and incentives to facilitate collaboration;
- Structures and incentives in individual academic institutions to enhance both research and teaching towards regional development; and
- Effective teaching and research by academics, which are aimed at responding to regional needs.

The OECD Report further argues that these four dimensions are strongly interrelated and should be treated as complementary rather than distinct aspects or phases. In their analysis of the institutional, regional and even national aspects that inform these dimensions of regional development, the OECD explores policies, structures and functions in various institutions and how they enhance / fail to enhance the development and support of these dimensions.

The policy review provides evidence that the policy environment needed to support the regional development role of higher education institutions in South Africa is weak. They observe that “currently, South African policies have a lack of incentives for and articulation of demand for universities’ regional engagement ...” (Puukka, et al., 2012:180). On the basis of the National Spatial Development Plan, the report argues that the peripheral nature and the “organisational thinness” of the province do not give it the innovative edge that will be needed to build dynamic clusters and networks to enhance regional development. Local firms consequently seem to be cut off from the innovation potential to be derived internally from higher education institutions and also from other knowledge coming from beyond the region.

The report observes that the separation or differentiation of higher education institutions, based on racial categories that historically aimed to create “separate but equal” institutions, did not enhance the establishment of a higher education system, but rather resulted in a set of disjointed institutions. Since the shift from the previous system that culminated in the restructuring of the higher education system, so the report remarks, some institutions are still in the process of articulating the consequences within their own institutions of such restructuring and of the change in systems. Meanwhile, higher education institutions continue to lack both the necessary levels of collaboration and the incentives for academics to engage meaningfully with their regional communities.

Arguably, while knowledge production remains the core part of higher education functions, universities would have to develop research, learning and teaching activities with the potential to have a socio-economic impact on the region. This will require ongoing collaboration with regional stakeholders. A regional engagement approach of this kind should distinguish itself from ad hoc, geographically circumscribed, opportunistic, project-based activities that currently characterise community engagement but which more often than not fail to have any sustained impacts on the region.

The report concludes the section by stating the relatively weak linkages and collaboration between, on the one hand, the two universities in the province, and on the other between the universities and FETs, the private sector (business) and provincial and local governments.

The report proposes a few recommendations:

- Increase the quality of higher education, not only in the province, but the nation, through the steering and leadership role of the Council on Higher Education and the Department of Higher Education and Training.
- Review the higher education funding policy to include a budget for engagement. This could be done either by restructuring the two main lines of government funding (block grants that currently carry 87% of government funding and earmarked grants, which account for the remaining 13% of government funding) or, alternatively, by creating another stream of funding that caters for regional needs.
- Build capacity within both top and medium management for regional engagement.

In conclusion, the following can be established based on the preceding analysis:

- Higher education in South Africa and in the Free State has experienced enormous transformation and expansion since the early 1990s. However, human capital for innovation remains low especially in key areas.
- The challenges facing higher education and human capital production for economic growth links to an underperforming school system and a massive school failure. There is need for better collaboration efforts to ensure improvement in the quality of the schooling system. Lundvall et al. (2008:697), arguing from a learning region perspective, agree with the OECD that, "in the redefinition of the nature of an educational system required by the economy", there is need for operating with a broader definition of the education system to include all levels of formal and informal education.

- The education system needs to become better aligned with the needs of the region. This should be done in a bid to enhance the transition to a secondary and tertiary economy while simultaneously ensuring competitiveness yet not compromising the ability of the primary sector to address issues of poverty and sustainable livelihoods. In this respect the OECD (1999) argue for an education and training sector, with new kinds of relationships and engagement platforms and relationships with all stakeholders.
- For this to be achieved, as reflected in the learning region approach, there is need for lifelong learning opportunities for the large population groups who cannot afford regular schooling programmes.
- The presence of engagement champions will be reflected in clearly articulated, long-term regional and institutional policies relating to research, teaching, funding and the demand for knowledge and skills development.

Though the OECD Review can be considered to give an extraneous perspective on the role of higher education in regional development in the province, it does nevertheless provide a perspective by means of which to engage with regional development policies and how they relate to higher education. There is a weak emphasis on regional collaboration and the role of the UFS in regional development remains poorly emphasised with a pronounced emphasis on national and international impact. Not only have these weaknesses been identified in the foregoing analysis of the relevant UFS policy documents but these weaknesses are in various ways echoed by the OECD Report.

5.6 Conclusion

Chapter Five has comprised a contextual description and analysis of the Free State Province in the context of higher education and of development policies. It has revealed that the province's high reliance on the primary sector is changing. In the main, this change is enhanced by the decline of the agricultural and mining sectors and the growing secondary and services sectors. Yet unemployment continues to prevail despite growth in both the manufacturing sector and the financial sector. The low employment level has been both a major cause and an effect of the low education and skills levels.

Education and skills levels across the province remain significantly low. Despite there being two universities, there is both a significantly low emphasis on the role of knowledge and relatively little investment in knowledge and research and development – a fact that has in part

been commented on in regional policies (FSGDS), in UFS institutional policies and also in the OECD Free State Review Report. Furthermore, analysis of UFS policy documents has revealed their weak regional relevance and embeddedness and that the UFS has deviated from its institutional mission and priorities. This is also revealed in the analysis of both the UFS Knowledge Commercialisation Policy and its Community Service Policy. This lack of cooperation with regional stakeholders is compounded by weak expectations from the FSGDS regarding higher education institutions. While the UFS has identified key strategic and structural changes to enhance knowledge production and transfer, there seems to be a major lack of alignment in key institutional policies, discourse and practice to ensure sustained regional relevance.

From a demand-side analysis perspective, there is no clear outline or implementation plan in the FSGDS on how to bring together the main knowledge role players in development planning and practice. This is compounded by the absence of a policy framework aimed at linking all the regional-level development stakeholders. This resonates with findings from an analysis of national policies (Chapter Four) in which a weak regional emphasis was likewise found to characterise knowledge and development policies at the national level. The emphasis on the National System of Innovation, coupled with a remarkable silence on the Regional System of Innovation as observed in Chapter Four, supports this argument. While both chapters have shown some characteristics of the learning region approach and its role in knowledge transfer, the general observation is that both the Free State Province and South Africa itself mostly demonstrate the characteristics of a less favoured region. However, as will be seen in the following chapters, the UFS, and especially the Faculty of Agriculture, has contributed to regional development through its knowledge outputs and engagement with the community. The data provides interesting findings that have been interpreted based on the indicators of a learning region with specific reference to a less favoured region.

CHAPTER SIX

UNIVERSITY KNOWLEDGE TRANSFER: SUPPLY-SIDE ANALYSIS

Changing a university's culture takes time, like turning a tanker takes time, there's a lot of inertia to overcome

Theodore Poehler, (in Lynch, 1988)

6.1 Introduction

The previous chapter examined the policy environment informing regional development within the Free State Province in the context of a knowledge economy. This examination critically scrutinised the link between provincial and institutional policy documents in a demand and supply relationship. The review analysed the level of formal expectation regarding the role of knowledge from a provincial development planning perspective and how universities, through their policies, perceive themselves to be responding to their joint regional context. The analysis was informed by indicators derived from knowledge-transfer theory and by theoretical tools developed from the learning region concept.

This chapter offers an analysis of the perceptions of academics regarding the supply factors that affect knowledge transfer. Using key concepts from the learning region concept (Section 3.6) the analysis seeks to understand the main factors that affect university knowledge transfer in a less favoured region. The emphasis here is on the enablers and the challenges encountered in the process. As a qualitative research design is followed, the findings use explanatory narratives and participant statements that capture the experiences, perceptions and observations related to a particular indicator or factor of knowledge production and transfer. The quantitative data used in the chapter are mainly in support of these explanatory narratives.

The data and findings have been organised so as to provide an empirical analysis that is supported by theoretical discussions from the literature. Quotations from UFS academics have been numbered and referenced as 'Academic x', where x, is the number of the transcribed interview, while quotations from Senior Management are referenced as SM Y, where, Y is the number of the transcribed interview. For example 'Academic One' and 'Senior Management Two' are used respectively for the first interview with a UFS academic and for the second transcribed interview of a university senior manager. Furthermore, it should be noted that interview transcripts are presented verbatim and only minor editing was done for the sake of clarity.

This chapter principally seeks to answer the following research questions already presented in Chapter One:

- What has been the relationship between the nature of the university and its region?
- How has research specialisation in the agriculture departments developed over time?
- What have been the dominant forms of knowledge transfer from the faculty and case-study departments?
- What have been the main supply factors that have affected the creation, transfer and application of knowledge from the faculty to regional stakeholders?
- What knowledge-transfer channels are applicable in less favoured regions?

The next section deals with the main types of knowledge produced by the faculty. These outputs are classified as teaching, research and community engagement. Section 6.3 is an analysis of the main channels of knowledge transfer from the Faculty of Agriculture as obtained through the data-collection process. The fourth section (Section 6.4) analyses the main factors informing and affecting knowledge transfer. Six factors have been identified and discussed under separate subsections. The discussion is informed by theoretical concepts identified in Chapter Two and Chapter Three and in the relevant literature. A table summarising the main findings concludes the chapter.

6.2 Types of knowledge output

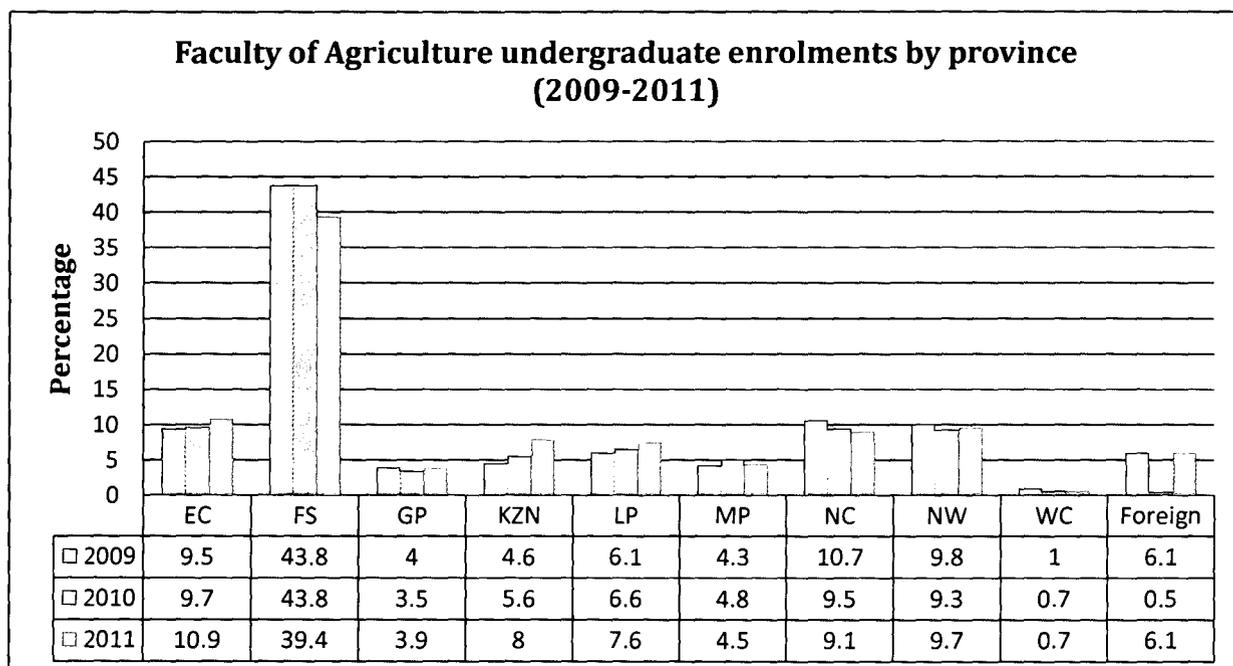
A further analysis of the channels of knowledge transfer using the key functions of the university (teaching, research and engagement) offers more interesting findings on the types of knowledge produced and how the knowledge that is produced relates to the development of the region and of the nation. The analysis further follows the international footprints of the faculty's output. In line with the three main activities of the university, the analysis of the main knowledge outputs have been classified under the categories of teaching, research and engagement.

6.2.1 Teaching outputs

With a view to analysing the human capital impact of the UFS on regional skills development through the graduates it produces, use was made of institutional data on the origin of students, namely their home addresses. The analysis further sought to determine the extent to which teaching has improved the research and development capacity of the agricultural sector by the production of high-skills graduates – as in Master's and Doctoral graduates. The analysis

also uses the origin of students to determine the regional impact and contribution to human capital of the faculty. Given the current absence of tracer studies at the UFS (which could have been used as a proxy for determining where the graduates go to), it was difficult to determine where students went once they had completed their studies. This limited the analysis of human capital production in this study. Figure 6.1 presents a graphic representation of student enrolments in the case-study departments in the Faculty of Agriculture by their home province.

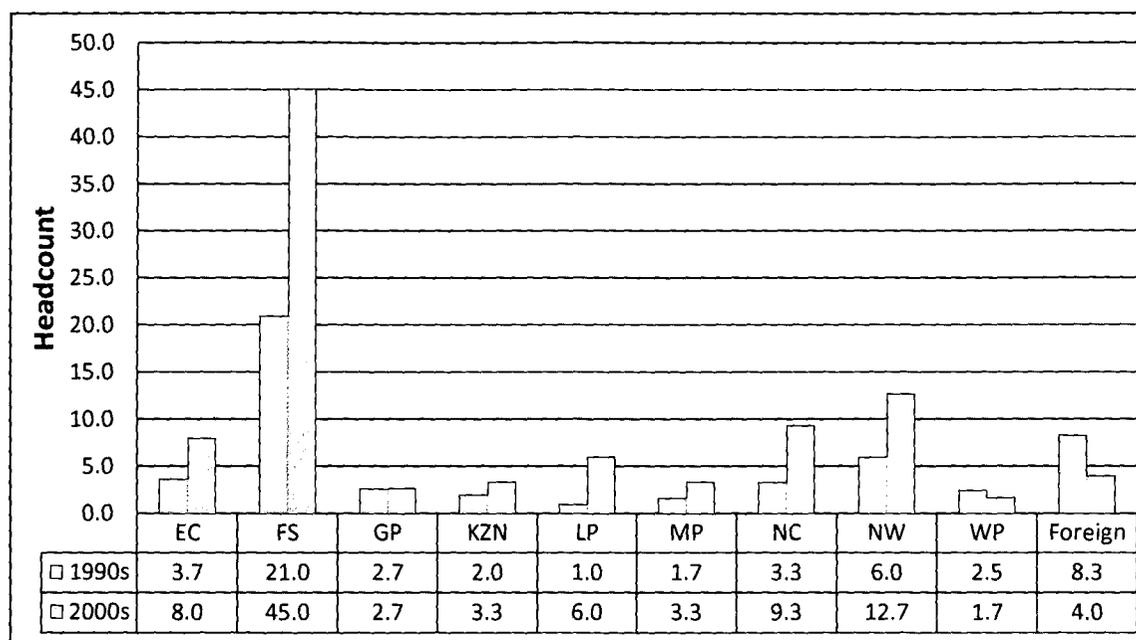
Figure 6.1: Undergraduate students' enrolment at the Faculty, by province of origin, 2009–2011



Source: UFS, 2012c

The figure indicates that the majority of students (close to 45%) come from the Free State Province in which the university is located, while the second highest number (10.7%) hail from the Northern Cape Province, which thus indicates the more regional relevance of the university. This can also be observed from Figure 6.2, which provides information on graduates by province of origin.

Figure 6.2: Faculty of Agriculture bachelor degree output by province of origin, 1990s and 2000 (n)



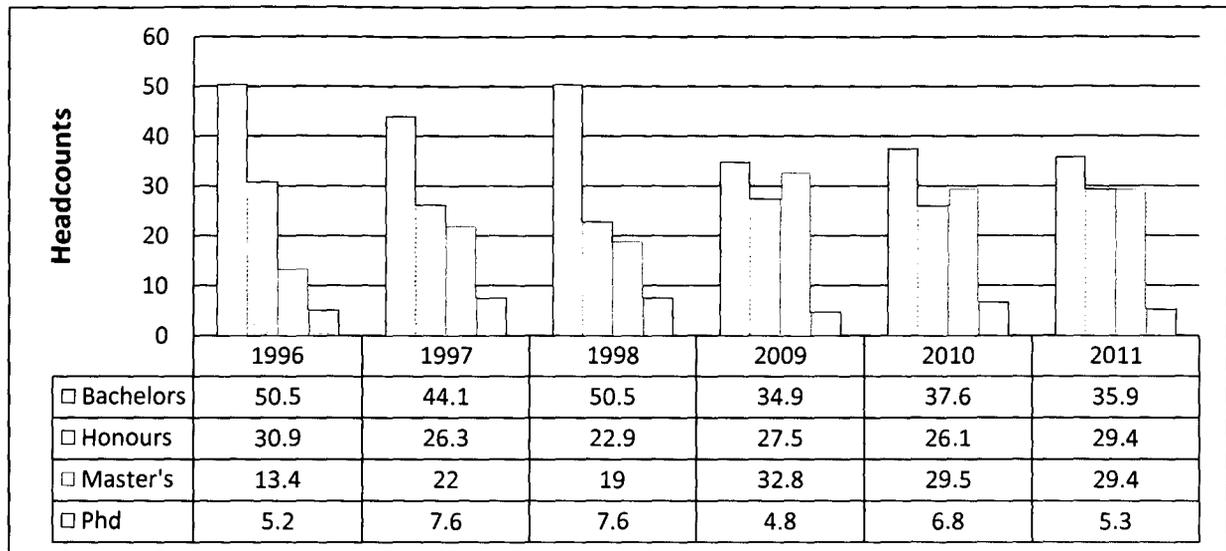
Source: UFS, 2012c

Though the percentage of students who remain in the province to work in the agricultural sector cannot be reliably determined because of the absence of tracer studies, the data below indicate that the UFS Faculty of Agriculture, through its human capital output, is making a significant contribution towards regional development.

While both the strategic plan and current institutional changes seek to position the UFS in a national and international context, evidence from the teaching data shows that, currently, the majority of students who enrol and graduate from the university are originally from the Free State Province (amounting to about 45% of inputs and outputs). If the regional dimension is broadened to include the Northern Cape and North West provinces and the northern parts of the Eastern Cape, then this impact could increase to more than half of all enrolments and graduates.

A more nuanced analysis of the teaching-output data sought to investigate how the faculty output has changed over time. Using data from the late 1990s (1996–1998) and the late 2000s (2009–2011), graduate data by level of studies indicate changing patterns in a number of aspects as Figure 6.3 indicates.

Figure 6.3: Faculty of Agriculture graduation data by degree level, 1996, 1997, 1998, 2009, 2010 and 2011



Source: UFS, 2012c

Scrutiny of the data reveals that there is a gradual shift towards increased postgraduate production throughout the system. For example, in 1996 more than half (50.5%) of the total enrolment was at the undergraduate level – a figure that has declined to 35.9% in 2011. The decline in undergraduate outputs has been met by a corresponding increase in the number of Master’s degree graduates. There has been a relatively stable trend at the PhD level. With knowledge production through Master’s and Doctoral graduate skills being a key requirement for learning in the knowledge economy (Florida, 1995; Lundvall, 2002; OECD, 2001), it can be argued – based on Figure 6.3 above – that the faculty is shaping its knowledge outputs to meet this knowledge demand.

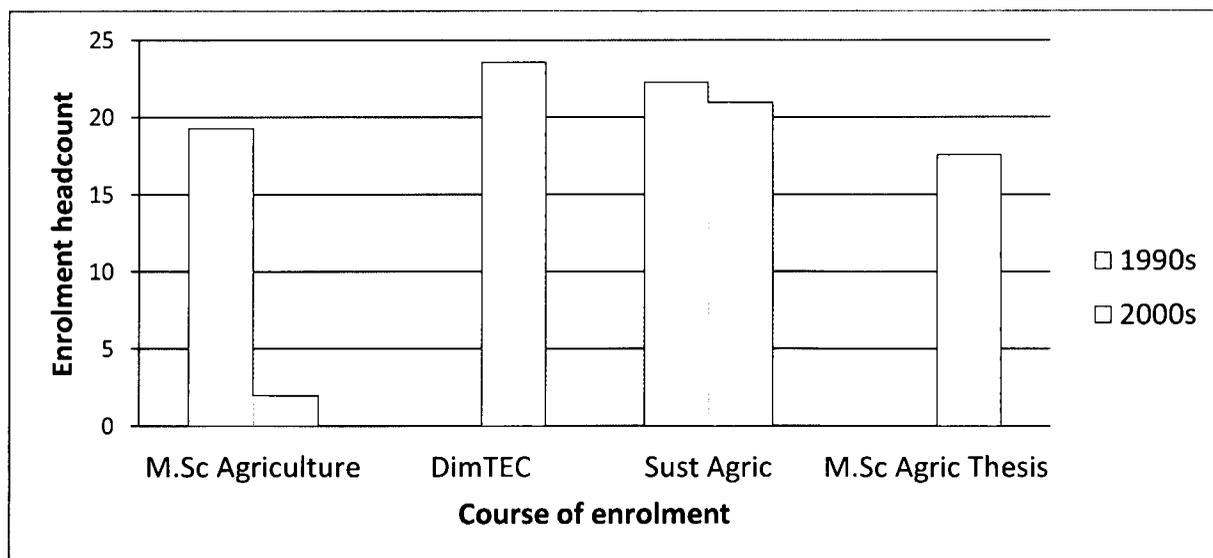
However, more detailed analysis reveals two things. The first is that most of the Master’s programmes are structured with a weak research focus, and secondly, in some of these programmes, the majority of students come from across South Africa and from the African continent. Thus, the relatively weak stock of human capital in the province and the province’ weak industrial base suggest that most of the students will go beyond the provincial boundaries in search of employment and opportunities, a fact that limits the analysis of the faculty’s knowledge contribution. Secondly, it should be noted here that though there is an apparent increase in Master’s enrolments and outputs, most of the Master’s degree programmes (Disaster Management, Sustainable Agriculture and Environmental Management) were conceived mainly as a source of third-stream income. One of the

directors (Centre for Disaster Management Training and Education Centre for Africa) had the following to say regarding the recent changes at the Centre:

We try to do research; we have started now to appoint lecturers as we previously worked with contract staff and paid [them] from students' fees and consultancy ... The university's [new] policy is pushing us to do more research so I am cutting down on students; because somewhere you have to cut down, you cannot do both (Academic Five).

The above-mentioned centres have in many ways responded to the needs of the agricultural sector through the short courses and structured degree programmes that allow government officials and those in the agribusiness and private agriculture to enrol and complete their Master's programmes through structured block classes and mini-dissertations that are less demanding than the more academic, full thesis route. However, as seen in Figure 6.4, the UFS, in aligning itself with its desire to become research intensive, has improved the research Master's component. In recent years, there has been an increase in the number of students opting for the Master's-degree-by-thesis option, which corresponds to the high enrolment ratio of the structured Master's programmes.

Figure 6.4: Comparative analysis of master's degree enrolment at the Faculty of Agriculture, 1990s and 2000s (n)



Source: UFS, 2012c

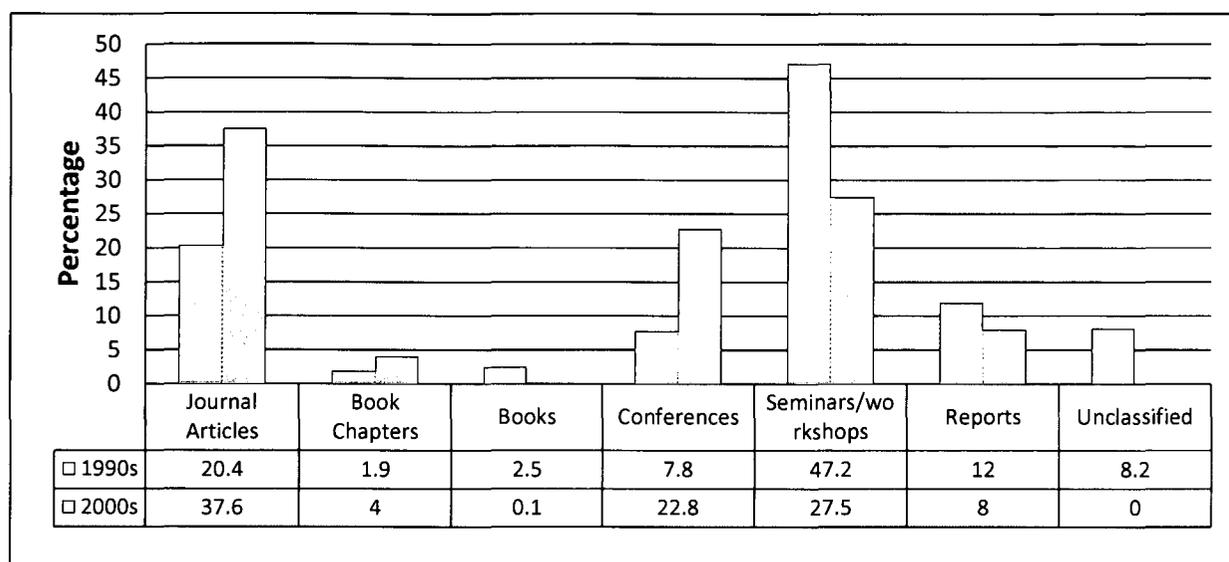
Obviously, the Faculty of Agriculture, through its teaching outputs, has been a major player in skills development in the province. With more than 45% of all undergraduates hailing from the province, it can be argued that these graduates return to their respective communities and in one way or another contribute to agricultural development both actively and passively.

Furthermore, the faculty has improved its postgraduate training and is thus making a contribution to developing a knowledge economy through responding to regional relevance, while also keeping a research-intensive focus at the postgraduate level. This will be further discussed below. While there has been a noticeable increase in terms of research Master's degrees, it should be noted that there has also been an increase in the structured Master's qualifications as observed in the Disaster Management Training and Education Centre for Africa, where almost all the Master's dissertations are of the structured variety. This is aimed at also increasing regional relevance by targeting practitioners such as farmers, government officials and farmers' organisations. Thus, the faculty is responding to the drive towards research intensiveness while also making a contribution to relevance. The level of coordination and institutionalisation of this dual role remains to be investigated.

6.2.2 Research output

Research output is generally measured in terms of both the number of scientific publications and the number of research Master's graduates and Doctoral graduates. From research data gleaned from faculty reports of the years between 1996 and 1998 and also between 2009 and 2011, knowledge output from the Faculty of Agriculture has demonstrated major shifts – not only in terms of the kinds of output but also in terms of where they are published. The methodology for data collection discussed in Section 1.8 classifies research output under the six main categories used in the faculty reports. Some publications were not classified. The report does not include Doctoral theses and Master's dissertations but only publications. Figure 6.5 indicates the percentage of research outputs according to publication type over the years in question.

Figure 6.5: Faculty of Agriculture research outputs by types of publications, 1990s and 2000s (%)



Source: UFS, 1996;1997;1998; 2009;2010;2011

The figure reveals that there has been a significant output increase in terms of the scientific knowledge types covered in journal articles, book chapters and conference presentations. Currently, close to 40% of the outputs are in the form of journal publications mostly in international and national scientific journals, which can be interpreted as the institution aligning itself with the new emphasis on international relevance and a move away from the character of the traditional university. The increase in conference presentations is also an indication of a drive towards an increase in publications. Figure 6.5 also reflects a drop in the numbers of seminars, workshops and report outputs. Even though seminars and research reports constitute just about a third of the research outputs, Table 6.1 below however shows them to be the most frequently used forms of knowledge transfer at the provincial/regional level (besides conferences).

Table 6.1: Cross-tabulation of academic publications by place of publication, 1990s and 2000s

Publication Type	Place of publication (percentages)							
	Free State		South Africa		International		Not identifiable*	
	1990s	2000s	1990s	2000s	1990s	2000s	1990s	2000s
Journal articles	4.5	1.9	25.8	49.5	6.6	25.5	55.1	81.3
Book chapters	1.5	0	0.34	0.7	0.9	12.1	6.1	0
Edited book	3.0	1.9	5.8	0	4.2	0	16.3	0
Conference presentations	1.5	39.2	0.34	25.1	0	29.0	0	2.7
Seminars and workshops	31.8	21.6	64.2	44.5	44.3	30.4	4.1	18.7
Reports	57.6	35.3	3.4	10.7	0.9	3.1	18.4	0

Source: : UFS, 1996;1997;1998; 2009;2010;2011 *Because of the method of analysis employed, some publications could not be categorised by place of publication

Though located in a less favoured, semi-urban economy with agriculture as a contributor to provincial GDP, the research outputs show that the kind of knowledge is comparable to that produced by academic institutions elsewhere in the world, where journal publications and conferences (international) remain one of the main channels for knowledge transfer. While the need for knowledge production for the sake of advancing the boundaries of knowledge (Mode One) remains important, the observed trend can be related to a number of institutional, personal (academic), governance or regional factors. The first, as observed in Section 6.2.2, could relate to the way the university has defined itself in its strategic plan: trying to be a research-intensive university and seeking a more national and international footprint rather than having a regional focus.

Table 6.2 provides a condensed version of the previous table but the emphasis is on recent data (UFS, 2009; 2010; 2011) and on how the current policies in respect of change are reflected in publication destinations.

Table 6.2: Faculty publications, by place of publication from 2009 to 2011

Department	Place of publication			
	Free State	South Africa	International	Total
Agricultural Economics	15	90	43	148
Animal, Wildlife and Grassland	12	76	24	112
Plant Sciences	16	79	58	153
Soil, Crop and Climate Science	11	78	74	163
Disaster Management	23	26	13	63
Environmental Management	3	25	24	52
Sustainable Agriculture and Rural Development and Extension	1	17	5	23
Total Publications	81	391	241	713

Source: UFS, 2009;2010;2011

The data further reflect the university's national and international orientation. It is a typical traditional university in which promotion and acknowledgement are based primarily on academic publications in accredited journals and on books published at the national and the international level. It should nevertheless be noted that, between 2009 and 2011, the departments within the agricultural sciences between them produced a total of 51 Master's (mini-dissertations included) and Doctoral graduates and that more than half of the theses dealt with livestock-related areas, a quarter of the publications focused on issues related to breeding and about 18% focused on water- and irrigation-related issues. The data also reflect how particularly relevant the studies are to the local, the regional and the national context. Thus, though publications and conferences largely focus on international journals, the research process is distinctly embedded in the regional and the local context in the form of case studies by means of which tacit knowledge is arguably transferred to local participants.

6.2.3 Community engagement and training

Academics from the faculty engage in different ways with diverse stakeholders that include government departments, agribusiness, agriculture-related research commissions and councils (Water Research Council and Agricultural Research Council), agricultural newspapers and farmers' publications, and regional and national farmers' organisations. The faculty also receives significant funding from agriculture stakeholders, for example for contract research, contract-research commissioning, undergraduate and postgraduate studies, for procurement of

research equipment and for partnership projects to increase skills levels and develop capacity within government departments and in the private sector (see Table 6.3 below).

Other forms of engagement with stakeholders, as earlier mentioned, include workshops and seminars. Some of the main workshops that were identified include the Quarterly Agricultural Market Outlook Workshop held by the Department of Agricultural Economics, which seeks to involve farmers and other stakeholders with a view to sharing insights and informing farmers regarding financial and economic literacy issues. Micro-project partnerships between local projects, districts and municipalities have also been initiated by different agricultural departments to support communities to enhance skills development and alleviate poverty. An example is the partnership between the Department of Agricultural Economics, Mashaeng Poultry and the Dihlabeng Local Municipality.

As is evident from the table, the majority of knowledge-transfer activities in the form of community-engagement projects take place at the regional/local and the national level. At the national level, while partnerships seem to be mainly with national agricultural organisations or other national bodies like the Water Research Commission, the faculty reports reveal that the majority of the projects have a direct or indirect bearing on the local/regional context in that most of the case studies are conducted in the regional context. At the international level, the majority of engagement efforts are channelled through conference presentations and exchange programmes between students and academics from the faculty to other universities across the world. While this does not have a direct impact, the skills and knowledge gained in the course of these visits are communicated by means of both farmers' days and informal interaction with farmers and other stakeholders.

The UFS, through the Faculty of Natural and Agricultural Sciences has three experimental farms. These farms are the Paradys experimental farm, the Lengau Agricultural Centre and the Sydenham Experimental Farm. These farms are located to the south of Bloemfontein and are accessible to farmers and agricultural workers from various sectors. These farms are used for training, research and community service. The Lengau Centre has been earmarked for agricultural skills development and the training of emerging farmers, farm labourers and entrepreneurs in agricultural business.

Table 6.3: Community-engagement activities, by departments and centres in the Faculty of Agriculture, 2008–2010

Department of Agricultural Economics	Department of Animal, Wildlife and Grassland Science	Department of Plant Sciences	Department of Soil, Crop, and Climate Science	Disaster Management Training and Education Centre for Africa	Centre for Environmental Management	Centre for Sustainable Agriculture, Rural Development and Extension
Local / Regional						
<ul style="list-style-type: none"> - Partnership project with WRC on banks of Orange River - Agriculture market-related workshop presentations at UFS - Value-chain courses to integrate black emerging farmers - Micro-partnership projects 	<ul style="list-style-type: none"> - Small-scale egg-production project training - Basic husbandry training at Bothaville - Cattle artificial insemination course with Glen College - Goat information day at Paradys -Farmers' days 	<ul style="list-style-type: none"> - Lectures on climate change - Public lectures 	<ul style="list-style-type: none"> - Joint projects with local funding (irrigation and soil-salinity project funded by the Free State Department of Agriculture) - ARC-funded project on impact of cultivation practices on organic matter in Bethlehem 	<ul style="list-style-type: none"> - Short courses - Consultancy - Farmers' organisations 	<ul style="list-style-type: none"> - Conference presentations - Cooperation with local organisations for example, Bloemwater - Workshops - Local water-monitoring, for example Loch Logan Urban Impoundment 	<ul style="list-style-type: none"> - Talks at farmers' days
National						
<ul style="list-style-type: none"> - Research partnership with producer organisations - Livestock and wildlife benchmarking studies - Publications in newspapers and agripublications 	<ul style="list-style-type: none"> - Role in boards of producer organisations - Public lectures - Training to Nguni cattle farmers - Workshops on animal breeding - Staff serve as judges in agricultural competitions 	<ul style="list-style-type: none"> - Leaf and stem rust-resistant wheat species 	<ul style="list-style-type: none"> - Project for managing salinity with irrigation - Conference presentations 	<ul style="list-style-type: none"> - Student placements in government departments - Short courses in GIS, disaster management and environment - Consultancy projects 	<ul style="list-style-type: none"> - Partnerships projects with national organisations, for example WRC - National biodiversity projects - Water sensitisation forums and workshops, for example Graaff-Reinet 	<ul style="list-style-type: none"> - Skills training for government-department employees and agricultural research councils - Talks at farmers' days
International						
<ul style="list-style-type: none"> - Conferences - Student and staff exchanges 	<ul style="list-style-type: none"> - Conferences 	<ul style="list-style-type: none"> - International conferences 	<ul style="list-style-type: none"> - Climate-change presentations and talks - Workshops (FAO and UNU to improve crop-water productivity) 	<ul style="list-style-type: none"> - Short courses - Memorandums of understanding with international organisations, for example UNU, World Vision - International consultancy, for example Congo Brazzaville 	<ul style="list-style-type: none"> - Conferences - 30% of students from Southern Africa Development Community region - International research collaboration on Orange River (ORASECOM) 	<ul style="list-style-type: none"> - Exchange students and staff - 35% of students are international - 101 Master's graduates from across Africa

Interviews with the director of the Lengau Agricultural Centre revealed that the centre owes its existence to the demands from regional stakeholders. Following a formal request from the local municipality in 2004, the faculty decided to respond to the skills needs of emerging farmers in the province and thus went ahead with the creation of the centre.

The centre was established after a letter from the Mangaung Local Municipality in 2004, with the request to establish a centre like this. The faculty accepted the request, consenting that the province needed a centre like this (Academic Seven).

The centre aims simultaneously to undertake systematic small-farmer training, address local development issues and also enrich the curriculum in terms of research and training at the UFS. The director observes that it is very important that the work of the centre feeds into the curriculum and a project has been designed to ensure this:

It is very important because most of our students leaving [university] with Bachelor degrees have not learnt to communicate, to transfer their theoretical knowledge to farmers. The agricultural extension service in South Africa is not up to standard. Not at all. And the reason is that capacity to communicate and reflect is not built-in at undergraduate level (UFS Academic Seven).

The centre is therefore not simply engaged in community service in the way that most universities practice community service, but it seeks to ensure that the work of the centre informs and contributes to student training and ultimately to successful knowledge transfer. Knowledge transfer from the Lengau Centre occurs through the following channels:

- Sharing facilities as part of training for farmers and prospective farmers in cattle farming, dairy farming, small-stock farming, pig farming, poultry farming or vegetable farming;
- Short skills-development courses for entrepreneurs, farm labourers and other individuals;
- Information sharing on auctions, small land use, and infrastructure support;
- Outreach programmes by means of partnerships and collaborations to extend clientele using a 'hub-and-spokes' framework; and
- Knowledge sharing about social and health aspects relating to HIV/AIDS prevention, care and support initiatives.

The creation of a training centre required significant financial investment that the faculty could not afford at the time. The municipality therefore entered into a contract with the faculty. The faculty was to provide the training to the farmers, while the municipality would provide the necessary financial support. A funding contract of R5 million was agreed upon. The centre has

also sourced funding from other stakeholders in the province for specific projects such as the six hydroponic units that have been erected with financial support from the Mangaung Local Municipality and the Free State Provincial Department of Agriculture (UFS, 2010).

The centre has managed to forge collaborations with key stakeholders in the province and the sector. “The UFS, the Mangaung Local Municipality, the Free State Provincial Department of Agriculture and the National African Farmers Union (NAFU) have embraced the programme as partners in agricultural transformation” (UFS, 2007:106).

I have a very good relationship with the Head of Department of Agriculture [and] Land affairs at Glen College. I go there, they come here and we have a lot of meetings to address needs. We must work together – all of us (Academic Seven).

To ensure financial support and the general sustainability of the project, the centre was subjected to an audit. Based on the audit findings, it was decided that a service fee be introduced in respect of beneficiaries who had hitherto benefited from a 100% subsidised fee.

While Lengau Agricultural Centre has focused on emerging farmers and the development of skills for new farmers, the Paradys Experimental Farm is mainly used for the training of graduate and postgraduate students and for contract research. Doctoral and Master’s students conduct their research studies on the farm. The farm is also used for contract projects for other provincial and national clients such as the Water Research Council.

Despite the different focus, Paradys has also made significant efforts to engage with regional stakeholders and to help with the development of new skills for commercial farmers. In 2006, the farm was the first one to mechanise in-field rainwater techniques on a commercial scale. According to the 2010 faculty reports, knowledge transfer from the centre was achieved through the following channels:

- Twenty-two trainees were trained in boiler production;
- Four farmers’ days were organised successfully;
- Fourteen trainees in vegetable-production skills were trained;
- Two trainees in stock farming received land;
- Two trainees received funding for land;
- Sixty-four pest control operators wrote their qualifying examinations; and
- Thusano Animal Feeds was established to market particular products produced by the farmers.

By increasing their regional footprints and enhancing responsiveness, the centre is also contributing to regional development through outputs from the centre.

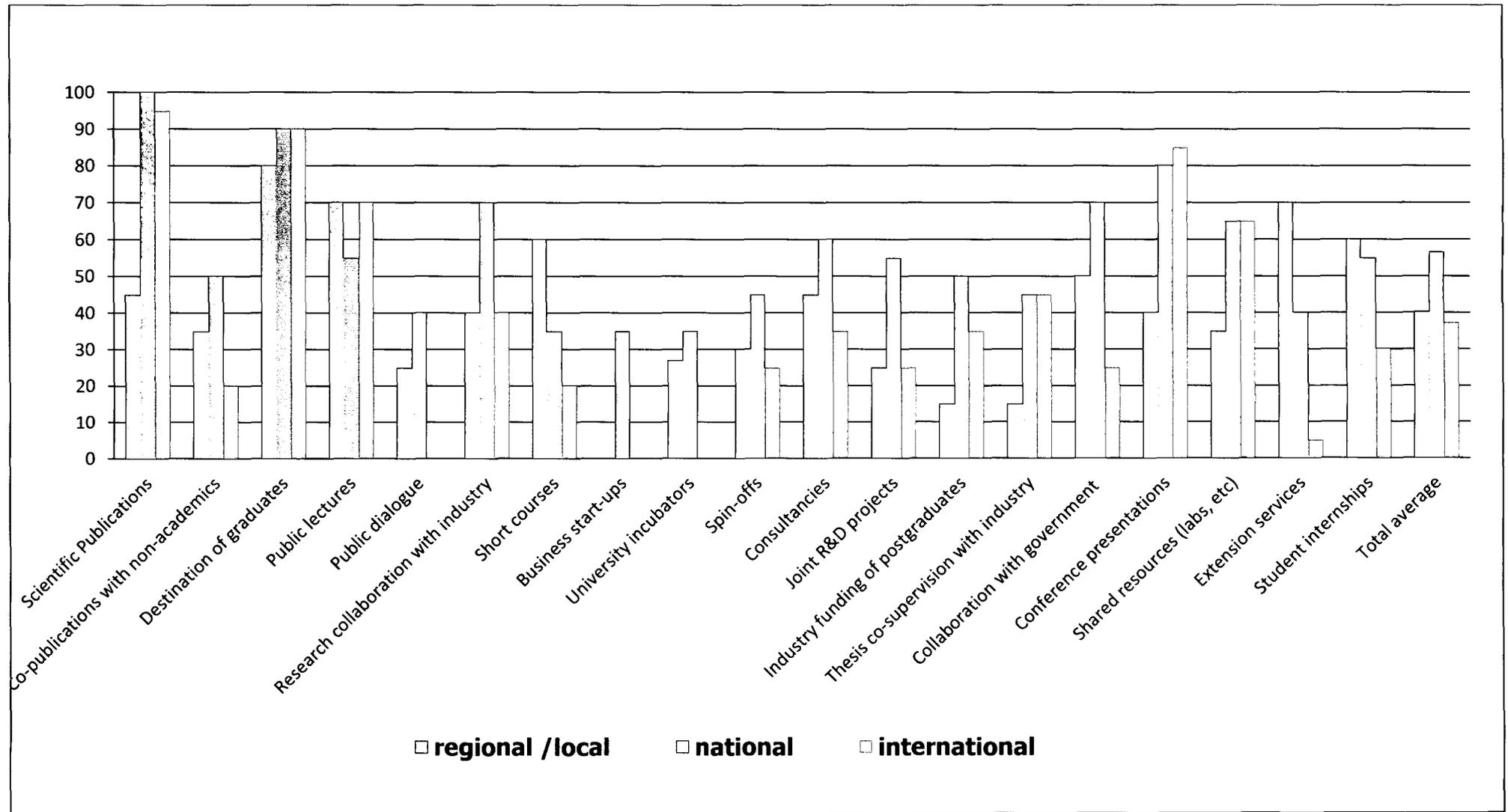
6.3 Channels of knowledge transfer

The next important objective of this study was to understand the different channels through which knowledge from the faculty was being transferred. Because the study involved a less favoured region, the researcher sought to understand how the knowledge-transfer channels in the region differed from traditional knowledge-transfer channels as identified in Section 3.3 of Chapter Three.

The literature on the main channels of knowledge transfer has most often been directed towards studies conducted in more successful regions. In the more advanced and successful regions, the relationship between the university and its regional stakeholders has increasingly focused on the economic aspects related to knowledge transfer for innovation, commercialisation, spin-offs and start-ups. This focus has aimed not only at increasing the economic competitiveness of the region, but also at raising third-stream funding for the university in the face of shrinking government support, increased demand for more accountability (Geuna & Muscio, 2008; Harris, 2001) and the imperative to remain relevant in respect of regional needs.

Data were collected by means of a quantitative survey involving academics in the Faculty of Agriculture. The analysis divided the findings into three categories: regional, national and international. This was done to probe into the regional emphasis given to the process of knowledge production and transfer in the various academic faculties and departments (see Figure 6.6).

Figure 6.6: Channels of knowledge transfer in the Faculty of Agriculture at the UFS, 2012 (%)



Source: Quantitative questionnaire response, (2012)

Using a number of knowledge-transfer indicators, the data provide evidence that academics engage more readily with agriculture-related businesses, producer organisations and agriculture-related industry at the national level. Thus, notwithstanding research taking place at the regional or the provincial level, the level of engagement with regional farmers or agricultural organisations nevertheless remains weak. Table 6.4 below, which uses six indicator channels, provides supporting evidence for this deduction.

Table 6.4: Analysis of selected knowledge-transfer indicators, by level of engagement

	Regional	National	International
Collaboration with non-academics	36	50	20
Research collaboration with related industry	40	70	40
Consultancies	47	60	35
Joint research and development projects	26	57	25.5
Industry funding for Master's and Doctoral students	16	50	37
Collaboration with government bodies	50	70	27

Source: Adopted from Figure 6.6

From Table 6.4 it is apparent that the process of knowledge transfer from the faculty is initiated mainly at the national level by producer organisations, research councils and commissions, and by industry. However, as a result of the affiliation of farmers (especially commercial farmers) to producer organisations and agribusiness, this knowledge is subsequently distilled through to the farmers. This trend clearly differs somewhat from what was found in previous research in more successful areas: universities there engaged more directly with key role players such as those in the engineering, information and communication technology and other applied science fields, for example biotechnology.

On closer analysis of the above table, three issues emerge. The first is that though the university positions itself as having a national and international outlook, the faculty is making a significant contribution to regional development. This contribution can be perceived from the different knowledge outputs that are transferred to the regional/local community. One academic supported this observation:

We contribute locally through generating postgraduates, but also nationally and internationally – with students from Africa, the Southern Africa Development Community and beyond – in helping to uplift and to improve animal production (Academic Four).

Secondly, the data further provide evidence to support the argument that the production of graduates and postgraduates constitutes a major form of knowledge transfer locally, nationally and internationally. However, even when knowledge is transferred at the regional level, it can be said that most of the engagement between academics and farmers takes place at the national level through partnerships with national farmers' and government agricultural associations, scientific publications and the provision of graduates. However, as will be discussed in the next chapter, a key explanation for this lack of regional focus is the regional agricultural sector's weak demand for research and knowledge.

Finally, Table 6.4 further serves to support Technology Transfer Office data on knowledge commercialisation indicating that, though the university has registered eighteen patents from the Faculty of Natural and Agricultural Sciences. These include two in food biotechnology, eleven in microbiology, two in biochemistry, three in chemistry and one trademark in biotechnology. None of these patents have been from agriculture departments. As will be discussed later, this can probably be related to the absence of an agricultural engineering faculty or department, an issue that has been debated for a couple of years. In the demand analysis in Chapter Seven, analysis of demand factors also suggests weak absorptive capacity and limited venture capital as possible explanations for the failure to register patents.

Based on the data, it can be concluded that though the faculty is located in a rural and semi-urban area with limited regional and institutional facilities, its knowledge output is in alignment with the notion of academic universalism as proposed by Bond and Patersons (2005). Based on their findings in Scotland and England, they argue that "in many respects the experiences and opinions of academics do indeed reflect a universalist perspective rather than a strong affinity to a national or subnational community" (Bond & Patersons, 2005:335)

Earlier sections (Section 6.2 and Section 6.3) have provided empirical evidence of the types of knowledge produced and transferred by the Faculty of Agriculture and also of the main channels through which these knowledge types have been transferred. While there is evidence of knowledge transfer, this study also sought to determine the key factors

influencing knowledge transfer. According to knowledge-transfer theory as presented in Chapter Three (Havelock, 1969), the process of knowledge transfer depends not merely on the presence of knowledge or knowledge channels, but more importantly, on the institutional, personal and sociocultural dynamics between knowledge producers and knowledge users. In the next section, theoretical tools borrowed from the learning region approach (Chapter Three) are utilised to identify and analyse the main factors that affect the transfer of knowledge from faculty to region in a less favoured region. The section is based on a thematic analysis of qualitative data collected primarily from interviews with faculty staff and from a review of policy documents. The analysis is further based on previous research and publications.

6.4 Supply factors affecting knowledge transfer

In the discussion of the learning region concept (Chapter Three), mention was made of a number of indicators that informs knowledge production at the regional level and also of the factors that influence knowledge transfer to regional stakeholders. Informed by these indicators, the data-collection process was designed to explore knowledge transfer at the UFS with specific emphasis on the academic departments related to agriculture. The identified indicators were investigated in a less favoured region of the Free State and this chapter presents analysis of the data. While the analysis of both qualitative and quantitative data did reflect the presence of almost all of the indicators, only findings of a significant nature are reported here. The main factors that emerged in respect of knowledge transfer were: the nature of the university, the attitudes of academics to knowledge transfer and engagement, the types of knowledge produced and the transfer channels, the level of institutional embeddedness and, finally, the presence of knowledge-transfer support structures.

6.4.1 The nature and history of the university

As discussed in Chapter Five, the UFS was established as a traditional university (see Chapter Five) whose key functions were teaching and research. Secondly, the UFS had originally been perceived and institutionally positioned as an instrument of the erstwhile apartheid system of government. Analysis of the data provides evidence that these two aspects of the history of the UFS – its traditional nature and the racial history – continue to shape the thinking of significant numbers of staff as regards knowledge transfer and engagement.

6.4.1.1 Traditional national university

Pinheiro (2012), in a concise analysis of the nature of the university and of how its nature affects both the university's relationship with a region and the institution's commitment to knowledge engagement, developed a classification model of the different types of universities that highlights their different inherent characteristics. Pinheiro's classification contains three stylised models that are considered to have emerged from the globally oriented university model of the 19th century: the research-intensive university, the regional university and the recently emerged entrepreneurial university. Table 3.1 highlighted some of the key characteristics and features of the different models.

Table 3.1 highlighted the key components of a university that ultimately define its nature. These components inform a university's orientation and its ideological mission, and further define how, with whom and to what geographical extent a university will engage in knowledge activities.

The decidedly traditional nature of the UFS has brought about an emphasis on academic outputs that focus on teaching and research, while there has been less emphasis on engagement. Manifestations of the traditional nature of the university as a concept figured in a number of interviews with academics, who felt that there was a disparity between what was said and what was practised. One academic remarked:

Contrary to what people believe, as far as engagement is concerned, most departments look down on community engagement [knowledge transfer]. The attitude is: "Why do you spend time around in the communities when you could publish? Who do you think will carry this department if you are out in the community? You should be here teaching and publishing" (Academic Three).

When asked about the importance assigned to knowledge commercialisation or to engagement in the current employment policies, almost all of the respondents observed that capacity or a history of engagement was given scarcely any consideration.

I don't think we are that precise or fine-tuned in our employment policy. We generally just look at somebody with a good [academic] pedigree with a degree, from a good university, and a good sense of productivity, and then, with younger guys, we look at academic potential. We should, but we don't look at knowledge dissemination *per se* as criteria (Academic One).

At the level of academic promotion, engagement also does not carry the kind of weight it should so as to incentivise academics to engage with the region. Several respondents indicated that teaching and research outputs in the form of publications in recognised journals remain the main factors when it comes to determining promotion. There was however general consensus that knowledge transfer, innovation and engagement would have to be taken into account in promotion policies.

The Minister of Higher Education and Training has described the attitude of academics as being “often fearful of an assault on traditional curricula, ‘revered as sacred’ and protective of ‘existing ideology as upheld at academic departmental, faculty or institutional level” (Dell, 2011:2). One of the academics articulated this sentiment: “Unfortunately in this university [it is the] same like in many others, but because of the kind of history, there seems to be a predominant attitude of being hesitant to engagement” (Academic Nine). This nature relates to a kind of the university seeking to become a leading research university.

This conflict between what is said and what happens on the ground was also mentioned in the context of the current policy regarding community engagement discussed in Chapter Five. As one academic observed, “You’ve got a policy of community engagement; but when it comes to the practice and how to drive it, it is not there” (Academic Four). This demonstrates that there is a divide between what the policy of engagement stipulates and how the policy is implemented to meet its aspirations.

In a project conducted by the European Commission, this lack of regional orientation on the part of university characterises what the commission refers to as “disconnected region”. Used to describe a region in which the university is seen as being *in* the region and not *of* the region, the focus of academics is on rewards for research and teaching, while institutional policies discourage engagement practice (European Commission for Regional Policy, 2011). This resonates with other findings (Section 5.4 and Section 6.2.2) indicating that there is more of a national and international agenda in the university’s strategic plan, which it could be argued, describes the university as being *in* and not *of* the region.

Using the notion of ‘entrepreneurial architecture’ as a key factor towards enhancing university engagement and knowledge transfer, Vorley and Nelles (2012:186) contend that a change in university institutional culture “is critical to ensuring the efficacy of the structures, systems, strategies and leadership which themselves constitute entrepreneurial architecture”.

This culture relates, *inter alia*, to the vision, mission, history and values that will be discussed in the next section.

6.4.1.2 The historical context

As mentioned in Chapter Five, the UFS was originally established as an institution for the white middle class, and though this was in a province in which black Africans comprised more than two-thirds of the population, it was principally reserved for the white minority. This racially compromised nature of the university endured until about 2006 and was arguably epitomised by the infamous Reitz Residence incident¹⁴ in which four students humiliated black workers and recorded their actions on videos (Soudien, 2010). The level of insensate actions in the video as it spread online received unprecedented international outcry and triggered a series of restructuring processes within the institution (Fourie, 2008). These included the public reconciliation of those who had been involved in the humiliating incident. Another major change was the change from Afrikaans to English as first language of communication. One academic reflected on the Reitz debacle as follows:

What happened in 2008 was extremely bad but also extremely fortunate, because it could only have been such a tremendous event that could shake the institution and make it realise that it was far beyond time for introspection (Academic One).

The introspection that followed led to a number of changes and processes aimed to change the face of the university. These changes sought to position the UFS in a different international space. The outlook is becoming increasingly positive as greater numbers of international academics of repute are becoming involved in UFS activities.

Another academic argues that the history of the province and the teaching and learning process often do not enhance engagement – especially in the agricultural sector

There is still the natural split between (let me be very blunt) white farm boys and small [emergent] farmers. They do not want to engage with each other. There are many programmes that expose them to that. But it is not just exposure, it is not trying to instil through the curriculum and especially through the people teaching them to understand what realities is [*sic*] out of Bloemfontein or at the international level (Senior Management Five).

¹⁴ <http://mg.co.za/article/2010-07-29-reitz-four-face-fine-after-guilty-plea>

Such conservative racial attitudes and an inability even to consider a more regionally engaged university probably go hand in hand. Reflecting on the historical context of the university and the challenges faced at different levels of transformation an academic argued:

Initially the thought of the UFS was [that of] a very racial university. I think the university has changed with the clusters and research development. We have improved research-wise (Academic Six).

Interviews with top management and with academics in the faculty at UFS revealed that inasmuch as new energy for change and engagement is being demonstrated – by, *inter alia*, the appointment of a black vice chancellor, the creation of the knowledge commercialisation office and a new impetus towards engagement – there is however still a strong sense of resistance current among the academic community. A respondent held the following view:

The Vice-Chancellor is a change agent, a transformational leader and is moving [old] paradigms long established in the institution. He is an inspirational leader. However there seem[s] to be lacking institutional support from top management and hence [a] need for sustainability of the current paradigm shift (Senior Management Two).

The above observation emphasises that the nature of the university affects how the university is perceived by external stakeholders, which in turn affects the extent to which external stakeholders would want to engage with the university. The racial divide between the university and its region (white and non-white) has, in many ways, informed both the kind and the level of interaction of the university with its region.

Another academic, who acknowledged that the historical nature of the university had not changed much in spite of some external, structural changes, echoed this observation:

I do not think we have made that transition as yet, [namely] to purposively transform the university on the inside – not only in terms of race but also in terms of our approach (Academic Five).

It can be argued that the majority of the changes at the UFS have been at the structural level with little change in the social construct, culture and dominant ideologies among academics and the outside world. The structural changes seem not to have been accompanied by the necessary social and cultural changes among the old guard and in respect of the academic culture of the institution. Bellah et al. (1991:26) recognise that in reshaping higher education institutions as social institutions, it will be very limiting to "... suggest that the problems are merely technical, [thus] ... we need a richer moral discourse with which to conduct public

discussion ...". The UFS is making significant efforts towards ensuring this kind of discourse at different levels of management and practice. Yet, it should be noted that institutions take time to change and thus the effects of both the structural and cultural changes will need to be assessed in about ten to fifteen years from now.

The historical nature of the UFS can thus be perceived from two positions. First, the UFS was created as a traditional university at which teaching and research were considered to be the core missions of the university. Secondly, the UFS was significantly aligned to the socio-political context of the country, which related to policies of separate development that favoured and protected historically white universities through a range of diverse policies. This has also been observed as a major factor affecting both engagement from within the university and also how others saw the university. Arguably, this political and social divide based on race and class in many ways informed the mind-set of academics regarding the regional stakeholders and also the region's perceptions regarding the university, thereby creating a 'natural' distance between the university and the community.

6.4.2 The changing landscape: policy versus practice

Analysis on the changing landscape was done at the institutional level and at the faculty level. This two-level analysis is based on the fact that some changes at the faculty level cannot be captured by means of institutional analysis.

6.4.2.1 The changing institutional landscape: from an inward-looking institution to a 'globally engaged' institution?

One important aspect affecting knowledge transfer is the nature of the university. Some reference has already been made to the changing dynamics at the UFS. In essence, the UFS is changing from an institution that first perceived itself to be part of a national hegemony to one in which academic excellence has become a key pursuit. Data collected through interviews and by reviewing current university strategic documents reveal an interesting dynamic that exists between strategic leadership and academic practice.

The orientation of the university – as regional, research-intensive or entrepreneurial – significantly influences both the kind of knowledge that is produced and the extent of its engagement. The nature of the university, as positioned in its strategic plan, outlines the strategic direction in which the university is driving and which, to varying degrees, defines the kind of graduates and knowledge produced by the institution. This analysis captures the

changing nature of the university and of the faculty. The data reflect the structural changes and determines the extent to which these changes have affected the university's culture of engagement.

Some of the changes at the structural level have included the appointment of the first black VC, the introduction of UFS 101 and a course in cultural awareness. Emphasis has further been placed on research publications and on establishing the Technology Transfer Office, the Office for International Relations and the South African Research Chairs Initiative. These changes have been made to give a new, changed image to an institution that had, in many respects, been considered to be disconnected from both its immediate and extended communities.

According to its Strategic Plan as described in the previous chapter (Section 5.4.2), the UFS has set out to position itself in an international context. The UFS envisions that it will be "a university recognised across the world for excellence in academic achievement and in human reconciliation" (UFS, 2012a:10). This is embedded in the long-term vision of being a research-intensive university (UFS, 2012a). This vision sets out to make the university "one of the top three research and teaching universities in the country thereby laying the initial groundwork for academic excellence and competitiveness on a worldwide scale" (UFS, 2012a:15).

This international ethos was echoed in an interview with a member of the top management and with an academic in the following responses regarding their perceptions of 'the community':

My community is the world. I present talks in the United States on racism and the like ... talks in Mozambique. I am an internationalist by faith, so any nationalist [regionalisation] talk drives me 'nuts' (Senior Management One).

Our focus is international. The principles of the research is [*sic*] applicable over the world but of course more applicable locally (Academic Three).

The international focus is further reflected in the establishment of the Postgraduate School that has been established to enhance the research-intensive drive of the university. The Postgraduate School serves to train and support postgraduates. It has a clearly stated mission, namely:

... to produce graduates who are global citizens, research literate and able to reflect ethically on the purpose, process and product of research; ... and contribute to the development of people beyond the limits of their discipline (UFS, 2012b:44).

Arguably, this mission again relates to the international or global perspective of the university and its products and its limited emphasis on developing postgraduate students able to think and affect the circumstances in their immediate surroundings.

Questioned on the relevance of the curriculum to meeting contemporary challenges in the agricultural sector, most of the academics sought to position themselves in an international and national context with little focus on regional or local needs:

We try to be internationally competitive, we have extraordinary professors here at the Centre, and part of their job is to look at the quality of the knowledge we give here. So, we try to link our centre with international universities and [to] get involved, so we have a curriculum at [the] international level (Academic Six).

The UFS Strategic Plan and the above perceptions tend consciously and unconsciously to ignore the regional and local context and thus focus on the national and international context of being a research-intensive university. This vision arguably suggests an undertone of research for the sake of research and publication (Mode One) in international academic circles and demonstrates little concern for regional impact. In perceiving itself as belonging to the international academic community, the university seeks to have national and international relevance as opposed to being committed to regional or local engagement. Pinherio (2012) captures the crux of the problem in observing that a university's vision determines its level of engagement. It should however be pointed out that while most academics in the faculty strive for international relevance in alignment with the strategic mission of the university, other clusters and departments are seeking to strike a balance between international competitiveness and regional relevance. Typical examples are the clusters for poverty reduction and sustainable development. The heads of clusters play a significant role in this drive for regional relevance. This brings us to the role of leadership.

6.4.2.2 Faculty leadership

This section considers the nature of the agricultural faculty and the leadership in relation to regional engagement. During the interviews, the nature of the faculty and its leadership emerged as a major factor. A senior faculty official had the following to say:

I do know that my predecessor did a lot of reaching-out with the [agricultural] unions, because obviously the unions are important vehicles to drive capacitating projects. A lot of the outreach came from the dean's office. I have not engaged the unions at all.

The former dean was an agriculturalist by training and was thus able to engage more effectively with the relevant agricultural stakeholders. The current dean is a zoologist whose specialty is herpetology. His field of research involves mainly laboratory research and analysis and perhaps he has more links with environmental organisations than with agricultural stakeholders. By his own admission, he moreover has limited entrepreneurial inclination:

I am your general academic; I am not an entrepreneur, which relates to generation of funds. My research is mainly fundamental. I am sure there are issues I could engage in. It has never been part of my making. I don't think I am an academic entrepreneur (Dean)

While another academic from the faculty echoed this perception of the dean, he suggested that the splitting of the faculty into two entities (Natural Sciences and Agriculture Sciences) as it had previously been could enhance regional engagement from the agriculture faculty. He also considered the role of the faculty head to be important in this drive towards increased engagement.

I think we are big enough to split out the faculty into Agricultural [Sciences] and Natural Sciences. A natural scientist will not naturally have the feeling [disposition] and will not be able to drive efforts by [in] agriculture. I think one of the solutions will be to split the faculty into two as they used to be. Then you can have an office dedicated to agriculture from which you can drive these programmes from an institutional side in a better way. Currently I think it's individuals, maybe here and there (Academic Five).

According to literature (see last paragraph of Section 3.2.2), a key factor in knowledge transfer is an academic's past experience and disposition to engage in knowledge transfer (Bercovitz & Feldman, 2004). Furthermore, Cohen and Prusak (2001) identify the motivation of the (knowledge) source as a key factor in knowledge transfer, opining that where there is less motivation from top faculty management; knowledge transfer would arguably be less. For Hansen (1999), such an absence of disposition and willingness could significantly limit the sharing of knowledge. Though the nature of the faculty leadership did not figure strongly in the other interviews, there was a strong sense that the previous dean had

been more engaged with the agricultural sector than the current dean. It thus can be said that the differing leadership styles of the previous dean and the new one may well have had an impact on the knowledge-transfer mechanisms in the faculty.

Sections 6.4.1 and 6.4.2 provide an historical analysis of the UFS. While the university is making significant structural changes in the process of changing the legacy of the former political regime, there is a sense that either these structural changes have not filtered down to the knowledge practices of individual academics or that the impacts are not yet visible. While the changed top management are now open to an engagement discourse, academics continue to see themselves as separate from the region.

Regarding regional engagement, there is however a further divergence between academic work and strategic leadership: academics see themselves as part of a national system rather than a regional system, while strategic leadership is currently positioning the university in the international arena. Both are thus in different ways ignoring the regional context. It can be concluded that while universities in more successful regions are seeking to maintain the balance between being “globally competitive and locally engaged” (OECD, 2007), universities in less favoured regions – like the Free State Province – seem to ignore their local and their regional contexts by seeking to position themselves in the national and international arena.

6.4.3 Attitudes of academics to knowledge transfer

This section probes into the disposition of academics towards knowledge engagement with regional stakeholders. Balázs (1997:3) “... understands academic entrepreneurship primarily as *behaviour*, which modifies patterns of research”. In other words, it is not first about the number of innovative discoveries or the amount of money generated from patents or about business spin-offs, but rather about the behaviour of the academics and how that behaviour affects not only the practice of research and knowledge production but also its transfer from faculty, department and/or centre within a knowledge-producing institution. Two issues are addressed in the next section: the perceptions of academics regarding engagement and the perceived benefits of engagement.

6.4.3.1 Perceptions of academics regarding knowledge transfer

Interviews revealed a set of diverse perceptions from academics ranging from seeing engagement as important, to perceiving it as a waste of time. An academic in one of the departments, in responding to aspects of engagement, observed:

It depends on your attitude. You know these academics will only do something if there is something in it for them financial wise. They feel their time is worth money, which I don't agree with. I believe [that] if you work in a higher education institution there is a sense [that] you should like to transfer your knowledge to people (Academic Three).

The above respondent went on to highlight the low esteem generally accorded to the notion of engagement and especially to knowledge transfer:

Contrary to what people believe, as far as community engagement is concerned, most departments look down on community engagement. The attitude is, "Why [would you] ... spend time around in the communities when you could publish? ...who do you think will carry this department if you are out in the community? You should be teaching and publishing (Academic Three).

This view was also forcefully echoed by two respondents who stated that while there were indeed some incentives to encourage community engagement and knowledge transfer, the institutional culture of academics might not provide the right conditions, expectations and incentives for academics to engage:

... but there are still some others who have a very parochial outlook in terms of outreach and engagement. They will like to just sit here [and] read, write and publish. And even if they are approached, they see no need; they see no reason to engage (Senior Management Five).

The emphasis here again falls on the main activities of a traditional university, namely teaching and research alongside scientific publications. Paterson (2001) reflects on this attitude, saying that with the increased demand for academics to become more 'of' rather than 'in' their communities, there seems to be a marked tension as regards the values academics claim to be their peculiar responsibility. In this tension, the scale seems to tip towards teaching and academic scholarship for publication rather than towards societal relevance.

However, further interviews with other academics revealed that, consequent to the enactment of new policies, a wave of positive change was being seen to be creeping into the entrepreneurial culture:

I think it [institutionalisation of knowledge transfer] was not the case previously, but I think it is beginning to change, it's getting better; we are not there yet. But I see a change for the positive (Academic Six).

Yes we have now introduced new policies. We have about four or five new policies going through the system. Our new Intellectual Property Policy has been revised and is in line, it supports venture creation, profit or benefit sharing with [academic] personnel. It is fairly liberal [in] trying to create an entrepreneurial environment that stimulates this [knowledge transfer]. So yes, we are now putting in place mechanisms and a guideline to establish a university that wants to be entrepreneurial (Technology Transfer Office respondent).

Though the Technology Transfer Office was only recently established, there already seems to be a negative perception from academics regarding its role in knowledge transfer and how they perceive this office. Geiger (2010) emphasises the importance of finding the right mix of incentives and suggests that if universities became more flexible about their intellectual property policies, industry would be more open to collaborating. What is more important in the creation and establishment of a knowledge-transfer office, is academics' attitude towards such an office (Link et al., 2007).

6.4.3.2 Perceived benefits of engagement

Inasmuch as there are new policies for knowledge transfer and other structural changes to forge a change in culture towards greater engagement, data from the interviews indicate a mixed bag of perceptions from academics with regard to knowledge engagement. Link et al., (2007:469) point out that "institutional success in technology (knowledge) transfer depends on faculty attitudes toward the Technology Transfer Office". From the data obtained, there seems to be evidence that many academics are sceptical of recent policies initiated by the UFS through the office in respect of knowledge transfer and commercialisation.

An academic head expressed the following views on the policies coming from the Technology Transfer Office:

I haven't seen one thing in that policy that will support us. They claim it's for control – which I understand, as there was maybe not enough control. But there is nothing to

motivate me to continue with this [engagement] from the university side (Academic Five).

The background of the above quote relates to the new policy from the Technology Transfer Office, which, among other things, requires that all UFS staff involved in private consultancy projects that are run through the UFS need to pay the university 21% of the proceeds of such projects. While the UFS is trying to provide a balanced environment for engagement while simultaneously enhancing third-stream income, there seems to be a sense of objection among some academics. This emphasises the loosely coupled and sometimes fractured nature of the university.

Regarding Mode Two knowledge discourse, one of the academics stated:

The 'Mode One'-'Mode Two' [knowledge] debate is a big challenge because of a number of factors. First of all, the subsidy formula with which the university receives funding is based on publication output. It's a numbers game and not [about] quality or impact (Academic Two).

While there has been increased emphasis on the institutionalisation of knowledge transfer from university to industry and on motivating academics to engage with stakeholders towards achieving sustainable development outcomes, the relationship between academics in the UFS and regional stakeholders remains ad hoc with limited institutionalisation. Firstly, academics do not perceive engagement and knowledge transfer to be part of their core missions; those who do, seem not to have the right motivating environment and incentives to enhance engagement. The current commercialisation policy has widely been received with dissatisfaction as academics perceived it to be over-regulating and that it moreover limits creativity in the process of raising third-stream income. This perception by academics resonates with what was earlier observed by Geuna and Musio (2008), namely that little attention has been paid to issues relating to the management and governance of the knowledge-transfer process.

6.4.4 Quality of knowledge

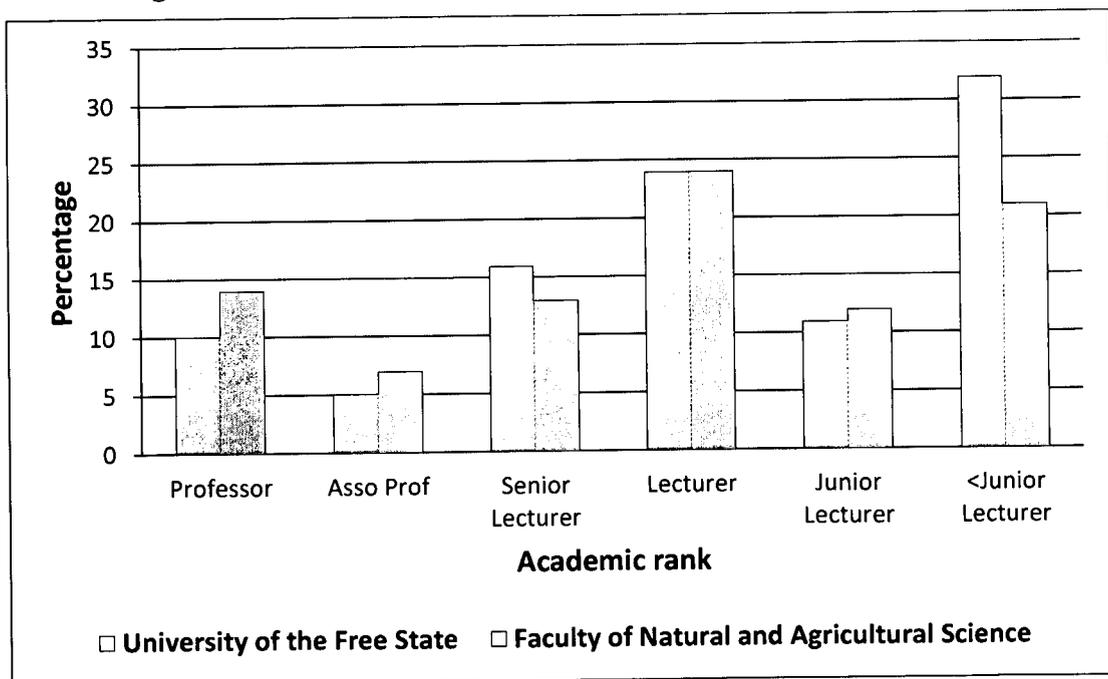
This section deals with the quality of the academic core entrusted with producing the required knowledge.

6.4.4.1 Quality of academics

The qualifications of academic staff have widely been used as an input proxy for the quality of research outputs. Casper Gerhard, former president of Harvard University, in arguing that the quality of the teaching staff influenced the quality of output from the university, stated that “not only do students benefit when taught by scholars who are themselves engaged in creative endeavours [research]; rather, scholarship itself is enriched when the younger generation consciously, if naively, questions it” (Gerhard, 1998:2). He emphasised that academics who lectured needed to be strongly involved in research. He further emphasised the link between teaching and research when he posited that “the link is nullified when teaching at the university is primarily carried out by those who have no direct relationship to research” (Gerhard, 1998:2). The role of knowledge in development discourse thus necessitates that attention be given at the institutional level to ensure that the appropriate knowledge type is made available to users.

Data from the UFS indicate that less than 35% of all academic staff (research and instructional staff) has doctorates and that about a third (32%) of all academic staff have been appointed at below junior lecturer levels (see Figure 6.7).

Figure 6.7: Percentage distribution of academic staff in the Faculty of Natural and Agricultural Sciences by rank, (2012).



Source: UFS, 2012c

In comparison with the university as a whole, staffs of the faculty have higher academic qualifications, more academics at the levels of professor and associate professors and fewer staff below the junior lecturer level. However, the lower percentage of academics at the senior lecturer level, together with the high percentage of junior lecturers arguably generally undermines the quality of teaching and research in that the junior academics are not always involved in high-profile research. On the other hand, this skewed profile could also be indicative of a situation in which the senior academics with impressive research records secure significant consultancy projects and then leave the teaching and tutoring duties to junior staff, a situation that limits scholarly engagement:

University-industry interaction can only strengthen scholarship or should only strengthen scholarship. There are many people at university who have a lot of engagement with role players but it doesn't translate into scholarship. and it doesn't translate into an enriched and informed learning environment. Whatever is being done should be [done] in a scholarly framework, knowledge produced and gained. How does engagement enrich your students? Teaching universities should have a strong research component to inform teaching (Academic Five).

The argument by this academic (Five) is in alignment with findings by Cloete et al. (2011) who bemoans the lack of an institutionalised notion of engagement that aims to strengthen the academic core. Based on their findings from universities in eight African countries, the authors propose the notion of 'projectisation', which defines ad hoc, disjointed consultancy work that does not support scholarship and scientific knowledge production and transfer. However, at the UFS, while there is evidence of such tendencies, it is also apparent that the faculty has been recognised nationally for its quality knowledge output and that efforts have thus been made to integrate engagement with scholarship.

The nature of the knowledge-transfer relationship between university and region has been captured by Bramwell et al., (2012:1138) who observe that one of the important conditions in knowledge transfer is also the fact that the quality of knowledge output informs how much demand for university products towards the region as well the attitude of the university towards the region. Taking into consideration the quality of the staff as revealed in Figure 6.7, it can be said that the quality of the teaching – and thus the quality of the graduates from the faculty and university – will have to be assessed in the context of relevance and of the skills acquired – both for employability and also for transition into postgraduate study. This,

too, will have to be probed better by means of tracer studies with a view to gaining feedback from employers of UFS graduates regarding how satisfied they (the employers) are with the graduates.

6.4.5 Institutional embeddedness

According to Beerkens (2004:55), “the notion of embeddedness brings back the social context in economic analysis and emerged as a reaction against the separation of society and economy and the assumption of the autonomy of markets”. This builds on Polanyi’s (1944) contention that the economy is not autonomous but is embedded in the social, religious and other institutions in shaping the economy. Keane and Allison (1999) observed that, when applied to universities’ activities and the role of knowledge in regional and national contexts, the embeddedness of a university is apparent in its linkages with regional stakeholders through various aspects including training, advisory services, destination of products and sales, and community support and involvement and how these linkages influence the work of the university. The level of embeddedness can thus also be referred to as the kind of knowledge produced and in how that knowledge or the process of production relates to the local context and to local circumstances. In this analysis, two aspects are analysed and presented: the level of collaborative platforms and engagement, and that of social capital between academics and regional stakeholders, as indicated by the level of informal relationships and trust.

6.4.5.1 Regional collaboration

Interviews with academics and analysis of qualitative data indicate that there is a lack of institutionalised collaboration between key stakeholders from both the faculty and the community. As discussed below, three issues emerged in retrospect of collaboration. The first issue concerns the non-alignment between the desired impact of the university and the university’s actual current footprint. The second is what has been described as the lack of ‘informality’ in most of the formal relationships that do exist.

Firstly, impact, in this context, is used to describe the regional relevance of the university and the kind of knowledge it communicates specifically to the regional level rather than to the national level. Findings from this study show that there is a weak regional emphasis in communication and engagement even though, as seen from the empirical data, the majority of

graduates go back into the community. There is therefore need for better collaboration between the knowledge producers and the potential users so as to improve relevance.

When asked about how to enhance knowledge transfer between knowledge producers and users at the provincial level, a member of the top management at the UFS maintained:

The only way to do this is to bring the two closer so the one knows what the needs of the other are. And, because of this lack of coherence in the past, we have this big divide and that is the challenge of my office to try and bring these closer together (Technology Transfer Office respondent).

Findings from the OECD Review of the Free State Province encapsulate the problem:

... the universities in the Free State do not have a regional focus in their recruitment strategies and do not systematically monitor the students' regional background. They aim to draw the best students from the country with no specific regional targets for recruitment (Puukka et al., 2012:88).

While the CUT has been making progress in this regard, the UFS is only now beginning to identify the importance of having a regional footprint. Interviews with academics at the UFS provide evidence that there is a lack of good communication between the relevant regional and even national stakeholders. "There is lack of a formal platform for a triple helix communication" (Academic Two).

There is as yet no formal institutionalised platform on which engagement takes place. Most instances of engagement are dependent on the presence of a 'champion' in the person of the newly appointed vice chancellor and of those working closely around him. A respondent, when asked about the level of collaboration, affirmed that collaboration was not well coordinated:

There is interaction between Glen and the UFS, between Glen and Grain South Africa, but no interaction between all the role players. There are informal arrangements and collaborations between some of the staff members and the small grain institutions. There is definitely, without doubt, need to strengthen the relationship and professionalise the interaction to the benefit of all the participants – especially the smallholder farmers (Senior Management Two).

According to Leydesdorff and Etzkowitz (1996), the triple helix model for regional development ensures that the three spheres – government, industry and university – work in constant cooperation and communication, continuously and interchangeably taking on the

role of the other. This enhances communication of the needs of each sector to the others. While this interchange can sometimes result in conflicts of interest, it significantly increases communication in what Etzkowitz and Dzisah (2008:658) have referred to as “institutional cross-fertilisation”, in which “each helix is infused with new ideas and perspectives from the others”. For this to be fully achieved, knowledge product and knowledge supply must be conceived as a process rather than a product. Vingilis et al. (2003:468) caution that, “if research is treated as an end product rather than a process, potential knowledge users are not given the opportunity to inform the topics to be researched or the approach to be adopted”.

This analysis points to two main aspects of collaboration among academics and the regional stakeholders. Firstly, there is some level of interaction and collaboration at both the informal and the formal level between different groups. However, this interaction has not been institutionalised and thus the process continues to lack communication and feedback mechanisms. Secondly, as indicated in the literature, such limited collaboration points to academics’ limited level and notion of embeddedness in the region. The weak embeddedness – as indicated by some respondents – cannot only be linked to the university’s historical past but is further indicative of weak knowledge demand from stakeholders. The demand factors will be discussed in the next chapter.

6.4.5.2 Networks and social capital

A second important measure of the level of embeddedness, one that emerged strongly from the data, was the divide between formal and informal collaboration and the contribution each is supposed to make towards enhancing knowledge transfer and engagement. One factor that informs this embedded informality is the level of trust between stakeholders. One of the senior management officials acknowledged the importance of trust:

Some individuals have reservations in their relationship with the university due to past experiences with particular individuals who are not necessarily in the faculty of agriculture or have even moved out of the university. Even if the university signed a[n] memorandum of understanding with the department or organisation in question, the lack of trust will not support the realisation of the expected outcome of such a formal endeavour due to a substantial lack of informality in the relationship with stakeholders (Senior Management, Three).

One such example of a lack of trust, according to a respondent, is the belief that the university or faculty most often has a hidden or selfish agenda when it engages with the community on some research-collaboration project. Stakeholders expect the university to be able to consult

with them from the onset of the research design and hear their own perceptions of the problem before finalising the research project. More often than not, the university comes with a finished project for Master's or PhD research and these findings are hardly ever communicated back to the community or organisation.

One of the respondents from the Office for Community Engagement observed the level of formality and informality in their relationships with the community and how it affects knowledge engagement:

A lot of time we are forced to have more formal structures and memorandums of understandings, but sometimes it takes time and could hamper working or cooperating with certain organisations; especially with the government (Academic Three).

The above observation suggests that though the university seems to emphasise the need for formal relationships, these not only take time to be established, but the process of negotiating the formality could be a hindrance to the relationship itself. When asked about the sustainability of formality of interactions and how they sustain engagement, one respondent at the UFS observed:

Memorandums of Understanding for me are just a formality. But if managers of institutions and academics are serious, it gets implemented. Memorandums of understanding need people behind them (Senior Management Four).

I think we need to meet in more informal meetings other than Senate to communicate some of these ideas (Senior Management Six).

These perceptions were also reflected by another academic who maintained that formal collaboration should be built and sustained through informal arrangements:

A formal agreement is worth nothing more than the paper it is written on without informal agreements between the two parties as well. You cannot force people through memorandums of understanding to work together and [formal] memorandums of understanding should start with informal memorandums of understanding. If we start working together then maybe we decide at the institutional level to sign an agreement. And through that you create other informal agreements ... But if the two of us have an informal agreement and through the university sign a formal agreement and there are no other informal agreements developing from that, once we are gone, then there is nothing left. We have a lot of memorandum of understanding in this university that are not working. But I think we have more informal agreements working without memorandums of understanding (Academic Five).

The above observation by an academic in a different unit resulted from practical experience in the Lengau Agricultural Centre where an agreement was signed by the UFS, the Provincial Government and farmers regarding the training of emergent famers. However, the initial agreement and the memorandums of understanding became null and void and had to be cancelled because of a lack of informal relationships to enforce the agreement.

This observation in no way negates the importance of formal memorandums of understanding. They are important in respect of formalising relationships and of providing some level of protection to the various participants. However, the key finding is that, in dealing with academics and stakeholders, there is a need for an underlying level of informality in these formal structures.

The need for informal structures of engagement to support formal agreements between the university and regional stakeholders has been emphasised in the literature on knowledge transfer and university engagement. Though Garlick and Pryor (2002) reiterate the importance of having an agreed purpose for engagement and demonstrated commitment (preferably in writing), it is also emphasised that “these formal engagement approaches are of limited use in achieving day-to-day understanding between complex university organizations and complex regional communities” (see Allison & Eversole, 2008:99).

While Reagans and McEvily (2003:240) acknowledge that “[I]nformal interpersonal networks are thought to play a critical role in the knowledge transfer process”, they do not provide a detailed analysis of the role of informal networks in knowledge transfer. According to Inkpen and Tsang (2005), connections developed by overly informal processes such as social gatherings tend to strengthen networks between stakeholders better than do formal processes.

Secondly, the level of trust that can be informed by a number of past and present events significantly affects collaboration and thus also knowledge transfer. In this analysis, as already mentioned in many sections, political and historical events have been found to have shaped much of the thinking and behaviour. It has moreover been observed that socio-political issues most often undermine levels of trust and relationship between stakeholders. Reflecting on some of the challenges faced by one of the agricultural centres, a respondent observed:

Internal political issues around NAFU undermine the level of cooperation between NAFU, local government and the Lengau Farm. Most of the farmers said they are not coming [to the farm] if [Lazarus]¹⁵ is part of the meeting (Academic Seven).

Another observation relating to trust indicates that the level of interaction depends on the level of trust that needs to be built especially by the university, which was previously perceived to be a tool for oppression.

The post I am in now requires me to work with the African National Conference and though being an analyst my post requires me to put that part of me aside and say, "Well, for the next five years you will not be analysing anything" because you have to build trust (Senior Management Six).

The above respondent further argued that when academics make an active effort to build trust and ensure collaboration, they will have to move out of their comfort zones and sometimes even physically reach out to the community to forge relationships, break inherited patterns of animosity and thus begin to build a new picture of the university as being an asset to the community.

A study conducted in Australia, indicated that "effective knowledge transfer requires additional capabilities, infrastructure and, most importantly, relationships that extend beyond those required for 'traditional' academic functions" (Australian Department of Education Science and Training, 2006:20). This emphasises the argument that knowledge and good quality knowledge alone do not suffice to ensure knowledge transfer. There is a need for academics to develop more people-centred relationships and also for social infrastructure to be integrated into the transfer process. Generally, the UFS demonstrates very poor signs of embeddedness as regards its knowledge activities. Manifestations of this deficiency are limited communication platforms and limited collaboration and feedback processes from the different stakeholders.

Yet, most of the academics in the faculty are members of various agricultural boards; they do thus engage with different stakeholders at formal and informal levels. Furthermore, the cultural closeness of some of the academics – themselves farmers – presents evidence of

¹⁵ Lazarus is a pseudonym used to protect the identity of the person in question.

close and informal relationships between knowledge producers and users. One academic demonstrated the level of the relationships in stating:

I think the relationship [with the farming community] is excellent. I think it is good. They invite me to the Free State Agriculture Symposium every year to give a lecture. ... I am also in the committee that makes the selection for the best extension officer. I am actually part of the Snow Protocol for winter planning on the mountains. I am also in some [farmers'] forums (Academic Eight).

Three aspects typical of less favoured regions have emerged from the above section. The first of these is the presence of formal structures that are not built on trust or mutual networks or informal partnerships. The second is the presence of lock-ins and limited communication, which are not only remnants of prior experiences but that also hamper collaboration between stakeholders. Lastly, for better trust and social capital, individuals will have to build on existing good relationships to develop new capabilities and forge newer relationships aimed at ensuring increased mutual benefits between the university and the community.

6.4.6 Presence of knowledge-transfer support structures

This section examines some of the structures that have supported knowledge transfer and also where the challenges have been. Two main issues have surfaced from the data: the presence of the recently created Technology Transfer Office and incentive structures.

6.4.6.1 The Technology Transfer Office

Technology Transfer Office and incubators have been identified in the literature as major instruments in effective knowledge transfer. Siegel and Phan (2006) emphasise the skills levels of the Technology Transfer Office manager as a crucial aspect of effective knowledge transfer. In 2009, the UFS established an office for technology transfer. The declared mission of the Technology Transfer Office is to enhance knowledge communication and commercialisation from the university and the faculty level. One of the representatives of the Technology Transfer Office had the following to say about its purpose:

The establishment of the office is to facilitate the process of knowledge transfer. The institution realises that if it doesn't want to be marginalised by its community in the future, it has to change and evolve and it has to do so very quickly. So, we are becoming a more engaged university. We have not fulfilled that mandate in the past (Technology Transfer Office).

The need for knowledge relevance was clearly identified as a crucial need by one of the academics in the Office for Research Development. In his response, he emphasised that the need for knowledge-transfer policies is important for two reasons – the production of relevant knowledge and its transfer to relevant stakeholders:

There are two points on the policy of knowledge transfer: the first is that to generate knowledge is important; but equally [important] is that we must make sure we do not generate knowledge for the sake of knowledge, especially in the developing context where we must make sure that the knowledge we produce are [*sic*] being informed by the needs of the community. And that we should be able to transfer the knowledge to the benefit of the community. Otherwise, the university is seen as an ivory tower (Senior Management Two).

Viewed from the perspective of the Research Office, the role of the university in developing and enhancing a knowledge-based economy is to produce knowledge that is relevant to its community and then to ensure that this knowledge is transferred to the rightful stakeholders.

In line with increasing demands for knowledge in the current economy, no matter how much knowledge is produced for international significance and recognition, the regional dimension remains important in the context of the imperative to contribute to regional socio-economic development (Arbo & Benneworth, 2007; OECD, 2001). From data collected in this study, there seems to be evidence of a changing landscape at policy and the practical level in that new policies and institutional offices have been put in place to support the engagement discourse at the UFS. However, the levels of regional policies and structures need to be assessed more critically.

6.4.6.2 Knowledge-transfer incentive structures

The second dimension of support structures investigates the incentive structures that have been established to encourage engagement and knowledge transfer. The justification and rationale for academics' engagement with regional and national stakeholders in knowledge-transfer activities have been the topic of a plethora of research studies involving scholars from diverse backgrounds ranging from economics, human geography, higher education policy, management, innovation and regional policy – to name a few. Different incentives have motivated scholars to engage with their regions. Using the terminology of institutional theory thinking (DiMaggio & Powell, 1983), the nature of academics' behaviour in engagement could be coercion, normative behaviour or mere mimicry. Scrutiny of the recent

knowledge-commercialisation policies initiated by the Technology Transfer Office, would lead one to suspect that financial benefits would prove to be a major incentive and motivation for engagement. This was highlighted by one of the academics:

I am afraid ... with the low salaries of our universities compared to other universities, some of the lecturers and professors actually signed contracts for third-stream [income] to increase their [personal] incomes. There is a risk for the top academics to move away from the university and take their consultancy to industry or to another university. They must rethink the policy (Academic Five).

The above view was further reiterated by another academic who emphasised the need for financial incentives to academics to engage in knowledge transfer.

In a way, that policy is making it difficult for third-stream income as not much money is getting back to the academics' entities or departments. I personally think it is very important to give academics freedom to get third-stream income and maybe use some of that money for students' research, which affects conference attendance and student funding (Academic Six).

The absence of a standard incentive structure has significantly hampered the institutionalisation of a culture of engagement among academics. When asked about the presence of incentives to support engagement and knowledge transfer, a senior manager stated:

That is a sensitive point because the feeling of academics is that we don't get any benefit from knowledge transfer through community engagement. They will heavily focus on those things that will advance their careers. One can argue that community engagement can also be structured. In this faculty, the disciplinary research is regarded as more important than community engagement unless the community engagement speaks to the discipline (Senior Management Three).

While the Commercialisation Policy aims to strike a balance, on the one hand, between using incentives to motivate academics and, on the other, attempting to increase the university's third-stream income from engagement activities, academics nevertheless feel that there is too much control. There is thus a feeling that the UFS does not provide the right balance of financial incentives for academics. In order to address this lack of incentives, one of the academics reveals that knowledge transfer will only be geared towards those who are able to pay:

On the one hand, the commercial agricultural sector pays for the research we do for them. So, from that point of view there is [an] incentive. On the other hand,

smallholder agriculture, in many cases, cannot afford to pay for it. So, therefore, the government should provide for the needed incentives or the university management – if they are serious about service learning – or engagement with [the] smallholder agricultural community should provide that incentives. And, I think in many cases there are no tangible incentives (UFS Research Office).

Therefore, incentive structures would need to be carefully designed and implemented so as to prevent incentives – rather than the need for relevance – from becoming the driver of engagement. Incentives from government could result in dysfunctional collaboration in which academics would tend rather to engage in consultancy projects merely for the sake of financial benefits, while their research would not enrich the academic curriculum. Bekkers and Freitas (2009:33) emphasise that “the promotion of universities-industry [engagement] requires policies to address effectively a wide variety of channels and to keep incentives for long-term research lines” as opposed to short-term rewards. However, engagement literature regards both short-term and long-term issues to be important with a view to relevance and academic excellence.

In summary, scholars have emphasised the need for incentives for engagement. The perception of academics towards engagement is that there are not enough incentives for them to engage in community engagement, knowledge transfer or Mode Two knowledge production. Though, admittedly, the Technology Transfer Office is there to enhance knowledge transfer, academics will, however, first need to see that there is something in it for themselves before the office will get the required support from academics. The above data indicate that there is still a feeling of a lack of adequate incentives to motivate academics.

6.5 Conclusion

In this chapter, three main aspects were discussed and assessed. It started off by profiling the type of knowledge being produced by means of teaching, research and community engagement. The distinctly regional character of the university was illustrated by the fact that more than 40% of undergraduate students and more than 40% of graduates still indicate an address in the Free State, while nearly 60% have addresses in the agricultural hinterland of the province, many of which are directly linked to a family-farm enterprise somewhere in the Free State. At the same time, there are signs that the Faculty of Agriculture is currently producing considerably more postgraduate students than in the mid 1990s. This increase in the numbers of postgraduate students has partly been the result of an increase in the numbers of international students who are pursuing postgraduate studies in the faculty. This is

probably a direct result of the increasing pressure towards internationalisation and towards the institution being research intensive. Thus, although the faculty has, at the postgraduate level, increased its international component, the outputs in terms of human resources and skills at the undergraduate level remain largely regionally orientated. The provision of skills for an agricultural region such as the Free State in an ever-increasingly globally competitive industry should not be underestimated. As regards the research outputs, there seems to be an increasing tendency towards national and international level outputs. Although I shall discuss these outputs in relation to the agricultural needs of the province in more detail in Chapter Seven, this does not necessarily mean that the research is less appropriate. In fact, it might actually be an indication of the improved quality of research.

An assessment of community-engagement activities suggests the Agriculture Faculty's involvement – across departments – in a range of activities at the local, the national and the international level. However, it seems as if the focus on emerging farmers has been channelled to a specific centre. Although this might reflect on the need to establish viable black commercial farmers, it also holds the danger of not integrating black and white farmers (a point to be elaborated upon in Chapter Seven). The fact that a significant degree of this is moreover labelled as 'community outreach' and not 'regional engagement' can however easily be interpreted as "doing good" rather than as ensuring that these emerging farmers are incorporated in mainstream agriculture in the province. Thus, from a purely supply-side point of view, the Faculty of Agriculture is continuing to play a significant role in creating human resources capacity for farming and in increasing the quality of the knowledge base for commercial agriculture. Whether the same can be said with regard to emerging black farmers and whether what is supplied links up with demand are topics to be fully discussed in Chapter Seven.

The second part of the chapter dealt with the channels of knowledge transfer in more detail. In essence, the evidence in this respect suggests that a wide range of knowledge-transfer mechanisms are used but that a substantial part of this knowledge transfer takes place at the national level rather than at the regional level. Furthermore, the analysis of the knowledge outputs reveals evidence of academic universalism. Though they are in a less favoured region, academics tend to produce the same kind of knowledge as those produced by academics in more successful regions, while journal publications and international conferences are still the main forms of knowledge output.

Thirdly, the chapter evaluated the supply-side factors influencing knowledge transfer. A number of factors was highlighted in this respect, and included the historical character of the university as an academic or traditional university, the historical context of apartheid and of Afrikaner nationalism, and the mismatch between policy and practice. There is little doubt that current increases in academic publications and postgraduate students are the result of changing leadership at the UFS. The role of faculty leadership was also highlighted. In addition, the mainly negative attitude of academics towards engagement and the limited rewards related to engagement were also found to be impacting on the process. The quality of the academics in the Faculty of Agriculture seems to be better than in the rest of the university. Furthermore, the evidence points to the fact that the UFS is poorly embedded in the region with regional engagement taking place in an ad hoc rather than an institutionalised manner. Aspects of trust (also noted in Chapter Five) and informal relationships seem to be limited mainly to the "white" commercial farming fraternity and include neither the regional government nor emerging black farmers. The fairly recent introduction of knowledge-support structures at the UFS also means that no long history exists in this regard.

From the above assessment, it seems as if knowledge transfer to the region is not purposefully managed and that a number of institutional factors contributes to the limited knowledge transfer being experienced in the region. The increased pressure on internationalisation poses a threat to regional engagement. Yet, if managed correctly, internationalisation could improve the knowledge base for agriculture in the region.

The next chapter turns to a demand-side assessment. Essentially, Chapter Seven provides a three-level demand analysis: firstly, the kind of demand captured in national and provincial policy, which is followed by an analysis of how university knowledge outputs have responded to the demand, and, finally, there is an analysis of the key factors affecting demand and how they relate to key theoretical aspects of the learning region in less favoured regions.

CHAPTER SEVEN

UNIVERSITY KNOWLEDGE TRANSFER: DEMAND-SIDE ANALYSIS

In short, the creation of the right economic and institutional conditions in a given region ... implies the triggering of learning processes in the regional economy which allows regional firms [agencies] to become more innovative, anticipative and adaptable to rapidly evolving markets and techno-economic conditions.

Landabaso et al., 1999:2

7.1 Introduction

The demand/supply approach has been found to provide the required framework for determining how knowledge is transferred from the faculty to the region (see Chapter Three). This framework operationalises theoretical indicators adopted from the learning region approach to depict the role of universities in knowledge production and knowledge application. Chapter Six provided an analytical understanding of both the process and the factors affecting knowledge production at the university and the subsequent transfer of knowledge from the university. Yet this presents only one side of the coin. It is necessary also to provide an understanding of the demand-side factors that affect knowledge transfer. The opening quotation by Landabaso and colleagues (1999) suggests that the absence of the appropriate socio-economic and institutional conditions could present significant challenges to the kind of learning that is proposed in the learning region approach and thus by implication also to knowledge transfer for development purposes.

Based on some of the key research questions, the present chapter offers empirical evidence of such conditions and of how these conditions affect knowledge transfer. The key research questions include the following:

- What have been the main issues related to the demand of agricultural knowledge in the province?
- To what extent have university knowledge outputs responded to these regional demands for knowledge in the agricultural sector?
- What have been the main factors affecting knowledge demand from the UFS by the regional stakeholders?
- How have the above factors affected knowledge demand?

The empirical evidence is presented by means of quotations from interviews and by analysis of secondary quantitative data. Secondary data were collected both from previous research and from other institutional databases such as the UFS, AgriSA and agricultural departments. Primary data were mainly collected via interviews with stakeholders, for example commercial and emerging farmers' organisations, farmers' union representatives, government departments, agriculture training and research centres, regional organisations and individuals who served as informants. The data were analysed using the theoretical indicators discussed in Chapter Three. New concepts are clarified in the text of the present chapter.

The chapter starts by outlining the main demand features of the agriculture sector in relation to knowledge. While the first part provides some background on the factors informing demand, the second part investigates how the university – through its core functions of teaching, research and community engagement – has responded to these particular demands. The third section highlights some of the key factors that have affected the level of university response to demand. Then, having considered the issues of demand and university response, the chapter finally turns to an analysis of the implications of the factors that impact on knowledge transfer and regional development.

7.2 The demand side

7.2.1 Understanding the origins of demand

Before I turn to a more detailed assessment of the demand-side factors that have an influence on knowledge transfer, some consideration should be given to how demand is to be understood in the demand-side analysis. The demand for knowledge originates from three different sources, namely the agricultural industry, national and provincial planning processes and the specific regional context of the Free State Province. Various aspects of demand have been discussed in Chapter Four and Chapter Five (for example the FSGDS). The aim of this section is to bring together previous discussions and to articulate the demand side appropriately. This should provide a platform from which to discuss factors that either inhibit or support knowledge transfer in the Free State.

Agricultural businesses fall into three subcategories, namely individual farmers, agribusinesses (for example cooperatives, agricultural machinery producers and seed producers) and agricultural producer organisations (agriculture in South Africa is fairly well organised in this regard in that a range of agricultural products such as wool and maize have

their own producer organisations). Furthermore, there are two subcategories of individual farmers, namely well-established commercial farmers (mostly white farmers) and emerging farmers (mostly black farmers) who have benefitted from land-reform programmes since the advent of the democratic dispensation in 1994. The Free State farming environment is dominated by individual farmers. Of the very small number of agricultural businesses in the Free State, most are agribusinesses that provide services or inputs to producers. Finally, the importance of producer organisations as knowledge organisations should be borne in mind. In practice, this means that individual farmers are unlikely actively to procure research but that they would most likely do so via producer organisations. However, much of the demand from both farmers and producer organisations is directly related to ensuring economic viability amid a competitive environment that is becoming increasingly international and also the global context of climate change and local environmental limitations. This demand is best articulated by the motto of the 2013 Grain South Africa's Conference, "Doing more with less", which relates to previous research that has emphasised the demand for increased production on less land (the need for land reform) and less rain (climate change) by using more knowledge and technology (The Economist, 2011). In addition to demands from producer organisations, knowledge demand could perhaps also originate from agribusinesses.

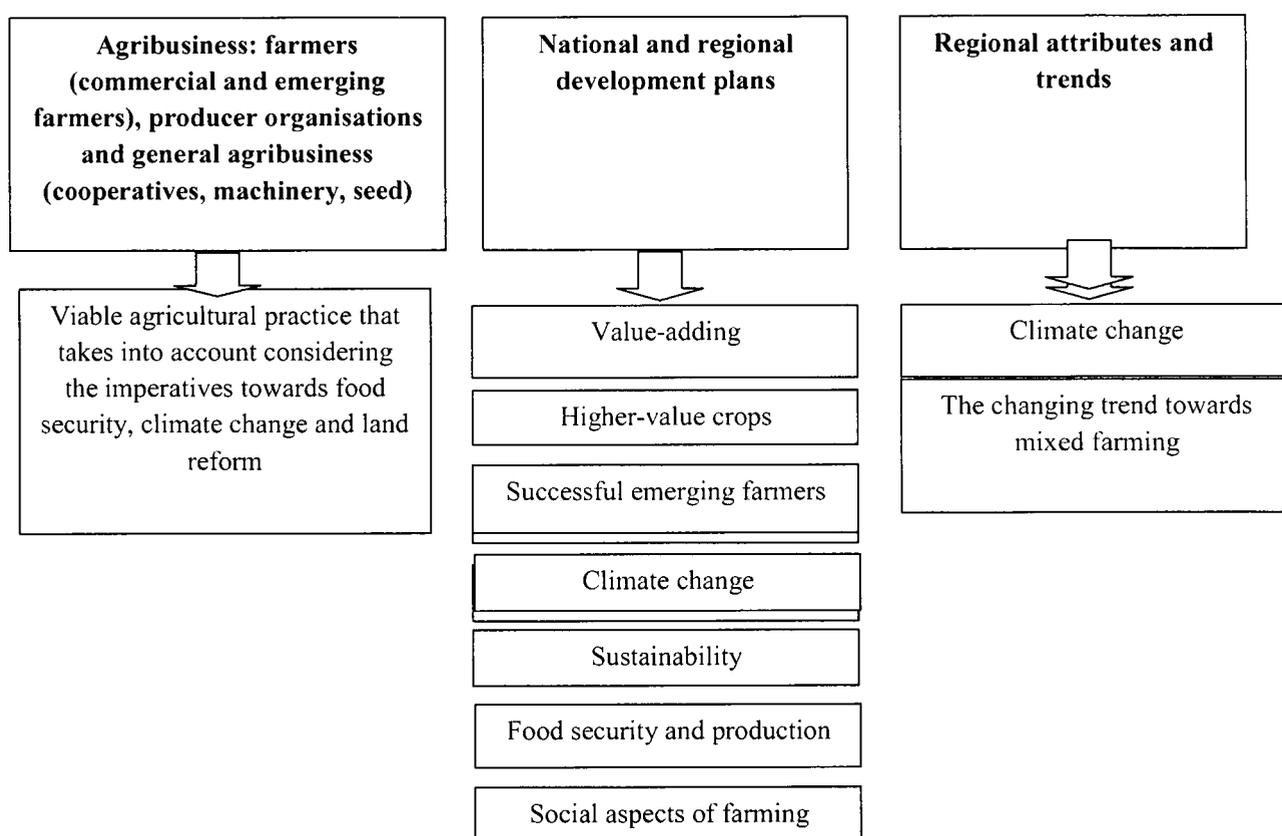
The demand side is further heavily influenced by national and regional planning documents. Reference has been made to the NDP (Chapter Four) and the FSGDS (Chapter Five). From these documents, the following issues of demand should be highlighted:

- The demand for value-adding to agricultural products;
- The demand to move towards higher-value crops;
- The need to establish successful black farmers;
- The need to integrate sustainability into farming practice;
- The need to address climate change;
- The need to ensure sustainable food production;
- The need to address a range of social factors surrounding agriculture (security, farm labourer health, housing and labour practices); and
- Increased pressure to be internationally competitive.

Finally, the demand side is also influenced by the physical characteristics of the region. Two aspects should be mentioned in this regard. First, climate change will make demands on

agriculture (this is also identified by farmers, agribusiness and national and regional planning documents). Current estimates are that the western parts of the province will in future receive less rain (FSGDS, 2013). A second regional trend that should be mentioned is the shift in agriculture in the province – a shift from crops to a larger degree of mixed farming and game farming. Stated differently, the demand for knowledge and skills has thus changed from mainly crop-related knowledge to knowledge regarding mixed farming. Figure 7.1 attempts to provide a conceptual framework of demand based on the above.

Figure 7.1: Agricultural demand as expressed by agribusiness, planning documents and regional attributes and trends



Closer analysis of the main research focus areas also coincides with some of the changing trends in agriculture not only in the Free State Province but in South Africa as a whole. An analysis of the changes in agricultural production, by sector and by product between 2000 and 2010, indicates that there has been an overall increase in production, with field-crop production increasing by 111%, the horticultural production increasing by 163%, and animal production witnessing an astounding 230% increase over the ten-year period in question (Department of Agriculture, 2011:79). Furthermore, amid changing climatic conditions and

given the semi-arid nature of central South Africa, water research has become a principal factor affecting not only agriculture but sustainable livelihoods in general. There is thus an arguable correlation between regional and national needs and the kind of research that is currently being done. Yet there is very little evidence of any coordinated efforts towards enhancing and sustaining this perceived alignment.

7.2.2 Aligning knowledge production with regional demand

This section seeks to answer the question: To what extent is knowledge output responding to the needs of the region as articulated in provincial policy? In an attempt to provide both a descriptive and analytical answer to the question, the next section has been divided into two parts. The first part is an analysis to indicate the areas in which the faculty has responded positively, while the second part highlights the areas that require much more attention. The analysis provides an integration of quantitative and qualitative data aimed at providing an understanding of how knowledge production relates to the identified regional needs.

It should be mentioned that there was a divide among academics as to the faculty's level of responsiveness to regional needs and demands. While there seems to be a general agreement that there has been a trend towards change, a number of academics so far remain critical of the extent of change and think that more needs to be done. The data have been presented based on these two arguments. Building on the areas identified by respondents as requiring a better response, the section concludes with a short analysis of the main demand aspects relating to teaching outputs.

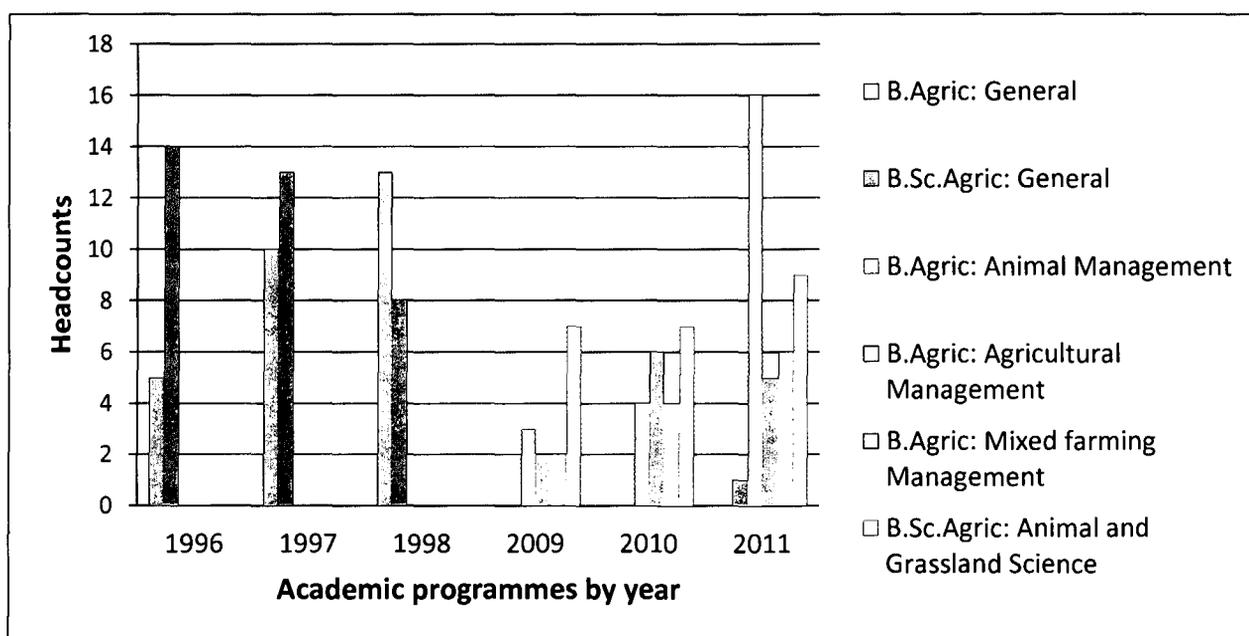
7.2.2.1 Evidence of demand-oriented output

From a number of responses received from academics in the faculty, it was observed that the teaching curriculum has been changing over time in response not only to some of the core needs articulated by the agricultural sector but also in response to national and international priorities. One respondent from the Centre of Sustainable Agriculture confirmed that both the subjects they offered and the course content were continually changing in response to farmers' needs:

The subjects and different combinations of subjects are changing. So I think we adapt to the different situations of the emergent farmers. The university is changing; I think it's time for us to make development on our subjects so [that] we meet the demands of our clients (Academic One).

The changing nature of the teaching syllabus was also apparent in the faculty's changing degree programmes and in the secondary data collected from the Office for Monitoring Institutional Research. Scrutiny of the data presented below (Figure 7.2) reveals that the degree programmes offered have been changing to accommodate new needs experienced in the agricultural sector. There has generally been a shift towards management courses and away from the general degree programmes that previously dominated the curriculum.

Figure 7.2: Trends in the Bachelor's graduate output in the Faculty of Agriculture at the UFS, 1996–1998 and 2009-2010 (n)



Source: UFS, 2012c

The data on the demand aspects contained in Figure 7.2 reveal that the need for good sustainable agricultural practices is being addressed by training better agricultural managers in the Bachelor's degrees in Agricultural Management and Animal Management. The B.Sc. programme in Mixed Farming Management also responds to the need for skills to meet the shift to mixed farming. The data also indicate that some of the degrees that were perceived not to be fit for particular purposes were terminated subsequent to curriculum reviews. While this study did not probe the processes that informed the changes in graduate degrees, it is apparent that the changes are in alignment with the broader changes in the agricultural sector.

Furthermore, the need to train and mentor emergent farmers to become competent is also responded to by the different centres and initiatives of the faculty. A respondent in a senior management position gave a detailed account of some of these initiatives:

Through the CDS, the Centre for Sustainable Agriculture and the Lengau Experimental Farm, I think the UFS and faculty has tried to position itself to also address and become more cognisant and aware of the need of the smallholder agricultural sector. Because, at the end of the day, establishing a small holder agriculture where historically all the research was only aimed at addressing the technology need of the large commercial sector becomes important (Senior Management Three).

According to the manager of the Lengau Farm, the centre had been created in response to a local demand, one from the Mangaung Local Municipality in 2004 to address the needs of emerging black farmers who needed practical training and support. The manager went on to reveal that training at the centre had been done free of charge until 2012, after which a new policy was instituted. The manager explained:

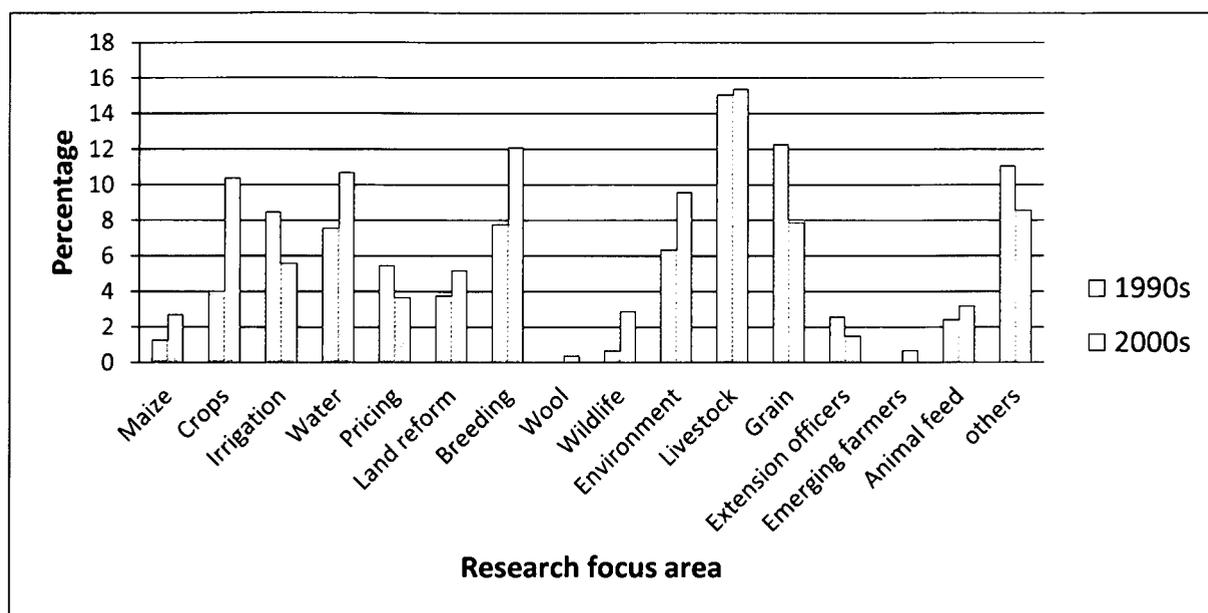
We have now changed the approach for trainee farmers to pay a minimum service fee for each [head of] cattle they have. Farmers need to start paying so as to have a holistic view of the process of having and managing a farm (Academic Eight)

Another academic observed that the feedback he had received from his students when he had encountered them at conferences and other gatherings had been used by the faculty to respond to diverse needs. He continued:

The only way to measure that [relevance] is that when we attend conferences in South Africa and especially in the Free State Province we usually see our former students. They come back to us and tell us they have learnt a lot and have applied what they learnt here. They appreciate what they've learnt here. For me that means we are doing something right, [especially] as they say they make a difference in their workplace. I get the feedback very frequently (Academic Six).

Comparative analysis of research outputs between the late 1990s and the late 2000s reveals that there has been a significant change in the research outputs (see Figure 7.3). Outputs included journal publications, books, book chapters, conference presentations, seminars, workshop presentations and consultancy or contract reports.

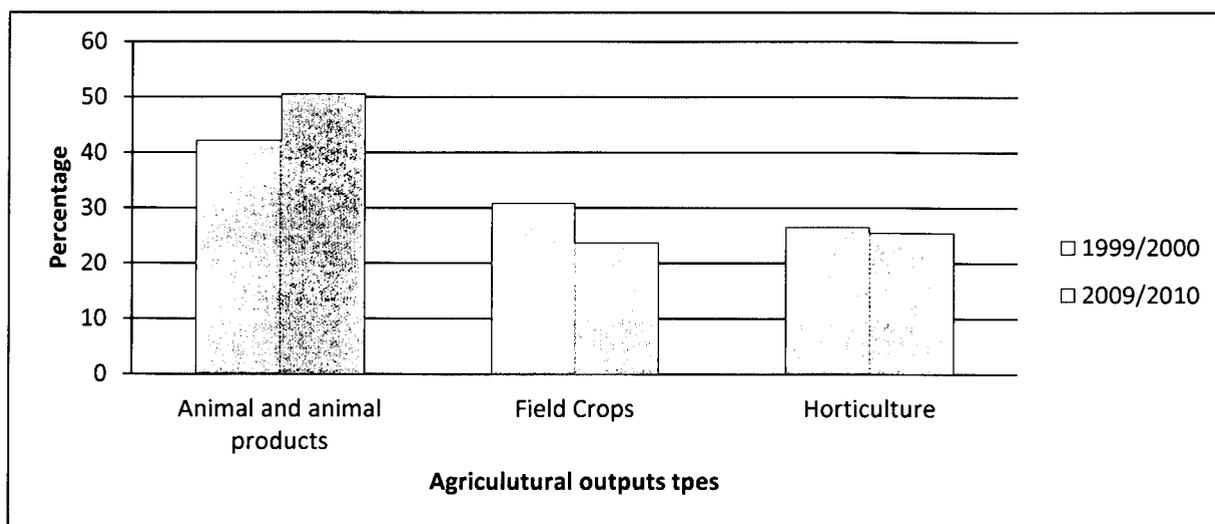
Figure 7.3: Comparison of the research focus in the Faculty of Agriculture at the UFS, 1990s and 2000s (%)



Source: UFS, 1996; 1997; 1998; 2009;2010;2011

The most obvious deduction to be made from the data is that there seems to be a clear shift towards animal and animal-related agricultural research activities. These findings show the faculty to be in alignment with national shifts in agriculture with more farmers – according to the Institute for Race Relations – shifting towards animal-related agricultural outputs (see Figure 7.4). The long-standing research related to water probably also positions the outputs of the Faculty of Agriculture in line with the needs associated with climate change.

Figure 7.4: Changing trends in agricultural outputs over time, 1999/2000 and 2009/2010 (%)



Source: South African Institute for Race Relations, 2012

There is thus empirical evidence from the analysis of quantitative and qualitative data to support arguments that the faculty has indeed been responding to some of the key demand areas of the agricultural sector. Though it can be argued that the majority of academic publications are in national and international scientific journals, the very fact that the research areas tend to align with the changing research interest is indicative of a shift towards being more responsive. Furthermore, with a number of academics having indicated that they were members of some farmers' organisation or serving in a farmers' organisation board, this knowledge is being transferred by means of informal discussions and open-day presentations on campus.

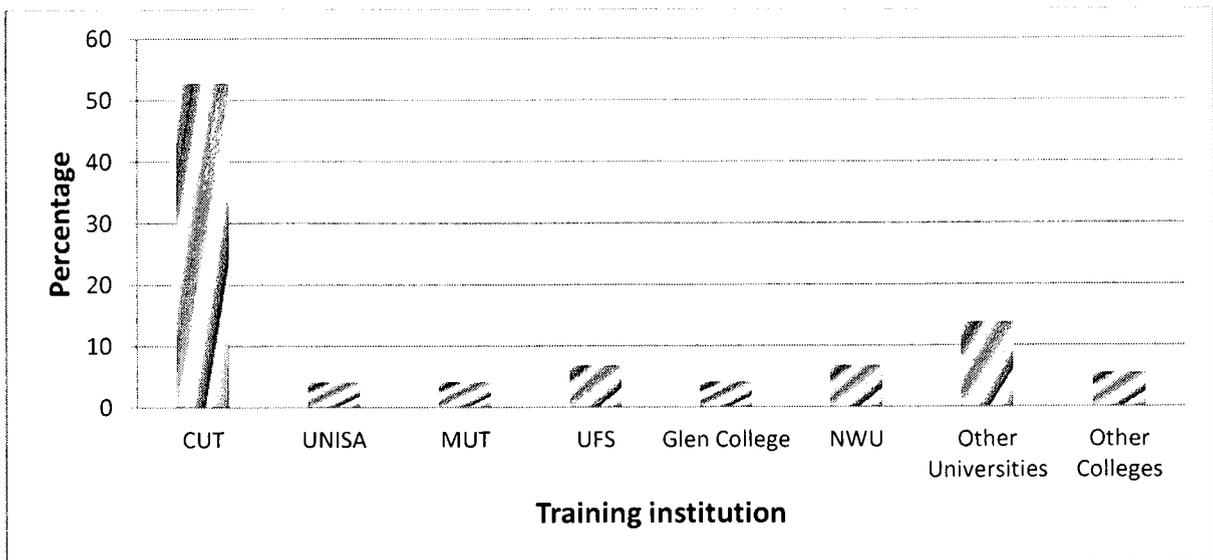
However, as in most social dynamics, there were a number of other respondents who, while not denying that the faculty had thus far played an important role, believed that more and even much more needed to be done before the faculty and the university would be able to become the 'engine' they were supposed to be in supporting regional development. These perceptions are analysed in the next subsection.

7.2.2.2` Demand for more relevance

While most respondents did agree that the faculty, by way of its teaching outputs, had been responding to the needs of the agricultural sector, there was a strong feeling – from senior management right down to academic staff – that more needed to be done. The emphasis goes beyond the kind of knowledge being produced to include social and institutional changes aimed at (re)positioning both the faculty and the university at the very centre of engagement and of relevance with the key stakeholders.

There seems to be some degree of exclusion of members of the community and the sector. Analysis of the training of extension workers as reflected in Figure 7.5 provides one with evidence of lack of focus on emergent farmers in the curriculum. Data were collected from the databases of five of the six agricultural district offices in the Free State.

Figure 7.5: Description of agricultural extension workers in the Free State by university / college of study, 2013



Source: Free State Agriculture District Offices, 2013

The figure reveals that more than half of all extension workers in the province are currently being trained by the CUT, while the UFS trains less than 10%. While the faculty has admittedly been responding to farmers’ needs through the agricultural farms, it can be argued that this particular group of farmers has not been adequately integrated into the academic mainstream. One could thus say that there is significant non-alignment between the faculty’s output and one of the main demands as described in Figure 7.5, namely the one relating to the emergent black farmers. This is supported by a response from an academic:

At this stage our research structure is more focused on commercial farmers and improving animal production and to a lesser degree on emerging farmers. Commercial farmers are sustainable and literate while emergent farmers are illiterate and do not have the facilities, skills and finances [with which] to improve (Academic Three).

One of the top-management respondents affirmed this need to reorient the faculty activities so as to become more relevant to the changing demands by arguing for the introduction of a Faculty of Agricultural Engineering:

I just spoke for the first time in my life, to a whole lot of farmers under the umbrella [of] Grain South Africa and I realised for the first time how distant we are as a university from interacting, dialoguing regularly in a systematic way with the farmer community and being in the Free State this is strange. And so a lot of things we are

planning, for example [a] programme in Agricultural Engineering, [a] search for a Chair¹⁶ in Renewable Energy and attempts to have a more important platform in the university for talking to young farmers (Senior Management One).

The above respondent also argued the need for an institutionalised platform for engagement:

So, I think we need to institutionalise those initiatives. We need to have an advisory board in the Faculty of Science and Agriculture between farmers and producers if we are going to connect the professional training of farmers to the reality in [the] workplace. Those are [some of the] things I am looking at in a very serious way (Senior Management One).

Another respondent in the Research Management Office agreed with the above view, arguing that though there has been a fairly good working relationship. This relationship has however, been at the personal level and not the institutional level. He stated:

Over the years, there's been a good working relationship or collaborative relationship between the farmers, the farming community, the agricultural cooperatives and the university. In many cases [this working relationship] has been at [the] personal basis (Senior Management Four).

Another respondent suggested that for there to be increased relevance between knowledge output and demand, there is need for interaction between the academics and those who are supposed to be users of the knowledge. He argued:

There is a much bigger need to make sure that we really interact and understand [each other] and that the research that we undertake is well informed by the needs of the community or agriculture community on the one hand, and, on the other hand, to make sure that many of the research [projects] that we conduct should be on-farm research (Academic Eight).

This collaboration has also been evident in the fact that a number of academics have served on agricultural boards or have served as judges in farmers' competitions. One of the academics shared his thinking about some of these recent changes such as the decision to start a school for the training of extension officers at the Qwaqwa Campus and to make mentorship programmes available to emerging farmers:

I think it is a step in the right direction. But in terms of our research focus, we are still doing high-level or high-technology research. Very little is going in to assist the land-reform programme. That is a big challenge (Academic Five).

¹⁶ As part of the South African Research Chairs Initiative

In conclusion of this section, both the UFS and the faculty are making significant efforts to change their images. One such effort is being relevant to the needs and demands of the different sectors, the stakeholders and the communities around it and beyond. One change concerns outputs from the Faculty of Agriculture. While there have been a number of shifts – as seen in the previous subsection – there is an ever-growing demand for increased relevance. One of the academics articulated his perception in this regard:

I do not think we have shifted [enough]. But there are some efforts now. The Lengau Agricultural Farm is a good example. We are now ... planning ... to start a centre or school for training extension officers at the Qwaqwa Campus and to provide mentorship programmes for emerging farmers. I think it is a step in the right direction (Academic Seven).

There is thus a focus on training the emergent farmers to become more commercial and independent and on responding to the particular needs in respect of farming skills, financial and farm management techniques and sustainability. Table 7.1 attempts to summarise the demand/supply relationship from Chapter Six and the discussion above.

Table 7.1: Summary of the relationship between knowledge demand and supply

Regional agricultural demand	Nature of supply/response
Good and sustainable agricultural practices	<ul style="list-style-type: none"> - Shift in undergraduate training with more management-related courses - Master's course in Sustainable Agriculture - Increase in the number of short courses and of stakeholders attaining these courses - Farmers' days and practice in agricultural centres
Value-adding and high-value crops	<ul style="list-style-type: none"> - Research on rust- resistant wheat species - Proposal for an agricultural engineering section - Application of improved animal species such as the Nguni cattle
Successful emergent farmers	<ul style="list-style-type: none"> - Creation of experimental farms, for example Lengau - Training and mentoring of farmers until they acquire their own agricultural land - Programme has however not been integrated into mainstream academic scholarship. - Renewed focus on of training extension workers
Environmental issues: climate change	<ul style="list-style-type: none"> - Increased research focus on water-related issues - Have increased and strengthened research and collaboration links with Bloemwater - Creation of the Disaster Management Training and Education Centre for Africa
Shift to mixed farming	<ul style="list-style-type: none"> - Have increased research related to mixed farming. - Teaching outputs in the form of graduates also show a corresponding shift. - Have increased game farming-related research. - Academics' perceptions in respect of research that focuses more specifically on mixed farming are changing. - A number of community activities aimed at sharing knowledge related to mixed farming
Food security and social aspects: animal theft, etc.	<ul style="list-style-type: none"> - Academics active in different agricultural boards. - Short training courses on various aspects of food security: egg production, dehorning and many others. - There is however evidence of a limited focus on social issues.

Source: Author (2013)

There is relatively strong evidence of conscious efforts to address the issues of less favoured regions through local engagement with farmers who need more tacit and experiential knowledge than the codified knowledge of which the faculty boasts and which is transferred in the form of teaching and research outputs. Some of the issues that will be discussed include partnerships and collaboration between government, university and society, networks, trust, raising and sourcing venture capital and willingness to learn and unlearn.

It is clear that while there has been some degree of response to demand at the departmental level, the initiatives have not only been ad hoc but have not always been informed by the farmers' own inputs. Based on the learning region model of university engagement with the region, an effective response from academics to the needs of their communities hinges on

effective networks and interaction between knowledge producers and users (Hassink, 2005). However, regarding less favoured regions, Landabaso et al. (1999:6) suggest that these regions “either do not have the necessary interfaces and co-operation mechanisms for the supply-demand matching to happen or the appropriate conditions for exploitation of synergies and co-operation ...” These interfaces, it is argued, are built and developed on networks and on social capital that is based on trust and a win-win mentality (Maskell, 2000; Wolfe, 2001). Based mostly on interview data, the next section analyses the interplay of some of these social structures and knowledge structures and how they affect knowledge transfer.

7.3 Demand-side factors affecting knowledge transfer

Regarding the university’s reaction to agricultural need, the focus in this section shifts towards the factors influencing knowledge transfer from a demand-side perspective. Key themes that emerged from the data include: the kind of knowledge produced, the absorptive capacity of the region, the knowledge perception of farmers, the availability of venture capital and institutional thickness. These themes informed both the search for and accumulation of quantitative data to validate the emerging themes or otherwise.

7.3.1 Kind of knowledge produced

This subsection deals with two main findings that emerged from the interviews and from secondary data. These findings relate to the analysis in Section 7.2. The first provides arguments to support the contention that the kind of knowledge produced will either enhance or undermine knowledge transfer. As observed in Section 7.2 and Table 7.1, knowledge transfer is strongly affected by the degree of alignment between knowledge demand and knowledge supply. The analysis in the previous section revealed that there were a number of areas in which the knowledge output was in alignment with demand and has thus contributed to increased knowledge communication and transfer. On the other hand, in areas where this alignment has been weak, such as in the training of extension workers, the faculty has made a very weak contribution in the production of extension workers (see Figure 7.5).

Another level of analysis of the knowledge types is between applied and basic research. This relates to the Mode One and the Mode Two notions of knowledge. In Chapter Six it was observed that academics tend to disagree on the relative importance of these types of knowledge. Some academics believe that because of promotion policies and limited incentives for engagement, the emphasis should be on Mode One; others think it remains

important that the university, the faculty and academia seek to balance the search for academic 'truth' and relevance. Building on Chapter Six and on Section 7.2, it can be argued that the focus on applied knowledge that is tailored to demand has only in recent years begun to take root as an institutionalised notion. The notion of a 'scholarship of engagement' remains weak and poorly conceptualised and thus affects how knowledge is created and also subsequently transferred.

While a good number of academics do admittedly engage with non-university stakeholders, for example industry and government, such engagement however remains weak, ad hoc and embedded in the 'philanthropic' thinking of community engagement as opposed to making it part of an academic core function (Kruss, et al., 2012). A vivid example of this, it can be argued, is the Lengau Experimental Farm. Though responding to the needs of emergent farmers, it has not been adequately embedded in the knowledge mainstream.

7.3.2 Absorptive capacity of region

Absorptive capacity as reconceptualised by Zahra and George (2002) describes a firm or entrepreneur's ability and willingness to learn, understand and incorporate new knowledge or technology in its production or processes. Using an analogy from business studies, analysis of absorptive capacity considers the qualifications of enterprise personnel and the presence of research and development activities as factors that enhance knowledge uptake and determine how compatible the community's cognitive levels are to the kind of knowledge produced by the faculty.

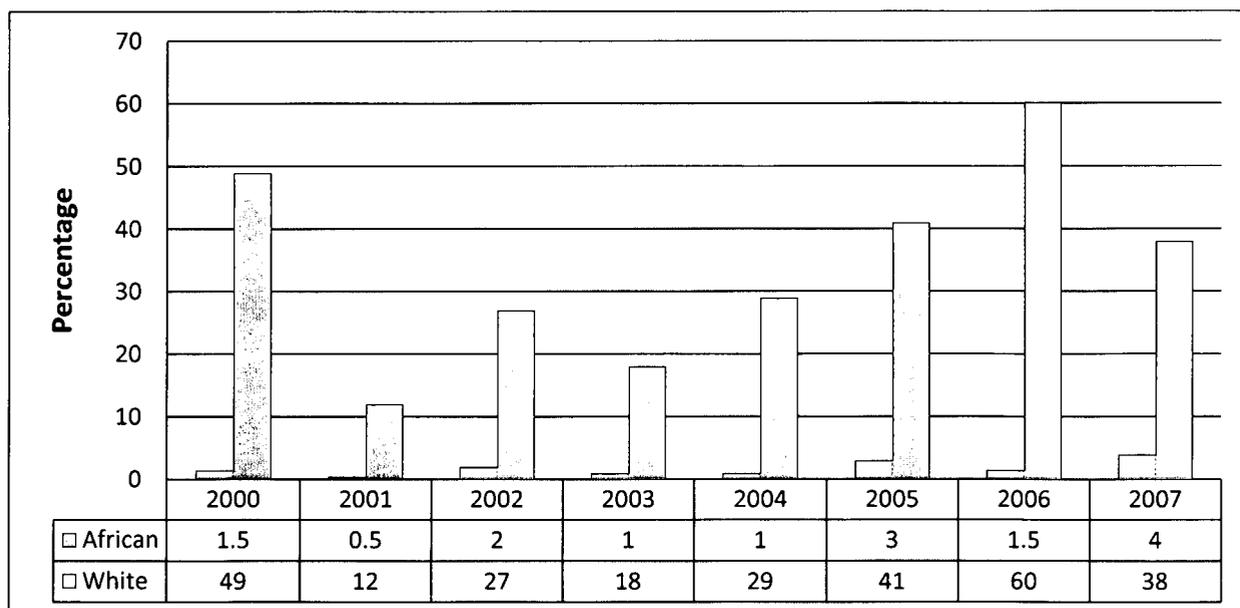
Two aspects of absorptive capacity are articulated in the following analysis: the educational levels of agriculture workers and the extent of research and development investment in the province.

7.3.2.1 Skills levels of the agricultural workforce

It is a generally accepted that education and training enhance increased capacity, confidence and the disposition to demand new knowledge, and to acquire and adopt innovative technologies. New knowledge also improves process and management techniques, minimises risk and promotes profitability. Furthermore, there is a strong indication that agricultural workers who engage in further training have a better return on income.

Two indicators are used to profile the skills levels of agricultural workers in the Free State. In the first place, consideration is given to the percentage of skilled workers, while the educational status of workers is also considered. Statistics South Africa uses a three-level classification. The skilled workers work in legislatures, are senior officials or managers or have professional occupations. Semi-skilled workers are technical and associated professionals, clerks, service and sales workers. The rest are unskilled – for example agricultural or fishery workers, farmers, craft workers, plant and machine operators and assemblers, workers in elementary occupations and domestic workers. The Free State Provincial Decision-Making Enabling (PROVIDE) Project, using previous data collected in the 2007 Labour Force Survey done by Statistics South Africa, conducted a skills analysis to take a more detailed look at the skills of the agriculture workforce. It found even more evidence of the existence of a very weak knowledge base – one that is unable to absorb the kind of knowledge produced by the university. Figure 7.6 provides an overview of the percentage of skilled agricultural workers by population group in the Free State. This includes both part-time and full-time labourers.

Figure 7.6: Skilled agricultural workforce by population group in the Free State, 2000-2007 (%)

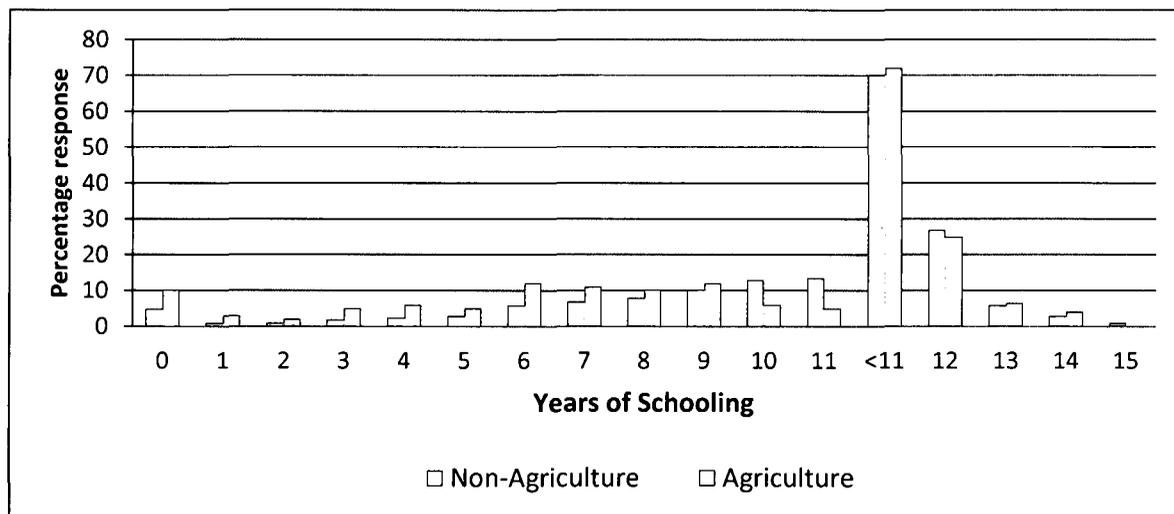


Source: PROVIDE Project, 2009

Figure 7.7 below indicates that in 2007 fewer than 5% of Africans in the agricultural sector in the province were skilled, while about 40% of whites were skilled. If skills levels have to be

described by the years of education received, then Figure 7.7 provides supporting evidence of low skills levels among the agricultural workforce. Fewer than 30% of both agricultural and non-agricultural workers obtained qualifications beyond Grade Twelve, which would qualify them for tertiary education.

Figure 7.7: Agricultural workforce in the Free State by years of education attended, 2007



Source: PROVIDE Project, 2009

According to Figure 7.7, less than 5% of workers in the workforce have obtained a degree or received an equivalent of 15 years of formal education. Because there are many intermediate steps in transferring knowledge, this situation limits knowledge-transfer potential. Using evidence from organisational knowledge-transfer studies, Hamel (1991:97) observes that “if the skill gap between partners is too great, learning becomes almost impossible as the recipient may be unable to identify, if not retrace the intermediate learning steps between its present competence and that of its partner”. Figure 7.7 provides evidence of the existence of such a gap: educational levels (by years of education) in the agricultural workforce in the Free State Province remains significantly low especially for black populations. The low skills levels are encountered not only in the agricultural sector but also in the economy as a whole (see Section 5.2). Significantly, this accounts for a high unemployment rate in the province. While, this could be considered a simplistic analysis, the data provide evidence that though the agricultural sector is facing changes at both policy levels – more imports from other countries and changing climatic and social factors – the low skills levels limit beneficiation and innovation within the sector. The next aspect relating to absorptive capacity is the research and development capacity of the region.

7.3.2.2 Research and development capacity of region

Innovation inputs at the provincial level are an indicative proxy for the research and development capacity of a region. The innovation input relates to the human capital base as measured by the number of graduates remaining in the region and also the level of investment in research and development. The inputs as investment in innovation are measured by a number of indicators relating to the human capital and research base of the province or region. Table 7.2 provides a comparative analysis of some of the main indicators of research and development at the regional level.

Table 7.2: Comparative analysis of South Africa's knowledge economy by selected provinces, 2007

	HE enrolments (headcount)	Graduates (headcount)	Permanent staff (academic/research)	% of total South African university research and development**	Regional contribution to national GDP (%)
Eastern Cape	67 881	12 476	1 814	6.45	7.7
Free State	39 446	7 749	1 026	4.67	5.5
Gauteng*	186 971	39 236	4 267	33.55	33.7
KwaZulu-Natal	85 861	17 075	2 392	14.48	15.8
Western Cape	96 641	23 707	3 077	29.42	14.1

Source: DoE, 2010; Statistics South Africa 2011; HSRC, 2008 *Data exclude students from the University of South Africa who are not all based in Gauteng Province

Table 7.2 indicates that knowledge investment for the knowledge economy occurs mainly in three provinces. The Free State Province lacks the knowledge threshold requirement to support and maintain a knowledge-based regional economy. This also limits the kind of knowledge investment that could take place regionally. This trend is reflected in an Human Sciences Research Council report that posits that "a characteristic of the South African higher education sector is the concentration of resources and doctoral students in a small number of universities" (SAaccess 2010:33). Five of the 23 public universities (Cape Town, Witwatersrand, KwaZulu-Natal, Pretoria and Stellenbosch) between them account for more than 65% of the total university research and development expenditure and for more than 50% of researchers and 56% of total doctoral students. Arguably, the Free State Province has a relatively weak innovation and knowledge base on which knowledge transfer can effectively thrive.

Florida (1995) earlier observed that regions with a high research and development and human capital base were “becoming focal points for knowledge creation and learning in the new age of global, knowledge-intensive capitalism, as they in effect become learning regions” (Florida, 1995:257). Boekema (2000) however identifies a paradox between the need for research and development investment and the capacity to invest and spend as regards the less favoured regions, on the one hand, and the more advanced regions, on the other. The absence of research and development limits economic development, while the absence of a certain threshold level of development limits sufficient investment in research and development. This can be described as a typical aspect of less favoured regions, one that affects the stakeholders’ demand for knowledge.

7.3.3 Limited institutionalised systems of engagement and collaboration

Despite there being a considerable amount of research output from the faculty and the university, very little of the knowledge, in comparative terms, is being communicated to regional stakeholders. This is partly due to the absence of systems to inform research production and knowledge up-take. This relates to the level of collaboration that informs research that is based on regional needs. This perception was reflected in a number of responses. Some have been captured below.

The following respondent proposed that there was need for broker organisations to bridge the gap between knowledge producers and users:

There is need for people to stand in the gap of communicating the knowledge between what is research[ed] and what farmers need.

While the need for broker organisations becomes more critical, not only in knowledge transfer but also in enhancing collaboration and cooperation between intrinsically different cultures (academics versus business or society), the opinion quoted above also highlights the need for research centres that are more responsive to the current needs of the farmers. It was observed that most of the research partnerships between the faculty and the community existed at the personal level, a view that was clearly articulated by a respondent from the Premier’s Office:

The UFS must make effort to find out who the key players in these areas are: health, agriculture and the like. But I think the formal involvement between UFS and government is very problematic, not only from the university side but also from government side.

During some of the discussions, we realise that students do excellent research (Master's, PhDs) but there is no entry route through which students can come and share the findings. And even if they do get entry, they don't get the right audience and if they get the audience, it might just end up there. But the point of entry is quite challenging (FS Office of the Premier).

Such ad hoc engagement by academics was also observed to be taking place in the Department of Agricultural Economics. Most of the stakeholders appreciated the work being done by various departments by means of open days. There nevertheless were signs of concern regarding the process of engagement, which occurred mostly at the personal level and would probably not be sustainable if the academics were to leave the university. Secondly, most of the farmers moreover felt that the network structures between the farmers and academics tended to support commercial farmers who historically had stronger social and cultural ties with white academics, while emerging black farmers had little or no social capital with academics. One of the stakeholder respondents, referring to the relationship between the university and the provincial Department of Agriculture, observed:

Most of the relationship is mostly individualised, meaning that there is nothing formal between the university and the department, which is what they are trying to achieve.

These responses highlight some of the key aspects of knowledge transfer: trust, mutual respect and a working relationship between the farmers and academics. While these attributes are admittedly very important for knowledge transfer, the absence of a framework that brings together all the role players, that informs the present relationship and that provides adequate opportunities for both commercial and emergent farmers remains a valid concern. In a study on knowledge transfer between the university and industry in a northeastern region of England, Goddard et al. (2012:5) expressed very similar concerns:

Because firms are very different kinds of organisation and fulfil very different economic purposes and societal functions, this inevitably creates challenges of connection and coordination. For this reason they suggest that 'bridging organisations, technology brokers or boundary organisations ... not only serve to connect different components of innovation systems in responsive mode, but also perform pro-actively, by animating new connections that might not arise spontaneously'. Nowhere is this lack of spontaneity likely to be truer than in a lagging region.

Another manifestation of this lack of cooperation and of systems not being in place is observed in the difference between stakeholder expectations, academic outputs and the needs

of the external stakeholders. While most academic research (especially at the Master's and Doctoral levels) generally takes more than two years to conduct, most commercial organisations and private organisations cannot afford to wait for such outputs and what they expect to get from academics is often vastly different from what they receive. A respondent affiliated to one of the farmers' agricultural associations, Agri Free State, encapsulates the problem:

The problem is that most of our work is fire-fighting and we need quick response[s] and policies. We do not have the luxury for people sitting around. In the context of the university it is always a PhD or Master's, and that takes time. The problem is also that between the time when the problem is identified and when the solutions are proposed is too long.

This difference in relationship between academic functions and output types, and those of firms (including farmers, government and civil society) demands that a new kind of arrangement be set up by the creation of new organisations aimed at bringing the university and the region together to the greater benefit of the region. This shows a difference in the culture and practice of knowledge production and application between university and business.

Judging by the interviews, the main problem may not so much be a lack of alignment between the research output and farmers' needs but primarily a lack of communication as to the precise kind of knowledge that is needed and how to go about providing it. One issue that evolves from the above responses and the perceptions reflected in them is the absence of a regional or provincial think-tank structure or platform in which the main knowledge needs can be articulated and the research agenda established. This will inform how academics structure and implement research from Master's dissertations and Doctoral theses, and how the knowledge so produced can be packaged and communicated better than by merely publishing a thesis or a journal article.

Things are however beginning to change for the better. One of the main commercial farmers' representative associations, namely Free State Agriculture, has forged a partnership with the African Farmers Association of South Africa (AFASA), which follows close cooperation between AFASA and Free State Agriculture. Furthermore, for the first time, Free State Agriculture has appointed an agricultural economist from the UFS to assist new black farmers. The president of Free State Agriculture confirmed that "these are the first talks between black and white farmers on the key issues facing agriculture in the country"

(Volksblad, 2013). Yet he also warned that he considered an atmosphere of trust to remain paramount for the success of such an initiative (Volksblad, 2013).

Based on reported feedbacks from the process, some of the key attributes needed to support this new partnership are trust, leaving the past behind and creating a new “social pact for agriculture” that “is important for an empowered Agricultural environment in the Free State”. The deputy president who attended the meeting concurred that “if government can see that the so-called ‘white’ agriculture are caring for new farmers, supporting them, and taking them as their responsibility for the future, it will be good” (Volksblad, 2013). While this remains a complex sociopolitical issue, the current changes indicate a changing demand structure in that stakeholders are coming together in more coordinated and structured platforms to enhance the role of knowledge in agricultural development.

7.3.4 Farmers’ attitudes towards new knowledge

The process of knowledge transfer is also significantly affected by farmers’ demand for knowledge and their willingness to apply new knowledge.

Interviews with farmer organisations revealed that because of market and climatic uncertainty in the agricultural sector, farmers’ attitudes towards the demand for and application of new knowledge generally depend on their perceptions of the larger external market. These attitudes fall into three categories. The first category is what the respondents describe as ‘innovators or luxury farmers’ who get new ideas from the Internet or farmers’ organisations or sometimes even from abroad. These ‘innovators’, a very small proportion of the commercial farmers, engage with the ideas and try them out. Only when they succeed, will the other farmers join in the implementation. These other farmers are the ‘late adopters’ who will only apply new knowledge when they are sure that no risk is involved. However, many farmers have opted to be very conservative when it comes to applying new technology in farming processes. Hence, the last group, which can be described as “conservative”, prefer to stick to what they know best and rather maintain the status quo.

The bulk of the farmers just want to sit back to watch and wait to see if things work or not. They might acknowledge that the new idea is good but they want to stick to what they know best. We [farmers] do not always look at the long-term and bigger picture. Most of the farmers are all about survival. They are not very ready to adopt, which is also due to financial constraints (farmer’s organisation respondent).

Farmers' associations have advanced a number of reasons to account for some of the attitudes of farmers – especially commercial farmers – with regard to innovations. These include:

- Labour legislation: According to the farmers, the current legislation significantly discourages experimentation with new technology, as farmers are afraid of employing farm labourers whom they cannot in the long run afford to pay. Hence, they prefer to keep their current staff sizes and thus limit their capacity to try new technology or innovation that might require enlarging the workforce.
- Labour prices: Especially commercial farmers argue that current labour prices are too high when profit margins are taken into consideration. Because South African agricultural markets have been opened to competitors from Australia, New Zealand and even Latin America, turnovers have become smaller and smaller. Farmers only manage to break even. Most thus cannot afford to bring in more labour and new technologies – even if the labour policies were much better.
- Limited cash flows on farms and in rural areas: With the shrinking size of the agricultural sector, the rural areas are becoming less economically active. This limits the supply of and the circulation of money. This in turn reduces available venture capital, a fact that characterises less favoured regions and one which furthermore greatly affects knowledge transfer.

In line with the above arguments, Arocena and Sutz (2010:8) maintain that the propensity towards demanding new knowledge depends on the perceived rewards attached to finding solutions to unsolved or as yet not fully solved problems. Such rewards need to be sufficiently attractive to overcome inertia and the reluctance to incur the different costs related to knowledge demand. The majority of white commercial farmers have not, at the individual level, perceived enough reward related to knowledge demand.

For black emerging farmers, one of the key aspects affecting demand for knowledge is the lack of institutional preparedness. One of the studies that have assessed the training process of black farmers (Maphalla & Salman, 2002) reveals that there is inadequate investment in training facilities and that this limits training opportunities. The weak educational infrastructure not only 'demotivates' emerging farmers but also limits the skills they are able to acquire from the training facilities. Interviews with black emerging farmers show that there is a lack of adequate funding for them to obtain the kind of training they would like and

sometimes it limits the effectiveness of their farming in that they do not have adequate management and practical skills to ensure maximum output:

We do not have the right facilities to train ourselves in the different aspects of the farm. Sometimes fees and other demands make that we cannot get all the training we need and then our farms have to suffer. If the government could help with some of these training schools, we think that it could help improve our business (Maphalla & Salman, 2002).

The process of knowledge transfer is not only subject to the production of knowledge but also to the perceptions of farmers and entrepreneurs regarding the benefits to be gained from such knowledge and from the process of acquiring and applying the new knowledge. Rodrick (2007:10) posits the following:

Innovation in the developing world is constrained not on the supply side but on the demand side. That is, it is not the lack of scientists or trained engineers, absence of research and development labs or inadequate protection of intellectual property that restricts the innovations that are needed to restructure low-income countries. Innovation is undercut instead by lack of demand from its potential users in the real economy – the entrepreneurs. And the innovation is low in turn because entrepreneurs perceive new activities to be of low profitability.

Innovation is thus not only about the presence/absence of new knowledge but also about the willingness to engage with this new knowledge. This also relates to the entrepreneurial culture of the region and its knowledge users. An absence of entrepreneurial culture in many ways inhibits the quest for and application of new knowledge. For black emerging farmers, the demand of knowledge is a function of the availability of the basic infrastructure necessary to make sense of the knowledge obtained. In the absence of basic structures, the process of knowledge transfer becomes not only hampered but altogether unsustainable.

7.3.5 Source of research funding and venture capital

The literature provides significant evidence that a positive link exists between availability of venture capital, research funding and knowledge transfer. Studies by Wright et al. (2006) reinforce the notion that the availability of venture capital makes a significant statistical difference in knowledge transfer, especially via spin-offs. The entrepreneurial orientation of an institution, proxied by the percentage of its funding derived from industry, also determines how much interaction occurs between academics and industry and thus how much knowledge can be transferred (Di Gregorio & Shane, 2003). Two issues are discussed in this section: the

sources of research funding and the extent to which venture capital is perceived to affect knowledge demand.

7.3.5.1 Venture capital

The literature identifies the availability of venture capital as a key factor in the process of knowledge transfer in most developed and successful regions. Venture capital allows spin-offs to be generated and incubators to be developed. These incubators will serve as sites for the development of ideas that can later be used by the capitalists (Bearse, 1998; Etzkowitz et al., 2000). The absence of available venture capital at the regional and even the national level has been identified as a key factor affecting knowledge transfer in the Free State Province. A respondent at the knowledge transfer office at the UFS explained:

If I have a technology, I have to travel to Johannesburg or Cape Town or even Durban. These are the areas I have to visit and engage with for any kind of technology we have. Big business sits in Gauteng and other places. As a whole, South Africa lacks venture capital – even more so the Free State Province.

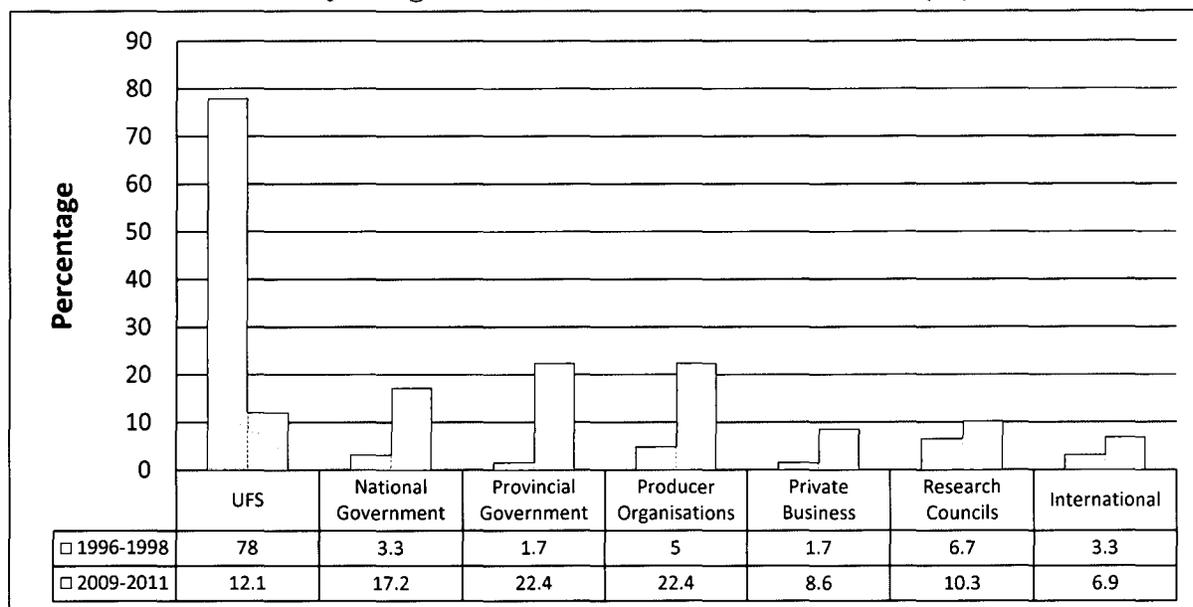
From the previous chapter, Figure 6.6 indicated that all of the start-ups from the departments have been at the national level and that the majority of the collaboration with industry has also been at the national level. Figure 6.6 further reveals that, while only about 15% of academics collaborate with industry in the supervision of Masters' and Doctoral theses at the regional level, close to 50% of all academics do collaborate at the national level. This can also be related to the limited economic base of industry in the Free State Province, which also limits the amount of venture capital and thus the amount of technology transferred at the regional level.

Nevertheless, it can be argued that, given the economic base of the province and the kind of knowledge needs identified in Section 7.2, the role of venture capital cannot have the same effect on knowledge transfer as in more advanced regions with different industrial structures such as in the fields of information and communication technologies, nanotechnology or engineering. Brennenraedts et al., (2006) support previous studies in arguing that sectors are important in understanding knowledge-transfer policies and practice.

7.3.5.2 Source of funding

Faculty reports provide an indication of the main research funders. Figure 7.8 provides an analysis of the main sources of third-stream income as captured from faculty reports.

Figure 7.8: Source of research funding for consultancy research reports completed by the Faculty of Agriculture, 1996–1998 and 2009–2011 (%)



Source: UFS, 1996; 1997; 1998; 2009; 2010; 2011

Two conclusions on the level of regional demand can be reached on the strength of the data reflected in Figure 7.8. Firstly, it can be observed that during the 1990s most of the consultancy projects were obtained via the university's direct relationship with other stakeholders. However, during this era, the university was not only faced with increased financial challenges but there was also a drive towards entrepreneurship. Yet, regional and national government linkages remained weak, with the main engagement with producer organisations occurring at the national level. However, along with the drive towards increased national and international engagement, there has been a significant decline in university-funded research and academics became more engaged and have established national, provincial and even international linkages. However, most of engagement has been with organisations outside of the province, and provincial linkages have accounted for only 22.4% of all linkages. While this indicates limited venture capital, it supports arguments for an engaging institution.

This trend has earlier been observed in the literature by Benneworth and Hoesper (2008:87): “[I]ncreased marketisation, global competition, standardisation and privatisation have encourage universities to focus their external engagement upon economically rewarding collaborations... reorganising financially and institutionally to best work with rich and well-configured external partners”. What remains interesting – as will be further discussed in later sections – is to question the implications for less favoured regions that have poorly-configured external partners who offer less ‘rewarding collaborations’.

Furthermore, the Lengau Centre observed that funding had been a major obstacle to the adequate training of farmers. However, the coordinator of the newly established Free State Regional Innovation Forum maintained that venture capital for innovation had not been the main hindrance to innovation and knowledge transfer in the province. According to him, there were a good number of potential innovation funders in the province – such as the Free State Development Corporation, the Industrial Development Corporation, the National Empowerment Fund, the Small Enterprise Development Agency, the Bloemfontein Chamber of Commerce and Industry and even the universities themselves. He rather thought that there were not enough ‘venture ideas’ in the province. He further argued that, especially given the province’s weak industrial nature, “[N]ot everything in innovation needs to be commercialised. I personally think innovation can take one of three forms ...” (Regional Innovation Forum, 2013)

These three forms are:

- Manufacturing: businesses will provide funding through venture capital;
- Community development (social responsibility): funds can be generated through trust and foundations; and
- Government service delivery: government departments and treasury.

This indicates that, in less favoured regions, innovation will have to look beyond the traditional processes and channels of innovation to more context-specific issues. Social innovation could attract more funding for socially relevant projects related to social development and government processes (service delivery). Thus, while less favoured regions might not have access or be exposed to the same levels of industrial venture capital that universities and regions in more successful regions may experience, the findings reveal that there could be more funding for development activities relevant to the sociocultural and

political aspects of the region. However, regional actors will have to identify and develop 'venture ideas' that will be capable of attracting this capital.

7.3.6 Institutional thickness between stakeholders

This final section on the demand factors investigates the nature of the relationship between different stakeholders in the agricultural sector in the Free State Province. Institutional thickness, according to Amin and Thrift (1995), refers to the "ensemble of local conditions favourable for economic growth" (in Coulson & Ferrario, 2007:593). Based on the notion of institutional thickness as a condition for effective knowledge transfer in learning regions, data analysis revealed a number of salient attributes in the relationships between local stakeholders and how these affect growth in the agricultural sector. Section 7.3.6.1 presents findings on the nature of the relationship between agricultural sectors. These findings are informed by two indicators: the types of support structures and the level of unity and feeling of common purpose.

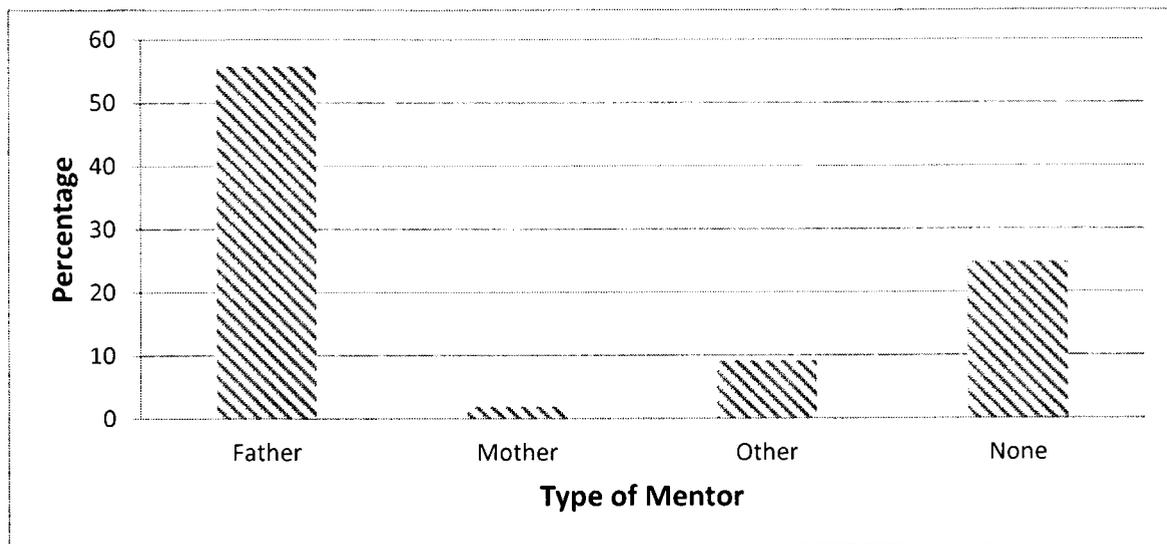
7.3.6.1 Knowledge support structures

Interviews with white commercial farmers revealed that most white farmers generally have their own support networks from which they obtain knowledge, skills and new technology that do not necessarily come from the university. As evidenced by the following excerpt, the family has traditionally been a major support structure in the training, knowledge acquisition and sustenance of white commercial farmers. One of the farmers stated the following:

I am not a member in any organisation. Basically [I got my knowledge] from agricultural magazines and I did my own research in libraries. My father was an accountant but he was also interested in farming, as he came from a background of farming. My father supported me financially and he provided me with the land.

Further evidence in support of this trend (see Figure 7.9 below) comes from a survey conducted among commercial farmers, which indicated that close to 60% of the farmers had benefited from mentoring from someone within their families, with the bulk coming from their fathers and only 2% from their mothers (AgriSA Commercial Farmers Survey, n.d.). Only about 10% of the farmers had been mentored by academics and by other mentors outside the family circle; about 25% had not received any form of mentoring.

Figure 7.9: Source of mentoring for commercial farmers in the Free State (%)



Source: Free State Agriculture, n.d.

In a study of commonage farmers in the southern Free State Province of South Africa, Atkinson (2007b) observed that commonage farmers significantly lacked the required knowledge skills to be able to maximise outputs. The study observed that compared with the mentoring relationships that exist among white commercial farmers; small farmers do not have such ties and networks of knowledge-sharing and -transfer. They are more dependent on the Department of Agriculture and on extension officers. However, most of the departments are understaffed or based at offices long distances away from small towns, while many extension officers themselves have fairly low levels of knowledge and experience (Atkinson, 2007b:720).

This kind of knowledge transfer has also been evident among small-scale farmers in the region. In a study of goat farmers in the Northern Cape, Burgess (2009) observed that about 25% of farmers learnt bookkeeping practices from their parents, with only 14% reporting having learnt through formal training. What was also interesting from her study was that about 16% of the emerging small farmers learnt from commercial farmers and another 16% learnt from other small-scale farmers, making a total of 32% who learnt from fellow farmers. According to Peacock (2007:9), “this farmer-to-farmer transfer of information (knowledge) is used by non-governmental organisations like FARM Africa in other developing countries” to enhance knowledge transfer.

Evidently, as observed in the current study, support structures for black emerging farmers remain a major challenge to effective knowledge transfer. There is a clear need for ongoing farming mentorship. Atkinson (2007b:721) asserts that "such an arrangement, possibly with carefully selected neighbouring commercial farmers, will add greatly to commonage users' knowledge base". However, for this arrangement to be achieved there is first a need to break historical legacies of distrust and then to build bridges of trust and mutual benefit as proposed by the learning region concept.

7.3.6.3 Feelings of mistrust and division within and between farmer groups

Another indicator of institutional thickness that emerged from the data concerned awareness among the different stakeholders of being engaged in a common enterprise. Interviews indicated that here there seemed to be rifts between the various black emerging farmers' organisations. The white commercial farmers, on the other hand, tended to believe that the black farmers and also government policies were not committed to their (white commercial farmers') welfare. A representative of the NAFU observed that there was at that juncture inadequate transformation of the agricultural sector to ensure that black emergent farmers obtained the required skills:

I am looking critically at the processes whereby agriculture can be transformed in the country so it becomes business as usual, so that it impacts deep rural areas and subsistence farmers to meet the demands of the markets, promoting young [black] people to become agronomists, scientists or else the agricultural endowment will be seated in one area [white], which cannot respond to black agricultural space. Black farmers need capacitating to be able to provide the kind of products needed for the 21st century.

However, even among the black emergent farmers there have been a number of differences in the execution of initiatives aimed at improving the skills of emergent farmers. This was demonstrated by the splitting of the NAFU – at the provincial level – into two different organisations because of lack of ability to work together.

The other (political) NAFU is made up of people who are suffering from 'kwashiorkor', who cannot see beyond their nose to see the current context. It is people who want quick gains.

It is not driven by [a] transformation ethos but on [a] survival and maintenance motive. We need to move to a transformation motive. We need to have young people who have

studied with all the skills needed to produce products. We currently import so much.
(NAFU Respondent)

The usage of the notion of 'kwashiorkor', according to the NAFU representative, points to a lack of strategic orientation to policy and practical issues, which go beyond personal interest to benefit the entire black emergent farmer community. Unfortunately, an interview could not be arranged with members of the other faction. The argument however shows that, even within one sector (black emerging farmers), there is a sense of lack of collaboration. This enforces arguments for the need of agencies to ensure that the engagement gets to levels able to transform the entire industry so that it can respond to the needs of the whole society.

Similar feedback was obtained from the commercial farmers, even though it did not refer to intra-organisational dynamics but to the relationship between black farmers and society. Reflecting on current transformation policies in the agricultural sector, one of the white farmers maintained:

It's about targeting white farmers to get off the land. This is the same feeling for all white farmers, as it is an economic battle.

This signals a feeling of insecurity among one farmer group in the system, which limits trust and does not promote collaboration in that each person seems to survive at another's expense. Another member of a white farmers' organisation talking about the level of integration of black emerging or commercial farmers with white farmer associations observed:

There are social gatherings and meetings in which much knowledge is communicated. Farmers learn from farmers' days in which they share. We need the black farmers' extension workers to join. Unfortunately the meetings are in Afrikaans and the people [white farmers] do not want to speak in English. Unfortunately we haven't worked as well in bringing in the new black farmers in the organisations.

It was however observed that some of the farmers do generally speak in Afrikaans because they cannot express themselves well in English. Yet, by the same token one could argue that an inability to understand Afrikaans is a potential deterrent to effective communication and thus cooperation.

Agriforum is trying to forge a new kind of agriculture which has not been there. But unfortunately we get very superficial support from government. We have been speaking to Glen College and the college needs to play its role as an agricultural centre. It needs to provide a critical intellectual ability to spearhead transformation in the country.

The coordinator of the recently created Free State Regional Innovation Forum observed that the process of innovation went beyond the available skills and knowledge. He contended that a crucial aspect was the ability to break mistrust and build synergy between the various stakeholders. Referring to one of the major knowledge providers in the province, he stated:

When we started they were on the back foot with many questions [of a suspicious nature] and we had to draw close to them, meet with them in a neutral venue and answer most of their questions. And you can see, mistrust [was] broken down slowly and trust [was] being built. And then you realise communication is only 20% verbal and 80% non-verbal. Trust is not something that is written on paper. It will have to be built.

Innovation is not only about the science and skills; an important aspect of innovation is the skill to bring people together. Set them at ease and let them feel secure as well as their ideas feel protected.

A key finding is that there has been limited coordinated system of communication between the UFS and the region regarding the specific needs of the farmers. Given that a plethora of stakeholders in the agriculture sector each have conflicting needs, it would be fair to say that the university as a knowledge provider does not get a clear and emphatic message regarding the relevant needs of the sector. This lack of coordination, limits the kind of knowledge that is produced for the region. This further highlights the weakness of less favoured regions because "in strong and dynamic regions, there are often well-developed private sector networks that are plugged into higher education and articulated through chambers of commerce" (Goddard & Puukka, 2010:395).

7.4 Conclusion

The demand side of knowledge transfer in the case study area has been found to be characterised by a number of properties. These findings can be described at three broad levels. The first level relates to the nature of the demand; the second relates to the kind of response from the faculty and the third level relates to some key factors that have affected the demand for knowledge and the capacity of the agricultural sector to reap maximum benefit from the knowledge being produced by the Faculty of Agriculture.

The nature of the demand can be described in terms of how demand is articulated. The analysis in Section 7.2 describes the demand as originating at three levels: at the level of agricultural business, at the national and regional policy levels and at the provincial level. While the level of coordination between these three levels of demand cannot be adequately demonstrated here, there is, nevertheless, evidence of the complementary yet conflicting aspects of demand. This, in many ways, does not communicate a clear message to the knowledge producers as to either the key research areas or the knowledge priorities at specific points in time. For example, while the government seeks, via national policies, to ensure social equality in farmer distribution by ensuring that more black emerging farmers are successfully assimilated into the agricultural mainstream, agribusiness is more bent on ensuring viable, value-added agriculture, while focusing less on the social aspects of the sector. There is thus a need for a more coordinated system across the three levels of demand and also a better system of communication by means of which the UFS may communicate with knowledge producers especially at the regional or the provincial level. This would minimise the impact of time frames and priorities that have been identified as main factors affecting knowledge transfer.

Secondly, at the level of the UFS's response to demand through its knowledge outputs of teaching, research and community engagement, there is significant evidence of a shift by the faculty towards meeting the changing needs of the agricultural sector. This was evident both in the new kinds of undergraduate and postgraduate training programmes that were offered and in a shift regarding research focus areas so as to reflect relevant areas of knowledge needs. A major shift was the move towards increased breeding and animal products with a corresponding decrease in the focus on crops. The faculty is however just now beginning to respond to the needs of the emerging farmers, especially in the form of the training of and support to extension workers. Though there has been a perceived weakness in respect of support to emergent farmers through teaching and research, the creation of the agricultural farms, especially the Lengau Farm, has been an indication of a major response to the needs of black emergent farmers. It has nevertheless been observed that the activities of the farm have not yet been adequately integrated in the curriculum to ensure its maximum contribution to scholarship, while also ensuring that the emergent farmers are not left out of the knowledge mainstream – one that has up to now largely been limited to white commercial farmers.

The third main conclusion relates to the factors affecting adequate knowledge demand and absorption. Of the six factors identified from the data, three key aspects are especially

important to less favoured regions. Firstly, there is need for a united, collaborating sector that is able to forge the appropriate avenue through which demands can be channelled to the UFS and to other knowledge-producing organisations. As mentioned in the data analysis, this would depend on significant levels of trust, formal and informal networks and a sense of mutual benefits being derived from a common endeavour. Secondly, the analysis of interview data further reveals that commercial farmers generally have a weak perception of the value of knowledge in enhancing output. Thirdly, because the province has a weak human capital and research base, farmers tend to demand their knowledge from national farmers' organisations. This in many ways continues to limit the amount and quality of research and knowledge production at the provincial or the regional level. There is thus a need not only for incentive structures aimed to attract and retain knowledge workers, but also for skills and for the research and development required to support the transition to a knowledge economy. Finally, the UFS is producing knowledge, knowledge that is relevant. Yet, there is a need for an appropriate mix of demand factors and supply factors so as to ensure that knowledge is effectively transferred from the departments to the various knowledge users. Especially in a less favoured region, systems of trust, collaboration, networks and coordination are needed to ensure a mutually rewarding partnership for sustainable regional socio-economic development.

CHAPTER EIGHT

SUMMARY OF STUDY, IMPLICATIONS OF FINDINGS AND CONCLUSION

The man who has the time, the discrimination, and the sagacity to collect and comprehend the principal facts and the man who must act upon them must draw near to one another and feel that they are engaged in a common enterprise.

Woodrow Wilson, 1856–1924

8.1 Introduction

This study has built on the recent plethora of studies on the role of universities in regional and national development, as discussed in the literature review section (Chapter Two). The study set out to fill two gaps. The first relates to the limited number of studies from developing economies in general and especially from less favoured regions. The second identified gap concerns the limited application of the learning region concept in knowledge transfer studies. Using the theoretical concepts from the learning region concept, the present study aimed to contribute to academic scholarship by focussing specifically on a less favoured region. While most research has hitherto been econometric – with a focus on universities' economic impact (backward linkages) such as spending, jobs and infrastructure (Felsenstein, 1996; Keane & Allison, 1999) – this study has sought to understand the contribution of the UFS to the development of its region principally through knowledge creation and transfer (forward linkages) by the Faculty of Agriculture.

As postulated in Chapter One, the main aim of the study was to provide a theoretical understanding of the process of knowledge transfer from the Faculty of Agriculture at the UFS to the main regional stakeholders. Using the demand and supply conceptual framework as set out in Chapter Three, the study provided an analysis of the key factors that affect the transfer of knowledge from the university to the region. The study employed a qualitative approach, enriched by quantitative data from a range of sources. Primary data were collected by means of interviews with academics, senior management at the university and also from agriculture stakeholders in the Free State. Data collection focused on the perceptions of respondents regarding the process of knowledge engagement between academics and the regional agricultural stakeholders. Quantitative data were collected from faculty reports, institutional data and from five of the six agricultural districts in the province.

Further important data review of national and institutional policies (Chapter Four). The latter chapter provided a detailed overview of higher education and knowledge and development policies at the national level, and how the role of knowledge was articulated for national- and regional-level development. In Chapter Five, the policy analysis focused more specifically on the provincial and institutional levels. Key documents reviewed included the UFS Strategic Plan, the Knowledge Commercialisation Policy and the Community Service Policy. At the provincial level, the FSGDS and the OECD Review Report of the Free State Province were subjected to scrutiny. Chapter Six and Chapter Seven respectively reported on the empirical findings from a supply- and demand-side perspective.

This chapter provides a summary of the key findings and discusses the implications of the study for higher education institutions (UFS), regional stakeholders and theory (see Table 8.1).

Table 8.1: Summary of main research questions and the various chapters they were addressed in the thesis

	Research question	Chapter Answered
1	How has the relationship between universities and their regions evolved in the broader development discourse?	Chapter Two
2	From policy and practice, how has knowledge transfer been conceived in more successful economies?	Chapter Two and Chapter Three
3	What are the main aspects of the learning region concept that aid one's understanding of regional development and how does the concept relate to less favoured regions?	Chapter Three
4	What has the relationship between knowledge and development been as described in national, provincial and institutional policies?	Chapter Four and Chapter Five
5	How have research and knowledge specialisation evolved over the years? What has informed any changes?	Chapter Five, Chapter Six, Chapter Seven
6	What have hitherto been the main channels of knowledge transfer from the departments?	Chapter Six
7	How has the university 'third mission' been developed and implemented?	Chapter Five and Chapter Six
8	What factors have influenced knowledge demand and knowledge supply from the Faculty of Agriculture to the regional stakeholders?	Chapter Four, Chapter Five, Chapter Six, Chapter Seven
9	What are the implications for effective knowledge transfer in less favoured regions?	Chapter Seven, Chapter Eight

8.2 Summary of key findings

8.2.1 Significant policy misalignment

In Chapter Five, it was observed that limited linkage structures exist between the regional development policies and higher education institutional policy regarding the role of knowledge and learning. While the FSGDS mentions the role of universities and higher education institutions in enhancing regional development, there is very little emphasis placed on the role of the UFS and the Faculty of Agriculture towards ensuring agricultural beneficiation, in training of farmers or of extension workers, or on collaborating actively with the major stakeholders in the sector. Although some of these factors may well be embedded in the plan, the lack of a direct reflection on the role of the universities in the region and the limited reference to the importance of “knowledge” for regional development are serious omissions.

Furthermore, while the NDP states that higher education institutions must integrate their regional context into their functions of teaching and research, the UFS Strategic Plan is conspicuously silent on the regional context. The strategic plan moves from internal human and academic transformation to gaining national and international recognition, with little emphasis on the regional context. This reveals a lack of synergy between the national policy, regional political agents and university management.

8.2.2 Nature of the university

As observed in Chapter Three, one of the main factors affecting knowledge in more successful regions is the nature of the university (and its history). The research in this thesis supports previous studies that found the specific nature of the university to be a key factor in informing the type of knowledge produced and how that knowledge is transferred. Evidence from the analysis reveals that the UFS was established as a national university with a traditional university ethos. This national orientation has shaped the nature of engagement away from a regional focus and towards a more national emphasis. The current strategic plan further emphasises research intensiveness and a drive towards internationalisation and global competitiveness. This trend is apparent in a shift by academics to publications in international journals and attending international conferences, with a proportionate decline in regional-related outputs. While this drive probably enhanced the university’s international image, provided a platform to attract top academics and postgraduate students, and improved the

quality of research (which might in itself have significant regional benefits) there has however been only limited emphasis on knowledge produced for regional stakeholders.

Furthermore, the Faculty of Agriculture at the UFS, in its drive to become a research-intensive institution, have, over the past ten years, focused more specifically on scientific research publications at the national and the international levels. This resonates with previous studies that point out that research-intensive universities seek to excel in research and knowledge commercialisation at the national and the international level (Goddard & Puukka, 2010). However, the practice of regional engagement remains a major challenge particularly for “longer-established institutions organised around academic disciplines and along a supply-driven agenda” (Goddard & Puukka, 2010:395). This is also observed by Newlands (2003:9): “The conflict between meeting local needs and operation on a global scale is particularly acute for older, research oriented universities”. This has been particularly evident in the study of the UFS Faculty of Agriculture. The majority of academics in this faculty focus primarily on international and national knowledge outputs in the form of publications and research partnerships that have little regional interest. The regional focus has been steered through the establishment of centres such as the Centre for Disaster Management Training and Education Centre for Africa, Centre for Sustainable Agriculture and Centre for Environmental Management. These seek to increase third-stream income by responding to the skills, training and lifelong learning needs of the regional stakeholders through offering short courses and structured Master’s programmes. As discussed below, there were also some strong links between demand from the region and knowledge supply by the faculty

8.2.3 Attitude and disposition academics

The attitude of academics emerged as a major supply-side factor affecting knowledge transfer. Based on the analysis, three kinds of academics were identified: firstly, those who did not perceive engagement as an integral part of their functions and who would rather focus on teaching, research and publications. The second sets of academics were those who, though they perceived engagement as important, would only engage if some form of financial or other incentive was offered. The low levels of research on aspects in relation to black farmers could probably also be attributed to this tendency. The third set were those who engaged in knowledge transfer from a normative point of view. They believed that there are benefits to promoting, in one way or another, the development of their communities, the region and the nation.

This finding significantly aligns with previous research on the importance of academics' attitude in enhancing knowledge transfer. The history of the university – established as an instrument for reinforcing apartheid ideologies in 1904 and the faculty in the 1950s – enhanced its relationship with middleclass whites that could also be attributed to this “skewed” engagement in favour of white farmers.

8.2.4 ‘Distorted’ network structures for adequate demand and supply

A major finding is the presence of some form of institutional thickness that has been described in this study as ‘distorted embeddedness’. While a strong network exists between mainly white academics and white commercial farmers, this network has not been broadened to include black farmers, local governments and other stakeholders in the sector. A network of this kind can also be linked to the socio-political history of the university, the province and the country, one that limits the development not only of the emergent farmer sector but also further limits the level of collaboration within the agriculture sector in general and thus by extension limits the impact of the sector in the region. It remains important that more social ties be created to include all stakeholders, improve social embeddedness, enhance trust and support knowledge transfer.

While there is some level of collaboration between particular academics in departments, some agricultural organisations and also the provincial government, there still is no regional engagement platform that brings together all the major stakeholders and which is in line with the prescriptions of the learning region concept. What is lacking is the strong yet flexible kind of connectedness of regional actors who agree to a certain set of principles. Consequently, informal interactions are significantly lacking in the relationship between the university and its agricultural stakeholders.

Furthermore, the lack of adequate networks between stakeholders in the same sector and between sectors has resulted in the absence of an adequate demand structure. Chapter Seven has argued that there is a significant lack of a demand system between the various stakeholders in the region, while a number of respondents maintained that the time frames of university knowledge outputs are not in alignment with the needs of the knowledge users. Furthermore, the process of research conceptualisation usually does not take cognisance of those who are supposed to be the users of the knowledge that is produced. Alter (2005) describes this as creating “enabling platforms” that bring together community-based experience and academics in a relationship characterised by deep mutual understanding (Hart

et al., 2009:52). Chapter Seven shows that at the UFS there is a lack of coordination between knowledge demands of the region and knowledge supply by the university. There is no coordinated system by means of which the knowledge needs can be communicated to researchers, nor is there a funding structure to support funding for locally relevant research. This has been related to the history of governance at the provincial level, which is mainly a black-dominated governance structure operating in a white-dominated farming and academic sector.

8.2.5 Role of venture capital and incentive structures

Interviews with academics, especially those at the Technology Transfer Office, along with econometric analysis on the levels of employment in the region, has provided evidence that the lack of venture capital limits the amount and the quality of knowledge that can be transferred. The historically strong agricultural sector and the declining mining industry have not provided the threshold economic base that is necessary to attract more investment into the region. While the petrochemical sector, through the Sasol plant in the northern parts of the province, makes a significant contribution to the provincial GDP, there is limited direct economic impact from Sasol on the region. This weak industrial base and the historical alliance in the primary sector support neither knowledge demand nor its transfer.

On the other hand, through interviews with academics, the study revealed that there is a need to provide an adequate incentive and motivating structure to encourage academics to increase their engagement with their region. Interviews with academics regarding the current policy on knowledge commercialisation revealed that there is a perceived lack of adequate incentive structures in university promotion policies and also of financial incentives for generating third-stream income. Analysis of the interviews indicates a lack of intrinsic benefits for most academics to generate and share knowledge.

To summarise, the Faculty of Agriculture at the UFS, through its knowledge outputs, is contributing to regional development. However, because of a combination of demand and supply factors, and also the nature of the university and the regional context, the faculty's contribution is not embedded in a learning region approach. This limits both the broader impact and the sustainability of the contribution. Table 8.2 below is a summary of the main findings.

Table 8.2: Summary of main findings

Main finding	Empirical evidence	Conclusion
Limited policy alignment towards knowledge transfer	National, regional and institutional policies fail to emphasise the role of the UFS and knowledge in regional development. The UFS currently emphasises engagement and relevance at the national and the international level. This drive towards international competitiveness has constrained regional efforts.	- As in most traditional universities, the UFS has a relatively narrow view of its role in regional development.
Nature and history of university	The UFS was established as a traditional university with strong nationalistic attributes in alignment with apartheid ideologies. This historical context has since limited engagement with the predominantly black government and emerging farmers via mainstream academic paths. However, academics continue to have good formal and informal relationships with white commercial farmers.	- There is a tacit consensus that engagement at the regional level limits the national and international relevance of the university as it seeks to become research intensive.
Attitude of and disposition of academics	Academics will generally focus on the perceived core functions of teaching and research while placing less emphasis on community engagement and knowledge engagement. Engagement is generally considered a secondary activity and is most often done as a philanthropic activity with little or no scholarship of engagement. Academics are more disposed to engage in activities in which they perceive direct academic benefits. Of those who do indeed engage with the region, most engage with commercial white farmers who are able and willing to pay for consultancy projects.	- This narrow perception of development constrains engagement with external role players, and in many ways discourages regional development.
Distorted network structures and weak regional governance	<ul style="list-style-type: none"> - The knowledge infrastructure is weak and characterised by: limited number of other research institutions; low higher education enrolment; and, insufficient permanent academic staff as a percentage of the population when compared with other regions. - Collaboration with other stakeholders remains weak. - Most role players are still held in institutional lock-ins caused by historical social and racial divisions. - Networks are mostly formal with limited 'informality' on which trust can be built. - Black emergent farmers continue to lack support structures and networks through which to develop and gain new knowledge. - There is growing collaboration between AFASA and Free State Agriculture, but issues of trust continue to challenge the engagement. - The nature of the provincial governance framework has not enhanced engagement between the different stakeholders. The recently established Regional Innovation Forum is attempting to address this limitation. - The provincial government seems rather to be aligning itself with national imperatives, which gives it a limited regional mandate. - The above issues tend to limit and weaken knowledge demand structures. Only about 10% of commercial farmers (the 'innovators') are willing and able to pay for new knowledge. 	<ul style="list-style-type: none"> - The Free State Province is a typical example of a less favoured region. - While the agricultural sector continues to face challenges on different fronts (climate, policies, etc.), the weak institutional thickness between the different role players limits potential levels of innovation in the sector. - The learning region principles need to be applied so as to address path dependency and lock-ins in the sector. - Study supports previous studies which revealed weak regionally embedded governance structures which do not support either interactive learning or the development of a learning region.
Limited incentive structures for academics and a lack of venture capital	<ul style="list-style-type: none"> Academics perceive management as doing little to motivate them to engage in knowledge transfer at the regional level. The recent Policy on Knowledge Commercialisation is widely perceived as being overly controlling and demotivating. - Limited venture capital is linked to the weak industrial base. - The largest share of consultancy funding comes from national farmers' associations, research councils and government. There is limited funding from the province. 	<ul style="list-style-type: none"> - Need to balance motivation and control to ensure that all three functions of academia are fully met. - Venture capital relates also to the generally poor relationship existing between the UFS and its regional stakeholders.

Source: Author

8.3 Implications of findings

This section discusses the implications of the above findings for knowledge transfer in less favoured regions. Three implications have been identified and discussed below, implications for a research university, implications for regional stakeholders and implications for academic scholarship and theory.

8.3.1 Research-intensive universities and regional development

The role of universities in regional development continues to be a major policy issue in academic, governance and economic policy circles. Case studies from the West have increasingly called for universities to become more relevant to regional needs. However, universities continue to function as “loosely-coupled complex, contradictory and internally fragmented institutions” (see Pinheiro, 2012:2) with the different parts that go to make up the whole coexisting in a relationship characterised by continuous tension.

A few pointers can be given as to the kind of relationship a research-intensive university should have with its immediate and extended region. Firstly, the role of a research-intensive university in a metropolitan area and that of a similar kind of university in a rural or sub-urban area cannot be the same. This also applies to regions of high industrial infrastructure and activities, in contrast to those situated in a weak industrial base or a less favoured region. Slaughter and Rhoades (2008:47) suggest the following:

We must imagine a new university with organizational structures, incentives, and rewards for the kind of society we want and then create the new circuits of knowledge, interstitial organizations and intermediating networks to achieve it.

Secondly, the study supports arguments that seek to dismiss the simplistic and pessimistic thinking that “regional engagement will automatically provoke the ruin of academia” (Rodrigues, 2009:3625). The university/regional engagement nexus does not present an either or situation in which academics who engage at the regional level do not have the national and international drive required to produce excellent scholarship. In fact, it rather supports previous arguments (OECD, 2007; Rodrigues, 2009) that, especially in less favoured regions, academics could still gain international recognition while doing valuable co-operative work within their region.

Furthermore, because the region has a weak industrial base, there has been little concrete evidence of transfer of commercial knowledge to the region. The present study agrees with previous research that has suggested that research-intensive universities will have to approach knowledge transfer and innovation policies differently. In view of the discrepancies between demand and supply factors, universities will have to break the vicious circle and widen the scope of innovation policies so as to include social innovation. Policies of this kind will ensure inclusive development and improve the well-being of the most deprived part of the population, particularly those who are in less favoured and lagging regions. These 'off-the-radar' problems have not been addressed by modern, traditional science, partly because of commercial reasons, but it could go a long way towards addressing developmental issues in such regions.

This approach relates to the notion of an engaged university. It describes a university culture that develops an approach more responsive to regional needs. This responsiveness, so Uyarra (2008:14) asserts, "implies a greater alignment between the different university functions and regional development trajectories ... embedded in all the key functions: promoting social inclusion and mobility, providing a base for skills development and stimulating innovation through basic scientific research". Chatterton and Goddard (2000:475) contend that "[T]he emerging regional development agenda can be argued to require engagement to be formally recognised as a 'third role' for universities and colleges, not only sitting alongside but fully integrated with mainstream teaching and research".

The notion of academic universalism continues to hold true even in less favoured regions. No matter where academics find themselves, they are influenced by the same drive to produce and publish knowledge and to disseminate it in international journals, at conferences and through other outlets as do their peers across the globe. While the UFS has made significant strides in contributing to regional development through its teaching and research outputs, and has moreover established training centres for emergent farmers, this 'third role' has not been institutionalised in the culture and mission of the university and the faculty. Especially in a less favoured region, and as the university has the potential to be a major player in forging a developmental pathway for the region, the UFS will have to align itself more effectively with the emerging regional development agenda. For this to be achieved, the regional/institutional context will need to be addressed.

8.3.2 Implications for regional stakeholders

As observed in the analysis of demand aspects (Chapter Seven), one of the key aspects affecting knowledge transfer is the lack of a system to ensure that there is adequate coordination between academics and the potential knowledge users – such as the provincial government, farmers' organisations and unions and the farmers themselves. This relates to weak regional coordination. The study revealed that innovation and knowledge have not been positioned as strategic pillars for regional development in the province. The emphasis is still on skills training and development rather than on knowledge and innovation.

In more successful regions, as the United Kingdom and other European regions, regional development agencies have played crucial roles in enhancing the contribution of universities to regional development. This has mainly been through the promotion of university-industry and government links. Uyarra (2008:12-13) foresees that “[R]egional innovation support partnerships would then encompass wider networks of regional actors such as Technology Transfer Offices, science parks, regional development agencies, public research labs, and other intermediary organisations”. This will enhance inter-organisational learning, build trust and ultimately provide a positive framework for development.

With the recent establishment of the Regional Innovation Forum for the Free State that is currently being hosted in the nearby CUT, it will be important that development needs and issues be co-ordinated and that a proper forum be created for channelling the needs and issues to the relevant knowledge producers. This would inform the process of research for both academics and for postgraduate students who are themselves also a major source of knowledge outputs. This type of forum is needed to bridge the gap between the dual farming systems and to bring together white commercial farmers and black emergent farmers in a mutually beneficial framework. Each will have to make an effort to break away from the relics of past socio-political lock-ins and begin to forge new kinds of partnerships based on trust and that aim to enhance learning and ‘unlearning’.

8.3.3 Implications for theoretical consideration

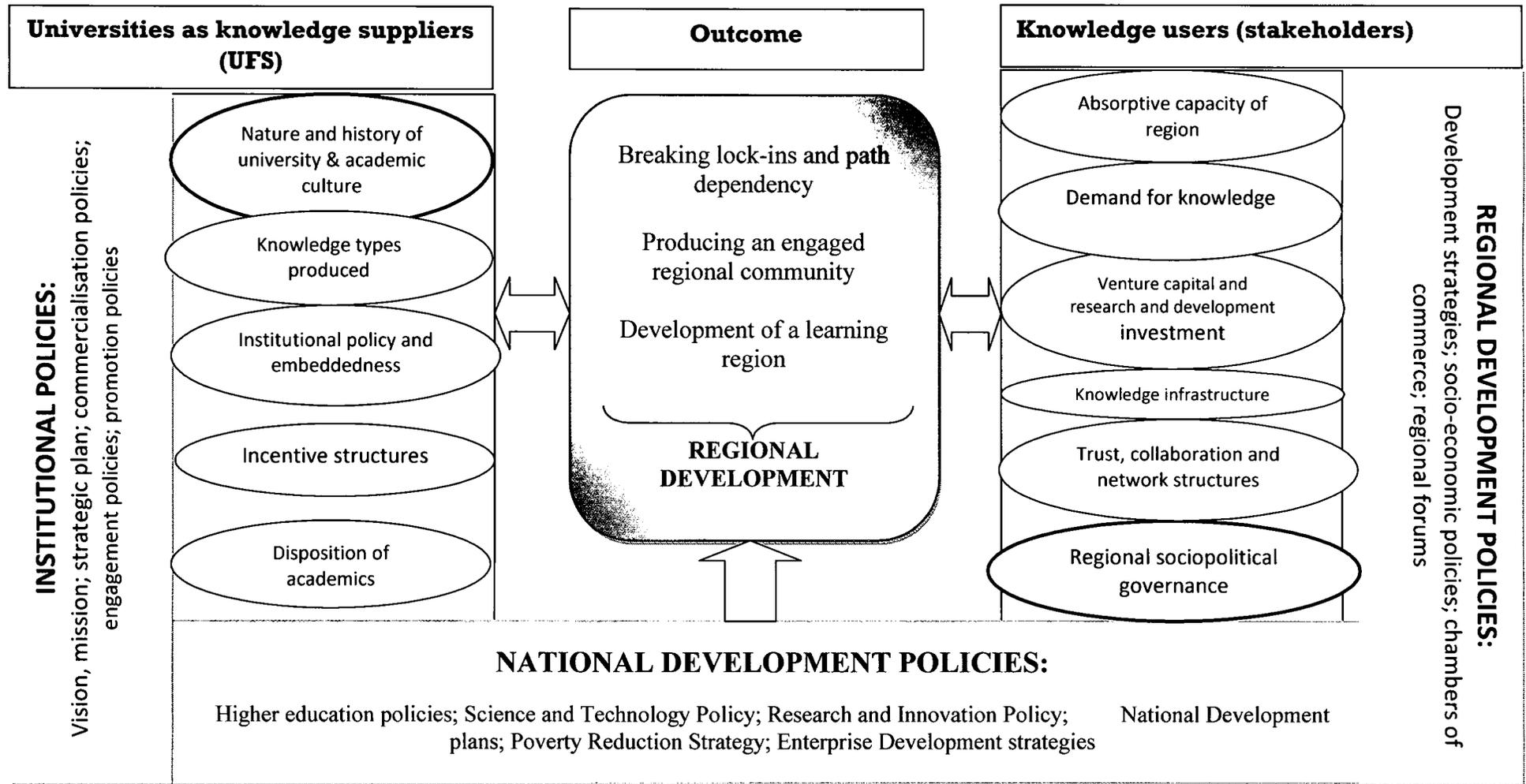
The study has in many ways served to support the broad theoretical discourse that, higher education institutions do contribute to regional development through forward linkages, even in less favoured regions. This has been demonstrated by the main channels of knowledge production, namely teaching, research and community engagement. Being one of the few studies on the African continent and the region to investigate the role of higher education

institutions and their contribution to regional development, the study has shown that universities do contribute to their regions' growth and transformation.

The study makes two significant contributions to scholarship. Analysis of the primary data, interviews and policy documents have revealed that the process of regional development in the Free State Province, viewed from the perspective of the learning region approach, is plagued by numerous lock-ins. There exist "cultures, economic structures and institutional arrangements which act as barriers to economic success" (Linders et al., 2005 in Benneworth, 2006:2). Furthermore, while these institutional challenges in former industrial regions in the West develop mainly from *functional* lock-ins, the experience in the Free State Province is primarily a *political* lock-in that has its origins in the historical events and relationships of the apartheid era.

These lock-ins have resulted in some form of path dependency in the relationship between academics and farmers and also those between academics and other regional. *Path dependency* is described as the "fact that future developments of a system (region) depend on its current characteristics and past events that influence development today. This means that decisions, events, circumstances, knowledge and skills affect the probability of future events to occur" (Brekker, 2012:4). This study has further furnished evidence that path dependency and lock-ins can be broken by the application of the constructs of the learning region concept. As described by the OECD (2001:24), such regions are "characterised by regional institutions, which facilitate individual and organisational learning through the coordination of flexible networks of economic and political agents". The framework applies learning region concepts within the demand/supply analytical model to argue that the synergy between universities as knowledge producers and regional stakeholders is important for regional development.

Figure 8.1: Framework for enhancing knowledge transfer in less favoured region



Source: Author (2013)

8.4 Limitations of the study

Because of data-collection challenges at the regional and the national level, some of the quantitative data are not as recent as would be desired, but the data do provide a broad understanding of the main issues presented.

At the theoretical level, there have been only a limited number of studies using the learning region concept. This was found to be a challenge in addressing the theoretical gaps in the present study. This has however also proven to be a key contribution of the study in that the findings of this study go a long way towards strengthening arguments in favour of using the learning region concept to address the role of knowledge in less favoured regions in which diverse forms of lock-ins and path dependencies are found.

At the methodological level, the collection of primary data through interviews was done prior to the collection and analysis of secondary data (key policy documents and quantitative data). This resulted in a number of gaps, a shortcoming that should be addressed in future research.

Furthermore, some difficulties were encountered in the data-collection process. Response rates were generally low and another major challenge related to communicating with most of the farmers who were fluent in their home languages (either Afrikaans or Sesotho), while the researcher was only able to communicate in English. Hence, some of the interviews showed evidence of poor grammatical construction, which could hamper the interpretation and understanding of what the respondents were attempting to communicate.

Both limited financial resources and time constraints prevented the researcher from travelling extensively in the province. Hence the majority of the respondents were in the immediate vicinity of Bloemfontein.

The absence of tracer studies at the Faculty of Agriculture and at the university in general was a key limitation in respect of analysis of the regional contribution of the faculty to regional development through its human capital production. Tracer studies facilitate the tracking of former graduates and alumni and thus provide evidence of the regional footprint of the university and of the Faculty of Agriculture. The UFS should in future undertake such studies.

8.5 Areas for further research

In the course of the present study a number of promising research avenues were identified. Firstly, it is important to carry out an econometric study to measure the socio-economic impact of the UFS on its immediate region (Bloemfontein) and on the province at large, by measuring direct and indirect indicators and also multiplier effects. This will enable the university to position itself at the regional or provincial level and could also stimulate more engagement among regional stakeholders.

Secondly, a number of structural changes have been taking place at the UFS during the past four to five years. These changes have, *inter alia*, sought to change the image of the university, attract better postgraduate students and attract more established academics. It will be important to carry out a similar study in the next couple of years to assess how much these changes have improved the processes of knowledge production and transfer. Such studies should focus not only on the attitudes of academics towards knowledge transfer but also on the destination of knowledge outputs.

Thirdly, the absence of tracer studies by the university has significantly limited the analysis and conclusions in this study. It is thus important that the university, through one of its academic or support units, should embark on a longitudinal tracer study to determine where the graduates from the university go once they have graduated.

Some of the academics who participated in this study reported getting informal feedback from previous students and farmers on the training received during formal graduate programmes or during short courses. The faculty should carry out a series of studies with key stakeholders to obtain feedback on various activities ranging from formal training in graduate programmes and the impact of such training on the professional life, short courses and even training and mentoring through community engagement. Such studies will assist the knowledge already available and would also serve to highlight 'blind-spot areas' for further research, policy and practice.

8.6 Concluding remarks

Both knowledge and universities have been recognised as crucial factors in regional development. Their contributions are felt either through economic aspects related to job creation or to regional GDP (backward linkages) or through the transfer of knowledge outputs they generate (forward linkages). This study has revealed that this transfer of knowledge is dependent

on numerous demand and supply factors related to the university and to the regional stakeholders. However, the successful transfer of knowledge depends on the quality of the interaction between these stakeholders. The application of the learning region concept enables us to enhance such interactions.

While the Free State Province still faces a number of challenges in ensuring such regional integration, the UFS has shown itself to be a major player in regional development. This contribution has been observed in the quantity and quality of knowledge outputs, (graduates, publications and training). However, to maximise this impact and for the UFS to become the 'engine for development', the university will have to redefine itself in the regional context, while the regional stakeholders will also have to position themselves for meaningful engagement. Only then, will universities, knowledge and innovation achieve their full potential in less favoured regions.

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APPENDIX 1

RESEARCH CLUSTER ON

SUSTAINABLE DEVELOPMENT AND POVERTY ALLEVIATION

Participant Information Sheet.

This research is being carried out by Mr. Samuel N. Fongwa as a requirement for a doctoral degree at the Centre for Development Support in the Faculty of Economic and Management Science at the University of the Free State.

Title of Research: Universities in Regional development: Knowledge transfer in a less Favoured Region.

Rationale of the study: The research has been motivated by a number of key reasons. Primary is the increasing role of knowledge in development discourse in the present knowledge economy. Hence the needs using a theoretical review the complex relationship that exists between universities as knowledge producers and regional development. Using the learning region concept as an analytical tool, the study further seeks to investigate the process of knowledge transfer in a less favoured region in South Africa. Key indicators have been identified from the literature and have been operationalised in a demand/supply framework.

Description of study. The study employs a case study design in the data collection and analysis. The faculty of Agriculture at the University of the Free State was chosen. However for comparative reason, a second case study, the Faculty of Science and Agriculture at the University of Fort Hare has been selected. Two main target groups of respondents have been identified. The first consist mainly of knowledge producers which are university researchers and secondly, knowledge users which include inter alia farmers, agriculture unions, related SMEs and local government departments. The respondents will be required to participate in a 45 to 60 minutes interview with questions which would have been communicated to them before-hand. You have been approached because you are considered a knowledge producer at the faculty or have been referred to by one who fits the criteria for participation and may be interested in the project themes.

Confidentiality: The confidentiality of every respondent in this research project will be highly respected all through the project and thereafter. A consent form will be attached to every questionnaire which will be signed before participation and which will not be made available to public upon thesis completion.

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Interview guide for Academics

1. Background Information

- a. What specific area of agriculture-related research is your research on?
- b. For how long have you been doing research at the UFS?
- c. As an academic/researcher do you find your working environment conducive? What area are you more interesting in (teaching, research, regional engagement)?
- d. Are you part of any research group(s)? If yes please can you explain the focus of the research?
- e. Are you part of any group actively engaging with farmers or non-academic organisation in the province – community engagement, or university extension services towards enhancing agriculture output? Please explain.

2. Knowledge production at the faculty/unit/Centre/School.

- f. What kind of knowledge does your research aim at? Basic, applied, consultancy
- g. How has research specialisation in the faculty developed over time?
- h. What have been the main drivers of your research specialisation? Mode 1 or Mode 2.
- i. Who do you consider stakeholders or interested parties to the knowledge you produce? Regional, national, local.
- j. How has teaching over the years been adapted to become more relevant to emerging student groups? Short courses, Lifelong Learning programmes, etc?
- k. How relevant is your research/knowledge produced to the different stakeholders. Farmers' versus students' needs?

3. Knowledge transfer

- l. What is your understanding of the notion of 'university knowledge/technology transfer'? What does it imply to you as a researcher?
- m. Is there any expectation from university management on academics/researchers to engage in knowledge transfer activities? How is that expressed (formal or informal)
- n. Do you think research from the department/centre/unit is relevant for local (provincial) agriculture industry? How?
- o. In your opinion how will you compare the amount of knowledge produced to that transferred to or applied by regional users? And who are the major users?
- p. And who usually initiates the transfer process? Can you describe a few cases?
- q. From a demand/supply (pull/push) perspective how will you describe the process of knowledge production and its transfer in the department/centre/unit so far?
- r. Do you think there is sufficient motivation for academics to engage with regional stakeholders in knowledge transfer? Please can you provide some examples?
- s. Are you a member of any form of partnerships, collaborations, innovation or community engagement between knowledge producers (researchers) and knowledge users (current and potential farmers/government/civil society)? Please explain.

- t. Do you think there is a demand for the knowledge you produce by regional stakeholders (farmers, government etc)? Please explain with an example.
- u. What do you consider the major factors affecting/enhancing knowledge transfer?
- v. Have any formal strategies been put in place to ensure these factors and enhance knowledge transfer? If yes, how successful have they been?
- w. Do you think informal structures (personal social links, relationships, networks and trust) provide better mechanisms for knowledge transfer? Provide a case example.
- x. How does the current university funding structure influence knowledge transfer / engagement with potential knowledge users?
- y. What do you consider the major challenges facing knowledge transfer at the department/centre/unit? How can these challenges be addressed?
- z. Finally, how will you assess the knowledge absorptive capacity of agriculture stakeholders in the region?

Final comments?

Interview Guide for Stakeholders

Background Information.

1. In what agriculture related sector do you work?
2. What does your organisation do?
(For private sector):
3. How many employees/workers do you have in your enterprise?
4. What is the average level of formal educational level?

Knowledge use by your organisation

5. Are you a member of an agricultural association or union? Do you need additional technical or scientific knowledge in improving performance or output? If yes what kind of knowledge would be useful?
6. Have you asked advice from any other institution towards improving performance or output? (e.g. university, consultants, private research agencies). What has been the experience so far?
7. Do you think your staff can effectively use new knowledge? Please explain.
8. Have you or your workers taken part in any form of short-courses or refresher courses to improve knowledge on the field and output? Which and why? Were they useful?
9. Have you used information or communications technologies to access information or data? (e.g. internet, subscriptions to electronic data-bases, on-line support systems, etc).
10. Are you prepared to provide funding to gain new knowledge for better output?
11. Have you had any relationships with the UFS? If so, has this contributed to your organisation's effectiveness?
12. Do you have any formal or informal relationship with any *other* research or knowledge producing institutions within or outside the province? Which and why? Has this been a useful relationship?
13. In your view, how can research assist the Free State to improve its agricultural performance? What research is needed by the agricultural sector as a whole?
14. Who can best provide such research? Who would pay for it?
15. What should be done to encourage this research, as well as dissemination? (What practical steps?)
16. How will you assess the level of responsiveness/engagement of the UFS Faculty of Agriculture and Natural Science towards agriculture related needs of farmers and province at large? Has it improved or deteriorated over time (decade or two).
17. Who should take the lead in improving knowledge production and dissemination in the Free State?

SUMMARY

We are just now perceiving that the university's invisible product, knowledge, may be the most powerful single element in our culture, affecting the rise and fall of professions, ... social classes, of regions and even of nations.

Clark Kerr, 1963:30

This dissertation is an exploratory study aimed at increasing the theoretical and empirical understanding of knowledge transfer from a university to its region. The study builds on the increased emphasis on the role of universities as 'engines' for development. By using the Faculty of Agriculture at the University of the Free State, South Africa as a case study, this study aimed to provide a nuanced understand of the factors affecting knowledge transfer between academics and stakeholders in a less favoured region.

By means of the learning region concept and supported by other empirical studies, key indicators were identified from the literature and were developed for investigation. A qualitative approach was followed to collect data from academics in the Faculty of Agriculture and from relevant stakeholders by means of semi-structured interviews and a detailed review of some key policy documents. Institutional data, farmer databases and an academic survey provided quantitative data with a view to facilitating the triangulation of data and the minimising of bias.

Findings from the study revealed that the process of knowledge transfer from the UFS was affected by a combination of demand and supply factors. Some of the factors affecting supply included the nature and the history of the UFS and the Faculty of Agriculture, adequate incentive structures, the level of policy alignment and the embeddedness of knowledge outputs from the faculty. Demand factors included the absorptive capacity of the region, the presence of coordinated demand systems and the nature of the networks that existed between stakeholders.

This thesis argues that because of institutional lock-ins in the region – that have led to path dependency in the practice of agriculture – knowledge from the faculty has failed to realise its potential in respect of contributing to regional development. While there is evidence of networks between farmers and academics, the network forms are 'distorted' and as yet strongly embedded along historical social and racial lines. There is also limited evidence of a properly institutionalised notion of engagement with emerging farmers and thus knowledge transfer continues to be path dependent.

The findings have implications for the UFS, for the faculty and for the region. While the UFS has defined itself as having both a national and an international agenda, the university will

consciously have to define its regional role and then have to establish structures for active engagement – not only broadly but also specifically with the agricultural sector. At the faculty level, engagement needs to be reconceptualised, with engagement moving from a philanthropic ethos to one that is part of the core function of teaching and learning. At the regional level, there is a need for the establishment of new forums in which the UFS and the different stakeholders may engage. More importantly, these initiatives will have to be built on trust, social capital and networks for collective benefits to result.

OPSOMMING

Hierdie proefskrif is 'n verkennende studie wat daarop gemik is om die teoretiese en empiriese begrip van kennisoordrag van 'n universiteit na die streek waarin dit geleë is, te verbeter. Hierdie studie bou voort op die toenemende klem op die rol van universiteite as 'ontwikkelingswerktuie'. Deur die Landbou Fakulteit aan die Universiteit van die Vrystaat, Suid-Afrika as gevallestudie te gebruik, het hierdie studie ten doel gehad 'n begrip van die faktore wat kennisoordrag tussen belanghebbendes en akademici in 'n minder begunstigde streek beïnvloed.

Sleutelindikatore is in die literatuur geïdentifiseer en met die oog op ondersoek ontwikkel deur middel van die konsep van die leerstreek en op grond van ander empiriese studies. 'n Kwalitatiewe benadering – aan die hand van semigestruktureerde onderhoude en 'n gedetailleerde oorsig van enkele deurslaggewende beleidsdokumente – is gevolg ten einde data van akademici in die Landbou Fakulteit en van relevante belanghebbendes te bekom. Kwantitatiewe data ten einde die triangulasie van data te fasiliteer en sydigheid te verminder, is verkry by wyse van institusionele data, databasisse aangaande boere en 'n akademiese opname.

Die bevindinge van die studie het aan die lig gebring dat die proses van kennisoordrag vanaf die UV deur 'n kombinasie van aanvraag- en voorsieningsfaktore beïnvloed is. Van die voorsieningsfaktore wat voorsiening beïnvloed, sluit in die aard en die geskiedenis van die UV en van die Landbou Fakulteit, toereikende insentiewestrukture, die vlak van beleidsgerigtheid en die verankertheid van kennisuitsette vanaf die fakulteit. Aanvraagfaktore was onder andere die absorpsievermoë van die streek, die teenwoordigheid van gekoördineerde aanvraagstelsels en die aard van die netwerke tussen belanghebbendes.

Die argument wat in hierdie proefskrif voorgehou word, is dat – as gevolg van die institusionele inperking (*lock-in*) wat in die streek voorkom en wat tot koersafhanklikheid (*path dependency*) in die landboupraktyk aanleiding gee – kennis vanaf die fakulteit nie daarin kon slaag om die potensiaal ten opsigte van streeksontwikkeling te laat realiser nie. Alhoewel daar aanduidings is van netwerke tussen boere en akademici, blyk hierdie netwerkvorme 'verwonge' te wees en tot dusver sterk veranker te wees in historiese en rassekontoe. Ook is daar weinig aanduidings van 'n behoorlik geïnstitusioneerde begrip van betrokkenheid by opkomende boere, met die gevolg dat kennisoordrag steeds koersafhanklik (*path dependent*) is.

Die bevindinge het implikasies vir die UV, vir die fakulteit en vir die streek. Alhoewel die UV volgens eie definisie oor sowel 'n nasionale as 'n internasionale agenda beskik, sal die universiteit sy streeksrol pertinent moet definieer en dan strukture vir aktiewe betrokkenheid

moet vestig – nie net in die algemeen nie, maar veral in die landbousektor. Op fakulteitsvlak sal betrokkenheid geherkonseptualiseer moet word, met betrokkenheid wat moet verskuif van 'n filantropiese etos na 'n etos wat deel is van die kernfunksie van onderrig en leer. Op streeksvlak is daar 'n behoefte aan die vestiging van nuwe forums vir die wisselwerking tussen die UV en die verskillende belanghebbendes. Belangriker egter is dat sodanige inisiatiewe op vertrou, sosiale kapitaal en netwerke gegrond moet wees met die oog op kollektiewe voordele.

